Academic Year 2024 Periodic Program Review

Department of Plant and Soil Sciences (PSS)
Martin-Gatton College of Agriculture, Food and Environment
University of Kentucky

Self-Study

March 2024

Submitted by Department Chair, Dr. Rebecca McCulley, and faculty of the Department of Plant and Soil Sciences

to

Dr. Nancy Cox, Dean of the Martin-Gatton College of Agriculture, Food and Environment, and to the Program Review Committee

The following academic programs are included in this report:
Agricultural Ecosystem Sciences (AES) B.S.
Integrated Plant and Soil Sciences (IPSS) M.S. and Ph.D.

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1 OVERVIEW

The Department of Plant and Soil Sciences is one of 15 academic units in the Martin-Gatton College of Agriculture, Food and Environment (MG-CAFE) at the University of Kentucky (UK). This is one of the oldest departments in the College and has a long history of serving agricultural producers and other clientele across the Commonwealth. The department's programs are diverse in both our mission areas – teaching, research, and extension – and in our areas of expertise – agronomy, crop science, environmental science, plant molecular biology, and soil science. The department has at present 36 full time faculty members, 12 adjunct faculty members, 58 staff members, 8 post-doctoral scholars, and 51 graduate students (9 of which are advised by Department of Horticulture faculty). At any time, there are a several Visiting Scholars in the department on serval months to year long appointment.

1.1 Mission Statement

The mission of the University of Kentucky is as follows:

The University of Kentucky is a public, land-grant university dedicated to improving people's lives through excellence in education, research and creative work, service and health care. As Kentucky's flagship institution, the university plays a critical leadership role by promoting diversity, inclusion, economic development and human well-being.

The University of Kentucky:

- Facilitates learning, informed by scholarship and research.
- Expands knowledge through research, scholarship, and creative activity.
- Serves a global community by disseminating, sharing, and applying knowledge.

The University, as the flagship institution, plays a critical leadership role for the Commonwealth by contributing to the economic development and quality of life within Kentucky's borders and beyond. The University nurtures a diverse community characterized by fairness and equal opportunity.

The mission statement of the Martin-Gatton College of Agriculture, Food and Environment is:

The Martin-Gatton College of Agriculture, Food and Environment ***serves the people*** of the Commonwealth and across the world through education, outreach, service, and research by finding solutions to improve lives today and creating a sustainable future. We do this by:

- educating current and future leaders;
- producing and disseminating knowledge through creative research and discovery;
- promoting lifelong learning and strengthening Kentucky communities through applied knowledge.

The department's mission is fully aligned with those of the college and university and is articulated as:

- To improve, through scholarly research, the understanding of plant and soil systems as sustainable resources for human use while preserving and enhancing environmental quality.
- To recruit, educate, and graduate top-quality students and serve our broad-based clientele by providing progressive education programs and effectively interacting with partners in the public and private sectors.
- To anticipate and effectively respond to societal needs for improved agricultural productivity and for the wise use of natural resources in order to enhance the quality of life.

1.2 Strategic Plan

The department does not have its own strategic plan but rather strives to support the college's and university's goals (https://pres.uky.edu/strategic-plan). The department has developed a shared vision for our unit which is as follows:

The department strives to balance the three mission areas of a land-grant institution: teaching, research, and extension. We take seriously our role of responding promptly to agricultural and environmental issues. We address a broad subject matter including the chemistry, physics and biology of plant, soil and environmental systems ranging from the molecular, to the whole plant, to the ecosystem scale. The department works towards sustainable and profitable crop production, renewable resource management, and environmental protection for now and the future.

Our activities in fulfilling this mission contribute directly to the university's strategic plan areas: Putting Students First, Taking Care of Our People, Inspiring Ingenuity, Ensuring Greater Trust, Transparency and Accountability, and Bringing Together Many People, One Community. We support the goals enumerated in the MG-CAFE strategic plan: Prepare highly motivated and culturally adaptive graduates; Build and nurture relationships with the people of the Commonwealth and across the world; Recruit, develop, and retain exceptional faculty and staff; Show CAFE commitment to diversity and inclusion; Produce innovative solutions through multidisciplinary collaborations; and Build state-of-the-art facilities equipped with cutting edge technology.

1.3 Recommendations and Changes from the 2017 Periodic Review

The recommendations from the most recent (August 2017) periodic review and actions taken by the department in response to those recommendations are found below.

1. **Develop an overall vision and direction for the HPLS (Horticulture and Plant and Soil Science) undergraduate degree considering future opportunities that will allow the department to compete successfully for potential students. Plan to engage stakeholders in this process.**

   Actions: We decided in 2018 to withdraw from the HPLS undergraduate degree program. We launched our new undergraduate degree program (AES – Agricultural Ecosystem Sciences) in

Fall 2019, as an option within the Agriculture Individualized Curriculum 'incubator program' within the college. This degree program was guided by extensive faculty input, market research, and interactions with stakeholders. All new coursework has been approved by through the University Senate. Student enrollment in the program has steadily increased (Fall 2019=7; Fall 2020=14; Fall 2021=19; Fall 2022=25; Fall 2023=27). The degree program graduated its first cohort Spring 2022 (n=3) with 4 more graduating in 2023. We have created a steering committee for the degree program from within the department faculty, and three Plant and Soil Sciences (PSS) faculty are actively advising/mentoring students in the program.

Analysis of actions and reflection: PSS faculty are broadly supportive of the new AES degree program, as a much better representation of what we all do and where agriculture is headed than the old HPLS degree. Student recruitment is going well, though we will need it to continue to grow. We have high caliber students coming into the program. Through new courses, we are engaging with our stakeholders and getting the current students introduced to them and to jobs in relevant fields.

Ongoing improvement actions: We must increase our recruitment efforts and student numbers. We hope to submit paperwork to convert AES to an independent, stand-alone program (outside of the Ag Individualized Curriculum) within the next year or two. We need to build our alumni network and database and better track where our graduates end up.

2. **Explore ways to enhance scientific collaboration and transformative ideas by facilitating faculty interactions, particularly with extension faculty and new faculty hires.**

Actions: Since the last Department Review, the department has supported six annual faculty retreats, six academic calendar year seminar series, and occasional workshops and field days for PSS folks and stakeholders. Faculty participation in these events is strong. The chair continues to support an annual Extension Faculty only meeting in December, which is also well-attended and appreciated/enjoyed. Additionally, the department chair supports internal calls for proposals yearly, and favors collaborative, multi-user proposals for funding. From these efforts, several successful grants have emerged that include new collaborations within the department and beyond. During faculty candidate interviews, we emphasize our collaborative environment and expectations therein.

Analysis of results and reflection: Faculty report liking our retreats and based on participation appear to see value in attending them. They want the chair to continue with annual retreats and all extension faculty meetings in December. Our newest cohort of faculty report satisfaction with the chair's new on-boarding process and feeling included within our unit.

Ongoing improvement actions: Beginning with FY 2019, collaboration grant totals exceeded departmental primary lead grant totals and have continued to outpace primary lead grants each year. The chair will continue to look for opportunities to stimulate and support scientific collaboration amongst the faculty.

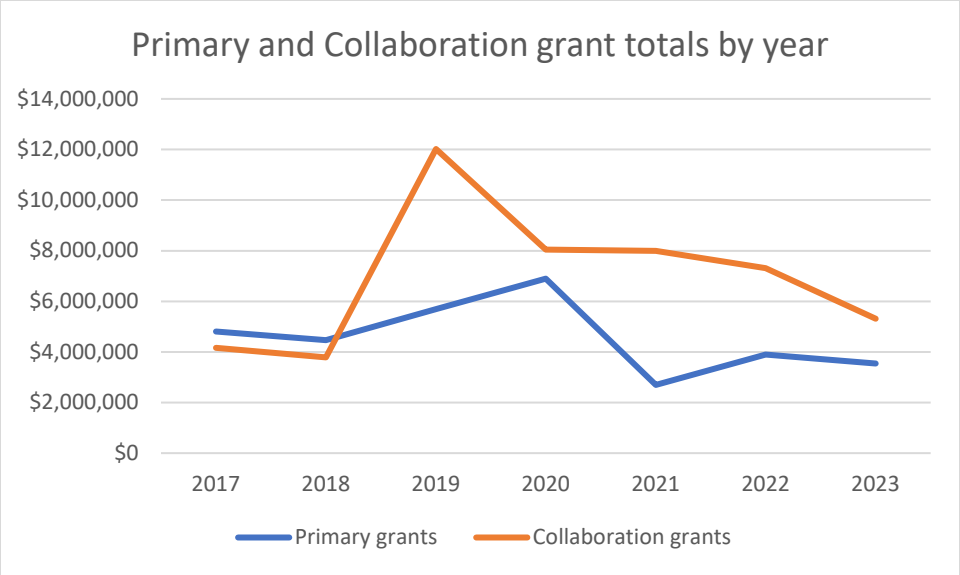


Figure 1: Primary lead PI and collaborative grant dollars over the review period.

3. **Construct a management plan and process for North Farm operations that will allow all faculty to have access to plots, equipment, and personnel.**

Actions: In 2018, the chair convened an 'ad-hoc' North Farm committee of relevant and diverse faculty and staff to figure out how best to move forward with this recommendation. Per the recommendations of the ad-hoc committee, the chair reconstituted the Land Use Management committee, and this group has developed and instituted an online 'land use request' form that aims to streamline aspects of planning and process at the North Farm. We have gone through six growing cycles with the new land use request form. Complaints have been few and it appears to be functioning well, though use is somewhat spotty and varies across faculty members. Several long-time staff retirements and/or resignations allowed for some reorganization and the creation of a new position – PSS North Farm Coordinator - as well as several other staff position upgrades. This reorganization has contributed to the improvement of process, facilities, management, accessibility, inclusivity, and the culture of the farm. In 2019, we successfully transitioned the long-term no-till plots from single PI control to committee control, effectively broadening inclusion and transparency for how this departmental resource is managed and is available for research. This committee is functioning well and has vetted and approved several new projects over the subsequent years.

Analysis of actions and reflection: We have dismantled many of the barriers that existed at the Farm for new faculty and staff. We continue to actively work to improve the culture of the Farm: to have greater buy-in and regard for safety, to eliminate exclusionary practices, to improve access and transparency of various processes, and to correct a variety of farm employee issues that stem from limited supervision/oversight. We have improved our communication with the facilities and management staff overseeing the Farm.

Ongoing improvement actions: We continue to have issues regarding shared use equipment and use/upkeep of common spaces. Major changes with Foundation Seed this year are being worked through with the relevant stakeholders. The chair and the PSS North Farm Coordinator will continue to work closely together moving forward to try to find solutions and continue to improve farm infrastructure and accessibility for everyone.

4. **Devise a departmental strategy for providing all staff with the opportunity for professional development, including participation in scientific meetings where appropriate.**

Actions: In the first year of the college-level staff professional development program (2017), our department had only one application, which was granted, to attend and present at a scientific meeting. In 2018, we had three staff members apply (and receive funds) for a diverse set of experiences: learning new techniques, better communication skills, and how to lead a state-wide water quality program. In 2019, we have had four staff members apply for a similarly diverse set of professional development opportunities and receive awards. We also received four staff-led Research Activity Awards in 2019. Due to COVID-19, no staff members applied for professional development awards in 2020, as frequently those awards involved travel. However, in 2020, we had a staff member lead a successful Sustainability Challenge Grant, at the University-level. In 2021, we had four staff members apply for (and receive) professional development awards to attend scientific meetings. In 2022, three staff applied for (and received) college-level research activity and professional development awards.

Analysis of actions and reflection: The college's Professional Development as well as the Research Activity Awards have been beneficial for our staff. The chair reminds the staff of the programs at bi-annual staff meetings, and the department has budget committed to match what they receive from the college. Staff value having these experiences, and the applications are easy to fill out.

Ongoing improvement actions: The department will continue to support staff that apply for the college-level awards as well as other opportunities that arise.

5. **Explore opportunities for developing online courses for Extension Agents interested in pursuing master's degrees.**

Actions: We had two faculty respond to the call for online course proposals put forward by the new online MS Science Translation and Outreach (STO) program in 2018. Drs. Henning and C. Lee developed online Forage Management & Use and Grain and Oilseeds courses, respectively. Both courses were taught, but only one is currently being offered (Forage Mgmt & Use). Additionally, Dr. Coyne was slated to create an online version of his Soil Microbiology course to be offered to STO students; however, with his retirement (June 20, 2022), this did not come to fruition. Several Extension faculty advise STO students, and Dr. Henning is the Director of Graduate Studies (DGS) for the STO program.

Analysis of actions and reflection: COVID changed the online course world dramatically, as all instructors were forced to go online. Many discovered there are some benefits to online instruction, though some challenges remain. While convenient, the data specific to this program indicates students do not learn as well online as in-person. Further, there is little incentive to entice faculty to develop online programming, though perhaps the new Net Tuition Revenue model from the Provost Office will change this perspective.

Ongoing improvement actions: Dr. Henning, DGS for the STO program, and the IPSS Steering Committee are working to encourage more faculty to have online classes available. We have discussed whether our primary MS/PhD program - IPSS - should have an online-only option and decided not to go this direction. We will stay involved in the college- and university-wide discussions regarding online education and try to think creatively about what additional offerings we can create and programs we can be involved in.

6. **Evaluate departmental committee structure and improve procedural transparency.**

Actions: Every year, the chair reviews the departmental committee structure (provided in Appendix A), checks with various committees to see whether they are still functioning, solicits input from faculty and staff, and makes appropriate revisions. The chair also modifies and creates new policies, as needed, with input from faculty and staff, to improve procedural transparency. As part of our departmental response to the UK@Work effort, we deployed a survey to staff asking a variety of questions regarding communication of information. The chair has made efforts to increase procedural transparency by explaining things at both faculty and staff meetings.

Results: We now have fewer departmental committees, and faculty and staff appear pleased with improved communication and procedural transparency. To better incorporate staff in decision-making, the chair created a 'staff advisory committee' that is tasked with advising the chair on staff-related issues.

Analysis of actions and reflection: So far, the staff advisory committee has only met once. The utility of this committee in departmental decision-making is unclear. The chair will continue to monitor and make changes as needed.

Ongoing improvement actions: Continue to assess effectiveness and usefulness of our committees and make changes where needed.

7. **Continue to evaluate space and equipment needs for the program and develop a long-term strategy for improving these aspects of the program.**

Actions: The chair works with various faculty-led efforts to improve space utilization and access to equipment. This includes holding spring calls for internal equipment proposals and infrastructure improvements when the budget allows.

Results: The chair has had annual internal proposal calls for over a decade. Staff, graduate students, and faculty are encouraged to submit proposals. Funds granted have ranged from $30K - $450K in total, annually. The chair makes sure these funds are dispersed equitably across our various missions and locations. The chair continues to support the departmental shared-use Nutrient Analysis Lab (Ag Science North S-104) by supporting the lab manager position associated with it and providing funds for needed equipment upgrades in the space. Currently, the chair is working hard to make sure our space needs will be met in various new building projects that are in the design phase and anticipated to be operational in 2026 – 2027.

Analysis of results and reflection: Our department has been lucky to have funds available to help programs achieve space and equipment needs. These funds have stemmed from faculty and staff salary savings. With the new university policy to take back open faculty lines starting this FY (2024), our ability to invest in larger infrastructure needs moving forward is likely to be more limited than it has been in the past though there is a process in place to request carry-forward funding through the Dean's Office.

Ongoing improvement actions: The chair will continue to help the faculty achieve their goals with regard to equipment acquisition and space utilization, as long as the budget allows for it.

8. **Work with the Office of Philanthropy and Alumni to develop specific goals and objectives for future philanthropic efforts.**

Actions: The chair engaged with the Office of Philanthropy and is developing relationships with potential donors. We have garnered ~$100K to date from donors to recognize and support graduate students. We worked with Philanthropy to generate an Alumni database and mailing list. We have produced four annual Alumni newsletters (2020 – 2023). These are electronically delivered to ~500 people and the unique open rate has increased over time from 22.4% to 48.2%. We have reached 32 states and 5 countries. We threw our first-ever PSS Alumni Round-Up event in October 2021 - a catered evening dinner in the grounds by the Plant Science Building. This has become an annual event, with ~30-50 people in attendance - a mix of current folks and alumni.

Analysis of actions and reflection: We have had success engaging with our alums, which helps us build connections between our current students and our past. There is more that could be done in this arena.

Ongoing improvement actions: Continue discussions with Philanthropy and Alumni and watch for opportunities. Continue to hone plans to engage with alumni. Continue to offer annual newsletter and Round-Up event. Consider developing more frequent, shorter news clips for alumni dissemination.

9. **Consult with current and past graduate students on ways to improve the overall graduate student experience in the program.**

Assessment method: We conducted a satisfaction survey of current IPSS graduate students in 2018 and 2022. In 2018, we created an exit survey to extract similar information from students moving forward upon their graduation. We are doing every other year analysis of the exit survey data.

Results: In 2018, the PSS Chair, working in conjunction with the Associate Dean for Instruction, created a formal IPSS Steering Committee, which has representation from all IPSS departments (PSS, Hort, FNR, anticipated Plant Pathology), one outside college committee member, and current graduate students. This committee has revised the IPSS handbook multiple times and completed several major curricula changes, including creating new specialty areas. We also created a new IPSS Alumni Early Career Award to recognize the achievements of a recent IPSS graduate, annually. This award is being administered by the IPSS Graduate Student Association (GSA) and occurs as part of the PSS seminar series. The PSS Chair provides modest funds to the IPSS GSA to help support professional development opportunities every year.

Analysis of results and reflection: The summer 2022 satisfaction survey indicated that our students are more concerned about their finances and mental health than they were in 2018. This is not surprising, given the pandemic and persistent inflation. This information led us to raise our minimum stipend amounts by ~$3K/yr. This change went into effect in August 2022, and though it pre-empted the University-mandated increase in graduate student stipends that is occurring now, we have additional stipend raises coming. The IPSS GSA remains remarkably organized and active. Incorporating Plant Pathology into IPSS will grow the IPSS program, making it even more transdisciplinary.

Ongoing improvement actions: The chair will continue to support the efforts of the IPSS Steering Committee and Graduate Student Association moving forward.

1.4 Self-Study Process

Planning for the periodic review and the creation of this self-study document began in November 2023 when the college's Office of Faculty Resources, Planning, and Assessment (OFRPA) met with the review team Chair, Dr. Tammy Stephenson, and the PSS Chair to describe the process. The self-study document was developed by Department Chair, Rebecca McCulley, in conjunction with the department's 2023-2024 Faculty Advisory Committee. Sub-groups of members of this committee wrote different sections of the document: Research – Art Hunt, Jan Smalle, Dave Van Sanford; Degree Programs – Erin Haramoto, Dave McNear, Chris Matocha, Ole Wendroth; Extension – Andy Bailey, Bob Pearce, Chris Teutsch. The chair pulled together the rest of the document. The unit's full faculty and staff reviewed the document; the IPSS Steering Committee reviewed sections relevant to that program.

The department is grateful for the Program Review Committee's time and expertise across varying perspectives to consider our current strengths and challenges—and make recommendations in

support of our vision and mission. As part of the Self-study development process, we have created a list of ongoing challenges we are especially interested in hearing committee feedback and recommendations on (See section 9- Reflection).

2 DEGREE PROGRAMS

2.1 Undergraduate Programs

2.1.1 Program History:

In 1995-1996, because of low student enrollment, majors in Agronomy and Horticulture were combined to create the B.S. in Plant and Soil Sciences. In 2005-2006, the Department of Agronomy changed its name to the Department of Plant and Soil Sciences (PSS) and the name of the shared undergraduate degree program was changed to Horticulture, Plant and Soil Sciences (HPLS) to reflect both of the contributing departments. Enrollment in the HPLS program peaked at ~100 students during the 2001-2005 review period, falling to 62 students by the 2006-2011 review period, to roughly 45 students in the 2011-2017 review. The number of PSS students in the HPLS major declined to 23 in 2014 and to six in 2019. Several factors, both external and internal to the University, contributed to declining enrollment in the PSS portion of the HPLS degree. Efforts were made to reverse the trend. Recognizing the decline and a need to revitalize the PSS portion of the HPLS degree, PSS started the Modern Agronomic Production (MACP) option in 2015 under the colleges '*incubator*' Ag individualized program. An academic coordinator was hired in 2014 to assist with recruiting for MACP and HPLS. PSS tried re-branding to raise awareness of MACP and the PSS option in HPLS with an initiative called AgronoMe! The additional recruitment efforts did not bear fruit. In 2018, following the 2011-2017 departmental review, the MACP program was discontinued and the Academic Coordinator position eliminated.

2.1.2 Response to Previous Review (2017):

The first recommendation from the 2017 periodic program review was to *"develop an overall vision and direction for the HPLS undergraduate degree considering future opportunities that will allow the department to compete successfully for potential students."* Specifically, the reviewers noted "*… there is a clear need to develop a new vision for this* (HPLS) *undergraduate program. Rather than investing more effort (and money) into recruiting, a re-evaluation and possible re-direction of the degree program is needed."* Guided by this recommendation, the Faculty in the Department of Plant and Soil Sciences voted to disengage from the HPLS major and develop a new degree program. Guided by extensive faculty input, market research, and interaction from stakeholders, the **Agriculture Ecosystem Sciences (AES) major was created in the Fall of 2018 and launched in the Fall of 2019** as an option within the Agriculture Individualized Curriculum as an 'incubator program'. AES is the only undergraduate degree *owned* and administered by the Department of Plant and Soil Sciences; however, our faculty contribute significantly to instruction in interdisciplinary degree programs across the college.

2.1.3 Description of undergraduate programs served by the PSS faculty:

Instructional effort is quantified as student credit hours (SCH) per instructional Full Time Equivalent (FTE), defined as credit hours taught by program faculty in a unit, department, or discipline, divided by the number of instruction FTE of those program faculty. During the review period, **about 47% of 38 total PSS faculty provided instructional leadership** and time to teach courses and advise undergraduate students in two interdisciplinary Bachelor of Science programs, (i) Agricultural and Medical Biotechnology (ABT), and (ii) Natural Resources and Environmental Sciences (NRE), and one PSS administered program entitled Agricultural Ecosystem Sciences (AES). **The average instructional DOE of PSS faculty is 6.7%.**

Table 1: Student credit hours (SCH) earned per course prefix, Instructional FTE, and student credit hour per instructional FTE **undergraduate (≤400)** level courses.

Program Area of Courses	FY20	FY21	FY22	FY23	Total
Earned credit hours PSS faculty for **AES** courses	0	18	33	48	**99**
Earned credit hours PSS faculty for **PLS** courses	1554	1857	1801	1751	**6963**
Earned credit hours PSS faculty for **ABT** courses	339	263	434	237	**1273**
Earned credit hours PSS faculty for **NRE** courses	56	48	231	151	**486**
Earned credit hours PSS faculty for **Other** courses	114	66	163	110	**453**
Total earned credit hours for PSS faculty	**2063**	**2353**	**2662**	**2297**	
Sum of faculty instructional DOE (instr. FTE)	**6.66**	**7.43**	**7.37**	**5.34**	
Student credit hour per instructional FTE	**310**	**317**	**361**	**430**	

Note 1: Faculty FTE is pulled based on census date of Oct. 31 of the fiscal year, so for example, 2022-2023 FTE is as of Oct. 31, 2022. PSS Inst. FTE for FY24 (Oct. 31, 2023) is 6.19.
Note 2: Only includes Full-time faculty. Adjunct and PTI provided instruction is accounted for in the credit hours but is not accounted for in the FTE.
Note 3: Other courses include those taught by PSS faculty but cross-listed with other programs including AFE, BIO, ENT EQM, GEN, HON, HRT, and SAFS.

Typical enrollments in undergraduate courses (PLS<400 level) are 10-20 students, except for three courses that have higher enrollments (40-80 students) because they either serve as UK Core courses (Plants, Soils, and People, PLS 103 and 104), or as a degree requirement in AES, HPS, NRE, LA, and as guided electives in several undergraduate majors offered by other departments (Fundamentals of Soil Science, PLS 366).

In addition to regular on-campus lecture and laboratory courses, all students are required to participate in at least one off-campus, high impact experience, such as an internship (offered as AES, PLS, NRE, ABT 399 courses) OR an independent study/research project with a faculty mentor (AES,

PLS, NRE, ABT 395). Typically, students fill this requirement in the junior or senior year of their programs.

Instructional infrastructure (e.g. number of classrooms equipped with computer/projection systems, greenhouse classrooms/facilities, etc.) are adequate to meet most current needs. The soils teaching lab underwent a remodel in 2015. However, scheduling large enrollment courses is difficult due to a lack of larger classrooms in either the Plant Science Building or Agricultural Science Center. The planned construction over the next 3 years (new Ag Research Building adjacent to PSB will have teaching labs and the Martin-Gatton Agriculture building with a range of classroom sizes) we hope will alleviate many of the inadequacies found in the current buildings.

Descriptions of the undergraduate degree programs served by PSS faculty are as follows:

A. Natural Resources and Environmental Science (NRES), B.S.

NRES is a college based interdisciplinary degree program that prepares students for careers in natural resource management, restoration ecology, sustainability, environmental quality, environmental policy, urban planning, climate science and renewable energy, along with other emerging areas. Job opportunities in these fields are rapidly growing in response to a changing global climate and interconnected world economy. The public and private job sectors are increasingly more focused on topics related to sustainability and the conservation of natural resources. NRES students are attracted to the major because of the experiential, hands-on courses offered with the added flexibility to choose upper-level specialty courses. As a result, students are prepared for the workforce through acquired field and laboratory skills, and a self-directed study of what they care about, whether that is protecting critical wildlife habitat, improving food security, restoring ecosystem services, or educating the public. Additionally, the broad array of social and natural science disciplines in the curriculum gives students an understanding of the interrelated issues and diverse perspectives surrounding natural resource management.

From its inception in 1990, Faculty in PSS have contributed significantly to instruction, leadership, and mentoring of students in the NRES program. The original architects of the program were Drs. M. Scott Smith (Chair of then-Agronomy Department) and Bob Muller (Chair of then-Forestry Department). PSS faculty have served in leadership roles such as DUS (Grabau, Mullen, McNear, Matocha) and steering committee (SC) chair (Matocha), and in supporting roles as steering committee members (numerous), academic advisors (numerous), and research mentors (numerous) for the program. Currently, there are three PSS faculty who serve on the SC, teach courses for NRES majors, and advise. Dave McNear and Chris Matocha teach the required PLS 366 (Fundamentals of Soil Science, 4 Cr) course, Chris Shepard teaches PLS 396 (Soil Judging 1 Cr), PLS 406 (Advanced Soil Judging, 2 Cr), and PLS 573 (Soil Morphology and Classification, 3 Cr). The latter three PLS courses are found in the Soil Science and Field and Lab emphasis areas within the curriculum. Ole Wendroth teaches the cross-listed PLS/NRE 468G (Soil Use and Management, 3 Cr) and Hanna Poffenbarger is the instructor for NRE 470G (Soil Nutrient Management, 3 Cr)-both of which are found in the Soil Science and Global Sustainable Food Systems emphasis area.

B. Agriculture and Medical Biotechnology (ABT), B.S.

The primary purpose of the baccalaureate degree program in Agricultural and Medical Biotechnology is to train students in modern cellular and molecular biology and genetic engineering. Students will be provided with a firm foundation in the principles of genetics and molecular biology of both prokaryotic and eukaryotic organisms. Each student will specialize in an area appropriate to their and career objectives, including: microbial, fungal, plant, insect and mammalian biotechnology. Graduates will be prepared to assume government, university, and industry positions with research and technology applications to agriculture and food production. Employment opportunities include research scientists, laboratory technicians or managers in university, government, industrial, or clinical laboratories using biotechnological tools for research and production. Examples of research areas comprise: gene cloning, construction of novel pest and disease resistance genes, development of new immunological and nucleic acid types of diagnostic probes for plant and animal disease, genetic engineering of microorganisms for the production of important pharmaceutical agents, and development of new bioengineered strains of microorganisms for fermentation and food production services. Students will also be prepared to enter graduate programs in agriculture, molecular biology, and the biological sciences.

From its inception in 1992 by PSS faculty members Glen Collins and Joe Chappell, faculty in PSS have continued to contribute significantly to instruction, leadership and mentoring of students in the ABT program. PSS faculty serve in instrumental roles such as DUS (Collins, Moe, Perry) and steering committee chair (Moe, Kawashima), and in supporting roles as steering committee members (numerous), academic advisors (numerous), and research mentors (numerous) for the program. Agricultural and medical biotechnology encompasses cellular and molecular approaches to the manipulation and improvement of agricultural plants, animals and microorganisms, and the control of agricultural pests and diseases.

C. Agricultural individualized Curriculum (AICU), B.S.

The individualized B.S. program in agriculture (known internally as the AICU major) is helpful to a variety of students, allowing them to develop undergraduate curricular alternatives to our established degree programs. This guided curriculum allows us to help students who have aspirations for study that do not match any of our existing programs. With the individualized major, they work with their advisor to build a rigorous, focused curriculum that meets our college curricular expectations, yet satisfies their unique goals. Conversely, we have some students who are approaching the end of their current programs and come to intractable course roadblocks (e.g., chemistry for an animal sciences major). After encouraging them to take all appropriate measures to succeed in that coursework, they are advised to transition to an individualized major in order to complete this more general degree (sometimes they otherwise simply give up and do not complete a degree of any sort). The AICU is also used as an "incubator" for departments to launch new programs. Historically, This curricular configuration has been especially successful for launching new multi-disciplinary programs such as agricultural and medical biotechnology (ABT), natural resources and environmental science (NRES), equine science and management (EQM), and sustainable agriculture and community food systems (SAFS).

2.1.4 Agricultural Ecosystem Sciences (AES) Program

A recommendation from the 2011-2017 departmental review was to develop an overall vision and direction for the HPLS undergraduate degree program considering future opportunities that will allow the department to compete successfully for potential students. In response, the department voted to withdraw from the joint HPLS program and develop a new program aimed at educating the next generation of plant and soil scientists. The AES program was created in 2018 and launched in 2019 under the AICU umbrella as an incubator program.

A. AES program mission

The need to sustainably produce food, fiber, feed, and fuel to satisfy the needs for an ever-growing global human population in the face of a changing global climate while at the same time preserving or enhancing environmental integrity and resiliency of our agricultural production systems presents one of the greatest challenges facing the humans. To meet this challenge, the AES program aims to equip students with the knowledge and skills required for the responsible stewardship of our agricultural production systems. Responsible stewardship in the context of this program means the application of advanced methodologies to increase yields from, and the multifunctionality of, the current agricultural land base providing solutions that optimize the local, regional, and global benefits people gain from agricultural ecosystems.

B. Program Justification - Student and Employer Demand

B.1. Job Market Analysis

To assess demand for students trained in the AES major a job market analysis was performed using the Lightcast (formerly Burning Glass) data platform available via the UK Gatton College of Business and Economics (https://careers.gatton.uky.edu/labor-market-insights/). Lightcast mines job postings from the previous 1-5 years across the United States, extracting data to generate employment trends, employment demand, salary range, and supporting data related to core competencies and technical skills required for the selected career. Data can be sorted by state. The 'Plant and Soil Scientist' occupation was used to generate national career data. Job titles included for this occupation are shown in **Table 2**.

Table 2: A top-20 list of job titles for all unique postings in a given career generated for the Plant and Soil Scientist occupation, sorted by frequency.

1. Agronomists	11. Research Agronomist
2. Botanist	*12. Technical Agronomist*
3. Fermentation Scientist	13. Chemical Specialists
4. Field Research Assistants	*14. Field Agronomists*
5. Productivity Specialist	*15. Agronomy Manager*
6. Horticultural Specialist	*16. Sales Agronomist*
7. Soil Scientist	17. Plant Breeders
8. Soils Technicians	*18. Regional Agronomists*
9. Growth Specialists	19. Adapted Physical Education Specialists
10. Agricultural Specialists	*20. Extension Specialists*

Note: Job titles in *Italics* emphasize titles targeted and obtained by AES graduates (see Table 4).

Over the next 10 years, national employment demand for these careers as a Plant and Soil Scientist is projected to grow by +10.16%. The median annual earnings for persons in these job titles is $65,195 (**Figure 2a**). Almost 29% of persons in this career path hold a Bachelor's degree, with 38% and 24% holding Master's or Doctoral degrees, respectively (**Figure 2b**).

Figure 2: Annual earnings data (a) and educational levels attained (b) for persons in plant and soil scientist careers. Generated on 1/11/24 via Lightcast using the Plant and Soil Scientist occupation.

B.2. Program Uniqueness in KY and Region

The AES program caters to students interested in being part of production agriculture. What separates the AES program from other Agriculture programs in the state and region is the emphasis placed on helping students appreciate the farm as a component of a larger, integrated ecosystem. What happens on the farm can have significant downstream local or regional effects, and what happens globally can have significant on-farm effects. This is, in part, why 'Ecosystem' appears in the program name. During the program, students are required to tangle with these issues and consider the local, regional, and global implications from social, economic, and environmental perspectives. Students are also taught to think creatively, and critically to develop, and be part of on-farm solutions for some of the world's most pressing problems (e.g., food insecurity, climate change). The AES program is complementary to the Sustainable Agriculture and Community Food Systems (SACFS) degree offered by the UK Department of Horticulture. The SACFS program emphasizes organic agriculture production, economic viability of local food systems, and issues related to social responsibility, and food access.

There are several regional public universities in Kentucky that offer B.S. agriculture degrees (CIP 01.9999) including Eastern Kentucky University (B.S. Agriculture), Kentucky State University (B.S. Ag, Food & Environment), Western Kentucky University (B.S. Agriculture), Morehead University (B.S. Agriculture), and Murray State University (B.S. Agriculture) (**Figure 3**). There are three universities within 30-60 miles of UK and two in the western portion of the state. Proximity to the major row crop producing regions in the state is often cited as one reason for falling enrollment of KY residents in the agriculture major at UK. For students who do not want to go far from home,

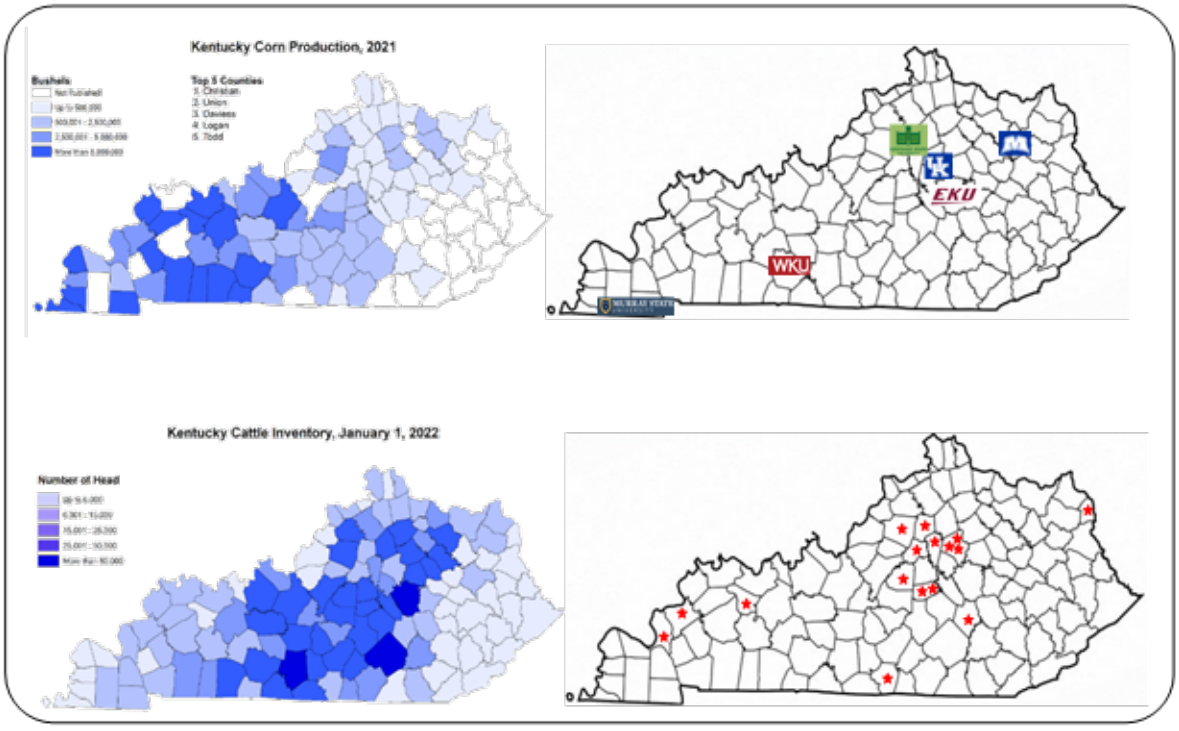


Figure 3: Distribution of corn and cattle production in relation to Kentucky public universities offering a B.S. Agriculture degrees and the counties AES students from KY originated from (stars).

wish to farm on the weekend, or do not like the big city (Lexington), this juxtaposition gives those western KY universities (especially Murray State in Calloway Co.) a recruiting advantage. Nevertheless, 50% of the students in the AES program are from KY. Over half of the KY students are from central KY with several coming from far western counties, a southwestern, and far eastern county (**Figure 3**). As the only R1 land grant institution in the state with a long history of leadership in supporting the agricultural economy of the commonwealth, we are obligated as the university for Kentucky to offer a high quality B.S. degree in agriculture. The AES program, MG-CAFE, and the university as a whole offer unique opportunities and resources for students that are not found elsewhere in the state. While the program title is unique, participation in the academic common market (ACM) (https://www.sreb.org/) is unlikely because the AES curriculum is not significantly different (>50%) than programs at ACM-participating out of state universities.

C. AES program delivery – (see Appendix B for full program description)

C.1. Governance - Steering committee

A steering committee was formed in 2022 consisting of PSS faculty members Dr. David McNear (soil science), Dr. Erin Haramoto (weed sciences), and Dr. Hanna Poffenbarger (agroecosystem nutrient cycling). The steering committee meets as needed to review curriculum structure and assessment. All advising and mentoring is currently handled by Dr. McNear but will be divided among steering committee members as the program grows. PSS business office staff provide support for course planning (e.g., AES 320 Summer Field Experience), advertising, and communications.

C.2. Program structure

The AES program starts with the UK Core requirements designed to build skills such as critical thinking, writing, reasoning, ethics, and global understanding that are necessary for our students to compete in a global marketplace, participate in democratic self-governance, and live a well-intentioned and meaningful life. UK Core and pre-major requirements include coursework designed to develop a firm foundation in the basic sciences (chemistry, math, biology) that are essential for constructing a thorough understanding of the interrelated processes defining agricultural ecosystem sciences. Following the UK Core and pre-major requirements, students complete coursework that will introduce them to several of the fundamental building blocks of farming operations (plants, soils, animals) where they will develop a broad level of understanding of the individual components of a diversified farm production systems. In the summer after their junior year, students attend a 2-week agricultural field experience (AFE). The AFE is an opportunity for students to visit several of the CAFE farms as well as partner farm or farm-adjacent operations where researchers, extension specialists and producers demonstrate the fundamental principles of modern food, fiber, feed and fuel production and management. Students will then move on to classes aimed at explaining how the fundamental agricultural production system components are interrelated, and how understanding this interdependence is essential to the responsible stewardship of the food, fiber, feed, and fuel production system.

To hone their skills into specific areas of interest, students will be required to choose a Technical Specialization (TS) and an Applied Specialization (AS). Classes taken in the chosen TS (Agricultural Economics & Policy, Applied Plant Biology, GIS and Technology Support, Sampling, Testing and Analysis, Agricultural Business Management) are intended to provide a student with specific technical skills which they will then apply to a chosen AS (Crop Production, Animal Production Systems (*minor*), Soil Use and Water Management, Pest Management (*minor*)). For example, a student interested in precision agriculture could choose the GIS and Technology Support TS and then apply this to the Crop Production AS to encompass data collection, mapping and analysis functions that occur in modern day row crop production. Students who are interested in agriculture but do not find a TS or AS that fits their career goals do have the option of working with their advisor and mentor to develop an individualized concentration area.

C.3. AES prefix course descriptions (AES101, AES 301, AES 320, AES 490, AES 395/399)

There are five AES prefix courses required for all AES students (AES 101, 320, 490, 399/395). All the required courses are taught by AES Director and DUS McNear with assistance from Dr. Jimmy Henning.

Table 3: AES-prefix and cross listed courses offered 2019-2023 and primary instructor.

Semester	Course	Instructor
Fall ’18-‘23	*AES 101 Intro to AES	McNear
Summer ’21, ‘23	*AES 320 Field Experience	McNear/Henning

Spring ’21, ‘22	AES/PLS 301 Microbiomes	Coyne (now retired)*
Summer ’19-current	*AES 395 Research Experience *AES 399 Internship Experience	McNear McNear
Fall ’21-23	AES/PLS/SAG 416G	Haramoto
Spring ’20,’23, ‘24	*AES 490 Capstone	McNear and Henning

*Note: Planned for new soil microbiologist (Dr. Osburn) to begin teaching this course Spring 2025.

C.3a. AES 101 Introduction to AES (1Cr)
AES 101 is taken by all freshman and transfer students in the first semester on campus. AES 101 introduces students to the principles and practices of food, fiber, feed, and fuel production systems (i.e., agriculture) and how this system of living organisms functions together with the physical environment (i.e., as an ecosystem) to produce products that sustain and enhance human life. AES 101 serves as an introduction to the AES major in which students will learn about the structure of the AES curriculum and how the various areas of specialization can be used to meet their interests and desired career goals. Invited Speakers representing a variety of potential future career paths are invited to discuss the skills needed to be successful in their chosen path. Career exploration, preparation of a resume, and creation of an individualized development are also developed.

C.3b. AES 320 Agricultural Field Experience (2Cr)
Students are required to attend an agricultural field experience. The agricultural field experience (AFE) is a 2-week summer experience offering an opportunity for students to visit several of the CAFE farms as well as partner farm operations where researchers, extension specialists and agricultural producers will demonstrate the fundamental principles of agronomic production and management of agroecosystem for a sustainable food, fiber, feed, and fuel production future. Examples include demonstrations of precision agriculture, UAV's, farm equipment operation, animal production (e.g., CAFOs and grazing operations) and manure management, plant breeding trials and breeding programs, soil and plant testing and analysis (i.e., crop consulting, soil testing lab), fiber and fuel production systems, etc. The syllabus from the Summer 2023 offering is found in Appendix C**.**

C.3c. AES 490 Capstone (3Cr)
Capstone is required of all students in the AES major and is taken in the final year of the program. Capstone is intended to help the students synthesize their in-class and field experiences during their time in the major and bring this knowledge to bare by addressing a local or regional agricultural issue of significance. Ideas for real world projects are solicited from extension faculty and county agents. Students will be asked to choose from 2-3 real-world AES related projects and then assess, as a group, the physical, chemical, biological, social, economic, and environmental aspects of the proposed project. The group will collaborate with the external stakeholder to present a report (both written and oral) on project feasibility to interested stakeholders; complete with recommendations.

C.3d. AES 399/395 Internship or field/lab experience (0-9 Cr)
Experiential learning is a required element for students in the MG-CAFE. This requirement is met by either working with a researcher to develop an independent lab or field-based research project or by interning with a local, regional, national, or international agricultural or agriculture-related business. Students are encouraged to take advantage of study abroad opportunities to satisfy this requirement. Students wishing to receive academic credit for their internship or lab research

experience should enroll for 3 credits in either AES 395, or AES 399 respectively. Students not wishing to earn academic credit for their internship, but who would like a record of the experience on their academic transcript can enroll for zero credits.

D. Curriculum updates

A major advantage of launching a new undergraduate program under the Individualized (AICU) umbrella is that it makes dialing in program requirements to meet student and stakeholder needs more responsive. A curriculum revision was completed in the Fall of 2023 to align UK Core and pre-major requirements with student competencies and program core requirements and to add and subtract new and no-longer-existing courses, respectively, in the technical and applied specializations. Changes to the pre-major requirements include adding STA 210 to the list of accepted statistical reasoning courses (now STA 210 or STA 296), adding MA 109 College Algebra to the list of accepted quantitative foundations courses (now MA 109 or MA 123). Students who wish to go to graduate school or pursue a business management minor through the our university's business college are encouraged to take MA 123 and STA 210 as these are prerequisite courses for the minor and many graduate programs.

E. Number and composition of students

E.1 Enrollment

Prior to 2018, student numbers in the purely Ag individualized track were growing and viewed as problematic by other programs and MG-CAFE administrators. Dissolution of the HPLS major and retirement of the MACP-AICU track in 2018 and the growing number of *programless* students in the purely individualized track provided some of the impetus to create the AES program. The expectation was that the AES program would capture some of the purely AICU students interested in production agriculture. In August 2019, the Associate Dean for Instruction changed and a DUS was created for the AICU program (Lou Hirsch, Plant Pathology). Priority for the purely individualized track shifted to those students in '*project graduate*' or who were demonstratively self-directed and for whom no other undergraduate program satisfied their long-term goals. In the current AICU program structure, students who 1) are interested in agriculture but not sure what area, 2) not part of project graduate, and 3) not demonstratively self-directed could enter the college as undecided or may choose to enter AES program. As AES numbers grew, no-option AICU #'s fell (**Table 4 & Figure 6**).

Table 4: Number of students in Agricultural individualized track options, HPLS, and the sum of all PSS directed students in HPLS, MACP, and (after these programs ended), AES.

Ag Individualized	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
Agricultural Ecosystem Sciences (AES)	--	--	--	--	--	8	19	23	22	25
Agriculture - Individualized Curr (pure, no option enrolled)	7	4	3	12	26	23	11	8	6	7
Modern Agronomic Crop Production	--	2	6	6	4	Program Ended	→			
Sustainable Ag. & Community Food Systems	15	21	19	20	21	24	Program Approved	→		

HPLS	2014	2015	2016	2017	2018	2019
Hort	23	36	29	31	23	31
PSS	23	23	15	14	8	6
Total	46	59	44	45	31	37
%PSS	50%	39%	34%	31%	26%	16%

Sum of PSS, MACP, & AES	23	25	21	20	12	14	19	23	22	25

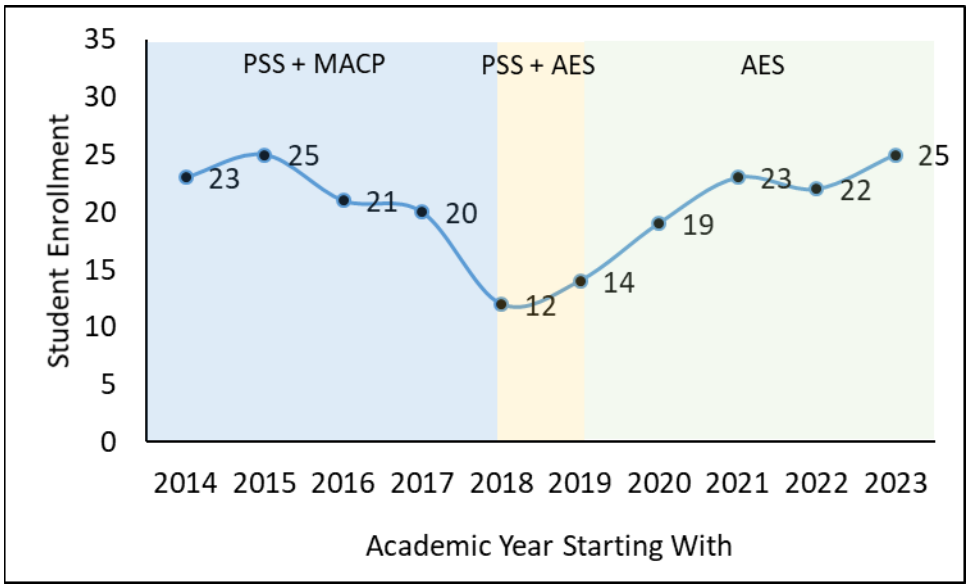


Figure 4: Sum of PSS directed students in the HPLS and modern agronomic crop production (PSS+MACP) tracks from 2014-2018, and PSS+AES after the MACP program ended and HPLS program dissolved, and after 2019 when the AES program started.

The AES program accepted its first five students in the Fall of 2019 and has accepted about 5-10 new students per year since (**Figure 5**). The program graduated its first three students in Spring of 2022 and will have graduated 15 students by the end of the Spring 2024 semester. Both the number of fall freshman and graduates are increasing.

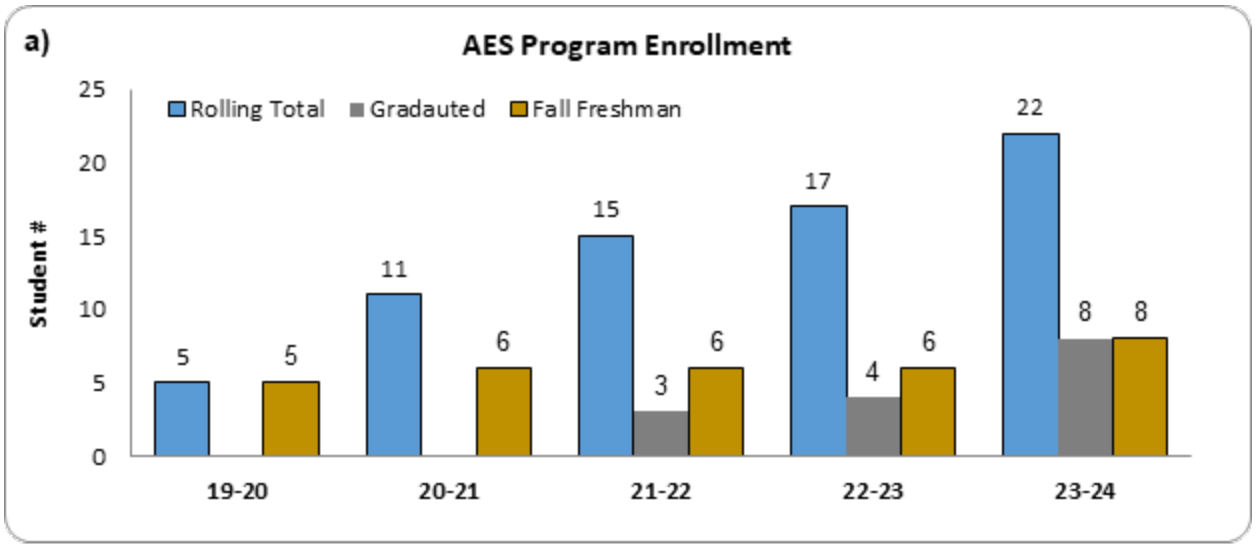


Figure 5: Rolling student enrollment, students graduated, and incoming freshmen who stayed in program. All data by academic year. Anticipated F'24 new enrollment n=10.

E2. Student Composition

The majority (52%) of students come from KY, with the second largest cohort from Ohio (27%), and the remaining coming from PA, MS, MD, and NC. Most of the students from Ohio come from the South-Central part of the state (Mason (2), Washington Courthouse (2), Marion (2) counties). Southern Ohio may represent a geographic area to focus future student recruitment efforts.

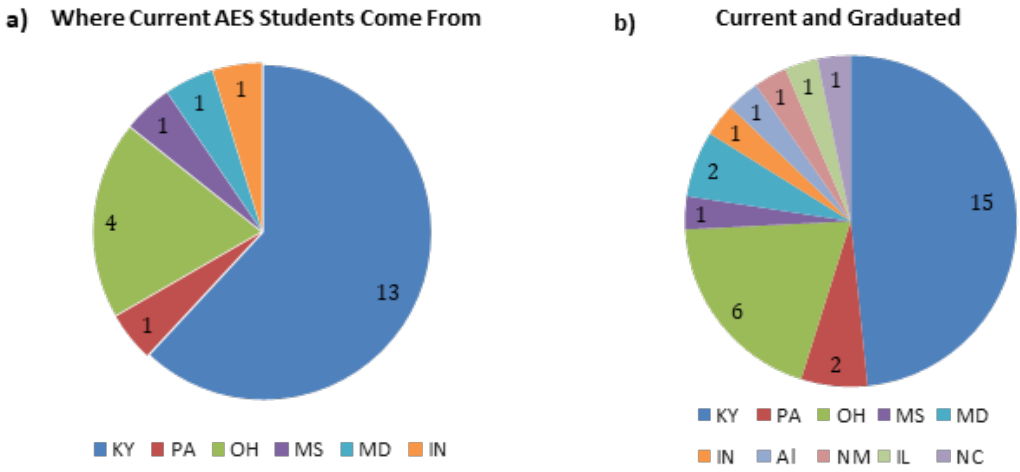


Figure 6: State from which **a)** current and **b)** current and graduated students originate.

The relative ratio of female to male students in the AES program is approximately 52% (**Figure 7**). The percentage of women in the AES major is less than the University and national averages for Title IV institutions (58% and 59%, respectively); however, it is above average for undergraduate degrees in Agriculture, agriculture operations, and related sciences (49.9%; www.nces.ed.gov/ipeds/). Six percent of the students in the AES program identify with a race/ethnically other than white (multi-racial) (**Figure 7**). This is above the national average for multi-racial students receiving BS degrees in Agriculture, agriculture operations, and related sciences from Title IV institutions (0.2 %

www.nces.ed.gov/ipeds/), although well below the total percentage of other-than-white degree recipients (18.7%). Notably, Of the 1,955 MG-CAFE students enrolled in the 2023-2024 academic year, 323 (~20%) identified as a race/ethnicity other-than-white (American Indian/Alaskan Native (URM), Asian, Black or African American (URM), Hispanic or Latino (URM), Native Hawaiian/Pacific Islander, Nonresident Alien, Race and Ethnicity Unknown, and Two or More Races (URM)) and 16.5% are underrepresented minorities (URM) (https://www.uky.edu/irads/enrollment-demographics).

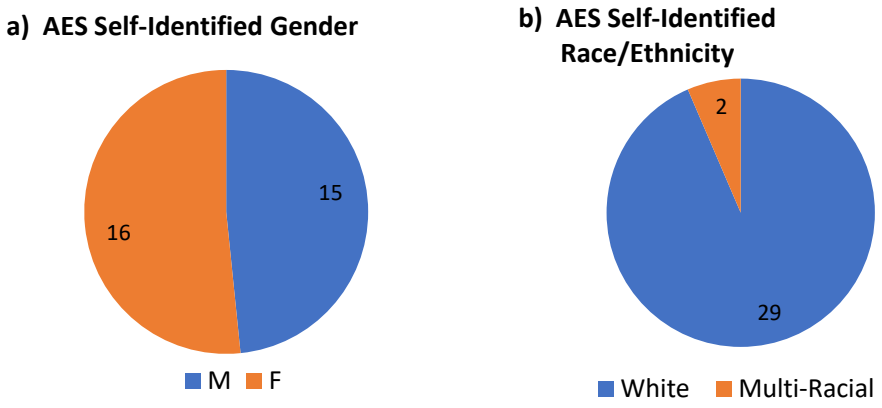


Figure 7: Self-identified gender a) and race/ethnicity b) of current all students in the AES program (current and graduated).

F. Recruitment and Retention

F.1. Recruitment

There are currently no department-directed recruiting efforts to attract students to the AES program. Increasing awareness of the program relies on word of mouth from faculty, current students, and alumni. The program maintains a website, and the department circulates a periodic digital newsletter that sometimes contains information about AES program developments. Recruitment for the program is helped by the MG-CAFE Director of Student Relations, Mr. Wayne Centers, and MG-CAFE Recruitment Coordinator, Margaret Badiarz. Wayne's office is responsible for managing the CAFE ambassadors program. The MG-CAFE ambassadors are a select group of undergraduate leaders who model and tell the story of our college, its mission and programs, as well as the University of Kentucky. There are approximately 20 ambassadors selected per academic year. Ambassadors give college tours and meet with stakeholders and prospective (high school) students. To date five AES students have served in the ambassador program. Margaret organizes one-on-one meetings throughout the year between prospective students and academic program leaders. These meetings are usually with high school seniors or transfer students admitted into MG-CAFE who are looking to make their final decision about college and program of study. Signage for the AES program was created in 2020 for tabling at selected recruitment and high visibility events (e.g., Ag Roundup, FFA visits) taking place on campus throughout the year. The college recently hired two additional staff members to assist with recruitment (Anne DeMott, Director of Transfer and Graduate Recruitment) and job placement (Sara Pulmano, Director of Employer Engagement) for all programs in the college. Transfers from local and regional community colleges are a target of recruitment through using the Blue Plus program (BCTC students can get 6 credits per semester at UK @ BCTC prices) and the 2+2

program (graduating from BCTC with an associate of science degree satisfies the first two years of most programs at UK). There are students in the AES program who have taken advantage of these arrangements.

F.2. Retention

Some attrition from the program from dropouts or major changes occurs within the first year of enrollment (**Figure 8**). Reasons for students dropping out of UK are varied but include: homesickness, lack of maturity, or financial obligations. Ten students changed to the following majors: AgEcon (4), SAFS (1), ABT (1), Geography (1), Forestry (1), and Communications (1) over the first 5 years of the program.

Major changes could be due to a variety of factors. If a student knows they want to study agriculture, but are unsure of what area, they may be directed toward the AES program instead of entering as undeclared. Once they settle in and get a better idea of the programs available, they may then change majors. According to the National Center for Education Statistics, 80% of students in college end up changing their major at least once. What is not shown here are the students who moved into the AES major from other programs including civil engineering, ABT, and animal science.

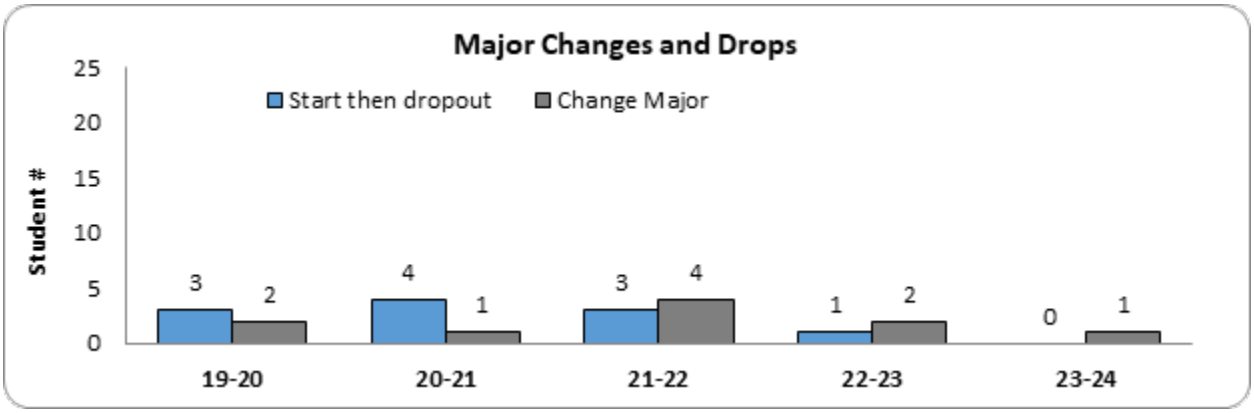


Figure 8: Number of students who started the AES major and then left UK and number of students who changed major after entering as AES by academic year.

F.3. Mentoring and Advising

The UK academic advising model changed in 2022. Prior to 2022, the faculty advisor was responsible for both ensuring that students were taking the correct sequence of courses to earn their degree in the shortest amount of time, and mentoring the student by providing advice on credentials, career paths, possible internships, etc. In 2022, the university required the college to move to a professional academic advisor (PA) model. Faculty who regularly advised in undergraduate programs had to re-envision their role. Having a PA relieves the faculty member from having to maintain detailed knowledge on the nuts-and-bolts of UK Core course details, prerequisites, transfer equivalencies, etc., permitting greater focus on helping the students develop a professional portfolio aligned with the student's career goals and interests. The AES program developed a 4-year mentoring plan describing the expectations and defining the deliverables for both the mentor and mentee. The goals of the mentoring program are:

1. *Create emerging leaders*: Helping students identify and obtain professional skills needed to make them leaders in their field.

2. *Develop new skillsets*: assist students in meeting their career goals by identifying and honing new and existing capabilities.

3. *Prepare for the future:* help students identify and obtain relevant internships, assistantships, and/or permanent employment.

New students are assigned a faculty mentor in the second (spring) semester of their first year. Transfer students are assigned a mentor immediately upon entering the program. Mentees develop an individualized development plan (IDP) as part of the AES 101 class. In the IDP, the student details their interests and skills, and outlines their short, medium, and long-term academic and professional goals. The student meets with their faculty mentor at least once in the fall semester (likely in October during the advising period) to discuss the development plan and review goals. A Qualtrics survey developed by the college is completed after the mentee-mentor visit, and then routed to the PA. The survey alerts the PA that the mentor-mentee meeting has taken place and provides them with any necessary information. Only after the PA receives the survey will the student be permitted to schedule an advising appointment with the PA to pick and register for classes. Mentees are free to change mentor at any time as long as both current and new mentor agree. See full student mentoring plan in Appendix D.

G. Assessment

The Agricultural Ecosystem Sciences - Student Learning Outcomes (AES-SLO) Assessment Plan is found in Appendix E. The assessment plan outlines the mission, vision, and goals of the program, and the basic assessment approach. The program-level learning outcomes are listed and mapped to the curriculum where artifacts are identified and the rubrics and a timeline for assessing the artifacts detailed. Methods for measuring teaching effectiveness and efforts to improve teaching effectiveness are provided. As a new program under the AICU umbrella, the student learning outcomes are assessed as part of the AICU-SLO. As such, the AES-SLO has yet to be fully implemented. SLO's for the AES program are as follows:

1. Students will be able to *describe* the various components of the agricultural ecosystem and effectively *explain* how each of these components work together to influence agricultural productivity, environmental quality, and human dimensions.

2. Students will be able to *synthesize* information from a variety of sources to *draw* conclusions and *formulate* recommendations that consider economic, social, and environmental aspects of agricultural ecosystem sciences.

3. Students will *demonstrate* proficiency in the use of fundamental natural, biological, mathematical principles to *solve* problems relevant to agricultural ecosystem sciences.

4. Students will be able to individually, or *operating* as part of a multidisciplinary team, *explain* to a broad audience in oral, written, and visual formats the importance of agriculture and agriculturally related issues from multiple viewpoints.

In addition to the formative assessment, several summative assessment artifacts are collected annually. These items include: 1) years to degree completion, 2) average graduated GPA, 3)

AES399/395 supervisor evaluations, and 4) post-graduation employment. Some of these values are found in **Table 5**. The average time to degree completion for freshman is 4 years with an average graduating GPA of 3.60. One-hundred percent of the AES graduates (n=10) are employed in the Ag sector with several employed by the same organization where they performed their internship (AES 399). Sixty percent of the graduates are employed in KY.

Table 5: Graduation data for AES students and their current positions.

Student	Grad SemYear	Sem. to Degree	GPA	Major - TS, AS	Minor or Certificate	Current Position
Student 1	SP22	4+4	3.22	AES – GIS, Crop Production		Foreman Kentucky Department of Fish & Wildlife Resources
Student 2	SP22	8	3.79	AES – GIS, Crop Production		GIS QA Analyst, Data Specialist, Soil Sampling Coordinator- Locus Agriculture, Lexington, KY
Student 3	SP22	8	4.00	AES + Honors, Ag Econ, Crop Production	Ag Econ	UKY AgEcon MS Student
Student 4	SP23	8	3.75	AES + AGEC (dual major)	DWBS Certificate	Agriculture Teacher, Grant Co., KY
Student 5	SP23	8	3.79	AES – Ag Econ, Animal Sci	Animal Sci.	Nelson, Co. KY 4-H Youth Development Agent
Student 6	SP23	8	3.19	AES – STA, Soils		Franklin Co. KY Conservation District. Soil Conservation Technician
Student 7*	SP23	4+6	2.25	AES – Indiv, Crop Production		Remington Seeds, LLC. Indiana
Student 8	F23	7	4.00	AES – Ag Econ, Crop Production	Ag Econ	BASF, Triangle Park, NC
Student 9	F23	7	3.78	AES- Ag Econ, Individualized	Ag Econ	Farm South Credit, NC
Student 10	F23	7	3.38	AES -	Ag Econ	UMd Extension, MD
Student 11	SP24	4+4	3.89	AES –STA, Crop Production		Lucas Farms
Student 12	SP24	8	3.94	AES – STA, Crop Production	Ag Econ	TBD
Student 13	SP24	8	3.77	AES – STA, Pest Management	Pest Mgmt.	TBD
Student 14	SP24	8	3.73	AES + AGEC (dual major)		TBD
Student 15	SP24	8	3.50	AES- STA, Animal Production Sys.	Animal Sci.	Greene Farms

STA = sampling, testing, and Analysis; *Graduated AICU but AES till last semester.

2.2 Graduate Programs

2.2.1 Description of the Integrated Plant and Soil Sciences (IPSS) Program

A. History of IPSS and Program Structure

The Integrated Plant and Soil Sciences (IPSS) graduate degree program was formed in 2011 by merging degree programs in Crop Science, Forestry & Natural Resources, Horticultural Science, Plant Physiology, and Soil Science. Graduate students enrolled in one of these degree programs before 2011 were allowed to complete their degrees in those programs but new admissions into the individual programs were no longer allowed. These former degree programs have now been removed from the books. Current IPSS students self-identify with one of five specialization/concentration areas within IPSS: Crop Science, Environmental Science and Ecosystem Ecology, Horticultural Science, Plant Biology, and Soil Science. A sixth specialization area within IPSS, Plant Pathology, was proposed in Fall 2023 and is currently under consideration at the University Senate level. This new specialization will house incoming students in the Plant Pathology discipline, as the Plant Pathology program has submitted a proposal to suspend admissions soon and close the program after five years.

Since its inception, faculty with appointments in IPSS have come from the Departments of Forestry and Natural Resources, Horticulture, and Plant and Soil Sciences. Three faculty from the Department of Plant Pathology also have an appointment with the IPSS graduate faculty (Drs. Chris Schardl, Nicole Gauthier, and Kiersten Wise). Appointment to a program's graduate faculty means that individual faculty members can advise students in the program, serve on graduate committees (within and outside of the graduate program), and teach graduate courses with the program's prefix. Recently, the IPSS graduate faculty approved appointment of a faculty member in Landscape Architecture, which does not have its own graduate program. It is possible that faculty from other departments without graduate programs, or those that align more closely with research interests of IPSS faculty than their own department's graduate program (i.e., Biosystems and Agricultural Engineering) may approach IPSS for an appointment to better serve their potential students. With the merger of Plant Pathology's degree program into IPSS, a faculty voting process will be conducted to appoint Plant Pathology faculty to the IPSS graduate faculty. All of these changes mean that IPSS will become larger and encompass more disciplines.

The program student learning outcomes for IPSS (detailed below in **section 2.2.4**) emphasize knowledge, skills, and abilities that will prepare students for their chosen careers regardless of their specific discipline; they also aim to provide professional development for our students. As an interdisciplinary program, IPSS is meant to be customizable, allowing students, advisors, and committees to develop coursework plans that best suit the students' research area, background, and career goals. Thus, the degree program has **few specifically required courses**. All students must take a graduate-level statistics course to bolster their quantitative analysis skills. Students also must take IPS 610 (Transdisciplinary Communication in Integrated Plant and Soil Science) and IPS 625 (Transdisciplinary Research in Integrated Plant and Soil Science), and typically do so during their first year. The former course develops professional communication skills needed in an interdisciplinary program. The latter course focuses on interdisciplinary research approaches by examining an issue in

plant and/or soil sciences through multiple lenses and from different perspectives. For most of the review period, students were also required to take PLS 772, Seminar in Plant and Soil Sciences. This course has since been effectively merged into IPS 610 and, as of Fall 2024, PLS 772 will no longer be required for the IPSS degree. As of February 2024, proposals for these changes were at the University Senate level. Finally, IPSS students must present annually at a forum open to the UK community. Most students choose to present at the Professor Donald J. Sparks & Professor Bill Witt Graduate Student Symposium, held annually before the start of the spring semester.

The IPSS program requires that incoming graduate students meet the minimum qualifications set forth by the Graduate School – a baccalaureate degree from an accredited US institution or recognized foreign institution; a minimum 3.0 GPA for undergraduate work; and language certification scores for certain students depending on native language and country of origin. The IPSS program does not require the GRE. The IPSS program requires that all students identify an academic advisor before they are admitted to the program. Thus, students are not encouraged to formally apply to IPSS unless an advisor has committed to academically advising them and financial support for their stipend and tuition has been identified. This is done to save students from paying application fees that will likely not result in acceptance to the program. Applications from students who have identified an advisor are evaluated by the Steering Committee's faculty members. The DGS takes the result of their review for submitting a formal recommendation for admission to the Graduate School.

Students can complete an MS or PhD degree in IPSS. The IPSS program offers Plan A (thesis) and Plan B (non-thesis) MS degrees. The rules for committee composition are the same for thesis and non-thesis MS students. In many instances, the DGS is the academic advisor for Plan B students; however, the DGS does not have to be the chair for all Plan B committees. MS students in the thesis option must complete 30 total credit hours. This must include at least 24 credit hours of coursework, with the remainder as research credits once coursework is completed. MS students must take at least 15 credits at the 600-level or above, and at least 20 credits in regular courses (no seminars, special topics, etc.). Requirements for non-thesis option MS students are similar, but they must additionally take 4-8 credits in Research in Horticulture or Plant and Soil Sciences (independent research conducted on-campus). Non-thesis MS students can also apply some approved post-baccalaureate graduate courses towards their total credits and take "Special Problems" courses for off-campus research. MS thesis option students must submit a thesis, and students in both MS options must present an exit seminar and pass a final examination. There exists no MS degree requirement for applicants who want to pursue a PhD degree in IPSS. If an applicant without a MS degree desires to pursue a PhD degree, the advisor, the DGS and the IPSS steering committee's faculty members have to agree. PhD students must take 36 credits. Up to 18 credits can be transferred in from an approved MS program. Such decisions about transfer are at the discretion of the DGS and the Graduate School. PhD students must take at least 18 credit hours to satisfy residency requirements, pass a written and oral qualifying exam, complete a dissertation, and pass a final examination.

B. Changes since last review period

The administrative nature of the IPSS program has changed considerably since the last review period. In 2018, the IPSS Steering Committee (SC) was formed. While the Plant and Soil Sciences

Department remains the administrative/academic home for the program, the SC is composed of members from each department that participates in IPSS. The chair of PSS, working with the Associate Dean for Instruction, and in response to the prior programmatic review, created the steering committee to provide support and a consulting body for the Director of Graduate Studies (DGS) and to provide a voice for all units and current graduate students regarding future directions and program function. The committee consists of the SC Chair, the DGS, at least one additional faculty member from all participating units, an outside the program faculty member, and two current graduate student members (the IPSS Graduate Student Association President plus one more). Terms are yearly for the students and last 2-3 years for the other positions, which are staggered to give continuity to the committee over time. A faculty representative from Plant Pathology was added to the SC in November 2023.

The SC and DGS have complimentary but separate responsibilities to the program. The SC is tasked with programmatic changes (e.g., consolidation of IPS 610 and PLS 772); improving IPSS program function (e.g., changes resulting from student satisfaction surveys, spearheading discussion of distance learning); and program communication (e.g., editing and refining the graduate student handbook). Dr. Jason Unrine (PSS) served as first chair of the SC, followed by Dr. Erin Haramoto (PSS) in 2021. The DGS is the liaison between the program and the Graduate School. The DGS handles much of the student administration according to the Graduate School's guidelines, oversees the graduate students' annual progress review, leads the four-year-cycle program review, disseminates information from the Graduate School, and serves as primary point of contact for IPSS students. The DGS role comes with considerable administrative effort for a program as large as IPSS. In 2021, Dr. Mark Coyne (PSS), the long-term DGS, retired. Dr. Ole Wendroth (PSS) was then appointed as the new DGS. The DGS receives 20% administrative distribution of effort (DOE) for their service to the program. The SC chair receives 10% admin DOE. All other committee members serve as part of their standard service DOE (typically 5% in MG-CAFE).

Starting in 2019, the University of Kentucky's Graduate School began releasing annual block grant funds to graduate programs. In recent years, this annual allocation to IPSS is approximately $23,000. The IPSS Steering Committee and DGS meet annually to determine how to distribute these block grant funds. The majority of these funds (approximately two-thirds) provide travel awards, up to $600, to an individual student to present at conferences, conduct research, or attend workshops. These awards are first-come-first-served. In 2022-23, 25 awards were distributed. Block grant funds also support the IPSS Graduate Student Association (GSA) officers with a small supplement, outstanding IPSS graduate student awards, symposium winners, and the GSA professional development trip. Funds from the block grants are available to all students in IPSS, regardless of their "home" department. Other changes since the last review period include the following:

- **2018:** Instituted mandatory exit surveys, completed by all students when they complete their degree, to capture student opinions about the program, job and salary prospects, etc.
- **2018:** Completed first student satisfaction survey (see Appendix F)
- **2019:** Formation of new and continuing MS and PhD student awards – open to all IPSS students (four categories, up to three awards in each category)
- **2020:** Formation of the new specialization / concentration area Environmental Science and Ecosystem Ecology

- **2020:** Combined existing multiple annual symposia into one, the Professor Donald J. Sparks & Professor Bill Witt Graduate Student Symposium. This occurs on the last Friday before the spring semester begins and is planned by students in PLS 772 (soon to be IPS 610) with assistance from the Plant and Soil Sciences staff. Having only one annual symposium has improved faculty, staff, and student participation
- **2021:** Consolidation of departmental (PSS) graduate student awards –
    - Dr. Doyle E. Peaslee and Dr. Ronald E. Phillips Graduate Student Award in Crop Science (departmentally funded; PSS only)
    - Johnston-Carringer Agronomy Graduate Student Award (departmentally funded; PSS only)
    - Gerald O. Mott Meritorious Graduate Student Award in Crop Science (offered through Crop Science Society of America)
- **2022:** Repeated student satisfaction survey (see Appendix F)
- **2022:** Stipend raise for students advised by PSS faculty
- **2023:** Two University Scholars Programs were established effective Fall 2023 semester, with AMBT and NRES undergraduate programs. These programs allow undergraduate seniors to take graduate-level classes, shortening their time to complete the graduate degree. The first IPSS student from this program (AMBT) started in Fall 2023
- **2024:** The University imposed a mandatory stipend minimum raise for graduate students that is being installed in two phases, one beginning 01/01/2024, the second on 07/01/2024. The new rates are based on national statistics. We succeeded in getting one CIP code for all IPSS departments. The CIP code is used to determine stipend base levels, so all IPSS students, regardless of home department, will receive the same base stipend. Moving forward, the University will determine stipend minimums on an annual basis (see **section 9.2** for more on this subject)
- **2024:** Proposals to create a new Plant Pathology specialization in each (MS and PhD) IPSS program are moving through University Senate approval process at the time of this report development. These were created in collaboration with faculty of the Plant Pathology department and degree programs

C. Support provided by the PSS Department

The IPSS program is interdisciplinary and comprised of multiple departments. It is administratively housed within the Plant and Soil Sciences department, which assists the program in multiple ways. Importantly, major leadership roles in the program are held by PSS faculty (DGS, Steering Committee chair) currently and have been since IPSS inception.

1. **The PSS department provides financial support for the Graduate Student Association (GSA) and their events.** On average, the department provides $1,800 annually for the GSA's activities. PSS funds are also used for student lunches with seminar series speakers; PSS administrative staff provide logistical support in ordering and organizing these lunches. Lastly, the department supports other internal proposals put forward by the IPSS GSA (e.g., regalia robe rental).
2. **Administrative support for individual students and GSA.** The department's administrative support staff help coordinate most IPSS events, including the 3MT (ordering lunch, reserving room, creating flyer, help advertising, helping with IT needs); the symposium (managing and tracking abstract submissions; preparing abstract booklet; coordinating with presenters and

judges; ordering all food; poster boards - ordering, coordinating delivery, set-up, breakdown, pick-up; reserving space; setting space up and take down; IT needs; judging forms; advertising; recording and tallying judging results, printing certificates, submitting SAG forms for awards); the professional development trips (helping with vehicle reservations, hotel reservations, reimbursements, travel paperwork, etc.); graduate student Meet-n-Greet (reserve space, order food, help advertise); the graduate celebration and awards ceremony (advertise, order food, reserve space); assisting individuals with expense and travel-related questions; and providing support to grad students preparing for quals or exit seminars (room reservations, prepare flyers). Importantly, the PSS front office is the "go to" for many students.

3. **Administrative support for DGS and SC and program administration:** assists with and tracks IPSS faculty appointments and reappointments to the graduate school; administers and tracks the student exit survey; works with DGS and SC to develop periodic student satisfaction surveys; assists DGS in coordinating and advertising the orientation events; coordinates the applications for annual IPSS awards (advertise, manage applications, prepare packets for judging, track progress, prepare SAG forms for award distribution); provide general support for issues arising with registration, graduation, visa issues, EEP program, etc.
4. Importantly, the department **provides all communication support for the IPSS program**, including updating websites and managing listservs.

2.2.2 IPSS Student Enrollment and Demographics

Since the last review (starting in Summer 2017), 6 PhD students have graduated from the legacy programs. In Summer 2017, one graduated in Plant Physiology and one in Crop Science. In Winter 2017, one graduated in Crop Science. In Spring 2018, one graduated in Plant Physiology. In Winter 2018, one graduated in Soil Science. In Spring 2019, one graduated in Crop Science. No MS students graduated in the legacy programs during this review period.

On average, IPSS enrolls and graduates ~7-8 MS and PhD students per year (**Table 6**). As with many other graduate programs nationwide, enrollment in IPSS declined during the COVID pandemic; however, numbers are rebounding. Historically, the ratio of MS to PhD students is around 1:2, with yearly variability. The IPSS program continues to be strongly supportive of female graduate students, particularly in recent years (**Table 7**). The percent of total students identifying as female has risen over the review period, with females currently representing greater than half of all students. While the IPSS program has high representation of international students (**Table 8**), particularly for PhD students, the number of domestic under-represented minority students has been and remains quite low (**Table 7**).

Table 6. Number of incoming students, rolling enrollment, and number of graduates in IPSS MS and PhD programs, by fiscal year.

FY	Incoming MS	Incoming PhD	Total Enrollment MS*	Total Enrollment PhD*	IPSS graduates MS	IPSS graduates PhD
2018	**9**	**9**	**25**	**40**	**7**	**9***
2019	**3**	**9**	**18**	**39**	**7**	**7***
2020	**8**	**8**	**15**	**39**	**12**	**6**

2021	**5**	**5**	**15**	**34**	**3**	**9**
2022	**9**	**10**	**14**	**37**	**3**	**6**
2023	**13**	**3**	**22**	**36**	**7**	**8**
average	**7.8**	**7.3**	**18**	**38**	**6.5**	**7.5**
sum	**47**	**44**			**39**	**29**

*indicates value includes those from legacy programs.

Table 7. Demographics of graduate students enrolled in IPSS (MS + PhD), beginning in fiscal year 2018. Each fiscal year runs from July to June, so students enrolling in the Fall, Spring, and Summer are shown within one fiscal year. First generation student reporting started in FY 20-21.

FY	Total Number	Underrepresented Minority	Female	First Generation
2018	**63**	**1**	**25**	**na**
2019	**57**	**0**	**25**	**na**
2020	**54**	**0**	**23**	**na**
2021	**49**	**0**	**25**	**2**
2022	**51**	**0**	**27**	**1**
2023	**58**	**1**	**30**	**2**

Table 8. Residency status of students enrolled in IPSS (MS and PhD separate). For both MS and PhD students, there is a fairly even split between students coming from Kentucky and coming from out-of-state. International students contribute heavily to the PhD program – approximately 50%. Representation of international students in the MS program is lower.

	MS				PhD			
year	**# in-state**	**# out of state**	**# international**	**% international**	**# in-state**	**# out of state**	**# international**	**% international**
2018	**11**	**10**	**4**	**16**	**10**	**7**	**21**	**55**
2019	**8**	**7**	**3**	**17**	**10**	**8**	**21**	**54**
2020	**8**	**5**	**2**	**13**	**11**	**10**	**18**	**46**
2021	**7**	**6**	**2**	**13**	**10**	**10**	**14**	**41**
2022	**5**	**6**	**3**	**21**	**10**	**10**	**17**	**46**
2023	**9**	**10**	**3**	**14**	**8**	**11**	**17**	**47**

2.2.3 Program Delivery

A. Graduate teaching by PSS faculty

Faculty in the participating departments for IPSS contribute to graduate teaching (see Appendix G for course lists). During the review period, most PSS faculty contributed to graduate teaching in the

IPSS program, including 19 regular title series faculty and seven from the extension title series. The majority of the earned credit hours representing regular coursework, as opposed to independent studies, are taught by faculty in the regular title series (data not shown). Extension personnel have taught key courses in the absence of faculty in the regular title series. Examples include PLS 510 (Forage Utilization and Management, Dr. Jimmy Henning) and, prior to the hiring of Dr. Hanna Poffenbarger, PLS 470G (Soil Fertility, taught by Dr. Josh McGrath). Historically, extension personnel have also taught courses on tobacco and hemp production (Dr. Bob Pearce) and grains and oilseeds (Dr. Chad Lee). Limited demand and/or other faculty responsibilities have removed these courses from regular offerings and highlight the need for curriculum review and matching faculty expertise to graduate teaching needs.

Faculty in PSS contribute to teaching in other graduate programs, with their graduate courses cross-listed in Plant Pathology, Entomology, Biochemistry, Biology, Earth & Environmental Sciences, Toxicology, Sustainable Agriculture & Community Food Systems, Natural Resources & Environmental Sciences (see Appendix G). Additionally, PSS faculty have served key roles in the online MS graduate degree program, administered through the college, Science Translation and Outreach (STO), with Dr. Jimmy Henning serving as the Director of Graduate Studies for this program from

Based on recommendations in the previous self-study, and desire to improve online course delivery for off-campus employees using their tuition benefits, the IPSS Steering Committee and our faculty began a robust discussion of distance learning options in 2022. Experiences with online courses during the pandemic led many faculty to rethink the potential of distance learning as an effective learning tool. Many graduate courses taken by IPSS students have a large discussion component; discussions are difficult to moderate with remote students and teaching discussion-based courses asynchronously requires thoughtful design and careful implementation to maximize their effectiveness. Other graduate courses have laboratory components that are difficult to administer via distance learning. Overall, faculty were concerned that moving courses online for off-campus students would dilute their content and reduce our ability meet our program's student learning outcomes. The ability to "gate keep" and make virtual options only available to off-campus students was another concern, as faculty want to maintain the in-person nature of our degree program. Lastly, the pool of students desiring virtual options is quite small, limited to employees at off-campus stations and county extension agents. Many faculty perceived the effort needed to move enough courses online as disproportionate given the small number of students that would benefit from it. The Steering Committee remains committed to assisting faculty wanting to develop online options and is actively working to develop online options for key courses of interest to county agents (i.e., PLS 512, Grains and Oilseeds).

B. Graduate course offerings in IPSS

A consistent theme emerging from student satisfaction surveys is that they are dissatisfied with course offerings. Questions in the 2018 and 2022 student satisfaction surveys asked students if they agreed, disagreed, or were neutral with statements indicating their satisfaction on the number, frequency, and variety of course offerings. They were also asked if they were able to consistently schedule "relevant courses that contribute towards degree completion." Results are shown below in **Table 9**.

Table 9. Results from the 2018 and 2022 satisfaction surveys shows the percentage of MS and PhD students disagreeing with the statements, thus indicating that they are dissatisfied. (For the 2018 survey, respondents indicating "strongly disagree" and "somewhat disagree" are summed.) Data source: 2018 and 2022 student satisfaction surveys (pdf for 2018; used PPTX for 2022).

	MS 2018 (n=11)	MS 2022 (n=14)	PhD 2018 (n=18)	PhD 2022 (n=26)
Number of courses	72%	7%	38%	23%
Frequency of course offerings	72%	29%	33%	27%
Variety of course offerings	72%	0%	22%	35%
Consistently scheduling enough "relevant courses that contribute towards degree completion"	36%	36%	33%	31%

Dissatisfaction with the number, frequency, and variety of course offerings was particularly acute for MS students surveyed in 2018 (n=9). Scheduling for MS students can be problematic, as some courses are offered only every other year. However, satisfaction among MS students improved dramatically between 2018 and 2022 (n=14 MS students). It is possible that key hires during this period led to improved course offerings (Kawashima, Poffenbarger, Ren, Salmeron, Shepard); if anything, fewer courses were offered in 2021 and 2022 compared to 2018. Importantly, between one-quarter and one-third of PhD students are not satisfied with the number, frequency, or variety of course offerings, and note that they have difficulty scheduling relevant courses.

IPSS graduate courses have long suffered from low enrollment (**Table 10**), with 600- and 700- level courses averaging just over 5 students per semester. These averages are bolstered by the inclusion of required courses IPS 610, IPS 625, and PLS 772 that are taught in the fall semesters. In 2022, the PSS Chair instituted a new policy for allocating instructional distribution of effort (DOE) in low-enrollment courses. For courses with fewer than five students enrolled, instructors receive 1% instructional DOE per student (per 3 credit hour course). Whereas before, instructors received full credit (10% DOE for a 3 credit hour course) for teaching courses with <5 students enrolled. This policy change was intended to encourage instructors to increase enrollment by more aggressively advertising their classes, cross listing their courses to increase recruitment from other programs, consider adding an online section to the course, and/or consider modifying the course in some other way to make it more broadly attractive (less specialized). A few instructors have responded accordingly, and their enrollments have gone up, albeit modestly. After this policy was instituted, there does not seem to be a marked increase in the number of canceled classes, which peaked during Fall 2020 (possibly due to the influence of COVID).

Tables are included below that show (1) average enrollment sizes for the different graduate level courses, by semester (Table 10); (2) earned credit hours and the number of courses for different

graduate levels, separately by semester (Table 11); and (3) number of canceled classes for the different graduate levels (Table 12).

Table 10. Average enrollment for graduate-level courses taught by PLS faculty. Graduate level courses taught by HRT faculty, which may be taken by IPSS graduate students, are not shown. Credits taken for research, residency, and independent study are not included in these totals. Other instructional notes: 400G courses can be taken by graduate students, but total enrollment also includes undergraduates. Data source: PSS instructor credit hours.

	400G	500	600	700	average
Fall 2017	10.0	11.8	6.3	6.0	8.5
Spring 2018	15.0	6.6	3.7	11.0	9.1
Fall 2018	5.0	6.0	7.3	1.0	4.8
Spring 2019	9.5	6.4	4.0	4.0	6.0
Fall 2019	7.0	4.1	7.0	10.0	7.0
Spring 2020	9.5	6.3	6.5	2.0	6.1
Fall 2020	1.0	6.0	4.7	10.0	5.4
Spring 2021	5.0	6.1	3.7	0.0	3.7
Fall 2021	2.7	7.3	4.6	11.0	6.4
Spring 2022	10.0	4.6	6.3	0.0	5.2
Fall 2022	3.3	6.3	8.4	13.0	7.8
Spring 2023	8.5	4.6	4.3	0.0	4.4
average	7.2	6.4	5.6	5.7	

Table 11. Sum of earned credit hours and number of courses taught at each graduate course level, separately by semester. Earned credit hours represent the product of course credit hours and number of students completing the course. Courses taught by both regular and extension title series faculty are included together. The number of courses only includes those that were offered for the entire semester. Data source: PSS instructor credit hours.

	400G		500		600		700		total	
Semester	earned credit hrs	# courses	earned credit hrs	# courses	earned credit hrs	# courses	earned credit hrs	# courses	credit hrs	# courses
Fall 2017	30	1	129	4	80	7	6	1	245	13
Spring 2018	42	1	125	7	62	6	23	2	252	16
Fall 2018	15	1	12	1	158	9	2	3	187	14
Spring 2019	54	2	125	7	33	3	4	1	216	13
Fall 2019	21	1	78	7	103	7	10	1	212	16
Spring 2020	48	2	99	6	111	6	12	2	270	16
Fall 2020	3	1	15	1	94	9	9	1	121	12
Spring 2021	24	2	123	7	69	7	0	0	216	16
Fall 2021	18	3	126	6	69	7	11	1	224	17
Spring 2022	60	2	90	7	72	3	0	0	222	12
Fall 2022	30	3	55	3	99	5	13	1	197	12

Spring 2023	48	2	109	8	88	6	0	0	245	16
average	32.8	1.8	90.5	5.3	86.5	6.3	7.5	1.1	217.3	14.4

Table 12. Number of canceled graduate-level PLS courses since Fall 2017. Courses are split into "regular courses" and "special topics". For the latter, cancellation may indicate that the course shifted into a regular course offering. Courses may also move semesters and be canceled in the original semester (i.e., PLS 772 was originally offered in Fall and Spring, but program changes meant students only enrolled in one of the two semesters). Some courses are canceled multiple times, and these are reflected in the numbers below. Data source: PLS cancelled GR courses 2017-24.

	500 level		**600 level**		**700 level**		
semester	**regular course**	**special topics**	**regular course**	**special topics**	**regular course**	**seminar**	**totals**
Fall 2017	2	3					5
Spring 2018		3			2		5
Fall 2018	2	4		1			7
Spring 2019	1	1	2				4
Fall 2019			1		2		3
Spring 2020	3	2	1	1		1	8
Fall 2020	4	1	3	1			9
Spring 2021	1						1
Fall 2021		5	1	1			7
Spring 2022			2		2	1	5
Fall 2022			5	1			6
Spring 2023		2	3		1	1	7

C. IPSS student "home" department and committee participation

Majority of students in the IPSS program are advised by PSS faculty (**Table 13**). However, student advisory committee composition reflects the interdisciplinary nature of the IPSS program (**Table 14**). Other MG-CAFE departments with large representation on IPSS student committees include Plant Pathology (n=19), Animal and Food Sciences (n=11), and Agricultural Economics (n=9), with more minor representation from Biosystems Ag Engineering, Community Leadership Development, and Entomology. Faculty external to the college serving on IPSS student committees come largely from the College of Arts and Sciences (n=17), College of Engineering (n=5), and the College of Medicine (n=3).

Table 13. Number and percentage of IPSS students listed by their "home" department, i.e. administrative department of their primary advisor. Numbers represent active graduate committees since Fall 2017 through Spring 2023. Source data "Active Committees by Student." MS student committees are typically formed early in the students' career, though committee composition is typically not officially filed with the Graduate School until the student defends. The MS columns represent mostly students who have graduated during the 2017-23 period and is thus an under-representation of total MS student enrollment.

	PhD		MS	
home department	**number**	**%**	**number**	**%**
FNR	2	3	0	0
HRT	15	21	6	15
PSS	53	76	34	85
total	70		40	

Table 14. Committee service by department. Both MS and PhD student committees are included here, if active during the Fall 2017 to Spring 2023 period. Source data "Active Committees by Student."

	member		chair		
department	**number**	**%**	**number**	**%**	**total**
Forestry and Natural Resources	5	1	2	2	7
Horticulture	47	14	21	19	68
Plant and Soil Sciences	194	58	87	79	281
other UK	78	23	0	0	78
external	11	3	0	0	11
total	335		110		445

2.2.4 Assessment

A. How is the plan developed and updated with faculty discussion and input?

The University of Kentucky is part of the Southern Association of Colleges and Schools Commission on Colleges (SACSCOC). SACSCOC is the institutional authority that assesses Program-level Student Learning Outcomes (PSLO) of graduate programs at each institution and compares them to their accrediting standards https://sacscoc.org/accrediting-standards/. Each graduate program, with input from their own faculty, now submits their own learning assessment plan, with specific learning outcomes, artifacts to assess the outcomes, and how these are assessed. UK changed the assessment process in 2019 to a four-year-cycle divided into collecting and reporting results over two years on specific outcomes, followed by a reflection phase in year 3, and the development and delivery of an action plan in year 4. Only in year 4, a report is written out with clear descriptions of the actions that the program takes in response to the results (years 1 and 2) and the reflection (year

3). The provost's office is accountable for meeting the SACSCOC requirements. Our students would not be eligible for federal financial aid if we did not have SACSCOC as the accrediting body that we answer to. Tricia Coakley in the Office of the Associate Dean for Faculty Resources, Planning and Assessment is our college's liaison to OSPIE (Office of Strategic Planning and Institutional Effectiveness) and the provost's office.

The initial assessment plan was developed by the IPSS program initiator and previous and first IPSS Director of Graduate Studies, Dr. Mark Coyne—and was then updated in 2022 by the next and current DGS, Dr. Ole Wendroth. While relatively similar, separate plans for assessment of the MS and the PhD program are requested and therefore designed. The four learning outcomes are as follows:

- **Knowledge:** Graduates will have acquired extensive knowledge of the sciences and technology that support research, education, and technological innovation in plant, soil, and environmental sciences, that help meeting current challenges of food security and environmental sustainability.
- **Skills:** Graduates will have developed skills in state-of-the-art measurement and analytical methods, computer programming, diagnostic and predictive skills using special computer software, and teaching subjects within agricultural and environmental sciences.
- **Communication:** Graduates will have acquired skills in communicating their ideas, critical and analytical thinking in research, education, and advocacy, and in communicating their science in peer-reviewed publications, and presentations to various audiences, e.g., scientists, growers, environmental agencies, public, and policy makers.
- **Professionalism:** Graduates will have acquired expertise, competency, and attitude for pursuing careers in science and education, production agriculture, agricultural and environmental policy making, agribusiness, and public service.

The PSLOs, measures, and artifacts were altered slightly by the DGS in 2022. The instruments (measures) for learning outcome evaluations were reduced to four, consisting of three mandatory courses and the annual progress report. This change was suggested by the DGS, discussed and revised with the IPSS Steering Committee, and discussed by the IPSS faculty.

<u>Measure 1:</u>

Professional communication: (e.g., grant writing, evaluation of public presentation)

Information on this measure is obtained from the course IPS 610 'Transdisciplinary Communication in Integrated Plant and Soil Sciences' which is mandatory for all graduate students and recommended to be taken early during their curriculum. This measure evaluates the graduate students' accomplishments in the PSLOs Knowledge, Communication, and Professionalism.

Rationale for this measure:

This measure was chosen because it specifically focuses on communication and professionalism skills. The instructor's grade is a dependent artifact whereas presentation judging by multiple faculty evaluators is independent. Strong pedagogic effect is given through graduate student peer feedback and learning from each other. This measure is characterized by a high level of competition.

Description of this measure:

All IPSS Graduate Students are required to complete this course.

A) Students write a short proposal simulating a proposal submission to an extramural funding agency.

B) Students prepare and present a 3-slide presentation on the research in their lab.

C) Students prepare a poster on their dissertation project.

D) Students make a 3-minute presentation on their research proposal.

E) Students review a minimum of 8 seminars or other presentations.

Summary:

Students compose and practice presentations in this class, learn from each other and receive feedback from their peers and the instructor in preparation for the IPSS symposium.

Goal:

For both, MS and PhD students, the goal in this measure is that 85% of the students reach at least 90% in each of the five categories.

Measure 2:

Apply knowledge and communication to evaluate complex problems which can only be solved with trans-disciplinary approaches.

Information on this measure is obtained from the course IPS 625 'Transdisciplinary Research in Integrated Plant and Soil Sciences' which is mandatory for all graduate students and recommended to be taken early during their curriculum. This measure evaluates the graduate students' accomplishments in the PSLOs Knowledge, Skills, and Communication.

Rationale for this measure:

This measure is introduced to broaden IPSS students' experience and awareness of the relevance of their major to the real world. The student learning success is measured through the instructor's grade as a dependent artifact. Further artifacts are: Reading assignments, presentations to class, leading of group discussions (Knowledge); leading discussion and grant proposal with assembling of a team of collaborators (Communication); and identifying skills necessary to conduct the research.

Description of this measure:

All IPSS graduate students are required to complete this course. During the course, they are exposed to invited speakers, visit local agriculture-related industries, lead group discussions, and create a transdisciplinary research proposal.

Goal:

The goal of this measure for both MS and PhD students is that at least 85% of students earn an "A" grade.

Measure 3:

PLS 772 Seminar in IPSS:

Information on this measure is obtained from the course PLS 772 'Seminar in IPSS'. This is another course that is mandatory for all graduate students and recommended to be taken early during their curriculum. This measure evaluates the graduate students' accomplishments in the PSLOs Knowledge and Professionalism.

Rationale for this measure:

Professionalism is reflected in the way a student handles questions from the audience (during the IPSS symposium) and the way in which students provide feedback and ask questions (in class). Instructor's grade is used as dependent artifact. Presentation referee's scores count as independent artifact.

Description of this measure:

All IPSS graduate students are required to complete this course. Specific problems in crop, soil, horticultural, environmental sciences, and plant physiology are discussed to enhance students' knowledge and awareness of the importance of their major for meeting environmental and food challenges. In the IPSS symposium, students are independently evaluated by three faculty who are not their advisors. Evaluation scores are scaled measures.

Goal:

One goal for this measure is that 85% of both PhD and MS students earn an "A" in PLS 772. Furthermore, 60% of the PhD students score > 90% in their IPSS Symposium presentation, while the goal for MS students is that 50% of them score higher than 90% in their IPSS Symposium presentation.

Measure 4:

Annual Progress Report:

Information on this measure is obtained from the Annual Progress Report. Main accomplishments documented in the progress report are published refereed journal articles, awards, conference participation and presentation, and the set of skills acquired in lab courses or field investigations, computer programming skills, computational skills, e.g., running computer programs for data analysis or simulation models. Therefore, this measure covers PSLOs skills, communication, and professionalism.

Rationale for this measure:

The Annual Progress Report with a strong component of externally evaluated (multiple and independent referees) accomplishments is the most rigorous and independent measure reflecting the degree of professionalism and skills of graduates. Advisors' evaluation of the four PSLOs is dependent. However, measuring criteria such as publications, computational, lab/field skills, conference participation, awards are independent assessments through outside reviewers and peers. Having a specific high-level skillset makes a graduate attractive for potential employers who look for particular expertise.

Description of this measure:

All IPSS graduate students and their advisors contribute to this document. Publications have undergone peer review, recognition through awards judged by award committees, presentations at conferences, special skill set in computation and diagnostics. The advisors and major professors provide feedback to their graduate students on an annual basis for each of the PSLOs, and the advisors indicate the level the graduate student is progressing, i.e., specifying whether it is lagging, progressing, on track, or advanced.

Goal:

For MS students, the goal is that at the time of their graduation all MS students have submitted at least one manuscript to a peer-reviewed journal. Entering their third year, PhD students are expected to have submitted at least one manuscript to a peer-reviewed journal,

and at the time of their graduation, PhD students have published at least one peer-reviewed article. Both, MS and PhD students have taken a course with a chemical, physical, biological or computational component. PhD students are proficient in at least one programming language or are experienced with a specialized computer software. Moreover, by the end of their second year, MS and PhD students are proficient in at least one analytical laboratory or field measurement skill. By the time they graduate, 50% of PhD and 25% of MS students have assisted in teaching at least one class. Both, PhD and MS students attend at least one national conference by the time they graduate. Entering their third year, PhD students submit at least one research proposal. MS students do not have a proposal submission goal.

B. What has been determined about student learning so far using the existing plan?

The results presented here are based on the academic year 2021-2022

IPS 610 – Transdisciplinary Communication in Integrated Plant and Soil Sciences:
Seven PhD and 5 MS students were enrolled in the course. All students received an "A" grade. The PhD students performed in the five different categories as follows:

A (proposal): 100 % scale:	7/7 PhD students scored 95.
B (3-slide presentation): 20-point scale	7/7 PhD students scored 20.
C: (Poster): 20-point scale	7/7 PhD students scored 20.
D: (3-min. research prop. pres.): 20-point scale	2/7 PhD students scored <15, 15 < 3/7 PhD students ≤ 18.0, 2/7 PhD students > 18.0.
E: (reviewing other presenters): 20-point scale	7/7 PhD students scored 20.

The MS students performed in the five categories as follows:

A (proposal): 100 % scale:	5/5 MS students scored 95.
B (3-slide presentation): 20-point scale	5/5 MS students scored 20.
C: (Poster): 20-point scale	5/5 MS students scored 20.
D: (3-min. research prop. pres.): 20-point scale	1/4 MS students scored ≤16, 16 < 1/4 MS students ≤ 18.0, 2/4 MS students > 18.0.
E: (reviewing other presenters): 20-point scale.	5/5 MS students scored 20.

Both, PhD and MS students met the criteria partially -- 5/7 PhD students and 2/4 MS students underperformed in the 3-minute presentation of their research.

In **IPS 625 'Transdisciplinary Research in Integrated Plant and Soil Sciences'**, all students in both MS and PhD categories performed equally well across all three PSLO's. All students completed this course with an "A" grade, and the criterion was fully met.

The **PLS 772 'Seminar in IPSS'** was completed by all PhD (7) and all MS (4) students enrolled with an "A" grade. This measure was fully met. Students' presentations were reviewed by independent judges. For PhD students, 50% scored > 90% in their presentation (10% fewer than expected). Hence, this measure was partially met for the PhD students. On the other hand, 50% of the MS students scored above 90%, fully meeting this measure of success.

Annual Progress Report:
All five PhD students who graduated in the timeframe considered here published a refereed journal article, and thus, this criterion was fully met. Among the five MS students who graduated, one published and two have submitted manuscripts. Therefore, MS students partially met this criterion.

From the 33 PhD students responding, 17 took at least one class with a lab component, 16 have special computation skills, and 10 special expertise in field or lab analytics. Among the 15 MS students, 15 took a class with a lab component, seven have special computational skills, and six special field or lab analytical skills. Both PhD and MS students partially met this criterion.

Nineteen out of 33 PhD students and 8 out of 15 MS students attended a national conference.

Regarding the submission of a research proposal, with 12 PhD students and 2 MS students having submitted a research proposal, this criterion was not met. Fourteen out of 33 PhD students assisted in teaching, and the respective goal was partially met. On the other hand, the MS students – five having assisted in teaching – met this goal in full.

C. Anticipated Changes to the Curriculum or the Assessment Process based on what has been learned to date

One significant change to IPSS and its curriculum will result from the creation of a sixth specialization area, Plant Pathology, that will house incoming students in this discipline. As the IPSS program expands and becomes even more interdisciplinary, the Steering Committee, DGS, and faculty will need to reevaluate the PSLOs and measures to ensure the program's academic rigor.

With regard to Knowledge, Skills, Communication and Professionalism, both MS and PhD students performed well. Not all graduated MS students met the publication goal, but PhD students did.

Table 15. Average student rating when asked "Please rate your overall experience with the IPSS degree program in each of the following areas". 1=terrible; 2=poor; 3=average; 4=good; 5=excellent.

Area	Average Rating	Percent Indicating "Good" or "Excellent"
Overall quality of the degree program	4.37	90
Quality of the faculty offering instruction/advising in the degree program	4.5	90
Academic standards of the degree program	4.2	82
Extent to which the program has kept pace with recent developments in your field	4.31	86

Benefit versus cost of the program	4.3	85

Table 16. Students were asked to rate these aspects of IPSS: they were asked "Please rate the IPSS degree program in each of the following areas". 1=terrible; 2=poor; 3=average; 4=good; 5=excellent. All aspects surveyed are shown in the table below.

Area	Average Rating	Percent Indicating "Good" or "Excellent"	Percent Indicating "Poor" or "Terrible"
Clarity of program objectives and goals	4.15	80	6.7
Coherence of program curriculum in meeting program goals	4.13	77	5
Relevance of courses to program goals	3.95	73	15
Academic rigor of courses	4.05	82	3.3
Instructional resources (textbooks, websites, media tools, etc.)	4.15	80	1.7
Quality of classroom	4.32	83	0
Quality of laboratory facilities	4.25	86	1.7
Quality of research/field facilities	4.45	92	0
Availability of laboratory facilities	4.47	91	3.5
Availability of research/field facilities	4.56	95	1.7
Professional development opportunities	4.26	81	3.5
Research opportunities	4.43	91	0

3. FACULTY AND STAFF

3.1 Faculty Composition

The number of faculty within the department has been declining for decades, following national trends for Agronomy Departments. This review period saw a more rapid decline (**Table 17**), resulting from the ~9.5% budget cut that we took at the beginning of COVID and a recent increase in retirements and resignations (**Table 18**). We have lost 12 faculty and only added 6 over the review

period, though we have one more slated to join us July 1, 2024, and we have two active faculty searches underway.

Table 17. Faculty size for the Department of Plant and Soil Sciences, 2017 – 2023. A faculty member with any percentage of extension/instruction/research DOE in the department was counted, so these numbers represent faculty count, not faculty DOE. Post-retirement appointments are not included.

Title Series	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**	**2023**
Adjunct	9	8	9	7	7	8	10
Extension	13	13	13	12	12	11	11
Regular	26	26	27	27	26	25	25
Research	1	2	1	1	0	0	0
Special	1	1	1	1	0	0	0
Total (-Adjunct)	**41**	**42**	**42**	**41**	**38**	**36**	**36**

Table 18. Faculty attrition, replacement, promotions Jan. 2018-FY 2024.

	Retirements	Resignations	Deaths	Hires	Not Tenured	Tenured
Jan. 2018-June 2018	0	1*	0	2	0	0
2018-2019	0	1*	1*	1	0	0
2019-2020	0	1*	0	0	0	1
2020-2021	1	0	0	0	0	1
2021-2022	1	1*	0	0	0	1
2022-2023	2 (1*)	2	0	1	0	3
2023-2024	1	0	0	2	0	na

* These lines were lost and not refilled, due either to budget cuts or to only partial appointments left in our unit (often the result of split-appointments or people taking on significant college-level administrative duties).

All Assistant Professors hired since FY18 who have gone up for promotion have been successful (n=6). In addition, four Associate Professors have been promoted to Professor during this review period (n=5 put forward). All faculty positions proposed to the college leaders, except for one, have been approved for filling. In addition, at least one position has had two rounds of searching. The department has a formal mentoring policy for new faculty members and the department chair has created a new faculty on-boarding training program that she conducts within the first two months of the individual joining our department (see Appendix H). These support programs are well-received by new and prospective faculty.

Faculty composition profile is as follows for FY23:

Plant and Soil Sciences
Faculty Snapshot FY 2023

All Faculty by Title Series

Title Series	Faculty	Percent
Adjunct	10	20%
Clinical	0	0%
Extension	11	22%
Lecturer	0	0%
Part-Time	0	0%
Post-Retirement	3	6%
Regular	25	51%
Research	0	0%
Special	0	0%
Total	49	100%

Full-Time Faculty by Rank

Rank	Faculty	Percent
Professor	21	58%
Associate	10	28%
Assistant	5	14%
Lecturer	0	0%
Senior Lecturer	0	0%
Total	36	100%

Full Time Faculty DOE for CPM 2.0 Groups

	Faculty
Instruction > 10 %	17
Research > 10%	33

All Faculty by Full-Time/Part-Time Status

FT/PT Status	Faculty	Percent
Full-time	36	73%
Part-time	13	27%

Full-Time Faculty by Assignment Period

Assignment Period	Faculty	Percent
12 month	35	97%
9 month	1	3%

Full-Time Faculty Credentials

Credentials	Faculty	Percent
Ph.D.	36	100%
Ph.D. and DVM	0	0%
DVM	0	0%
Ed.D.	0	0%
Master's	0	0%

Full-Time Faculty by Tenure Status

Tenure Status	Faculty	Percent
Tenured	30	83%
Tenure Eligible	6	17%
Not Eligible	0	0%

Full-Time Faculty by Years of Service

Years	Faculty	Percent
< 4	1	3%
4-6	5	14%
7-9	3	8%
10-12	2	6%
13-15	3	8%
16-18	2	6%
19-21	7	19%
22-24	2	6%
25-27	1	3%
28-30	2	6%
> 30	8	22%

Full-Time Faculty by Age

Age	Faculty	Percent
20-29	0	0%
30-39	4	11%
40-49	11	31%
50-59	8	22%
60-65	7	19%
>65	6	17%

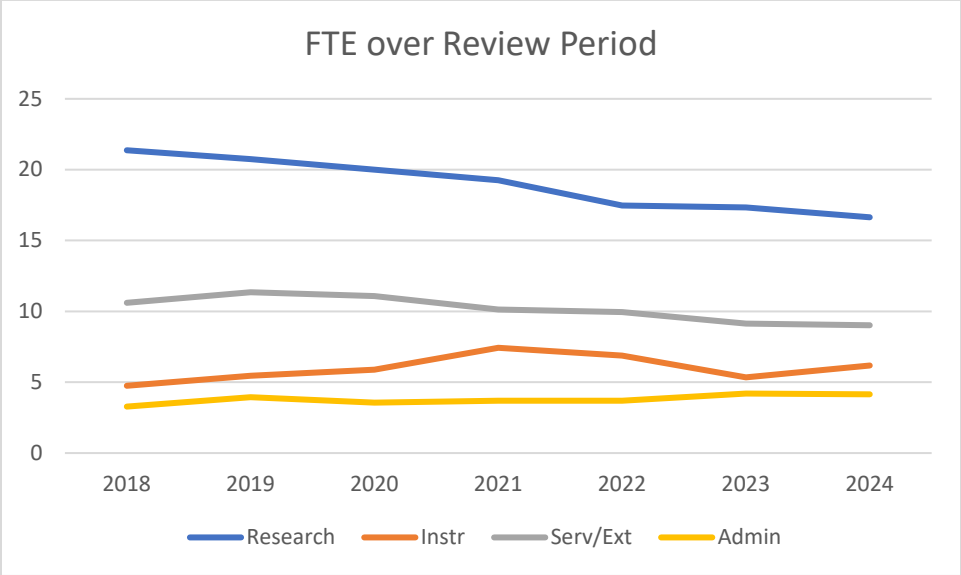
Full-Time Faculty Characteristics

	Faculty	Percent
Female	9	25%
Male	27	75%
URM	2	6%
Not URM	34	94%
CPM 2.0 Group	12	33%
Not CPM 2.0 Group	24	67%

Faculty composition is becoming younger and more diverse over time. We average 22% female and 10% under-represented minority over the review period.

Faculty average FTE over the review period is: 18.9 Research, 5.99 Instruction, 10.2 Extension/service, and 3.8 Administration. FTE in both research and extension/service have declined throughout the review period, whereas FTE in instruction and administration have increased (albeit modestly). The decline in research FTE is the most dramatic (~5 FTE) and is concerning given that our unit has historically been very research focused.

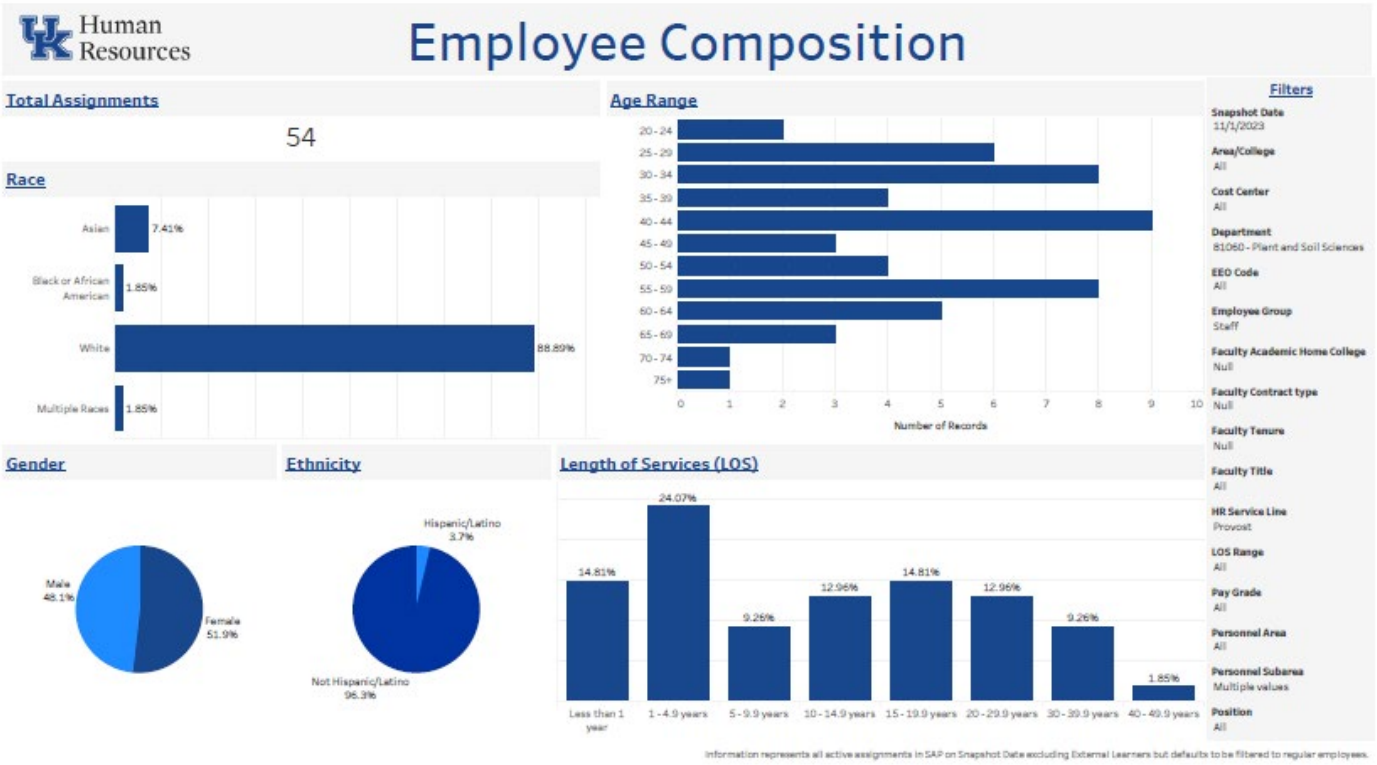
Figure 9. Changes in FTE over the review period.



3.2 Staff Composition

As of January 1, 2023, the department has 62 full-time staff, 33 undergraduate student workers, 17 temporary staff, 8 postdoctoral scholars, and 34 research/teaching assistants on our payroll. These numbers are on par with those reported in July 2017 as part of our last periodic review. Approximately, 1/3 of our staff are grant supported (in part or in full). Our staff are located on campus in Lexington, on the North Farm (Spindletop), and at the UKREC at Princeton. A snapshot of the demographics of our staff is included on the next page (**Figure 10**).

Figure 10. Departmental staff compositional make-up as of November 2023.



We have a large and dynamic staff population. We experienced a significant turnover in staff due to COVID, like the rest of the nation. Our business and front office staff positions and our Plant Science Building IT position have all turned over multiple times during the review period. The department chair has worked hard to get these critical positions filled as quickly as possible, and all are currently filled, but the constant training required to onboard new individuals is exhausting and has hampered our unit's function. We hope the work force is stabilizing and that the current folks will remain and grow in the roles.

3.3 Faculty and Staff Deployment

Faculty and staff assignments are determined via consultation with the department chair. The prior department chair worked to reduce disparity in staff assignments across faculty, and the current department chair has maintained that approach when possible. Most of our Extension faculty share a technician, while the majority of our research faculty are assigned a full technician position. Any additional staffing needs are expected to be grant supported. The current department chair re-organized the front and business office positions and created the Department Manager position. This position has proven critical, especially regarding the substantial emergency management situations and insurance claims that the unit has experienced (see section 8.1). The department manager is a delegate for the department chair for all approvals – a significant task for a unit the size

of ours – and helps oversee a variety of infrastructure and administrative functions of our unit (as well as for the whole of the Plant Science Building).

When changes in assignment (staff) or distribution of effort (faculty) are required, the department chair works to find replacements and/or solutions to fill holes that are created. The department chair is constantly working to improve the functionality and efficiency of our operations. With inflation and work force instability resulting in staff salaries rising dramatically over the past few years, open staff positions (not lost to budget cuts) are often used to fund raises for other positions. Open positions (staff and faculty) remain critical to cover our operational expenses (see budget section 8.3). Our financial resources are finite and as existing position salaries rise, our overall numbers of positions will likely have to shrink unless additional funds/sources can be secured.

3.4 Faculty and Staff Success

While faculty success has been reported elsewhere (e.g., **Tables 22**, **26**), our staff have been equally deserving and successful, with many receiving college-level recognition for excellent service (**Table 19**) and 3-4 staff members a year receiving college-level support for professional development. We have had one staff member receive a Sustainability Challenge Grant to create and install a diversity-oriented mural on our main building at the North Farm.

Table 19. PSS Staff receiving awards during the review period.

Awardee	Award	Year	Scope
Blue Water Farms Team	Outstanding Staff Award	2023	College
Anthony Clark	Outstanding Staff Award	2022	College
Suzette Walling	Outstanding Staff Award	2022	College
Matthew Allen	Outstanding Staff Award	2021	College
Jeanne Hartman	Outstanding Staff Award	2020	College
Chris Rodgers	Outstanding Staff Award	2019	College
Kai Su	Outstanding Staff Award	2019	College
Maggie Maynard	Outstanding Staff Award	2018	College
Krista Lea	Outstanding Staff Award	2018	College
Brian Lauer	Outstanding Staff Award	2017	College

In an attempt to better recognize staff who go the extra mile for our unit (since additional salary is difficult to come by), the department chair instituted a department-only 'PSS Staff Recognition Award' several years ago. Faculty, staff, or students can nominate someone for this award, and the nomination process is simple – a digital form link that asks for nominee name, nominator name, and then a box for justification for the award. This link is live on our internal website. To date, the department chair has received five nominations. The department chair purchases a small gift (within UK value limit) and presents it to the staff member along with a thank you note. The department chair reminds staff and faculty that this award exists at our regular meetings.

4. RESEARCH

4.1 Overview

The Department of Plant and Soil Sciences is research spans the entire range of agronomic science and more. This breadth may be viewed in terms of disciplinary areas; PSS faculty conduct research in soil science, environmental biology and science, ecology, crop science, plant breeding, molecular genetics and biochemistry, and biotechnology. The department is committed to multidisciplinary research and collaboration that spans disciplines. Our research addresses the impacts that the agricultural enterprise and human civilization have on the environment – air, water, and soil – and how management practices can sustainably minimize harmful impacts. Our research broadens the genetic and biotechnological resources available for crop improvement. Our research looks at cropping systems involving "traditional" and alternative crops from a range of perspectives that includes weed management, the rhizosphere and soil health, and plant-microbe interactions. Our research in forages is enhanced by collaboration with the USDA-ARS Forage Animal Production Unit (FAPRU), a collaboration that integrates crop science research with animal and environmental science. Partnering with the Kentucky Tobacco Research and Development Center (KTRDC) is a vital aspect of a strong tobacco science program and a burgeoning program that focuses on hemp and also adds strength to research in biotechnology. No picture of PSS research would be complete without highlighting the excellent applied research conducted by faculty at the Grain and Forage Center of Excellence, housed at the University of Kentucky Research and Education Center at Princeton (UKREC). Ground-breaking research into no-tillage agriculture is a hallmark of this group of scientists and it has led to Kentucky's position as the epicenter of the profitable, sustainable corn-wheat-doublecrop soybean rotation.

A. Progress since the last review

In the 2017 departmental review, the Review Committee recommended (among other things) that the department, "Explore ways to enhance scientific collaboration and transformative ideas by facilitating faculty interactions, particularly with extension faculty and new faculty hires." Since then, the department has conducted several activities to facilitate faculty interactions. There have been six off-campus faculty retreats held in the summer. These retreats provide opportunities for attendees (regular and extension faculty) to interact, as they typically include multiple meals, social evening engagements, and ample time during the meeting. Importantly, new faculty positions are discussed at these retreats; these formal deliberations allow the entire department insights into new directions and possibilities for cross-disciplinary initiatives. Our retreats also include volunteered flash/lightening talks from faculty, which are informative and help keep us up to date on what we are all working on. Prior to the last review, our unit had not had a retreat in >10 yrs.

Since 2017, there have been numerous annual workshops and field days for departmental faculty, staff, and other stakeholders; faculty participation in these events remains strong. Examples include the annual field days held for these commodities: wheat, corn, soybeans, hemp, and tobacco. Additionally, the forage group conducts field days and forage tours in the eastern and western parts of the state, and the weed science group has an annual field day. The chair also supports internal

calls for proposals yearly, and favors collaborative, multi-user proposals for funding. These efforts appear to be bearing fruit, as our collaborative grant funding went up significantly in 2018 and has remained higher than primary PI grant funding since (**Figure 1; Table 20**).

B. Research activity and highlights

As befits a department as large and with as diverse a range of research as ours has, the research accomplishments in the review period are many. Our research publication output has **averaged 4.9 publications per year per research FTE** (full-time equivalents; **Table 20**), which exceeds our 2017 goal by almost 2 publications a year**.** Of note are the active leadership roles of departmental faculty in the greater agricultural enterprise in the USA and the international arena. This is reflected, for example, in the contributions of departmental faculty to three important agricultural treatises that review progress and prospects:

- Hofmann, T., *et al.* Technology readiness and overcoming barriers to sustainably implement nanotechnology-enabled plant agriculture. *Nature Food.* (2020) 1, 416–425. https://doi.org/10.1038/s43016-020-0110-1
- Henkhaus, N. *et al.* Plant science decadal vision 2020-2030: Reimagining the potential of plants for a healthy and sustainable future. *Plant Direct.* (2020) Sep 1, 4(8):e00252. https://doi.org/10.1002/pld3.252
- Boyles, R. E., *et al.* Approaching 25 years of progress towards *Fusarium* head blight resistance in southern soft red winter wheat (*Triticum aestivum* L.). *Plant Breeding.* (2023), 1–16. https://doi.org/10.1111/pbr.13137

These reports are authored by distinguished international teams and set goals for the respective scientific communities. The participation of PSS faculty in these important activities reflects the stature that departmental faculty, and the department as a whole, has in the agricultural scientific community.

Table 20. Research productivity metrics for Department of Plant and Soil Sciences

	2016-2017	2017-2018	2018-2019	2019-2020	2020-2021	2021-2022	2022-2023
Full time faculty	35	44	43	41	41	38	36
Research FTE	22.54	20.37	20.74	20.42	19.26	17.64	17.33
Books and book chapters	8	6	8	2	1	3	1

Refereed journal articles	135	68	91	85	119	75	77
Books + book chap. + refereed art.	143	74	99	87	120	78	78
Publications per research FTE	6.3	3.6	4.8	4.3	6.2	4.4	4.5
Direct awards per full time faculty	$114,430	$106,236	$135,529	$164,190	$65,755	$102,637	$98,322
Direct awards per research FTE	$213,223	$219,044	$274,457	$337,680	$139,977	$221,100	$204,246
Direct grant awards	$4,806,056	$4,461,930	$5,692,231	$6,895,993	$2,695,948	$3,900,196	$3,539,584
Federally competitive grant awards	$1,134,777	$1,117,853	$1,284,407	$3,308,402	$1,126,606	$1,087,016	$1,597,015
% of grants federally competitive	24%	25%	23%	48%	42%	28%	45%
Collaborative grant awards	$4,158,219	$3,784,325	$12,019,758	$8,047,919	$7,988,262	$7,305,955	$5,306,635
Patents	0	0	0	0	2	0	0
Cultivar releases	0	1 dark tobacco	1 dark tobacco	1 burley tobacco	0	1 wheat	1 burley tobacco

We value student involvement in our research programs. Faculty encourage and work with our trainees to publish their work. Student publications have increased noticeably during this review period (**Table 21**).

Table 21. Summary of publications with graduate student authors, 2017-2022*.

	2017	**2018**	**2019**	**2020**	**2021**	**2022**	**2023**
Graduate student-authored publications (first author**/graduate students as 2nd or higher order co-author***)	9/7	16/7	30/9	34/16	33/6	22/9	17/9
Graduate student-authored publications (PSS faculty served on graduate student's committees /PSS faculty were collaborators in projects with external graduate students involved)	6/5	7/12	6/18	5/13	2/11	4/19	4/2

Graduate students enrolled (Spring/Fall)	63/63	61/57	55/54	56/49	50/51	54/58	52/54
M.S. and Ph.D. degrees awarded (MS/PhD)	7/6	9/7	9/6	5/9	5/7	5/7	3/4 (Fall N/A)

*Student publications are counted for graduate students advised in the Department of Plant and Soil Sciences while the students enrolled and the degrees awarded include all IPSS students, advised in both the Department of Horticulture and the Department of Plant and Soil Sciences.

**The publications with graduate students as first authors were published as refereed journal articles.

***The publications with graduate students as 2nd or higher order co-author (second, third or higher order) were published as refereed journal articles.

In addition to publications, departmental faculty have aggressively pursued extramural funding to support our research programs (**Table 20**). We successfully grew our extramural funding from 2016 – 2020 by 43%, but COVID negatively affected our extramural granting efforts. We saw a dramatic (>50%) decline in funding in 2020-2021, and while we are re-bounding, we have not yet reached pre-COVID levels. These trends in funding are undoubtedly also driven by the sizable reduction in research FTE we have experienced over the review period (from 22.5 in 2016/17 to 17.3 in 2022/23; **Figure 11**) and as we replace faculty with assistant professors. Our direct grant awards per research FTE values are similar now (~$200K) to those pre-COVID (~$220K), illustrating that the research faculty that remain are generally maintaining their productivity ($$-wise). This is also testified by the fact that the overall proposal yield (funded projects/proposals) has not trended significantly higher or lower over the review period (**Figure 11**). Thus, the reduction in funding and proposals is attributable to the reduction in research FTEs in the department, a trend that goes back beyond the current review period.

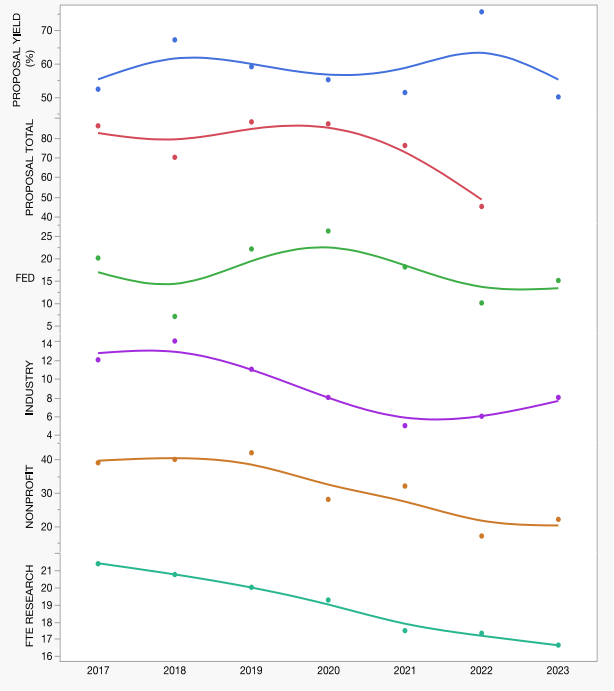


Figure 11. Trends in proposal submission and yield, Federal, Industry, and Non-Profit funding, and research FTE since the last departmental review.

It will be important that we retain current and fill open research-oriented faculty lines with strong candidates moving forward, which we are in the process of doing. This is particularly true as our unit is typically a leader in funding for our college (ranked top 5 in funding for MG-CAFE over the review period), a position we would like to retain and love to raise.

Our prowess in research is also demonstrated by departmental faculty being recognized with several significant awards since 2017 (**Table 21**). These awards include five MG-CAFE awards that recognize merit, four University Research Professor awards (the highest distinction bestowed upon faculty by the University of Kentucky in recognition of research accomplishment), a regional award that supports research collaboration between SEC universities, and an award (Fellow of the American Association

for the Advancement of Science) of considerable national import. We look forward to working with the Assistant Dean for Research to identify good opportunities for faculty award nominations in the coming years.

Table 22: PSS research faculty awards of note bestowed during the review period.

Year	Awardee	Award	Scope
2023	Ole Wendroth	Kirkham Soil Physics Award	National
2023	Ole Wendroth	Willie Woltz Lecturer Award, NCSU	National
2022-2023	Lauren Brzozowski	SEC Faculty Travel Program	Regional
2022	Ling Yuan	Thomas Poe Cooper Research Award	College
2021	Hanna Poffenbarger	FFAR New Innovator Award	National
2021	Jason Unrine	Bobby Pass Excellence in Grantsmanship Award	College
2021	Tomo Kawashima	Prestigious Research Paper Award	College
2021	Larry Grabau	Global Impact Education Abroad Award	University
2020	Bill Witt	Lyons Outstanding Service Award	University
2020	Jason Unrine	Thomas Poe Cooper Research Award	College
2019	Mark Coyne	William B. Sturgill Outstanding Graduate Education Award	University
2019	Hongyan Zhu	Prestigious Research Paper Award	College
2019-2020	Jason Unrine	University Research Professor	University
2018-2019	Dave Van Sanford	University Research Professor	University
2018	Hongyan Zhu	Thomas Poe Cooper Research Award	College
2018-2019	Arthur Hunt	SEC Faculty Travel Program	Regional
2017-2018	Ole Wendroth	University Research Professor	University
2016-2017	Arthur Hunt	University Research Professor	University
2017	Arthur Hunt	Fellows of the American Association for the Advancement of Science	National
2017	Carol Baskin	Seed Science Award	National

The following subsections describe research activity of note in several key disciplinary areas:

- *Sustainable agriculture and the environment*

Sustainability is perhaps the over-arching focus of the agricultural research enterprise worldwide. Research in this field has many inter-related goals including: increasing food security, improving ecosystem integrity, and facilitating adaptations of agricultural practice to expected changes in climate. A growing concern of several PSS faculty is the matter of carbon sequestration/storage by soils and the potential impact of climate change on agricultural systems. The flow and conversions of mineral nutrients (such as nitrate, nitrite, and phosphorus) have also been subjects of active investigation, aimed at developing sustainable management practices and resilient production systems. Since 2017, our field research faculty have made an effort to add sustainability to their research foci. These efforts include grain cropping systems research, small grain breeding, weed science, grassland and grazing research, nutrient and water management, nanoscience,

ecotoxicology, and soil science. This transition to an overt role in sustainability has, for the most part, been achieved through collaborative, transdisciplinary projects. Examples include collaborations between nutrient management and small grain breeding, nanoscience and entomology, toxicology and the Center for Appalachian Research in Environmental Sciences, etc.

- *Soil microbiology and the rhizosphere*

The crop-soil interface – colloquially, the rhizosphere – is recognized as a vital aspect of agricultural productivity. PSS faculty study this interface at many different levels. Biological and physical aspects of root system architecture are being studied, as is the significance of root architecture in the evolution and breeding of crop plants. Rhizosphere studies are done to better understand the complex interactions between microbial communities, plant genetics and metabolomics, and soil chemical processes. The compositions of soil microbial communities are being explored, as are the possible roles that soil microorganisms play in soil chemical processes and nutrient cycling. In addition, the complex interaction between microbial communities and plant genetics and metabolomics is being investigated, as this interaction has a profound impact on crop productivity and profitability. This research brings to bear a wide range of experimental approaches, including the use of high throughput sequencing (metagenomics and meta-transcriptomics) to the characterization of the compositions and dynamics of soil microbial communities.

- *Nanomaterials*

Nanomaterials (broadly defined as physical or chemical agents between 1 and 100 nm in size) are widely distributed in the environment and are typically (but not always) of human origin. Owing to the diversity and ubiquity of nanomaterials, characterizations of these materials at all levels are needed. Research conducted in PSS laboratories includes basic physicochemical characterizations of nanomaterials of a range of compositions and structures, so as to better understand the impacts of nanomaterials on the environment and to develop new and improved uses of nanomaterials. Among the latter that are being developed by PSS faculty include the use of nanoparticles to deliver small RNAs to target organisms, to deliver nitrogen to crops in precise and sustainable fashions, and to recover metabolites and toxic compounds from plants and other sources. PSS faculty also conduct research to understand the environmental and health impacts of nanomaterials.

- *Seed biology*

Seeds are the nexus of crop science – most uses of plants center on the seed, most crops are disseminated (in nature or by producers) as seed, and most aspects of overall crop yield and quality involve seed growth and development. PSS faculty add to the body of basic knowledge of seeds at several levels. The ecological and evolutionary aspects of dormancy and germination in higher plants are subjects of ongoing concern, as these inform the plant science community as well as crop scientists into mechanisms that govern reproduction of crop plants as well as weeds. PSS faculty have added greatly to the understanding of molecular mechanisms that guide reproductive decisions and seed development. In particular, aspects of the relevant regulatory networks (comprised largely of transcription factors and their modulators and targets) have been defined in model organisms as well as some crop species. PSS faculty have conducted pioneering research into the cellular and molecular mechanisms that underlie fertilization and early seed development in plants; these aspects of seed development underpin traits such as seed size and quality.

- *Regulation of gene expression*
Most aspects of plant and crop biology, including those that pertain to crop yield and quality, are controlled at the level of gene expression. PSS faculty have made important contributions to the general understanding of gene expression mechanisms in plants, at the levels of transcriptional control, post-transcriptional and epigenetic regulation, and post-translational modifications. These contributions have connected different regulatory mechanisms with important growth and physiological processes; included in the latter are the responses of plants to abiotic and biotic stress responses, the control of secondary metabolism (such as phenolics, terpenoids, and alkaloids), oils and lipid metabolism, and the specificity and efficiency of nodulation in legumes.

- *Soil structural properties and dynamics*
Soils are an integral feature of the agronomic enterprise. Our ability to manage soils, in real time and in a predictive sense, relies crucially on a basic understanding of the physicochemical properties of soils. PSS faculty have made many contributions towards fundamental understanding of soils. Studies have been made of the hydraulic properties of soils across landscapes, as well as the impacts of hydraulic properties on agricultural practices. Features such as sinkholes and fragipans pose particular challenges to agriculture and water and nutrient management in Kentucky; PSS faculty have been active in characterizing the genesis, properties, and impacts of these features to minimize the impacts they may have on crop productivity and water quality. Remote sensing and machine learning continue to be adapted and refined for the characterization of soil dynamics.

- *Crop breeding*
Researchers working with distilleries and the Kentucky Small Grain Growers Association have launched a project called: Bringing Rye back to Kentucky that focuses on value-added opportunities for growers along with increased sustainability and soil health through the use of rye's nutrient scavenging ability. This project involves plant breeders, agronomists, and agricultural economists. Other projects with distilleries involving breeders and soil nutrient management include studies on summer cover crops that impact soil health and bourbon flavor, and an evaluation of Kernza as a distillable perennial grain for the rolling hills of central KY. Investigators in the Department of Plant and Soil Sciences have been instrumental in forming The Ohio Valley Grain Exchange, a stakeholder driven group focused on sustainability of local small grain value chains that will benefit local economies through research on plant breeding, soil health and value-added opportunities with grain crops that involve bakers, distillers and other end users of grain crops.

- *Crop management and soil health*
Cover crops hold great promise for increasing crop yields, as they prevent soil erosion, water loss and nutrient depletion, and contribute to weed control. However, the adoption of cover crops in agricultural production systems has so far been limited. PSS faculty are working to enhance the effectiveness of cover crop-based conservation tillage systems, and to show how cover crops increase crop profitability, resilience and sustainability for corn and soybeans. Research faculty are working with extension faculty to leverage the results of scientific investigations and promote cover crop adoption by farmers.

- Hemp research

The Department of Plant and Soil Sciences has a significant involvement in the UK Agronomic Science Industrial Hemp Research Program that is currently headed by a PSS faculty member (Bob Pearce) and that involves numerous research staff and graduate students. The University of Kentucky is now leading the nation in industrial hemp agronomic research efforts, that includes field trials across the Commonwealth investigating all harvestable components, as well as extensive hemp breeding and pesticide research efforts.

C. New faculty hires promote collaboration and interactions between disciplinary groups

One approach to enhancing scientific collaboration and facilitating interactions has been to fill new faculty positions in ways that foster transdisciplinary research in agriculture while taking advantage of diversity among disciplinary groups in the department. Faculty in the department have historically aligned in three disciplinary groups – Soil Science, Crop Science, and Plant Biology. Agricultural Science has evolved greatly since these (logical) groupings evolved in the department, and the most current, impactful research necessarily involves subjects that span these areas. To increase scientific collaboration and transformative ideas, the department has intentionally encouraged proposals for new faculty positions that are decidedly multidisciplinary and that would span two or more of these "traditional" disciplinary groups. Seven new faculty have been hired within this review period with this intention in mind. Briefly, these new faculty and how they span (transcend) the "traditional" disciplinary areas are:

- **Dr. Hanna Poffenbarger's** research focuses on the flow of carbon and nutrients through soils to investigate interactions between agricultural management and nutrient cycling. This work draws upon the fields of agronomy, ecology, and biogeochemistry. As such, her research spans the disciplines of Soil Science and Crop Science.
- **Dr. Chris Shepard** researches soil formation and its impact on biogeochemical cycling within the context of the Critical Zone (CZ), the reactive near-surface environment of the Earth's crust. This work includes assessment of water transport of dissolved-phosphate that exceeds acceptable levels and can inform management strategies of growers where karst topography is pronounced. His work combines approaches from soil science, hydrology, geology, and ecology.
- **Dr. Olga Tyusko's** research deals with "stress biology in response to various anthropogenic stressors with the main focus on nanomaterials and associated metal constituents". This research spans the fields of environmental science, toxicology, ecology, and molecular genetics. In the context of the department, this research connects all three subdisciplines (Soil Science, Crop Science, and Plant Biology).
- **Dr. Lauren Brzozowski's** research program "studies the genetics of plant traits that mediate interactions between plants and other species." This work integrates "a variety of cutting-edge techniques - including genomics, transcriptomics and metabolomics - with field work to understand the genetic basis of these traits. These findings are applied to plant breeding for sustainable and climate-resilient regional agricultural systems." This research brings together Crop Science and Plant Biology.
- **Dr. Samuel Revolinski's** research program (still emerging) focuses on the biology of weed species with the goal of improving outcomes in applied weed science. This research brings to bear high throughput phenomics and genomics approaches. This research bridges the disciplines of Crop Science and Plant Biology.
- **Dr. Ernie Osburn** has been hired as a soil microbiologist, and his ambitions include research at the intersection of microbiology, molecular genetics and genomics, and basic soil science. As such, his program will connect Soil Science, Crop Science, and Plant Biology.

- **Dr. Katsutoshi Mizuta** will be joining the department July 1, 2024. The title of Dr. Mizuta's position is "Computational Agricultural and Environmental Science," and was designed as "a high-impact research program that integrates plant and soil sciences and data analytics to advance agricultural and environmental sustainability". Sustainability necessarily merges Crop and Soil Science, and the focus on data analytics is relevant to the area of Plant Biology (a discipline that is heavily driven by the generation and analysis of large genomic, metabolomic, and phenotypic datasets).

4.2 Research Faculty Profiles

Mike Barrett – Weed Science (*DOE FY24: 26% Instruction, 69% Research, 5% Service)*
Dr. Barrett's current research focuses on herbicide behavior and selectivity, resistance, and mode of action in plants. Current projects include development of a 2,4-D tolerant red clover line, to benefit mixed grass-legume pastures.

Carol Baskin – Plant Ecology
Dr. Baskin's research emphasis is the ecological life history of plant species, with particular reference to the seed germination stage of the life cycle. The goal of the research is to explain the ecological, biogeographical, and evolutionary origins and relations of the various kinds of seed dormancy. Her research focuses on three major areas: 1) the life cycle and germination ecology of woody and herbaceous species of angiosperms, 2) plant regeneration from seeds in the major vegetation zones on earth from a global warming perspective, and 3) diversity of embryos and seed dormancy in the major angiosperm plant families on earth. Dr. Baskin is a shared faculty position: 20% PSS and 80% Dept. of Biology.

Lauren Brzozowski – Plant Breeding & Genetics (*DOE FY24: 33% Instr, 62% Res, 5% Service)*
Dr. Brzozowski studies the genetics of plant traits that mediate interactions between plants and other species. Her focus is on plant traits, especially metabolites, which affect plant-pest interactions and contribute to human nutrition, and instances when these traits overlap. Her research integrates a variety of cutting-edge techniques - including genomics, transcriptomics and metabolomics - with field work to understand the genetic basis of these traits and apply these findings in plant breeding for sustainable and climate-resilient regional agricultural systems. Current projects include: leveraging plant immune responses to improve resistance to pests, 2) winter rye quality and genomics; 3) winter oat breeding; and 4) organic and specialty grains.

Elisa D'Angelo – Biogeochemistry & Environmental Science (*DOE FY24: 26% Instr, 69% Res, 5% Service)*
Dr. D'Angelo's primary research interests are determining chemical, physical, and biological factors that regulate aerobic and anaerobic fate and transport of inorganic and organic contaminants in upland soils, wetlands, and aquatic environments, and characterizing the microbial communities responsible for contaminant transformation processes. Her current projects include using a metatranscriptomics approach to determine the effects of nitrogen and phosphorus on harmful algal bloom ecology and toxin production in lakes and the effects of municipal biosolids application on

prokaryotic and fungal pathogen activities, antibiotic resistance gene expression and nitrogen cycling gene expression and processes in soils.

Erin Haramoto – Weed Science (*DOE FY24: 35% Instr, 50% Res, 5% Service)*
The goal of Dr. Haramoto's program is to develop and implement integrated weed management in agronomic crops (primarily corn and soybean), with attention to the interactions between climate, soil, management, and weed and crop response. More integrated methods will help to lessen reliance on chemical weed management while also managing herbicide-resistant weeds and slowing the evolution of new resistant weeds. Her research has a heavy emphasis on cover cropping.

David Hildebrand – Plant Biochemistry & Genetics (*DOE FY24: 3.5% Instr, 91.5% Res, 5% Service*)
Dr. Hildebrand's research program emphasizes the general area of plant biochemistry and genetics and the application of biotechnology to crop improvement with particular emphasis on food, lipid and oil quality, new uses of agricultural commodities and plant pest defense. This research involves the investigation of metabolic pathways and the identification, isolation, cloning and manipulation by plant genetic engineering of agriculturally important genes. A major research thrust is the understanding and manipulation of fatty acid metabolism and triglyceride synthesis with emphasis on soybeans, for improved edible and industrial quality.

Arthur Hunt – Plant Molecular Genetics (*DOE FY24: 19% Instr, 76% Res, 5% Service)*
Dr. Hunt studies RNA processing in plants, with an emphasis on mRNA 3' end formation and polyadenylation using multi-faceted approaches including genetic, molecular, and biochemical ones. The specific projects being pursued revolve around questions pertaining to mechanisms of mRNA 3' end formation, and to the connections between this process and regulatory events. Extensive use is made of the model organisms *Arabidopsis thaliana, Escherichia coli* and *Saccharomyces cerevisiae.*

Tomokazu Kawashima – Plant Molecular Biology *(DOE FY24: 14% Instr, 71% Res, 10% Admin, 5% Service)*
Dr. Kawashima's research seeks to determine growth traits and transcriptional profiles of the early-stage seed grown at different temperatures and investigate their molecular and physiological relationships with the final yield. To achieve this goal, he uses *Arabidopsis thaliana* and soybean as the crop model, to: (i) Quantify temperature effects during early-stage seed development on seed growth traits, (ii) Identify the processes occurring during early-stage seed development that are affected by temperatures, (iii) Conduct transcriptional profiling on early-stage seed compartments, and (iv) Establish a real-time live-cell imaging method to visualize cellular dynamics in the liquid endosperm. Integrating molecules, physiology, and environments, will reveal how early-stage seed development is affected by environmental conditions, shedding light on the mechanism of how plants control seed size and number.

Chris Matocha – Soil Chemistry *(DOE FY24: 40% Instr, 45% Res, 10% Admin (DUS NRES), 5% Service)*
Dr. Matocha's research program focuses on solving mechanistic problems related to the cycling of nitrogen and its interaction with other elements in soil such as iron, manganese, and carbon. One of his research areas looks at the fate of nitrate under waterlogged conditions in the field and the relationship between iron in clay minerals on the transformation of nitrate and nitrite. By understanding pathways which underpin these cryptic transformations of nitrogen, we hope to

improve fertilizer use efficiency. Interest in nitrogen stems not only from its importance to plants as an essential nutrient but also from a need to protect water supplies from elevated nitrate levels. He also investigates the role of cover crops such as ryegrass in the amelioration of fragipan soil horizons as a potential method to improve row crop yields on these soil types.

Rebecca McCulley – Ecosystem Ecology (*DOE FY24: 3% Instr, 12% Res, 80% Admin (Dept Chair), 5% Service)*
Dr. McCulley's research focus is on the structure and function of agroecosystems. She explores how human land use interacts with climate, soils, and biota in these ecosystems to impact the storage and cycling of nutrients at both local and regional spatial scales. Recent and ongoing studies include: 1) Quantifying the effects of land management and climate change on pasture and grassland biogeochemistry; 2) Evaluating the effects of fungal endophyte infection on tall fescue pasture structure and function; 3) Understanding the roles of ultra-violet radiation and soil erosion on arid land litter decomposition and microbial decomposer communities; 4) Exploring how invasive species alter grassland function.

David McNear – Rhizosphere Science (*DOE FY24: 43% Instr, 27% Res, 25% Admin (DUS AES + PSS Instr Coor.), 5% Service)*
Dr. McNear's research explores the biogeochemical processes occurring at the soil-water-plant interface (a.k.a. the rhizosphere) and how these processes influence the mobility and bioavailability of trace elements in natural systems. Metals enter the environment from a variety of sources, whether geogenically from metal rich parent materials, or anthropogenically from sources such as metal mining/smelting/refining, military training activities, land application of drinking water or wastewater treatment residues or animal waste applications. Dr. McNear's research seeks to understand how these metals interact with the numerous inorganic, organic and biological components present within soil is essential to predicting their overall fate and impact on or within the surrounding ecosystem.

Luke Moe – Environmental Genomics & Biochemistry (*DOE FY24: 29% Instr, 66% Res, 5% Service)*
Dr. Moe's research interest is in the biology and biochemistry of microbes and microbial communities in soil and associated with plants. Using the tools of microbial ecology, genetics, and biochemistry, he seeks to understand the myriad roles of microbes in plant health, agricultural yield, and postharvest quality of agronomic plants. He is also developing research in the area of microbial ecology of fermentation.

Ernie Osburn – Soil Microbiology (*DOE FY24: 15% Instr, 80% Res, 5% Service*)
Dr. Osburn's research interests broadly focus on anthropogenic influences on soil microbial communities. His research has explored the influences of forest management practices on soil bacteria as well as the impact of agricultural management practices on the composition and function of soil microbiomes. Ultimately, the goal of his research is to better understand the microbial components of soil food webs so that we can better predict how global change factors will influence the long-term health of our soils.

Tim Phillips – Plant Breeding & Genetics (*DOE FY24: 46% Instr, 49% Res, 5% Service)*

Dr. Phillip's research focus is on tall fescue genetics, wide hybridization in the *Festuca-Lolium* complex, and grass-endophyte interactions, as well as orchardgrass, hybrid bluegrass, and cereal rye breeding.

Hanna Poffenbarger – Soil Fertility & Nutrient Cycling (*DOE FY24: 30% Instr, 65% Res, 5% Service)*
Dr. Poffenbarger investigates basic controls on the flow of carbon and nutrients through soils and applies this knowledge to develop sustainable nutrient management practices. Her research applies principles of agronomy, ecology, and biogeochemistry to investigate interactions between agricultural management and nutrient cycling using laboratory, greenhouse, and field experiments. Her current research investigates nutrient capture and release by cover crops, spatiotemporal controls on nitrogen dynamics, optimal fertilization practices for crop yield and quality, and root impacts on soil organic matter formation and persistence.

Samuel Revolinski – Weed Science (*DOE FY24: 95% Research, 5% Service)*
Dr. Revolinski's research program focuses on weed herbicide resistance and weed adaptations. His research seeks to uncover the genetic and physiological mechanisms underlying herbicide resistance and explore genetic adaptations that contribute to the success of weeds across Kentucky. The herbicide resistance screening program he has established will be used inform agricultural producers about the herbicide resistance present in their fields and will be used in the development in the development of targeted remedial strategies.

Montse Salmeron – Grain Crops *(DOE FY24: 18% Instr, 77% Res, 5% Service)*
Dr. Salmeron is interested in studying the interactive effects of environment, management, and crop genetics on the productivity and sustainability of grain cropping systems. Her research addresses this complex question with a multi-disciplinary approach that integrates agronomic and hypothesis-driven eco-physiology research with the use of crop simulation models. Through her research, she seeks to fill knowledge gaps in soil-plant-atmosphere interactions and plant processes that ultimately determine yield and grain composition at the canopy, plant, and organ level, and then incorporate this new knowledge in process-based eco-physiological models. These results will aid in identifying new management and genotype solutions that address current and future challenges for increasing productivity, profitability, and sustainability of grain cropping systems.

Christopher Shepard – Pedology (*DOE FY24: 30% Instr, 60% Res, 10% Service)*
Dr. Shepard investigates the drivers of pedogenesis within the context of the Critical Zone (CZ), the reactive near-surface environment of the Earth's crust. His research has focused on pathways of pedogenesis related to dominant biogeochemical cycles that are relevant for Kentucky including: fragipan formation and Si cycling in western Kentucky, the influence of karst topography on pedogenesis and soil carbon cycling, and the role of phosphorus in soil carbon cycling in carbonate terrains. To understand these processes, he utilizes a CZ approach, integrating the tools of pedology, biogeochemistry, mineralogy, and geomorphology.

Jan Smalle – Plant Genetics (*DOE FY24: 30% Instr, 65% Res, 5% Service)*
Dr. Smalle's research program seeks to understand plant growth mechanisms and responses in agriculturally important crops. His current projects include: 1) study of the cytokinin response

pathway and the role of cytokinin signaling in controlling plant growth; 2) development of a non-destructive, nanoparticle-based method to isolate plant flavonoids from intact plants; and 3) researching the link between oxidative stress tolerance and the formation of Tobacco Specific Nitrosamines (TSNAs), carcinogenic chemicals that accumulate during the curing of tobacco leaves.

Olga Tsyusko – Environmental Toxicogenomics (*DOE FY24: 33% Instr, 62% Res, 5% Service)*
The overall focus of Dr. Tsyusko's research program is on stress biology in response to various anthropogenic stressors with the main focus on nanomaterials and associated metal constituents. She uses a set of approaches and techniques to examine environmental toxicity, molecular mechanisms, and genomic responses to nanomaterials before and after they enter soil and aquatic environments. The major themes of her research are: 1) Evaluating toxicity of nanomaterials to the nematode *C. elegans* under simple and complex exposure scenarios (multiple generations and environmental stressors); 2) Assessment of potential risks for nano-enabled agrochemicals (fertilizers); and 3) Safe-by-design approach for the products containing 2D nanomaterials for removal and degradation of per-and polyfluoroalkyl substances in water systems.

Jason Unrine – Environmental Toxicology & Chemistry (*DOE FY24: 16% Instr, 49% Res, 30% Admin (Dir. KWRRI), 5% Service)*
Dr. Unrine's research activity falls into four major interdisciplinary areas focused on distinct societal challenges:1) Environmental toxicology and chemistry of nanomaterials. The focus of this research is the development of tools to investigate the environmental transformations, bioavailability and bioaccumulation, trophic transfer and maternal transfer of contaminants; 2) Disinfection by-products (DBPs) in drinking water and health effects. This research aims to identify the factors influencing multi-route exposure to DBPs and help prioritize engineering solutions to reduce exposure; 3) Environmental chemistry and toxicology of trace elements. This research has addressed a wide array of topics in trace-element toxicology with an emphasis on food chain exposure and trophic transfer, maternal transfer, soil exposure, and drinking water exposure; and 4) Nanocarriers for delivery of RNA for RNA interface technology to increase sustainable food production. This work involves developing materials to deliver dsRNA to insect pests and insect disease vectors as well as utilizing the nematode *Caenorhabditis elegans* as a model species to understand the mechanisms of nanocarrier-mediated RNAi.

David Van Sanford – Wheat Breeding & Genetics (*DOE FY24: 34% Instr, 61% Res, 5% Service)*
Dr. Van Sanford's research focus is breeding soft red winter wheat varieties suitable for Kentucky's corn-wheat-double crop soybean cropping system. Thus, the priority is on high yields and test weight, early maturity, overall disease resistance and good straw strength. There is a focus on breeding for resistance to Fusarium head blight (FHB) and additional research foci include developing and sustaining local value chains, nitrogen use efficiency and climate resilience. Dr. Van Sanford 's program is also working to understand the genetic basis of flavor in wheat and cereal rye as they explore flavor variants in baked and distilled products. Current flavor research includes an assessment of the impact of FHB resistance genes on flavor, along with a study assessing the impact of summer cover crops and nutritional stress on flavor in wheat.

Ole Wendroth – Soil Physics (*DOE FY24: 22% Instr, 53% Res, 20% Admin (DGS IPSS), 5% Service)*

Dr. Wendroth's research interests center around landscape processes with a focus on soil water and solute transport processes at different spatial and temporal scales. He investigates transport processes in well-drained silt-loam soils, and the impact of soil management on transport processes, their scale dependence, spatial correlation length and association to other soil properties. Another focus is the investigation of spatio-temporal biomass development in farmers' fields related to variable-rate irrigation, describing the spatial pattern of biomass during the growing season based on crop sensor observations in combination with stochastic models.

Ling Yuan – Plant Gene Regulation & Biochemistry (*DOE FY24: 3% Instr, 12% Res, 80% Admin (Dir. KTRDC), 5% Service)*
Dr. Yuan's research centers in three main areas: 1) mechanistic study of transcription factors for plant metabolic pathway regulation, 2) mechanistic study of hormone crosstalk in plant growth-defense tradeoff, and (3) metabolic engineering of plant natural products. His research addresses some of the key issues in molecular biology, particularly in gene transcription, and metabolic engineering, contributing to the development of new-crop opportunities for the agricultural economies of Kentucky and the nation.

Hongyan Zhu – Plant Genetics & Genomics (*DOE FY24: 22% Instr, 73% Res, 5% Service)*
Dr. Zhu studies pathogenic and symbiotic plant-microbe interactions, with a special focus on legumes. Research projects involving root symbioses include: 1) functional analysis of non-legume orthologs of legume genes required for nodulation and mycorrhizal symbioses, 2) cloning and characterization of soybean and Medicago genes that control nodulation specificity, and 3) identification and cloning of Medicago genes that govern strain-specific nitrogen fixation and regulate natural variation in nitrogen fixation efficiency. Using genetic, genomic, and molecular approaches, he explores the mechanisms underlying natural variation in nitrogen fixation efficiency/specificity to develop novel strategies to enhance the agronomic potential of biological nitrogen fixation.

4.3 Postdoctoral Scholars

Postdoctoral scholar numbers vary in the unit, depending on grant funding, but generally range from five to eight per year. At present, we have the following postdoctoral scholars:

Jarad Cochran – Dr. Cochran's research is to develop safe and sustainable, highly efficient carriers for targeted nitrogen delivery to crops under the direction of Dr. Olga Tsyusko.

Angelica Jaconi – Dr. Jaconi conducts research to identify the spectral assignment of plant components (lignin, cellulose, hemicellulose) to assess composition in 'raw' plant roots and utilizes machine learning to evaluate soil carbon and other soil properties under the direction of Dr. Hanna Poffenbarger and Dr. Dave McNear.

Nasser Jalili Jahani – Dr. Jalili Jahani conducts research on the use of advanced analy cal techniques for source appor onment of airborne par culate pollutants accumulated on mosses under the direc on of Dr. Jason Unrine.

Rebecca McGrail– Dr. McGrail's research explores the role of roots and fungal endophytes in agroecosystem function, as well as climate change impacts on Kentucky pastures, under the direction of Dr. Rebecca McCulley.

Ramesh Palakurthi – Dr. Palakurthi conducts research to determine how biotic stresses shift biochemical profiles over the course of plant development under the direction of Dr. Lauren Brzozowski.

Ashmita Rawal – Dr. Rawal conducts research on effects of winter cover crops and nitrogen fertilizer requirements under the direction of Dr. Hanna Poffenbarger.

Mohammad Shamim – Dr. Shamim conducts soybean physiology research and crop eco-physiological modeling under the direction of Dr. Montse Salmeron Cortasa.

Andrea Webb – Dr. Webb conducts research investigates seed quality, seedling vigor, germination, and field establishment of hemp under the direction of Dr. Robert Pearce.

5. SERVICE, EXTENSION, AND OUTREACH

5.1 Overview

Our extension programs provide timely, factual, pertinent, and unbiased information to our clientele. Extension clientele encompasses many diverse people and organizations including extension agents, producers, crop advisors, landowners, agribusiness, and other parties in the Commonwealth and surrounding states. We disseminate information to this clientele in numerous ways including traditional methods such as meetings, extension publications, field days, and on-farm research and demonstration trials. We have adopted new technologies for electronic dissemination of information including mobile-friendly websites, blogs, social media posts, and other electronic resources. To support our information base, we conduct and collaborate on applied research trials that test relevant hypotheses and allow us to contribute up-to-date answers to clientele questions.

An often-overlooked service that Plant & Soil Science extension specialists provide to the public is service to the Plant Disease Diagnostic Laboratory housed in the Plant Pathology department. As the name implies, they diagnose plant diseases in field, horticultural, and other crops. Often a plant is submitted to the lab that is not diseased, rather it is influenced by some other factor. The specialists in the department identify potential causes and solutions for these issues which range from nutrient deficiencies, environmental conditions, herbicide interactions, and weed identification. This free service is a valuable resource to producers in the state and is strongly supported by extension faculty in the Plant and Soil Sciences Department.

Historically, Plant & Soil Science extension programs have used one-on-one meetings and consultations with clientele as a major part of programming. However, the COVID pandemic in 2020-

2022 dramatically changed the way that extension specialists interacted with county agents and growers. Specialists were very creative in quickly finding and utilizing virtual options to offer educational programming to agents and growers. The success of these virtual programs, born out of necessity during the pandemic, has resulted in increased versatility and broader use of our extension programs across our varied clientele. Although the pandemic has ended, we continue to use virtual and other electronic technologies to maximize the reach of our extension programs.

Another major event that occurred during this review period and disproportionately impacted PSS extension programming was the EF4 tornado that destroyed nearly all of the UK Research and Education Center (UKREC) at Princeton, KY in December 2021, which houses ~1/2 of the PSS extension faculty. Specialists have spent considerable amounts of time and effort since then in cleanup, recovery, and planning efforts as they work to rebuild UKREC by 2025 (see section 8.1 for more on this subject).

Below, we present a summary of our extension programs by focus area.

Soil and Water

The soil and water extension group currently includes three Plant and Soil Sciences faculty (B. Lee, Grove, Ritchey). The department is currently searching for a fourth extension faculty member specializing in precision agriculture/sensor technologies. The group conducts applied research and outreach programming focused on nutrient management, supported by competitive funding provided by the USDA-NRCS, USDA-AFRI, and support from Kentucky small grain (wheat), corn and soybean commodity boards. Through research and demonstration projects on producer-owned farms, presentations at county, regional, state, and national meetings, workshops and conferences, the group educates and encourages producers to apply the nutrients necessary for economic viability in the most environmentally sound manner possible. Extension faculty continue to evaluate fertility recommendations for grain and forage crops, including phosphorus and potassium fertility needs of soybean, sulfur and boron fertility requirements in wheat and tobacco, nitrogen rates for wheat, updated nitrogen source, rate and timing options for corn, efficiency enhancement/ stabilizer/inhibitor products for nitrogen and phosphorus in corn, and a region-wide survey of alfalfa nutrition. Ongoing trials are also evaluating how spatial scale influences plant response to phosphorus fertility. As the 7th largest broiler chicken producer in the nation, Kentucky accumulates poultry litter – and many Kentucky row crop producers are very interested in the nutrient efficacy, fate, and value of the nutrients and organic matter contained in poultry litter. Applied research projects emphasize nutrient availability from manure applications regarding timing and application rate, as well as placement (broadcast on soil surface vs. a new technique that injects litter into the surface horizon). Sediment and nutrient losses from common crop management practices, as well as the impacts of cover crops and other BMPs, are being evaluated via edge-of-field water quality monitoring. The information gleaned from this collection of nutrient management work, from both agronomic and environmental impact perspectives, is incorporated into the University of Kentucky Cooperative Extension Bulletin AGR-1 and the Kentucky Phosphorus Index, two principal components of the USDA-NRCS Nutrient Management Plan required for many agricultural producers in Kentucky. Through CES agent training programs (Kentucky Agriculture Training School, New Agent

Training, Crop Schools, and Certified Crop Advisor workshops such as the Kentuckiana Annual CCA Conference), clientele are educated about soil and nutrient management strategies to increase yield with minimal impacts to the environment. Grower-producers are educated through numerous county and regional meetings/field days, regular newsletter articles, and refereed extension publications (that remain free to the public).

By partnering with extension specialists in 4-H, Agricultural Education, and Horticulture, the soil and water extension group plays a critical resource role in meeting college extension educational needs. Soil and water extension faculty have also worked closely with urban audiences including homeowners, local utilities, the lawn and landscape management industry, and regulatory agencies involved in urban nutrient management. Although our connection to these audiences has diminished with the loss of our Turfgrass Extension faculty position, we remain committed to engaging these audiences via outreach programs through county CES meetings, Master Gardener trainings, and storm water management conferences. Soil and water extension faculty are regular instructors for the Master Gardener curriculum in the required Soils and Water Quality courses and the optional Compost course. Statewide, the extension group works with Municipal Separate Storm Sewer System permitted communities (MS4) and helps them meet their EPA regulatory permit requirements. The soil and water extension faculty group supports K-12 education programs through high school land judging contests, train-the-trainer workshops for science teachers, and technical assistance with demonstration compost projects, vegetable gardens and rain gardens. When requested, the soil and water extension faculty assist the Kentucky Legislative Services Agency with background bill development.

Grain Crops

Grain and oilseed crops in Kentucky include corn, soybean, wheat, barley, and rye. Corn, soybeans, and wheat are grown on about 3 million acres and comprise approximately 35 to 40% of the Kentucky agricultural cash receipts each year. Most of these acres are in western Kentucky where many of our targeted programs work directly with producers. When we “train the trainers,” we are effectively multiplying the information provided. The number of extension contacts reported by specialists, although substantial, falls well short of the people impacted through extension activities in our department.

Specialists working in grain crops have developed the KyGrains.info website in cooperation with local commodity boards (Corn, Soybean, and Small Grains). The website is mobile- friendly and houses the newsletters we produce and receives about 30,000 views per year. The official UK MG-CAFE grain crops website receives about 24,000 visits per year. Specialists and researchers working in grain crops use this site to disseminate information regarding current conditions, relevant topics, or general information. Electronic distribution permits clientele to easily access information at their convenience.

Numerous research and demonstration trials conducted by faculty, staff and students provide sought after information for grain crop producers in crop management, soil nutrient management, integrated pest management, farm profitability, grain storage, grain marketing, ecosystem services

and other areas. Some departmental scientists study field problems contending with herbicide resistant weeds such as Palmer Amaranth, Waterhemp, Marestail, and Italian Ryegrass. Applied research on these weed species in combination with demonstration plots and educational programs provide producers the best management strategies possible when dealing with the spread and control of these weeds. The information learned from these field, greenhouse and lab trials is incorporated into our extension programming. This type of research is essential to our extension efforts.

When compared to Cooperative Extension recommendations, farmer practices sometimes show a decreased profit due to excessive inputs, incorrect inputs, or improper management decisions. There are several examples where a producer changed a management practice after reading our materials or attending our events, resulting in substantial financial/labor savings. We often hear about these types of successes after meetings, through survey results, or by talking with individual producers.

Forages

The forage extension program in Kentucky is one of the top forage programs in the country. Over the last five years, we have helped to organize and present forage focused information at multiple statewide, regional, and international programs. In 2023, we hosted the International Grassland Congress, which was attended by more 55 countries. We publish a monthly Forage News newsletter, contribute to the bi-monthly Grazing News, and write for the monthly KY beef magazine Cow Country News and the biweekly publication The Farmers Pride. Jointly, these publications reach more than 25,000 subscribers monthly. The UK Forage Team has a close working relationship with the KY Forage and Grassland Council. This grassroots non-profit organization focuses on the profitable and sustainable production of forages. In this capacity we work jointly to plan producer driven programs and schools and conduct appropriate applied research. The Forage Extension Group has been active in securing external funding for applied research and extension programs at both the state and national level. These include multistate programs addressing organic production and climate change.

In this reporting period, we established the KYForages YouTube Channel. Currently this channel has more than 5,000 subscribers and houses more than 500 videos encompassing all facets of forage and livestock management. Since its inception, this channel has had more than 815,000 views with a total watch time of more than 10 million minutes. To meet the continuing need for agent training, the Forage Team initiated ‘Between the Windrows’, an hour-long zoom-based training with forage focused topics and time for questions and open discussion. More than 50% of the ANR agents participate in this training each month. In addition, all sessions are recorded and posted on an internal website for those unable to attend. Our team has provided leadership and support of agent driven programs such as regional hay contests. These contests were developed as a tool for increasing hay testing and improving hay quality in the Commonwealth. In this past reporting period, members of our Forage Team have received multiple awards for outstanding and sustained contributions to forage research, education, and extension (**Table 26**).

Hemp

Hemp production in Kentucky increased from the inception of the hemp program in 2014 to a peak of 26,500 acres (mostly floral production for CBD extraction) in 2019. During this time, there was tremendous demand for hemp production information and PSS Extension Specialists conducted numerous grower meetings, field days, and training sessions, including presentations at 10 national meetings for groups including USDA-NRCS, USDA-RMS, USDA-ARS, USDA-AMS, and Farm Journal. A hemp field day in 2019 at the North Farm attracted over 600 attendees with more than 20 states represented. Unfortunately, market forces resulted in many hemp growers not receiving compensation for their 2019 hemp crops and production fell to less than 1,000 acres by 2022. The COVID pandemic resulted in the cancellation of most in-person grower meetings in 2020 and 2021. Extension personnel responded by conducting a virtual hemp grower workshop in the spring of 2020.

Despite these challenges, the hemp program at MG-CAFE has maintained a consistent presence in part due to continued support from USDA-ARS. The program remains among the national leaders in the hemp space, with PSS specialists coordinating a national cultivar trial under the USDA S-1084 Multi-State Hemp Project. Locally, PSS Extension Specialists lead a hemp working group at UK and have continued to conduct a few grower meetings and workshops. Hemp field days were held at North Farm in the fall of 2022 and 2023 with approximately 100 people attending in 2023. Since the inception of the hemp program, we have worked closely with the Kentucky Department of Agriculture's Hemp Regulatory Program conducting compliance testing on cultivars and providing educational resources to help growers remain compliant with changing hemp regulations. We have increased our social media presence on platforms such as Facebook, Instagram and X (formerly Twitter) with timely updates on research results as well as field work information, while also maintaining our traditional forms of information delivery through websites and publications. Extension personnel are currently working with Kentucky based processors (Hempwood in Murray and Victory Hemp Foods in Louisville) to develop sustainable opportunities in hemp fiber and grain production for Kentucky producers.

Tobacco

The tobacco group is very involved in applied research across a broad spectrum of topics with the majority of funding provided by tobacco, seed, and/or chemical companies. This applied research provides specialists with information on management practices that can result in a better product while striving for sustainability. A substantial amount of applied tobacco research has focused on reducing levels of harmful constituents in cured leaf. Applied tobacco research focused on conservation tillage in burley tobacco, the effects of high-temperature aggressive fire-curing of dark tobacco on levels of harmful leaf constituents and fine-tuning nutrient recommendations for tobacco. In the absence of a tobacco pathologist in the Plant Pathology Department since 2019, tobacco specialists have also put considerable effort into testing fungicides and other disease control products for tobacco and conferring with tobacco pathologists in other states on updating disease control recommendations and requesting registration of new products. Tobacco specialists have also partnered with surrounding states to produce a multi-state comprehensive production guide for

burley and dark tobacco that has become the premier reference for production of burley and dark tobacco in the U.S. Tobacco specialists conduct annual tobacco agent trainings to update county agents on latest research results and industry information. Specific hands-on training has been developed and delivered based on our applied research. The US Tobacco Good Agricultural Practices Training that growers must attend each year to help ensure proper methods are being utilized in the field reached over 1,400 tobacco growers in KY and TN in 2023 alone. Tobacco specialists also disseminate information electronically in order to reach more practitioners more quickly. Both groups utilize social media outlets and have produced a number of 'how to' videos uploaded to YouTube including 'Chemical Topping Burley Tobacco', 'Farming Safety during COVID', and 'Dark Fired Tobacco'. Extensive research and extension efforts have also been focused on development of recommendations for production of cigar wrapper tobacco in Kentucky, specifically a new type of cigar tobacco called Connecticut Broadleaf that has been grown in Kentucky since 2018. Tobacco specialists are also involved in national and international organizations including the representative for all U.S. tobacco growers on the FDA's Tobacco Products Scientific Advisory Committee, the Editor in Chief of Tobacco Science Journal, service to subgroups and task forces in the CORESTA international tobacco research conferences, and others.

Turfgrass

Historically, our department has had two turf faculty members: one committed to extension and applied research and the other to instruction and basic research. Preceding the last Departmental Periodic Review, the instruction-oriented turf faculty member decided to shift his focus to industrial hemp and also accepted a director position at the Robinson Center for Appalachian Resource Sustainability (RCARS) facility in eastern KY. Soon after the last Periodic Review, this individual passed away and the salary associated with the position was not returned to the unit. Unfortunately, the only remaining turf faculty member decided to resign immediately preceding the 9.5% budget cut the unit took as a result of COVID though an effort was made by the department/college to retain the faculty member. Thus, we lost this faculty line at that time, leaving us with no faculty or staff focused on turf. The chair of the unit, working with the Associate Dean for Extension office and others, explored options for meeting the turf needs within the state. We opted to try a 3-yr investment in an Extension Associate Senior position supported by a portion of the time of three turf-oriented county agents. The Extension Associate position was filled in May 2022 and overloads for the county agents occurred soon after. The Extension Associate (Kenneth Clayton) reports to Dr. Ray Smith (Forage Extension faculty) and a description of his duties and accomplishments to date is provided below.

"As the Extension Associate Senior in Turfgrass, I have been involved in a broad spectrum of outreach and research activities since 2022. I am also the leader of the UK extension turfgrass group which is comprised of myself and three county agents who have 10% turfgrass overload appointments. I am regularly involved in supporting extension agents, and turfgrass managers across the state through consultations, site visits, timely updates through email and social media, and offering local programming. I regularly teach Master Gardener programs covering the lawn section. I have also contributed to "KY Pest News" newsletter and oversee regular updates to the turfgrass science website which gets approximately 500 views a month and approximately 800 downloads of

numbered publications. The turfgrass group has also made regular contributions to the highly viewed “Horticulture Wednesday Webinars” garnering nearly 2000 views to date on the lawn videos. Over the past year, I have been an author on five new or revised numbered publications covering different aspects of turfgrass management such as recovering lawns after the devastating floods in Eastern Kentucky, disease, and insect management. Additional publications on bermudagrass control in cool season lawns, wild violet and ground ivy control and seeding rates are currently in progress as well.

The extension turfgrass group has also given dozens of presentations at various events offering continuing education units to pesticide license holders allowing them to maintain their certifications and avoid steep penalties for letting them lapse. I lead efforts from July to February to host the 46th **annual Turfgrass and Landscape Short Course** offering a 3-day conference to over 550 individuals. This event is put on in partnership with the Kentucky Horticulture Council. I am active with the Kentuckiana Golf Course Superintendents association with a seat on the board of directors, which recently hosted the inaugural KY Turf Expo providing education and networking to around 100 golf course superintendents from Kentucky and Indiana.

Plans are made to host the 47th annual Turfgrass and Landscape Short Course with over 40 speakers and moderators from multiple universities offering learning tracks in golf, sports field, and lawn and landscape management. In addition to the many outreach efforts planned for 2024, a field day in partnership with Southeastern Turfgrass Research Center and the Kentuckiana Golf Course Superintendents Association is to take place in July. A field day has not been available to turfgrass managers in the state since 2019. Additionally, in a multi-state partnership with the Midwest Regional Turf Foundation, led by Dr. Aaron Patton of Purdue University, an herbicide workshop will be offered in December of 2024.

I have worked closely with the entomology department to conduct several insecticide trials for chemical companies as well as working to track and provide timely information to turfgrass managers on the most economically significant pest to turfgrass, the annual bluegrass weevil. Regular blog posts are written for the nationally recognized “WeevilTrak” program of Syngenta Corporation. I was one of the twelve researchers actively involved with this program. I am currently conducting research on improving the establishment of low input warm season turfgrass in the state with onsite plots in Northern Kentucky partnering with Virginia Tech University adding another location.”

Weeds

Weeds annually impact crop production relative to the potential loss in income due to lack of adequate control and the cost for implementation of control tactics. Furthermore, managing herbicide-resistant weeds has become a major concern during the past several years. Research trials provide sought after information by grain crop producers and crop consultants contending with herbicide-resistant weeds such as Palmer amaranth, waterhemp, marestail, Italian ryegrass, and johnsongrass. Applied research on these weed species in combination with demonstration plots and educational programs supply crop producers with best management strategies for mitigating the

spread of and maximizing the control of these and other common weed problems. The weed science program has implemented the annual Pest Management Field Day at the University of Kentucky Research and Education Center in Princeton, Kentucky to highlight applied weed science research. Furthermore, in order to provide the most current information for weed control options, the "Weed Control Recommendations for Kentucky Grain Crops (AGR-6)" is revised and published annually, which clientele rely on as the most comprehensive weed control resource available in the state.

Another major program emphasis has been associated with weed control issues in forage crops. Presentations at various producer and cattlemen's meetings, news articles, and on-farm research trials demonstrate benefits of weed control tactics in pastures. Extension publications such as Weed Control for Grass Pastures and Hayfields (AGR-172), Broadleaf Weeds of Kentucky Pastures (AGR-207) and Weed Control for Alfalfa and Other Forage Legume Crops (AGR-148) are updated as needed. Other resources include Practicing Good Herbicide Stewardship for Pasture Weed Control (AGR-219) and development of a new Guide to Plants of Kentucky Potentially Poisonous to Livestock (ID-2).

Other activities include support and interaction with Agricultural & Natural Resource and Horticultural Agents to assist with weed identification, weed control recommendations, and herbicide injury complaints including off-target herbicide issues in various crops and environments. Depending on the situation, some cases can involve making on-site visits and/or interaction with services provided by the Plant Disease Diagnostic Lab. Virtual sessions called 'In the Weeds' was initiated in 2021 to further support ANR agents on current and timely issues relative to weed control held bi-weekly throughout the growing season. The 'In the Weeds' sessions were expanded to cover all pest management topics including Plant Pathology and Entomology in 2023. Eight sessions were held in 2023 with over 230 total attendees at the sessions. The weed science team has also hosted a YouTube Channel with a plot walk video series and 'Weed of the Week' series that includes 37 videos posted over the past three years with over 120 hours of watch time.

Quantity and quality of outreach

The following tables present our quantitative metrics and the summary of the qualitative feedback on extension specialist activity by county agricultural agents, as well as the awards bestowed on our extension specialists during the review period. These data support the quantity and quality of our extension outreach programs.

Table 23. Numbered extension publications, progress reports, and success stories.

	2019	2020	2021	2022	2023
Numbered Extension Publications-New	8	17	5	16	11
Numbered Extension Publications- Revised	2	2	6	8	7
Progress Reports	18	17	17	15	15
KERS Success stories	43	35	48	32	40

Table 24. Categories and number of direct extension specialist contacts.

	2018-2019	2019-2020	2020-2021	2021-2022	2022-2023
African American	703	1066	171	581	749
Asian American	233	86	32	44	211
Hispanic	499	427	537	222	250
Native Americans	1	0	0	1	0
Other	168	12	9	71	4431
Total Contacts	143,890	78,988	69,341	57,681	46,419

Table 25. Number of funded grant proposals with extension specialists as PIs.

	2018	2019	2020	2021	2022	2023
Funded grant proposals with extension specialists as PIs	27	17	33	23	21	17

Table 26: PSS Extension Specialists awards of note bestowed during the review period.

Year	Awardee	Award	Scope
2023	Ray Smith	Allen Award of Illumination, AFGC	National
2023	Jimmy Henning	Distinguished Grasslander Award, AFGC	National
2022	Andy Bailey	High Impact Research/Extension Award	College
2022	Chris Teutsch	Public Service Award, KFGC	Regional
2021	Travis Legleiter	Outstanding New Extension Faculty Award, KASEP	Regional
2021	Ray Smith	High Impact Research/Extension Award	College
2020	Chris Teutsch	Garry Lacefield Public Service Award, AFGC	Regional
2019	Carrie Knott	High Impact Research/Extension Award	College
2019	Josh McGrath	Extension Service Award, ASA	National

5.2 Extension Faculty Profiles

Andy Bailey – Dark Tobacco Specialist (*DOE FY24: 75% Ext, 15% Res, 10% Admin – PSS Ext Coor.)*
Dr. Bailey's extension and research activities focus on the agronomic aspects of dark tobacco production, specifically variety development, tobacco pesticide screening, fertility, disease and insect control, tobacco air-curing and fire-curing, cigar wrapper tobacco production, and support of burley tobacco production. A major extension effort is administering annual tobacco Good Agricultural

Practices (GAP) Trainings for tobacco growers in the dark tobacco production region of Kentucky and Tennessee, as well as annual tobacco agent training. As departmental extension coordinator, major responsibilities are to coordinate review and publication of new and revised numbered extension publications as well as serve as departmental liaison with college extension administration.

Kenneth Clayton, Staff – Extension Associate, Turfgrass
Mr. Clayton's Extension activities include working with county agents and stakeholders on all aspects of turfgrass management including golf courses, sports turf, and lawn and landscape. He coordinates regional educational events to provide continuing education units for turf managers and works closely with plant diagnostics, soil testing, and turf entomologist to provide turf specific recommendations to industry stakeholders.

Jonathan Green – Weed Science (*DOE FY24: 100% Ext)*
The primary goals and objectives of Dr. Green's extension program are: 1) to develop weed control recommendations for grain, forage crops, and non-cropland areas and disseminate this information using a variety of educational approaches, 2) to investigate specific weed management problems utilizing field research trials including on-farm locations with county extension staff and farm cooperators, and 3) to develop traditional and innovative training programs for extension personnel, agrichemical retailers and applicators, crop consultants, and farm managers.

John Grove – Soil Science/Agronomy (*DOE FY24: 30% Ext, 65% Res, 5% Service)*
Dr. Grove's research and extension activities are in support of Kentucky's agents and growers and include development and delivery of information regarding soil biological, chemical and physical property management/soil resource conservation in the commonwealth's grain and forage crop production systems.

Jimmy Henning – Forages (*DOE FY24: 35% Instr, 45% Ext, 20% Admin - DGS STO)*
Dr. Henning's extension activities include applied research in baleage and soil fertility in hay/haylage fields. He provides leadership and support in the Eastern Kentucky Hay Contest and in the use of forage testing for better animal performance. He is an active supporter of the Equine Industry in Kentucky and a co-founder of the Kentucky Grazing School.

Tom Keene, Staff – Agronomy Specialist/Hemp
Mr. Keene's extension activities focus on Industrial Hemp Extension with producers, county agents and processors as well as Industrial Hemp Research. He works closely with Kentucky Department of Agriculture's hemp program and coordinates and facilitates Hemp Field Days as well as other meetings within the college and other stakeholders.

Carrie Knott – Small Grains & Soybean Agronomy (*DOE FY24: 10% Ext, 80% Admin – Managing Dir UKREC, 10% Prof Dev)*
Dr. Knott's extension activities include providing statewide leadership for the development and delivery of information for the productions and management of primarily small grains and soybeans and to a limited extent for canola and grain sorghum. Her research program is applied to maximize

profitability of small grains and soybean production. Her efforts in 2024 will be managing the rebuild efforts for UKREC.

Brad Lee – Water Quality (*DOE FY24: 1.5% Instr, 80% Ext, 18.5% Res)*
Dr. Lee's Extension and translational research activities address erosion and nutrient runoff from both urban and rural areas of the Commonwealth. Within urban communities, his program focuses on quantification of phosphorus loading in lawns and gardens, as well as developing nutrient reduction strategies. Within the agricultural sector Dr. Lee monitors sediment and nutrient runoff at the edge-of-field in row crops and wetlands, then utilizes this on-farm data to encourage adoption of conservation practices.

Chad Lee – Corn, Soybean & Small Grains Production (*DOE FY24: 3% Instr, 50% Ext, 17% Res, 30% Admin – Director, Grain & Forage Center of Excellence*)
Dr. Lee's extension activities include providing statewide leadership for the development and delivery of information for the production and management of Kentucky's grain crops which include corn, soybean, and small grains. Dr. Lee regularly interacts with commodity grain associations and other agriculture associations. His research focus is on corn, soybean, wheat, rye and barley to support Extension activities. Dr. Lee provides oversight of the Kentucky corn hybrid performance tests.

Travis Legleiter – Weed Science (*DOE FY24: 1% Instr, 80% Ext, 19% Res)*
Dr. Legleiter's extension activities include weed management in agronomic crops including corn, soybean, and small grains. His emphasis is on best management practices of herbicide resistant weeds and evaluation of herbicide application technologies for effective, targeted delivery to reduce drift, while ensuring coverage and deposition of product on the target pest.

Robert Pearce – Tobacco & Hemp Production (*DOE FY24: 4% Instr, 40% Ext, 26% Res, 30% Admin – Dir. Hemp Programs)*
Dr. Pearce provides leadership for the MG-CAFE research and extension effort for field production of hemp and coordinates a national grain/fiber cultivar trial in support of a USDA hemp muti-state project. His program conducts applied research on agronomic best management practices for hemp and disseminates this information through extension outlets including websites, social media, and field days. Dr Pearce's applied research on tobacco includes management practices to improve resilience of tobacco production systems to a changing climate. His tobacco extension activities include providing industry-required Good Agricultural Practice (GAP) to tobacco producers annually and he is a co-editor for the multi-state *Burley and Dark Tobacco Production Guide*.

Edwin Ritchey – Soil & Nutrient/Waste Management *(DOE FY24: 3% Instr, 80% Ext, 17% Res)*
Dr. Ritchey's extension activities include providing current recommendations for crop production in the areas of manure management, soil fertility, and soil management. Specific extension focus areas are to promote the judicious use of animal manures, provide research-based data regarding crop sulfur needs specific to Kentucky clientele, and provide science-based information for cover crop use. His manure-based research includes refining nutrient availability coefficients for poultry litter,

providing a better understanding of weed/poultry litter dynamics, and educating the public on the true value of animal manures relative to commercial fertilizers.

Ray Smith – Forages (*DOE FY24: 2% Instr, 76% Ext, 22% Res)*
Dr. Smith's extension activities include working closely with county agents and producers across the state; conducting applied forage research for Kentucky and the transition zone; helping organize multi-county, state, and regional forage conferences; and writing and updating forage extension publications. His research focuses on the establishment and maintenance of legumes in pastures, hay production, developing computer teaching models, grazing trials, and forage variety testing.

Chris Teutsch – Forages (*DOE FY24: 1% Instr, 80% Ext, 19% Res)*
Dr. Teutsch's extension activities include working closely with county agents and producers across the state; conducting applied forage research for Kentucky and the transition zone; helping organize multi-county, state, and regional forage conferences; and writing and updating forage extension publications. He leads the grazing and fencing schools held in the state.

6. DIVERSITY, INCLUSIVITY, AND CIVILITY

6.1 Promotion of Diversity and Inclusivity

The department is committed to enhancing diversity within our faculty, staff, and student bodies. We follow the best practice guidelines put forward by our college's Office of Diversity (https://diversity.ca.uky.edu/). This includes sharing details of various diversity-oriented trainings with our faculty, staff, and students as they are announced and encouraging participation. Many faculty and staff have availed themselves of these resources. Departments and programs within CAFE benefit greatly from the work of the MG-CAFE Office of Diversity. The MG-CAFE OOD offers outreach, education, and resources related to DEI, including DEI newsletters that are circulated to faculty 4 times per year. The University of Kentucky has a very active and award-winning chapter of Minorities in Agriculture, Natural Resources and Related Sciences (MANRRS), and we interact with this group as much as we are able. The chair requests DEI-oriented posters and signs and puts them in prominent locations within our spaces, in an effort to make our beliefs regarding inclusion visible (e.g., the PSS front office has a 'Safe Zone' LGTBQ+ sign on the front window). Faculty leading the AES program (McNear, Haramoto, Poffenbarger) have received DEI training. Dr. McNear, AES Chair and Director of Undergraduate Studies, is the DEI representative for the Department of Plant and Soil Sciences on the college's DEI committee. We work with the MG-CAFE Office of Diversity to advertise our faculty positions through their networks. While our undergraduate and graduate programs and faculty and staff pools are undoubtedly more diverse than they were 20 years ago, we still have more work to do in this arena.

6.2 Civility among Faculty, Staff, and Students

As mentioned previously, our department is widely viewed as quite collegial. We are proud of this reputation and believe it helps us to recruit talented people to our ranks. We are generally supportive of one another and accepting of our differences. Disagreements are normally handled in a professional manner. Often, the chair helps to mediate disagreements and/or problematic behavior. She is known for having an open-door policy and makes sure that all new people to the unit – faculty, staff, and students – know how to report various types of incidents and are aware of the consequences that ensue from such reports being made. We are clear in communicating that bad behavior will not be tolerated.

Based on results from the 2021 university-wide survey of faculty and staff, the following areas were identified as strengths of the department's work environment: (1) understanding how work performance is evaluated; (2) thinking that work performance is evaluated fairly; and (3) feeling that college/unit leadership supports equal opportunities for all employees. Concerns were raised regarding: (1) satisfaction with involvement in decisions that affect work; (2) reporting instances of dishonest or unethical practices to the appropriate authority without fear of reprisal; and (3) work being appropriately distributed among colleagues. The chair communicates the results of this survey to faculty and staff and reiterates that her door is open for anyone who wishes to discuss further how the unit can make improvements in these areas of concern.

6.3 Stakeholder Engagement

Many of our faculty and staff are directly involved with stakeholders throughout the state. Our stakeholders are diverse, as are our alumni. The chair has obtained and refined an alumni database and the front office creates and distributes an annual alumni newsletter. We collect data regarding the successful distribution and reader engagement with these newsletters (as mentioned previously). We engage stakeholders in our classroom (e.g., AES 101) and via our field days. Stakeholder engagement is a large part of what our extension faculty and service-oriented staff do on a daily basis. We involve stakeholders in our extension faculty searches and we make sure to consult with them regarding the direction we are taking new extension faculty hires.

7. ADMINISTRATION AND GOVERNANCE

7.1 Administrative Structure and Effectiveness

The Department of Plant and Soil Sciences is one of 15 academic units in the college. Based on faculty size, it is the largest department. The department organizes itself in overlapping groups:

1. Mission areas – teaching, research, and extension

2. Broad research areas – crop science, environmental science, plant molecular biology, and soil science
3. Commodity/resource committees – corn and soybean; forages; small grain; soil, water and environment; tobacco; industrial hemp; and weeds

By interacting across these various areas, faculty members are aware of the diverse needs of the groups. We are a diverse academic community and value our breadth. We are supportive of maintaining our faculty needs to meet the traditional demands of crop agriculture and extension, to fill the instructional requirements for multiple programs, and to provide a supportive, collaborative research environment for each faculty member and disciplinary group to conduct transcendent research. The collegial approach has been an underpinning for the department and we plan to keep it this way. We are widely viewed as a large, but highly functional, collegial unit.

Administratively, the department is organized under a department chair with a business office, front office, Departmental Coordinators of Instruction (McNear) and Extension (Bailey), and a formal committee structure (see Appendix A). Rebecca McCulley has been Chair since 2018 and just began her second term in this position (slated to go through 2030). The chair provides overall administrative leadership for the department including budget management, performance evaluations for faculty and several staff, allocation of facilities and equipment, philanthropy, alumni/stakeholder relations, faculty hiring, promotions, and award nominations, and coordination with the college and university administration. The department's Coordinator of Instruction (McNear) and the Extension Coordinator (Bailey) are faculty members who receive partial administrative appointments for these roles (and function much like Associate Chairs). The Instruction Coordinator leads the department's Academic Program steering committee, which is responsible for reviewing all curricula changes, assessment activities, etc., and the Extension Coordinator has responsibility for coordinating major departmental extension activities and overseeing our internal review process for extension publications.

The business office is led by a Business Officer, who is our primary fiscal officer and oversees two additional staff positions – one for purchasing and the other for HR. All three of these positions regularly interact with the College Business Office and work to help our faculty and staff adjust to changing business procedures and maintain fiscal compliance. The front office is a high traffic and forward-facing space for our unit and for the entirety of the Plant Science Building (PSB), as it is the only main office on the first floor. Thus, the PSS front office tends to coordinate various functions for the whole of the building, including handling multiple deliveries daily, answering visitor queries, overseeing Cameron Williams Lecture Hall and the associated lobby space, overseeing the visitor parking for the building, and communicating all emergency and infrastructure information. The front office is manned by a Departmental Manager, who oversees another staff person who is charged with all travel, communication (website and social media), and event management for our unit. The department shares two IT staff positions: one is housed in the Plant Science Building (PSB) and provides IT support for everyone in PSB and adjacent KTRDC; the second is housed in Agriculture Science Center North and serves PSS and Entomology needs located in that building. This shared IT support approach has worked well for us, and the other units involved. Both IT personnel regularly interact with College IT to keep our computing systems up-to-date and in compliance with cybersecurity guidelines set forth by the University.

The department has facility coordinators that are staff employees with a portion of their time assigned to the department: Spindletop Farm Coordinator, Campus Facilities Coordinator, Equipment Coordinators, and Safety Coordinator. The Faculty Advisory Committee, composed of the Coordinators of Instruction and Extension, the IPSS DGS and Steering Committee Chair, and the promotions and evaluation committee meets monthly during the academic year and advises the chair on policy, procedure, and other matters as needed. Our unit holds faculty meetings only three times a year (traditionally, late August, mid-January, and early May). Thus, the chair relies on the Faculty Advisory Committee to provide input in between the regular faculty meetings. The chair keeps track of service on these various committees and works to make representation fair and equitable across our varies disciplines, missions, and locations (i.e. UKREC is represented). The chair hosts all staff meetings twice a year (Spring and Fall) at two locations each time: one is held in PSB for on-campus folks with a zoom option for staff located at UKREC; the second is held at Spindletop farm the following day for staff full-time at the farm. The chair created a Staff Advisory Committee in 2019, as a way to more formally involve staff in departmental decisions. The staff representative for the College Staff Council automatically serves on this committee. To date, this committee has not been very active and may need to be reconsidered.

In 2018, at the behest of the faculty, the chair re-instated faculty retreats, which have been conducted in July/August every year since. Every other year, faculty retreat occurs at one of our State Resort Parks. We begin at 1pm, typically discussing faculty position proposals, which concludes with a vote that indicates our priorities for hiring moving forward. This is often followed by a lightening talk session, where faculty volunteer to present something they are motivated about/working on at present in a very short format (<5 mins). We have dinner together and the chair hosts a social that evening. The next morning, we have breakout sessions themed to research, extension, instruction, or whatever else is appropriate, and then retreat concludes with lunch. This format works very well for us and faculty report enjoying retreat. In off the years, we have a day-long retreat that has traditionally occurred in Lexington somewhere. Last year, we held it at Spindletop Hall. The day-long format works ok but feels long. The chair is open to ideas to re-imagine retreat.

Re-filling faculty positions is a serious endeavor for our unit. When the chair is alerted to an up-coming retirement, she solicits a call for new faculty position proposals from the faculty. Vacant positions are considered general positions and are not automatically re-filled with the focus from which the vacancy arose. Faculty position proposals include all necessary details (rank, title series, location, DOE, etc.) and provide a justification for the position. Proposals are due to the chair prior to retreat and shared with the faculty. At retreat, faculty members present their position proposals, discussion ensues, and a vote is conducted. The chair presents results of the vote to the group and a consensus is reached on our priorities moving forward. The chair then turns in a formal faculty position proposal to the deans for consideration. Our unit has used this process for years and we feel good about it. It is a democratic way to assess our priorities and the path forward for our unit. Positions not selected for moving forward are kept in a pool and revisited in subsequent years.

7.2 Governance-related Policies and Procedures

The university and the college provide substantial oversight, support, and guidance with regard to business procedures, fiscal and human resource management, student services, faculty appointments, promotion, performance evaluation, legal guidance, grant management, and legal counsel. The complexity of administrative compliance is substantial and continues to grow. New systems are regularly adopted which require substantial user training and adjustments. A significant example of this that occurred during this review period was the movement of all travel and Procard charges to Concur (an electronic system). COVID-driven turnover in staff throughout the enterprise has resulted in numerous challenges in getting the business side of our operation done. University administrative and governing regulations are available online (https://regs.uky.edu/) as are college-level policies and guidelines (https://administration.ca.uky.edu/ofrpa).

The primary departmental governing documents are the Rules of Procedure and the Statement on Evidences of Activity, which provides guidelines for promotion and tenure (see Appendix I). Our Rules of Procedure were approved by departmental faculty in February 2019. The Rules of Procedure outlines our unit's standard operating procedures, including frequency of faculty meetings, committee structure and responsibilities, promotion and tenure practices, annual performance review and DOE guidelines, and our unit's specific mentoring policy and peer review of teaching practices. Our Statement of Evidences document needs to be updated, as it was approve by faculty last in October 2009. The chair, working with the Faculty Advisory Committee, began a revision process of this document last spring, but work was derailed by other efforts. We need to pick this process back up and finalize an updated version of the document. We know the college leadership is interested in working with units to update these documents college-wide.

8. FACILITIES, EQUIPMENT, AND BUDGET

8.1 Facilities

The Department of Plant and Soil Sciences faculty and staff conduct farm-based research at three centers in Kentucky: the University of Kentucky main campus in Lexington, the UK Research and Education Center at Princeton, and the Robinson Center for Appalachian Resource Sustainability in Quicksand. We have faculty and staff physically located on main campus in Lexington and in Princeton at UKREC. The Princeton farm is approximately 1,300 acres with 120 acres allocated to Plant and Soil Sciences research, the Lexington area farm consists of approximately 3,800 acres with about 800 acres utilized by the department, and the Quicksand farm supports department research on about 40 acres. On-campus department research labs are located in three buildings: Agricultural Science Center North, Plant Science Building, and the Kentucky Tobacco Research and Development Center. The department occupies/utilizes approximately 194,000 sq. ft. of building space, including 85,000 sq. ft. in farm buildings, 48,000 sq. ft. of laboratories, and 35,000 sq. ft. of greenhouse space including 13,000 sq. ft. on campus plus a small grains research greenhouse, a forage research

greenhouse, and three tobacco transplant greenhouses on the Spindletop research farm. Research lab space and farm building space managed by the UKREC is assigned to the six Plant and Soil Sciences faculty located at Princeton and is currently in a state of flux, as the entire facility is being rebuilt following the devastation of the massive tornado that completely destroyed the farm in December 2021.

Unfortunately, our unit has experienced multiple significant infrastructure disasters that have taxed our faculty and staff considerably during the review period. In addition to the complete annihilation of the UKREC facility, the Agricultural Science Center North building has undergone 3-5 fire/flood events during the review period. These emergencies varied in scale from whole building to partial floor disasters. This building is 60+ years old and has reached the end of its usable lifespan. This is also true for our large greenhouse complex. Fortunately, our dean has been successful in lobbying for new infrastructure for our college, and we are slated to get a new USDA-ARS building, a new Agriculture Research Building, and significant renovations to two existing buildings to improve our teaching capacity. Some PSS faculty and staff are slated to move into the new USDA-ARS (forage folks) and new Agriculture Research Building (soil/environmental science group). We are engaged in designing the new Agriculture Research Building at present, which will have new greenhouses on the roof. These projects will undoubtedly improve the quality of our spaces, especially labs and greenhouses. Similarly, the UKREC is rebuilding and we are optimistic the rebuild will be better than what existed pre-tornado. Current timeframes are 2026-2027 completion for majority of these projects with the ground-work already started.

Another infrastructure loss that has negatively impacted all aspects of our unit's mission has been the elimination of our college's Motor Pool and associated vehicle fleet. The university has a corporate agreement with Enterprise that is supposed to replace the motor pool function, but we have universally found this solution unsatisfactory to downright counterproductive. Not only is there the substantial inefficiency of having to use off-campus Enterprise facilities (which is substantial at the UKREC, where the nearest Enterprise is a 40-minute drive away), there is no guarantee of the vehicle ordered/reserved will be supplied by Enterprise. For those of us that need specific vehicle types to meet our work assignments it simply is not ok to rent a truck, design all the activities around a truck, and then find out when you arrive pickup, Enterprise is giving you an SUV that will not meet the needs. Renting vehicles from Enterprise for class field trip purposes is simply not even a reliably viable option. Therefore, our unit purchased a used 12-passenger van last year (through the internal proposal process) in order to help ease our instructional vehicle needs to meet our stated instructional goals for our students. The loss of motor pool has significantly increased the difficulty and increased inefficiencies of numerous unit functions with no advantage seen by this unit in meeting the needs of Kentuckians.

8.2 Equipment

As a large research and farm-based unit, we have significant amounts of equipment (n=1,262 items of tagged inventory, which includes all computers and lab/farm equipment) which is housed across multiple buildings and farms. We have some shared equipment located in the departmental Nutrient

Analysis Lab and at Spindletop Farm. The Nutrient Analysis Lab is supported by the department and serves the needs of our faculty, staff, and students. The department supports the full-time staff position that oversees this space and provides a modest yearly allowance for the lab. The lab manager helps train students on various techniques and helps our labs obtain the nutrient data they need. This lab runs on a supply replacement basis (i.e., there is no set fee per sample and it is not a service center). After the last periodic review, the faculty discussed how to move forward with this lab and this model is what was decided on. It seems to be working well.

We also attempt to share field equipment when possible. However, this is challenging as the nature of our fieldwork often means many of us are trying to achieve the same thing at the same time (e.g., harvesting or planting). Still, sharing equipment has become more prevalent than it was during the last review cycle, possibly enhanced by the chair's internal proposal process which prioritizes multi-user equipment. The process operates as follows:

In January/February, the chair is able to assess funds available to support internal proposals. This fund source is usually state/federal/RCTF dollars, but in one year (2019), was instructional course fee funds. The amount of funding available varies from year to year based on staff/faculty line openings/savings. Items chosen for funding must be purchased and in-place by the end of the fiscal year (June 30). Proposals must include: (1) description of the purpose/need/impact of the project/acquisition; (2) identify which programs will benefit/use the items; (3) indicate where the items will be located or stored – especially important for large equipment and at the farm; and (4) $$ requested and $$ faculty have to contribute towards the purchase from other sources (i.e., match; not a requirement, but favored). The chair works to make sure funds are distributed equally across our various missions, locations, etc. The following tables indicate the amount of funding and type of items supported by this process.

Table 27. Number of internal proposals received, amount requested, and number and amount funded during the review period.

	2018	*2019**	*2020*	*2021*	*2022*	*2023*
# submitted	30	8	23	19	22	17
Total $ requested	$514,358	$35,186	$225,938	$133,964	$225,447	$439,581
# funded	20	5	17	16	19	17
Total $ funded	$198,395	$30,784	$119,553	$90,394	$171,433	$439,581

*2019 was an instruction-only call.

Table 28. Summary of funded internal proposals over the review period.

	2020	***2021***	***2022***	***2023***
Lab Equipment	*$46,098*	*$44,006*	*$69,788*	*$84,384*
Ag/Field Equipment	*$35,711*	*$28,400*	*$89,784*	*$60,512*
Farm Infrastructure	*$10,310*	*$10,500*	*$7,130*	*$0*
Building Infrastructure	*$0*	*$0*	*$4,543*	*$103,506*

Tech Support	*$11,000*	*$6,588*	*$0*	*$542*
Grad Students	*$8,000*	*$0*	*$187*	*$0*
Teaching Equipment	*$8,788*	*$900*	*$0*	*$38,655*

It should be noted that the department has covered the costs of substantial building and farm infrastructure repairs and updates through the internal proposal process over the years. For example, last year we replaced two out of four autoclaves in the Plant Science Building (~$100K in total), as the autoclaves are original to the building (>20 years old) were failing and parts were no longer manufactured. However, PSS is not the sole user of these autoclaves; thus, we are facilitating the research of everyone in PSB. Similarly, we routinely spend tens of thousands of dollars on upgrades to the Cameron Williams Lecture Hall AV system. This room is used by everyone in the college and such expenses are likely to have to be covered by the college moving forward.

8.3 Budget

The department is supported by funds provided through the college; however, individual programs in the department also receive funds from external grants, income accounts, and unrestricted gift funds. The total amount of state and federal funds provided to the department in fiscal year 2023 was $7,238,800. Departmental programs received $3,539,584 in grant funds, $193,100 in endowment funds, and held approximately $5,707,476 in income and gift funds. **Table 29** presents the department budget from state and federal funds for the reporting period. Majority of our unit's budget is in state research dollars and majority of our annual budget is tied up in faculty and staff salary (~90%).

Most years the University has supported a modest merit raise increase, which is illustrated in the small gains made yearly to our total budget. Several years during this review cycle, the university has forced the college to contribute to this raise pool from internal funds. Some years the college has been able to cover this cost centrally and other years the college has passed some of the burden down to departments to cover. In 2020-2021, due to COVID, the college took a ~9.5% budget cut. This cut was made across all funding sources and units. Starting this fiscal year (2023-2024), all funding associated with vacated faculty positions returns centrally and is distributed based on rationale and anticipated outcomes proposed by units for hiring a new faculty member. For our unit, this amounted to a ~$500K loss of funds. This new policy means units retain salary savings from faculty who leave the university until July 1. This is important, as most units in the college, including our department, fund our operating budget from open faculty and staff positions.

Table 29. Departmental Budget over the review period.

	Teaching	**Research**	**Extension**	**Graduate student support**	**Total**	**%**
2017-2018						
State	$690,529	$4,132,690	$1,173,426	$0	$5,996,645	80%

Federal	$0	$900,139	$94,149	$0	$994,288	13%
RCTF	$57,317	$212,336		$247,230	$516,883	7%
Total	$747,846	$5,245,165	$1,267,575	$247,230	$7,507,816	
%	10%	70%	17%	3%		
2018-2019						
State	$824,335	$3,305,694	$1,486,335	$0	$5,616,364	72%
Federal	$0	$1,552,540	$92,330	$0	$1,644,870	21%
RCTF	$66,850	$212,331		$247,230	$526,411	7%
Total	$891,185	$5,070,565	$1,578,665	$247,230	$7,787,645	
%	11%	65%	20%	3%		
2019-2020						
State	$823,056	$3,363,214	$1,573,583	$0	$5,759,853	73%
Federal	$0	$1,485,523	$92,330	$0	$1,577,853	20%
RCTF	$68,595	$217,636		$245,588	$531,819	7%
Total	$891,651	$5,066,373	$1,665,913	$245,588	$7,869,525	
%	11%	64%	21%	3%		
2020-2021						
State	$784,314	$2,951,331	$1,481,559	$0	$5,217,204	73%
Federal	$0	$1,399,236	$93,374	$0	$1,492,610	21%
RCTF	$68,595	$217,636		$195,642	$481,873	7%
Total	$852,909	$4,568,203	$1,574,933	$195,642	$7,191,687	
%	12%	64%	22%	3%		
2021-2022						
State	$750,033	$2,902,294	$1,481,559	$0	$5,133,886	70%
Federal	$0	$1,571,809	$93,374	$0	$1,665,183	23%
RCTF	$69,661	$220,670		$195,642	$485,973	7%
Total	$819,694	$4,694,773	$1,574,933	$195,642	$7,285,042	
%	11%	64%	22%	3%		
2022-2023						
State	$798,610	$3,030,862	$1,540,270	$0	$5,369,742	74%
Federal	$0	$1,274,982	$93,374	$0	$1,368,356	19%
RCTF	$74,031	$233,854	$0	$192,817	$500,702	7%
Total	$872,641	$4,539,698	$1,633,644	$192,817	$7,238,800	
%	12%	63%	23%	3%		

Table 30 shows the costs of operating our unit for the past two years. Current expense funds in our state, federal, and RCTF income streams has remained flat over the review period (probably for

much longer than that). However, operating costs continue to increase. Our department uses open faculty and staff lines to cover operating costs (the 'deficit' indicated in the table), fund internal infrastructure improvements and equipment proposals, and cover departmental faculty allowances. We are one of only two departments in the college that still fund extension travel internally. This is a practice we hope to continue to be able to provide our Extension faculty and staff. The chair uses departmental allowances to give faculty discretion as to how they spend a modest amount of funds every year (typical allowances ranges from $2K - $5K/yr). Faculty use these funds for publication charges, lab expenses, travel, new computers, whatever their program needs. It is expected that moving forward the college will have to start covering these routine departmental expenses, as there is likely to not be sufficient budget in the unit to do so.

Table 30. Departmental operating costs from 2022-2023.

Cost Type	**2021-2022**	**2022-2023**
Advertising Faculty positions	$3,976	$4,204
Communications (phone, internet, etc.)	$49,922	$57,204
Copiers, printer	$16,237	$14,021
Environmental Job Orders	$19,157	$19,071
Facilities, Equipment maintenance	$23,727	$30,420
Gas/diesel	$13,172	$2,958
In-state Extension Travel	$39,610	$52,421
Dept Allowances	$185,543	$180,723
Internal Proposals	$80,474	$318,901
Farm Janitorial	$3,661	$3,391
Vehicle workorder/fuel	$6,947	$4,740
Office supplies	$4,823	$3,565
Visitor parking	$1,440	$1,512
Faculty Retreat	$4,466	$5,492
Staff meetings, swag, seminar series, awards, faculty interviews	$27,252	$50,470
Staff professional development travel	$8,749	$2,216
Total costs	**$489,156**	**$751,309**
Operating $$ available in budget	$286,870	$286,870
Deficit	-$202,286	-$464,439

9. REFLECTION

We are a strong, highly functional, large department that contributes significantly to the Land Grant Mission of our college and to the goals of our University through our research, instruction, and extension efforts. We are proud of our productivity and accomplishments during this review period. We value our diversity, scientific and otherwise, and we feel that we are on a positive, upward trajectory in many of our mission areas. The following sections discuss challenges that need to be met in order to fulfill the promise and potential of our unit moving forward for Kentucky.

9.1 Undergrad Program: Current Challenges, Constraints, and Program Needs

A. Identifying contributing faculty

The average FTE for PSS instructional faculty is ~6. The majority of PSS faculty with teaching in their DOE can and do contribute to the interdisciplinary NRES and ABT undergraduate programs (**see Table 1**). About 67% of the required core courses in the AES program have the PLS prefix (**see Appendix B**). These are not AES only courses but serve several majors in the college. The remaining core courses within the AES curriculum borrow from other departments within the college and university. All of the AES primary prefix courses (i.e., not cross-listed courses; **Table 3**) were designed and are largely taught by one faculty member (McNear). Identifying current and new faculty with the subject area expertise, willingness, and time to participate in the AES program is absolutely necessary for a department that wishes to grow the program.

Are there **enough qualified and interested research faculty to meet the Instructional needs** of the program – specifically, the core courses (AES101, AES 320, AES 490, AES 395/399, etc.) and those in the applied and technical specializations – e.g., Crop Production, GIS, and Technology Support?

Are there **ways to engage extension faculty in classroom teaching** without having a three-way split? Extension faculty cite a need for an undergraduate agronomy program and have the needed subject area expertise but are not willing or permitted to teach. Students value the on-the-ground experience that extension faculty bring to the program; particularly their participation in the field experience (AES 320) and capstone class (AES 490). How do we connect the teaching needs of the program with extension faculty who have the subject area expertise?

B. A need for relevant courses

The most popular applied concentration area in the AES major is row crop production. However, there are few undergraduate courses available for students to satisfy the needed nine credit hours. Extension faculty maintained their focus on row crop production, however, there are no incentives for the already overstretched extension faculty to teach. Should a dedicated lecturer be hired to cover instructional and other needs? Are there faculty with the subject area expertise that have room in their DOE to teach needed courses? Are new hires encouraged to teach in the AES program? Do new hires have the subject area expertise to teach in the program? Is there sufficient **demand to warrant hiring a dedicated lecturer** (as other departments have done) to cover courses that current faculty do not have the time or subject area expertise to teach. This same person could also cover the many other duties (newsletter, mentoring, recruiting) currently spread amongst a few faculty and staff?

C. Monetary support

The department currently funds the field experience course (AES 320). There is no course fee. As numbers increase, this is likely not sustainable. How can the department continue to **offer and fund high value courses without passing the cost on to the student?** The Summer AES 320 course is a high-value experiential learning course with lots of stakeholder and extension faculty involvement. Students are required to come back to campus two weeks early, which can be

particularly burdensome for out-of-state students who already pay twice the in-state tuition. To offset the cost for students, the department currently covers part of the housing expenses, all food and transportation for the two-week class averaging ~ $550 per student. As the program grows, an alternative funding model that does not pass the cost on to the student (e.g., via course fees) is needed.

Should the AES field experience be dropped from the summer and the activities incorporated into the fall and spring semesters, or dropped altogether? The summer field experience is offered in the interim between the end of the last summer session and beginning of the fall semester (e.g., Aug 12-23, 2024). This period permits students to complete their internships and coincides with a lull in the growing season for producers who participate in the experience. However, we are no longer allowed by the University to offer courses in this period. The class must be moved to fit within the summer semester window (May 13–Aug 8) or incorporated into the fall or spring semesters. Doing so passes the burden to an already time-crunched and number-limited faculty during the fall and spring semester, and the cost on to the student and/or program if it is during the middle of summer.

D. Growth of the AES program

Should the program **push for higher enrollment and accreditation as a standalone program, or is operating under the Ag Individualized umbrella sufficient** to meet student needs, and department objectives? There is precedent for this modality established by the Entomology department. **If program growth is the objective, what are the most cost and time efficient ways to recruit new students?** Since the second largest cohort of AES students come from southcentral Ohio should this region be a target for recruitment? What other regions?

9.2 Graduate Program: Current Challenges, Constraints, and Program Needs

A. and B. Increasing enrollment in graduate courses and instituting required classes within the disciplinary areas.

The IPSS program does not require courses within any of its current specialization / concentration areas, and because they are not required, there is no mechanism by which the registrar can indicate the specialization/concentration on the transcript. Instead, the specialization/concentration areas have suggested courses from which individual students, guided by their advisor and committee, can choose. This is seen positively by some – students have historically noted the program flexibility as an asset. It also allows diverse areas, such as Horticultural Science, to attract students researching topics from epigenetics to high tunnel vegetable production. Having at least one unique required course for each disciplinary area would cause the selected area to be included on students' diplomas and on their transcripts. While this issue has not come up in exit or satisfaction surveys, IPSS faculty have heard anecdotally that some students are dissatisfied with the current lack of indication of specialization areas on their diplomas and transcripts.

The topic of course requirements is occasionally raised at all-IPSS faculty meetings and in meetings of faculty within the disciplinary areas. Some, including Soil Science, are more in favor of required courses. Others would prefer to allow students, their advisor, and the advisory committee to choose courses that best fit their research area. Course requirements, whether specific courses or having students select at least one from a pre-approved list, could provide students with a broader education in the fundamentals of their disciplines. Additionally, course requirements may also help solve a perennial problem in the IPSS graduate program – low enrollment in graduate courses, often leading to classes being canceled (see **section 2.2.3B**). Lastly, low enrollment can be addressed through merging courses with similar content and learning outcomes. Plant Pathology has also historically struggled with low course enrollment. As these students enter IPSS, there may be opportunities to merge some PPA courses with existing PLS courses and reduce potential duplication.

C. Improving the interdisciplinary nature of the program

The word "Integrated" is in the name of the program, but does the program provide an interdisciplinary education? What should be expected from an "integrated" program – interdisciplinary research? Transdisciplinarity? Multidisciplinarity? These terms have different meanings, and a broader discussion of the program's expectations in this area should precede our efforts to improve.

Comments in past student satisfaction surveys have indicated their desire for more interactions with other labs and disciplines within our departments. Currently, the IPSS program has numerous ways it attempts to increase interactions between our diverse students and faculty – through a required course on transdisciplinary research (IPS 625), through encouraging student participation in departmental seminars, through a graduate research symposium, and through supporting the IPSS Graduate Student Association.

In recent years, one of the required courses (IPS 625, Transdisciplinary Research in Integrated Plant and Soil Sciences) has focused on highlighting different research strengths of our combined faculty and how they address a common theme. Recent responses on student satisfaction surveys indicate that students appreciate the approach and focus, > 75% of students responding to the 2022 satisfaction survey indicated they agreed or somewhat agreed that it is a useful course. Their comments highlighted that they appreciated "getting to know other folks in the IPSS program," and appreciated "critical thinking to propose transdisciplinary idea." However, student ratings *of the course* on official Teacher Course Evaluations are not favorable, and they comment that they are asked to stretch their bounds perhaps too much. The IPSS Steering Committee is examining the course's learning outcomes and structures to offer suggestions.

In previous iterations of a required course (PLS 772, Seminar in Plant and Soil Sciences), graduate students were required to attend a certain number of departmental seminars and complete short reports. Students complained about this requirement and pointed out low faculty participation in the seminars at the time. At the time there were also three separate seminar series for plant biology, crop science, and soil science. To make the program more interdisciplinary and improve participation, the three seminar series were merged into one and the requirement was removed. Another venue for learning about activities around the program is through the annual Professor Donald J. Sparks & Professor Bill Witt Graduate Student Symposium. Most current students present either an oral paper or a poster at this event.

However, for those who prefer not participate in the Symposium, they are required to present annually at some forum open to the UK public. While the seminars and symposium showcase different types of research conducted in the program, dedicated effort is needed to turn these into true teaching tools.

In PLS 772, Seminar in Plant and Soil Sciences, graduate students are required to attend a certain number of departmental seminars and complete short reports. (This will continue to be required for PLS 610, Transdisciplinary Communication in Integrated Plant and Soil Sciences.) Another venue for learning about activities around the program is through the annual Professor Donald J. Sparks & Professor Bill Witt Graduate Student Symposium. Most current students present either an oral paper or a poster at this event. While the seminars and symposium showcase different types of research conducted in the program, dedicated effort is needed for these to really immerse and train students in integrated research.

D. Program administration

As outlined in **section 2.2.1A**, the IPSS Steering Committee was formed in 2018 to assist the Director of Graduate Studies (DGS) with program administration. The program is large, averaging 50-60 enrolled students per year, most of whom complete a thesis or dissertation. The program is also expected to grow as a new disciplinary area is added (Plant Pathology), thus bringing students and faculty from another department into the program. With this growth comes the need for guidance on how the program should govern and administer itself – through by-laws, a memorandum of understanding, guidance on appointing individual faculty members to the IPSS faculty of record, etc. Additionally, careful examination is needed to determine if the large and diverse program receives adequate administrative support from the college and university.

E. Financial support

A historical challenge for the IPSS program has been that graduate student stipend levels are determined by department, not by degree program. Thus, students in IPSS have received different levels of financial support depending on their primary advisor's academic home and financial resources. The majority of IPSS students are supported on grants and the different departments have varying levels of other resources available to help support graduate students. This has led to some inequity across the degree program.

The PSS Department is lucky to have resources (RCTF funds) to support some graduate student stipends and we receive Dean Tuition Scholarships and Official TAs (tuition waivers for students TA-ing courses) from the Grad School. However, Dean Tuition Scholarships have been declining over the review period. This loss of funds has been offset by our department gaining official TAs, though this year has initiated a reduction in those funds as well. The RCTF funds are a set amount of money coming into the unit per year. Thus, as stipends and tuition rise, the number of departmentally funded students will have to decline. During this review period, the department has fully funded (stipend + tuition + fees) ~10 graduate students per year on average. The department is also able to cover tuition for an additional 10–15 students per year using the Grad School provided sources mentioned above.

In the past, PSS faculty as a unit have decided on the magnitude and timing of graduate student stipend raises (see Appendix J for our policy on this topic). However, in FY23, central University administration decided to start using the Oklahoma State Stipend Survey (a nation-wide survey

of graduate student stipends based on CIP code) to set minimum stipend levels. Initially, department-specific CIP codes were used to determine these raises. This approach would have perpetuated the disparity across the different units within IPSS. Thus, we argued that one CIP code should be used for all of IPSS and we were successful in getting this approved. This means that all IPSS students will have the same minimum stipend moving forward. However, there is latitude to pay more, if available, so there is likely to still be some spread in stipends across students. For example, PSS has voted to make the new University-determined minimums our base and what MS students will receive, but we have elected to give PhD students an additional $1,000 pre-qualifying exam and an additional $3,000 over the base for post-qualifying students. As of January 1, 2024, the new stipend minimum is $24,431. This will go up to $25,716 on July 1, 2024. The University has indicated it plans to determine minimum stipends annually moving forward. As stipends increase and Graduate School funds decline, departmentally funded graduate students are expected to decline. This will increase pressure on faculty to acquire grant funds and other resources to support graduate training programs moving forward.

F. Potential actions for the future

The IPSS Steering Committee has suggested: (1) a curriculum review; (2) a program structure review; and (3) a review of ways to increase enrollment, including increasing Plan B MS students and/or incentivizing online or hybrid course development, as potential actions it can take to address the topics above. These activities may identify ways to simplify course requirements, merge existing classes, and thereby help solve some low enrollment issues.

9.3 Research Enterprise & Infrastructure: Current Challenges, Constraints, and Needs

A main challenge currently facing the department relates to the **availability of infrastructure**, due to a natural event on the one hand (tornado in Princeton), and an imposed relocation of labs, facilities, and offices on the other (new Agriculture buildings in Lexington). On December 10, 2021, the University of Kentucky Research and Education Center at Princeton was devastated by a tornado with winds that reached 190 mph. It completely destroyed the newly (2019) built Grains and Forage Center of Excellence and left the faculty and staff at Princeton without labs, offices, or equipment. Since then, much of their time, in some cases virtually all of their time, has been dedicated to rebuilding and re-equipping the experiment station. The Lexington-housed part of the department currently faces uncertainty with respect to infrastructure, due to a planned expansion of UK Health Care that will force a significant part of our department to relocate to a new building as well as the relocation of key facilities such as greenhouses and teaching rooms. It currently remains unclear whether these new accommodations will sufficiently address our departmental needs as they are currently being met, especially considering that these relocations are planned over a rather short time frame. At present, it looks like we will be getting less seedhouse and greenhouse space than we currently have. **We hope that the college will receive additional funds to build new greenhouses and renovate existing aging infrastructure at the farm to replace what we are losing on main campus adjacent to Agriculture Science Center North.**

Another primary challenge for our research focus is the **dramatic reduction in research FTE** that has occurred over time. We must increase our research FTE in order to maintain our place of prominence in research metrics within the college (and so the college remains where it does in these metrics at the university-level). While we are in the process of hiring new faculty, it will be **imperative that we are allowed to continue to fill faculty lines moving forward.** Our unit provides administrative leadership for a variety of important college-level functions. However, this leadership comes at the cost of our primary unit function (i.e., extension, instructions, or research), and we have lost a number of faculty positions to the college through our faculty taking college-level admin positions and then not returning to our unit. It is this deficit that we must be allowed to replace.

Our unit has benefited from being able to cover a number of our research and infrastructure needs, as well as our standard operating costs, internally using savings from open positions. The new policy whereby open faculty lines are removed from units July 1 will mean that these costs must be covered by other sources moving forward. Additionally, the loss of our college motor pool and associated fleet of vehicles has created significant operational inefficiencies to the level of we simply are not in a position to provide the very best across all aspects of our mission (instruction, research, and extension). The Enterprise corporate contract does not fulfill our needs. Alternative solutions to improve access and availability of required vehicles are necessary for transforming the lives of our students and advance the Commonwealth we serve — and beyond — through our teaching and learning, diversity and inclusion, discovery, research and creativity, promotion of health, and deep community engagement.

9.4 Extension: Current Challenges, Constraints, and Needs

Similar to research FTE, we have seen a **decline in extension FTE** over the review period. This stems from the loss of the turf extension position during the ~9.5% budget cut of COVID and the increase in administrative DOE for our grain crops extension faculty. There is concern about the future of the **turfgrass extension** and applied research work. Currently, the official funding for the turf Extension Associate Senior position as well as overload pay for the three county agents will end May 31st, 2025. These positions, if lost, would leave a large gap in the land grant mission of teaching, research, and extension for the turfgrass industry in Kentucky. Both of our current Grain Crops Extension faculty carry substantial administrative appointments for their roles as Managing Director of UKREC and Director of the Grain & Forage Center for Excellence (>1.0 FTE admin combined). **Grain crops extension** is central to what we do and what our stakeholders in the state need and demand. We must find ways to shore up the shortfalls in these two critical areas.

APPENDICES

Departmental Committees Document- Appendix A
Agricultural Ecosystem Sciences curriculum- Appendix B
AES 320 Field Experience Syllabus- Appendix C
AES Mentoring Plan- Appendix D

AES Program Assessment SLO- Appendix E
Student Satisfaction Survey- Appendix F
List of Courses (undergrad & grad) taught by PSS faculty- Appendix G
Chair New Faculty On-Boarding Program- Appendix H
Rules of Procedure and Statement of Evidences- Appendix I
PSS Grad Student Stipend Policy- Appendix J

Plant and Soil Sciences
2023-2024 Committees and Service Assignments

Director of Graduate Studies	O. Wendroth
Coordinator of Instruction	McNear
Coordinator of Extension	A. Bailey
Spindletop Farm Coordinator	Carter
Campus Facilities Coordinator	Nelson
Equipment Coordinators	Carter/Walling
Safety Coordinator	Nelson

Promotion and Evaluation Committee
(The department's Rules of Procedure state that an individual is appointed for two years and may serve for only four consecutive years on this committee. The current year of service is indicated in parentheses following the name below.)

Smalle (1) Matocha (2) Teutsch (2) Pearce (2) A. Hunt (3)
Van Sanford (1)

Responsibilities: To assist and advise on faculty evaluation and promotion.

Faculty Advisory Committee

Composed of the Director of Graduate Studies (and/or the IPSS Steering Committee Chair), Coordinators of Instruction and Extension, and the Promotion and Evaluation Committee.

Responsibilities: To advise on policy, procedure, and other matters as requested by the Chair.

Staff Advisory Committee
(The staff representative to the college Staff Council (indicated by *) automatically serves on this committee. The current year of service is indicated in parentheses.)

Matthew Allen (5) Laura Harris (5) Jim Nelson* (3) Carol Von Lanken (5)
Pamela Obura (2) Suzette Walling (1)

Responsibilities: To advise on policy, procedures, and other matters as requested by the Chair. Members serve 2-year terms, with no term limit.

IPSS Steering Committee

Haramoto (Chair) Wendroth (DGS) Downie (HRT) C.L. Rodriguez (HRT) Unrine (PSS)
Yang (FNR) Stallins (GEO) P. Cockson (GSA President) M. Talasila (Student At-Large)

Responsibilities: To coordinate programmatic changes, administration, and assessment. To lead efforts to improve IPSS structure and function, and to assist the DGS where appropriate.

Academic Program Steering Committee

McNear (Chair) Matocha Kawashima Shepard Haramoto Wendroth (DGS)
Walling (Dept Manager)

Responsibilities:
1. To review and evaluate undergraduate curricula, courses, and student activities in Plant and Soil Sciences.
2. To provide leadership in the development of new undergraduate and graduate programs as needed.
3. Coordinate student recruiting activities.
4. Coordinate, review, and evaluate undergraduate and graduate program assessment activities.

Seminar & Departmental Awards

Responsibilities: To coordinate and schedule seminars and Departmental Awards.

Department/IPSS[†]		Phillips – No-till[‡]	Instruction[§]	Outstanding Alumnus[¶]	Grad Student Awards[Θ]
Shepard, Chair	Vijyesh Sharma*	McCulley, Chair	McNear	Hunt, Chair	Wendroth, Chair
Salmeron	Mounica Talasila*			Henning	Phillips
Brzozowski	Front office event person			Zhu	Smalle
[†]Organize department seminars. *Students appointed from IPSS and responsible for coordinating the IPSS Alumnus Early Career Award. [‡]Organize the Shirley Phillips No-Till Agriculture program [§]Organize the annual seminar focused on instruction [¶]Select the Graduate Program Outstanding Alumnus and assist with their visit and seminar scheduling [Θ]Select outstanding graduate students each year to receive the Peaslee/Phillips & Carringer awards					Ritchey

[†]Due to the need to be working on seminar schedules early, annual turnover of this entire group is not ideal. Therefore, faculty service on this committee will be multi-year and staggered, to give continuity but also new ideas to the group. Normally, people will be asked to serve at least 3 years, though exceptions longer and shorter may occur. The Chair position will rotate annually. Students will continue to rotate annually, unless they wish to serve multiple years.

Hatch Project Proposal Review

Wendroth (Chair) Van Sanford Smalle Teutsch Tsyusko

Responsibilities: To review Hatch project proposals, enlisting other reviewers as needed.

Social Committee

Front Office Events Person (coordinator), with faculty and staff located on 4th floor PSB.

Responsibilities: To arrange and conduct the annual Holiday Luncheon plus other departmental social activities as appropriate.

IPSS-GSA Advisor - Van Sanford

Undergrad Agronomy Club Advisors – Suzette Walling & Tim Phillips

Foundation Seed & Seed Commodity Committee

Eggett* (Chair) Phillips* Van Sanford* Kawashima Geneve C. Lee

Responsibilities:

1. To make recommendations concerning variety release and certification.
2. The Foundation Seed sub-committee (indicated by *) will provide oversight to the Foundation Seed Project and advise the Manager and Chair about FSP operations.

Other Commodity/Focus Area Committee Chairs

Corn & Soybean – C. Lee & Knott
Small Grain – Van Sanford & Knott
Forages – Teutsch
Soil, Water, & Environment – Unrine
Tobacco – Pearce
Weeds - Green
Industrial Hemp – Pearce

Responsibilities:

1. To identify research and extension needs in these areas and encourage the group/individuals to address the identified needs.
2. To advise the PSS Chair on needs in the commodity/resource area.

Faculty self-select which of these committees they participate in. Committees can be created and/or removed whenever deemed appropriate by the faculty.

Outreach & Communications

Department Web Page/Social Media

Front Office Events Person (Chair) Kawashima Shepard Tsyusko Walling

Responsibilities: To review the appearance and utility of the departmental web page and social media posts and to offer suggestions for their improvement

Plant and Soil Sciences Research Chronicles - Editor

Pearce

AGR-1

Ritchey (Co-Chair)	Grove (Co-chair)	Knott	B. Lee
C. Lee	Bailey	Sikora	Henning

Responsibilities: Establish, review, and publish lime and fertilizer recommendations. Maintain data used to establish those recommendations.

Facilities and Safety

Safety Responsibility: As specified in UK Administrative Regulations (AR II-1.1 –14 –181), environmental health and safety is a shared responsibility of all of us: administration, faculty, staff, and students. The activities of the departmental safety committees do not relieve any others of their obligation to assure compliance with all health and safety requirements.

Farm Oversight College Committees:
North Farm – Pearce, Carter
Little Farm - Green

Spindletop Facilities:

Carter (Chair) Eggett Harris C. Lee M. Allen Kenimer

Responsibilities:

1. Oversight of issues related to management of equipment and buildings
2. Recommend allocation of facility resources at Spindletop.

Spindletop Land Use:

Pearce (Chair) Kenimer Carter R. Smith M. Peake Poffenbarger
Van Sanford Wendroth

Responsibilities:

1. Oversight of land assignment and use within the Plant & Soil Sciences area at the North Farm complex.
2. Assist PIs with land use requests outside of PSS area.
3. Collect and maintain history of land use for fields, including basic information regarding applications of fertilizer and chemicals.

Farm Safety Committee:

Carter (Chair) Bruening M. Allen Valentine G. Roberts
M. Piersawl

Responsibilities: Oversight of issues related to on-farm safety, confirm certified first aid trained employees, plus conduct an annual worker safety training.

Farm Pesticide Use and Oversight:

Green (Chair) Haramoto Valentine G. Roberts Carter

Responsibilities: To review and implement pesticide use guidelines, record keeping, and regulatory compliance, and promote our expectations for safe pesticide use.

Laboratory Safety Committee:

Nelson (Chair) Vandiviere Hunt Kupper Kurepa McNear

Responsibilities: Coordination, planning, and review of on-campus laboratory safety issues, oversight of laboratory chemical and waste handling, organize necessary safety trainings, and management of laboratory inspections as necessary.

Autoclave Committee:

Clark (Chair) T. Smith (1st floor Ag North) Hartman (3rd floor PSB)
Roberta Magnani (4th floor PSB)

Responsibilities: To oversee autoclave maintenance, certification and training in designated areas including required autoclave certifications

Grinding Rooms Committee:

Nelson (Chair) M. Allen Harris

Responsibilities: To oversee maintenance of grinding mills and grinding rooms plus review safety issues and provide training

Greenhouse Committee:

Barrett (Chair) Connelley Dinkins (FAPRU) Kawashima Martinez Rhodus Zhu

Responsibilities: Coordinate greenhouse space assignments, develop facility recommendations, and publicize UK CAFE greenhouse safety web page

Emergency Response:

Bruening (Chair) Clark Downie/Dirk Qin Obura Walling Walton McCulley Carter

Responsibilities: Review Building Emergency Action Plans for AGN, PSB, Spindletop farm. Keep emergency response information up-to-date on the department's web site and in the building locations where we work.

Coordinators of Specific Areas:

Analytical Lab (S-104) – Unrine
Computer Labs and Equipment – Lauer & Simpson
Seedhouse – Van Sanford
Soils Radioisotope and Molecular Biology Labs – D'Angelo
Graduate Student, Post-Doc, and Visitor Housing:
- AG North 1st Floor – Wendroth
- AG North 2nd Floor - Nelson
- PSB 3rd Floor – Von Lanken
- PSB 4th Floor – Barrett & Clark

College of Agriculture, Food and Environment
Department of Plant and Soil Sciences

Agricultural Ecosystem Sciences (AES)

PROGRAM GOAL

The ***goal of the AES program*** is to equip students with the knowledge and skills required for the responsible stewardship of our agricultural production system. Responsible stewardship in the context of this program means the application of advanced methodologies to increase yields from, and the multifunctionality of, the current agricultural land base providing solutions that optimize the local, regional, and global benefits people gain from agricultural ecosystems. The need to sustainably produce food, fiber, feed, and fuel to satisfy the needs for an ever-growing global population in the face of a changing global climate while at the same time preserving or enhancing environmental integrity and resiliency of our agricultural production systems presents one of the greatest challenges facing humanity. The American Society of Agronomy has recognized this, stating that agronomy's grand challenge for the 21st century is "*to double global food, feed, fiber, and fuel production on existing farmland … with production systems that enable food security; use resources more efficiently; enhance soil, water, and air quality, biodiversity, and ecosystem health; and are economically viable and socially responsible."* The Agricultural Ecosystem Sciences program will be at the forefront of preparing students to meet this grand challenge.

STUDENT LEARNING OUTCOMES

1. Students will be able to *describe* the various components of the agricultural ecosystem and effectively *explain* how each of these components work together to influence agricultural productivity, environmental quality and human dimensions.
2. Students will be able to *synthesize* information from a variety of sources to *draw* conclusions and *formulate* recommendations that consider economic, social, and environmental aspects of agricultural ecosystem sciences.
3. Students will be able to individually, or *operating* as part of a multidisciplinary team, *explain* to a broad audience in oral, written, and visual formats the importance of agriculture and agriculturally related issues from multiple viewpoints
4. Students will *demonstrate* proficiency in the use of fundamental natural, biological, mathematical principles to *solve* problems relevant to agricultural ecosystem sciences.

PROGRAM OVERVIEW

The program starts with the UK Core requirements designed to build skills such as critical thinking, writing, reasoning, ethics, and global understanding that are necessary for our students to compete in a global marketplace, participate in democratic self-governance, and live a well-intentioned and meaningful life. Further, UK Core and pre-major requirements include coursework designed to develop a firm foundation in the basic sciences (chemistry, math, biology) that is essential for constructing a thorough understanding of the interrelated processes occurring in the agricultural ecosystem. The graduate composition and communication requirement will be satisfied by taking WRD 204 Technical Writing.

Name:		Student ID #		Term Entered:
F = Fall Semester S = Spring Semester			Hours	When Course Was Taken
UK Core	U.S. Citizenship	GEN 100 (F freshmen)	3	
	Composition I	CIS/WRD 110 (F freshmen)	3	
	Composition II	CIS/WRD 111 (S freshmen)	3	
	Creativity and the Arts		3	
	Humanities		3	
	Social Sciences		3	
	Global Dynamics (suggest PLS103)		3	
UK Core & PreMajor Req	Quantitative Foundation	MA109 or 123 or 113 or 137	4	
	Natural/Physical/Mathematical	CHE 105/111 or CHE 109/110/111	4/1 or 4/4/1	
	Statistical Inferential Reasoning	STA 296 or STA210	3	
Pre-Major Requirements	Principles of Biology I	BIO 148	3	
	Principles of Biology II	BIO 152	3	
	Principles in Economics I	ECO 201	3	
	Business/Technical Writing	WRD204 (GCCR)	3	

Following the UK Core and pre-major requirements, students will take coursework that will introduce them to several of the fundamental building blocks of agricultural production operations (plants, soils, animals) where they will develop a broad level of understanding of the individual components of a diversified farm production systems. Students will then move on to classes aimed at explaining how the fundamental farming system components are interrelated, how they are integrated into the greater ecosystem, and how understanding this interdependence is essential to the responsible stewardship of the food, fiber, feed, and fuel production system. To hone their skills into specific areas of interest, students will be required to choose courses in a Technical Specialization (TS) area and an Applied Specialization (AS) area described in detail in the next section.

Program Core	Sophmore	Intro to AES	AES 101	1	
		Life Processes of Plants	PLS 210	3	
		Microbes in Agronomy	PLS 301	3	
		Genetics	ABT 360	3	
		Fundamentals of Soil Science	PLS 366	4	
		Animal Production Principles	ASC 382	3	
		AES Field Experience	AES 320 (2 wks Summer)	2	
	Senior	Plant Production Systems	PLS 386	4	
		Agricultural Management Princ.	AEC 302	4	
		Agroecology	PLS (SAG) 390	3	
		Integrated Weed Mangement	PLS 504	4	
		Principles of Plant Pathology	PPA 400G	3	
		Insect Pests of Field Crops	ENT 310 or 320 or 340	3	
		Soil Nutrient Management	PLS 470G	3	
		Senior Problem in AES	AES 490 (S)	4	

AREAS OF SPECIALIZATION

Class taken in the chosen TS area are intended to provide a student with specific technical skills in an area of their interest which they will then apply to a chosen AS. For example, a student interested in precision agriculture or Ag data management could choose the GIS and Technology Support TS and then apply this to the Crop Production AS to encompass data collection, mapping and analysis functions that occur in modern day farming. Similarly, a student could choose the *Agricultural Economics & Policy* TS and then apply this knowledge to the *Soil Use and Water Management* or *Animal Production Systems* AS where they would then be well versed in Ag related policy and laws dealing with nutrient runoff (e.g. the P index) or waste handling (e.g. CAFO), respectively. Students who don't find a TS or AS that fits their career goals do have the option of working with their advisor to develop an individualized concentration for one of these areas (not both).

Technical Specialization (TS)	Applied Specialization (AS)
Agricultural Economics & Policy (*minor*)	Crop Production
Applied Plant Biology	Animal Production Systems (*minor*)
GIS and Technology Support	Soil Use and Water Management
Sampling, Testing and Analysis	Pest Management (*minor*)
Agricultural Business Management (*minor*)	*Individualized**
*Individualized**	

**individualized curricula are developed together with a student's advisor and are subject to approval by the AES steering committee. (minor)- indicates* that there is an approved minor for this AS

TECHNICAL SPECIALIZATION DESCRIPTIONS

Students must select ONE area for their Technical Specialization *and complete nine hours of course work in the area from the list of courses provided below. Students must select from the courses listed under each TS but may request one (1) substitute course, subject to approval by both their academic advisor and the DUS. For the 6 class (18 credit h minimum) of TS and AS coursework, all classes must be 200-level or above and at least twelve (12) credit hours must be in 300-level or above courses. Classes taken to complete the TS requirement cannot count towards the AS course requirement. Experiential learning courses cannot satisfy TS requirements.*

Agricultural Economics and Policy: Economics and policy are important factors influencing the day-to-day management and economic viability of agricultural production systems. Students interested in the Agricultural Economics and Policy TS will take classes in which they can learn about how agricultural policy is developed and implemented, the set of laws and policies relating to domestic agriculture production, and those related to imports of foreign agricultural products. They will learn about the agencies that manage agricultural resources (e.g. USDA, NRCS, etc.), and how policies are evaluated for their impact on humans and the environment. **Note:** students choosing this TS are eligible to receive a Ag Economics minor if the correct sequence of courses are chosen. Please consult with your academic advisor.

Course	Cr; offered	Prerequisites
AEC 445G Intro Resource/Environ Economics	3; F/Sp	ECO201
AEC 324 Agricultural Law	3; F/Sp	C or better in ECO201
AEC 303 Microeconomic Conc. in Ag Econ	3	C or better in ECO201 & MA123
AEC/ECO 471 International Trade	3	AEC303
AEC 305 Food & Ag Marketing Principles	3	C or better in ECO 201
AEC 532 Agriculture & Food Policy	3; S	AEC303 and AEC305
AEC 309 Int Ag Food Nds US Trade in Ag Prod	3; F	C or better in ECO201
AEC 510 Internatl Trade & Ag Mkt	3; F	AEC 305
ANT 303 Topics Ant. Of Food Nutr.	3; S	none
ECO 202 Principles of Economics II	3; F/Sp/Su	ECO201
ECO 370 The Global Economy	3; F/Sp	ECO201 & ECO202
ECO 385 Law and Economics	3, ?	ECO201 & ECO202
ECO 391 Econ & Bus Statistics	3; F/Sp/Su	STA 296
GEN 305 Government in Agriculture	3; F/Sp	none

***Agricultural Business Management*:** Responsible stewardship of agricultural production systems will require the application of advanced management practices and technologies to increase yield and financial profitability of land currently or projected to be utilized for agricultural purposes. Students will take courses designed to teach them how to critically evaluate the impact of advanced crop management practices and technologies on yield and profitability, management of work force, equipment and infrastructure on profitability; and the importance of planning and keeping detailed records on yield and profitability. **Note:** students choosing this TS are eligible to receive a minor in Business if the correct sequence of courses are chosen (required ACC200 OR ACC202,

ACC201, ECO201, ECO202, STA296, AN300, FIN300, MGT301, MKT300). Please consult with your academic advisor.

Course	Cr; offered	Prerequisites
ACC200 Intro to Accounting for Decision Makers	3; S/F/Su	27 sem. Cr h
ACC 201 Financial Accounting I	3; S/W/F/Su	27 sem. Cr h
ACC 202 Financial Accounting II	3; S/W/F/Su	ACC201 or ACC221
ACC 221 Accounting Fundamentals	3Cr; S/F/Su	none
ACC 301 Intermediate Accounting I	3Cr; S/F/Su	≥C in ACC201 and 202
ACC 302 Intermediate Accounting II	3Cr; S/F/Su	≥C in ACC 301
ACC 356 Principles for the Financial Planner	3; S/W/F	≥60 sem Cr h
ACC 360 Accounting and Tax for Small Business	3;S	ACC201 OR ACC221
CLD 230 Interpersonal Relationships	3; F/S	none
CLD 402 Principles of Leadership	3; F/W/S	Consent of instructor
CLD 403 Leadership & Comm.	3; F/W/S	Consent of instructor
COM 281 Comm. in Small Groups	3; F/S	none
COM 315 Understanding Workplace Comm.	3; F/Sp/Su	none
COM 381 Comm, Leadership, & Entrepreneur	3; F/Sp	none
ECO 391 Econ & Bus Statistics	3; F/Sp/Su	STA 296
MGT 301 Intro to Managing Organizations	3; F/Sp/Su	Sophomore standing
MGT 309 Intro to International Business	3; F/Sp	MGT 301
MGT 341 Business Law	3; Sp/Su	None
MGT 410 Analysis of Organizational Behavior	3; F/Sp	MGT 301

Applied Plant Biology: Understanding the fundamental biological processes governing plant function is critical to improving yield under current and future environmental conditions. Students interested in the Plant Biology TS will take a series of classes in which they will develop knowledge and skills in plant propagation, genetics, plant breeding, plant-microbe interactions and plant physiology.

Course	Cr; offered	Prerequisites
PLS 220 Intro to Plant Identification	3; F	none
BIO 430G Plant Physiology	4; Fall	BIO 148,152,155, CHE 230, 231
ABT 460 Intro Molec Genetics	3; Sp	ABT 360 or BIO 304
ABT 461G Intro Pop. Genetics	3; Sp	ABT 360 or BIO 304, STA
BIO 418 Ecological Genetics	3; F	BIO 303 and 304 or equivalent
PPA 500 Phys of Plant Health & Disease	3; F	PPA 400G (or concurrent)
BIO 351 Plant Kingdom	3; F	Intro bio
BIO 325 Ecology	4; F	BIO 148,152 and genetics
HRT 440 Plant Propagation	3; Sp	PLS 210
BIO 425 Genetic Eng. Pl, An, Microbes	1; F/S	
PLS 597 Pop Genetics Lab	2; F	

GIS and Technology Support: The use of technologies such as precision guidance, remote sensing, remote controlled aircraft, geospatial referencing, and landscape mapping continue to increase in agriculture and knowing how to manage and analyze the resulting data is a key skill. Students taking this TS will learn about the latest technological developments and how to incorporate these technologies into the management of agricultural systems.

Course	Cr; offered	Prerequisites
GEO 309 Intro to GIS	3; F/Sp	None
GEO 409 Advanced GIS	3; Sp	GEO309 or consent of instructor
GEO 419 Intro to Remote Sensing	3;F	GEO309 or consent of instructor
LA/NRE 355 Intro Geospatial Apps for Land Analysis	3; F/Sp	consent of instructor
INF 401G Informatics Fundamentals	3; F	Junior Standing
IS 202 Tech for Information Services	3; F/Sp/Su	None
ICT 301 Introduction to Databases	3; F/Sp	None
LA/NRE 556 Advanced GIS systems and Landscape analysis	3;F	NRE355
BAE 599 Tops in BAE: Precision Agriculture	3; Sp	consent of instructor
CS 115 Intro to Computer Programming	3; F/Sp	none

***Sampling, Testing and Analysis*:** Accurate and reliable plant and soil analysis is necessary to predict nutrient availability, guide nutrient recommendations, and diagnose plant diseases. Students choosing this TS will take courses that will teach them how to properly collect plant, soil, and water samples, prepare the samples for laboratory analysis, perform the analyses employing different methods with quality assurance/quality control protocols, and learn how to interpret the results to provide accurate recommendations.

Course	Cr; offered	Prerequisites
PLS 581 Chem Anal Soil & Plants (4)	4; Sp	PLS366
PLS 567 Methods in Soil Microbio (1)	1; Sp	PLS366
PLS 396 Soil Judging (1-2)	1-2; F	Consent of instructor
PLS 406 Adv. Soil Judging (1)	1; Sp	Consent of instructor
PLS 573 Soil Morphology and Classification	3; odd F	PLS 366
BIO 209 Microbiology Lab	2; F/Su/Sp	BIO 208
CHE 422 Instrumental Analysis (4)	4; F/Sp	400+ P Chem course
CHE 226 Analytical Chem (3)	3; F/Sp	CHE107/113
CHE 230 Organic Chem I	3; F/Su/Sp	CHE107/113
AEN 203 Surveying	3; F	CAFÉ student
AEN 461G Biometerology	3; S	> Jr. standing
PLS 581 Experimental Design	3; Sp	None
PLS 468G Soil Use & Management	3;Sp	PLS 366 or consent of instructor

Individualized TS: Students not finding a TS option that fits their specific long-term goals can, working closely with their academic advisor, develop their own TS the acceptance of which is subject to the approval of the AES steering committee.

APPLIED SPECIALIZATION (AS) DESCRIPTIONS

Students must select ONE APPLIED specialization and complete nine hours of course work in each area from the list of courses provided below. Students must select from the courses listed under each AS but may request one (1) substitute course, subject to approval by both their academic advisor and the DUS. For the 18 hours of TS and AS coursework, all classes must be 200-level or above and at least twelve (12) credit hours must be in 300-level or above courses. Classes taken to complete the AS requirement cannot count towards the TS course requirement. Experiential learning courses cannot satisfy AS requirements.

Crop Production Systems: Efficient and sustainable crop production is central to the responsible stewardship of our agricultural production system. Students that select the Crop Production AS will learn to apply basic agronomic principles and use of the latest technologies to maximize yield and profitability in practical, 'real-world' situations. This is the preferred option for students planning to become a professional agronomist, farm manager, agricultural sales, or related career.

Course	Cr; offered	Prerequisites
PLS 512 Grains and Oilseeds	3; Sp	PLS 366, PLS 386
PLS 514 Grass Taxonomy and ID	3;Sp	PLS 220
PLS 502 Ecology-Economic Plants	3; e/o F	None
PLS 602 Princ. of Yield Physiology	3;e/o Sp	PLS 386 and BIO430G
PPA 500 Phys. Plant Health Disease	3:F	PPA 400G
PPA 300 GMO's: Facts, myths, impact on soc.	3; F	Jr. standing or consent
PLS 408 Tobacco	3:F	PLS 386
PLS 533 Hemp Production Systems	3;Sp	None
HRT 440 Plant Propagation	3;Sp	PLS 210
PLS 510 Forage Management and Utilization	3;Sp	PLS 386; PLS 410
AEN 252 Fab and Construction for Tech. Sys	3; Sp	None
AEN 220 Princ. Of Internal Combustion Engines	3; F	None

Animal Production Systems: Animals play important roles in agronomic production systems and in our food systems, currently and historically. Students choosing this AS will learn the basic principles of nutrition, reproduction, and animal genetics as they apply to the production and management of horses, dairy and beef cattle, sheep, swine, and poultry. ***Note:*** *student wishing to get an animal science minor must take ASC101 and ASC102 in addition to 3 of the courses below.*

Course	Cr; offered	Prerequisites
ASC 300 Meat Science	4;F	ASC 101 and ASC 102
ASC 325 Animal Physiology	3;F/Sp	BIO 152
ASC 362 Animal Breeding and Genetics	4;F/Sp	ASC 101 and BIO 152
ASC 364 Reproductive Phys of Farm Animals	4;F/Sp	ASC 101 and BIO152
ASC 378 Animal Nutrition and Feeding	4;F	ASC 101, CHE230 or CHE236
ASC 440 Poultry Production	3;Sp	ASC 101 and ASC 102
ASC 404G Sheep Science	4;F	ASC 300, 362, 364, 378
ASC 406 Beef Cattle Science	4;F	ASC 300, 362, 364, 378
ASC 408G Swine Production	3;Sp	ASC 101 and 102
ASC 410G Equine Science	3;Sp	ASC 310, 364, 378
ASC 420G Dairy Cattle Management	3;F	ASC 325, 364, 378

Soil and Water Use and Management*:* Soils are the building block for societies; performing critical functions for humanity including water filtration and storage, supplying nutrients for plants and animals, providing habitat for organisms, and climate mitigation. Students selecting this AS will learn to apply principles of soil and water conservation and management in support of agronomic productivity and environmental preservation from field to watershed scales. Students will learn to use soil information and land use characteristics to select and recommend best management practices. Students will learn about water requirements for successful crop production, methods for supplying supplemental water and to keep water clean when leaving agricultural fields.

Course	Cr; offered	Prerequisites
PLS 573 Soil Morphology and Classification	3; Odd Fall	PLS366
BAE 542 Intro to Stream Restoration	3; Spring	Consent of instructor

GEO 351 Physical Landscapes	3; F	GEO 130 or consent
PLS 566 Soil Microbiology	3;Sp	
PLS 567 Methods in Soil Microbio (1)	1	PLS366 or intro micro course
PLS 468G Soil Use & Management	3;Sp	PLS 366 or consent of instructor
AEN461G Biometeorology	3; Spring	Junior, Senior, or Graduate standing
GEO230 Severe Storms & Extreme Weather	3; Spring	None

Pest Management: Pests are a primary source of yield loss and are challenging to manage, especially as they evolve resistance to pesticides. Students selecting this AS will take courses on insects, weeds, and plant pathogens aimed at enhancing their knowledge of pest identification, biology, and behavior. **Note:** students choosing this AS are eligible to receive a minor in Pest Management or Entomology if the correct sequence of courses are chosen. Please consult with your academic advisor.

Course	Cr; offered	Prerequisites
ENT 300 General Entomology	3; F	1 course in intro Bio
*ENT320 Horticultural Entomology	3;Sp	
*ENT 340 Livestock Entomology	3;F	
ENT 574 Advanced Applied Entomology	4; Sp	Intro ENT course, or consent
PLS 531 – field school in crop pest management	2;F	ENT 300 or ENT 310 or ENT 320 and PPA 400G or COI
ENT 625 insect Plant Relations		
PPA 500 Phys of Plant Health and Disease	3;F	PPA 400G
PPA 620 Fungicides, advanced concepts		
PPA 640 ID of Plant Diseases		
PPA 641 Plant Diseases, Pop Bio, and Biotech		

** if not taken as part of program core*

Individualized: Students not finding an AS option that fits their specific long-term goals can, working closely with their academic advisor, develop their own AS the acceptance of which is subject to the approval of the AES steering committee.

UNIQUE AES COURSE DESCRIPTIONS

AES 101 INTRODUCTION TO AES (1Cr): AES 101 will introduce you to the principles and practices of food, fiber, feed, and fuel production systems (i.e. agriculture) and how this system of living organisms functions together with the physical environment (i.e. as an ecosystem) to produce products that sustain and enhance human life. AES 101 will serve as an introduction to the AES major in which students will learn about the structure of the AES curriculum and how the various areas of specialization can be used to meet their interests and desired career goals. Invited Speakers representing a variety of potential future career paths will be brought in to discuss what skills are needed to be successful in their chosen path. The course will also equip students with a set of skills fundamental to their success in the program and beyond (e.g. use of MS Excel, literature searches, etc.).

AES 320 AGRICULTURAL FIELD EXPERIENCE (2Cr): Students will be required to attend an agricultural field experience. The agricultural field experience (AFE) is a 2-week summer camp offering an opportunity for students to visit several of the CAFE farms as well as partner farm operations where researchers, extension specialists and farmers will demonstrate the fundamental principles of agronomic production and management of agroecosystem for a sustainable food, fiber, feed, and fuel production future. Examples include demonstrations of precision agriculture, UAV's, farm equipment operation,

animal production (e.g. CAFO's and grazing operations) and manure management, plant breeding trials and breeding programs, soil and plant testing and analysis (i.e. crop consulting, soil testing lab), fiber and fuel production systems, etc.

AES/PLS 301 Microbes in Agronomy (3Cr): Microbes are all around us. This course will be taught by Dr. Mark Coyne. Dr. Coyne will take the students on a journey through the natural world stopping at the various niches microbes occupy (e.g. soil, water, rhizosphere, phyllosphere, compost pile, rumen, insect gut, etc.) to examine their structure, function and management.

AES 490 Capstone (3Cr): Capstone is required of all students in the AES major and will be taken in the final year of the program. Capstone is intended to help the students synthesize their in-class and field experiences during their time in the major and bring this knowledge to bare by addressing a local or regional agricultural issue of significance.

AES 399/395 Internship or field/lab experience (0-9 Cr): Students who choose the option to work with a researcher to develop an independent lab or field-based project or to intern at a local, regional, national or international agricultural or agriculture-related business can enroll in AES 399 or 395, respectively. Students are encouraged to take advantage of study abroad opportunities to satisfy this requirement. Students wishing to receive academic credit for their internship or lab research experience should enroll for 3 credits in either AES 395, or AES 399 respectively. Students not wishing to earn academic credit for their internship, but who would like a record of the experience on their academic transcript can enroll for zero credits.

PLAN OF STUDY

Name:		Student ID #		Term Entered:
F = Fall Semester S = Spring Semester			Hours	When Course Was Taken
UK Core	U.S. Citizenship	GEN 100 (F freshmen)	3	
	Composition I	CIS/WRD 110 (F freshmen)	3	
	Composition II	CIS/WRD 111 (S freshmen)	3	
	Creativity and the Arts		3	
	Humanities		3	
	Social Sciences		3	
	Global Dynamics (suggest PLS103)		3	
UK Core & PreMajor Req	Quantitative Foundation	MA109 or 123 or 113 or 137	4	
	Natural/Physical/Mathematical	CHE 105/111 or CHE 109/110/111	4/1 or 4/4/1	
	Statistical Inferential Reasoning	STA 296 or STA210	3	
Pre-Major Requirements	Principles of Biology I	BIO 148	3	
	Principles of Biology II	BIO 152	3	
	Principles in Economics I	ECO 201	3	
	Business/Technical Writing	WRD204 (GCCR)	3	
Program Core – Sophmore	Intro to AES	AES 101	1	
	Life Processes of Plants	PLS 210	3	
	Microbes in Agronomy	PLS 301	3	
	Genetics	ABT 360	3	
	Fundamentals of Soil Science	PLS 366	4	
	Animal Production Principles	ASC 382	3	
	AES Field Experience	AES 320 (2 wks Summer)	2	
	Plant Production Systems	PLS 386	4	
	Agricultural Management Princ.	AEC 302	4	
	Agroecology	PLS (SAG) 390	3	
Program Core – Senior	Integrated Weed Mangement	PLS 504	4	
	Principles of Plant Pathology	PPA 400G	3	
	Insect Pests of Field Crops	ENT 310 or 320 or 340	3	
	Soil Nutrient Management	PLS 470G	3	
	Senior Problem in AES	AES 490 (S)	4	
Experiential Learning Req.	Internship or Research Project	AES 399 or PLS 395	1-6	
	Describe project:			
Technical Specialization	Area Selected:		Nine (9) hours total (6 must be 300+level)	
	1.			
	2.			
	3.			
Applied Specialization	Area Selected:		Nine (9) hours total (6 must be 300+level)	
	1.			
	2.			
	3.			
Free Electives to bring total to 120	Course Selected:		Nine (9) hours total (6 must be 300+level)	
	1			
	2			
	3			
	4			
	5			

Must have 45 hours of 300+ coursework and 120 total credits

Sample Semester Plan

Example Curriculum Agricultural Ecosystem Sciences- starting with MA111 (compensatory)

FALL YEAR 1

AFE100 UK Core IX	3
AES101	1
MA111 (need C or better)	3
UK Core Humanities (II)	3
CIS/WRD110	3
TOTAL	**13**

SPRING YEAR 1

UK Core A&C	3
UK Core Global Dynamics (PLS103)	3
CIS/WRD 111 UK Core VI	3
ECO201	3
MA109 (C or better in MA111 req)	3
TOTAL	**15**

FALL YEAR 2

CHE109 (prereq. MA109)	4
UK Core Social Sci (III)	3
PLS210 (Fall)	3
BIO148 (CHE105 coreq)	3
TOTAL	**13**

SPRING YEAR 2

CHE110 (prereq. C or > in CHE109)	4
CHE111	1
PLS366 (Fall and spring, CHE105)	4
BIO152 (prereq. C or > in BIO148)	3
STA210	3
TOTAL	**15**

SUMMER – AES 320 - AES Field Experience	**2**

FALL YEAR 3

ASC 382	3
PLS386 (PLS210 and PLS366)	4
PPA400G (BIO148, 152 or PLS210)	3
TS course #1	3
WRD204 (GCCR)	3
TOTAL	**16**

SPRING YEAR 3

PLS/SAG390	3
PLS404 (prereq. PLS386)	4
AES301 (prereq. PLS366)	3
TS course #2	3
ENT310, 320 or 340	3
TOTAL	**16**

***SUMMER –AES 399 - Internship**	**1**

FALL YEAR 4

ABT360 (Fall,Bio148/153,Che105)	3
AEC302 (prereq ECO201 with C or better,sp/f)	4
AS course #1	3
TS course #3	3
TOTAL	**13**

SPRING YEAR 4

PLS470G (spring, prereq366, 386)	3
AS course #2	3
AES490 Capstone	4
AS course #3	3
Free elective	3
TOTAL	**16**

120 TOTAL

*AES 395 Independent research in AES can be taken during the semester in lieu of AES 399 in the summer

Example Curriculum --Agricultural Ecosystem Sciences - starting with MA109 (standard)

FALL YEAR 1	
AFE100 UK Core IX	3
AES101	1
MA109 (UK Core VII)	3
CIS/WRD110 (UK Core V)	3
UK Core Humanities (II)	3
TOTAL	**13**

SPRING YEAR 1	
CHE105 (UK Core IV)	4
CHE111 (UK Core IV)	1
CIS/WRD 111 (UK Core VI)	3
ECO 201	3
UK Core Global Dynamics (PLS 103)	3
TOTAL	**14**

FALL YEAR 2	
BIO148 (prereq. MA109, CHE105 concurrent)	3
WRD204 (GCCR)	3
PLS210 Life Processes of Plants	3
STA210 Making Sense of Uncertainty	3
Free Elective	3
TOTAL	**15**

SPRING YEAR 2	
BIO152 (prereq. C or > in BIO148)	3
AEC302 (F/Sp; prereq C or > in ECO201;)	4
PLS366 (Fall and spring, CHE105)	4
UK Core Art&Cre. (I)	3
TOTAL	**15**

SUMMER – AES 320 - AES Field Experience	**2**

FALL YEAR 3	
ASC382 Animal Production Principles	3
PLS386 (prereq. PLS210 and 366)	4
PPA400G (prereq. BIO148, 152 or PLS210)	3
ENT 310, 320 or 340	3
TS course #1	3
TOTAL	**16**

SPRING YEAR 3	
PLS470G (prereq. PLS 366, PLS386)	3
PLS/SAG390	3
PLS404 (prereq. PLS386)	4
AES301 (prereq PLS366)	3
TS course #2	3
TOTAL	**16**

***SUMMER –AES 399 - Internship**	**1**

FALL YEAR 4	
ABT360 (Prereq. BIO148/152,CHE105)	3
AS Course #1	3
TS course #3	3
UK Core Social Sci (III)	3
Free elective	3
TOTAL	**15**

SPRING YEAR 4	
AS course #2	3
AS course #3	3
AES490 Capstone	4
Free Elective	3
TOTAL	**13**

120 total

*AES 395 Independent research in AES can be taken during the semester in lieu of AES 399 in the summer

Example Curriculum --Agricultural Ecosystem Sciences - starting with MA123 (advanced)

FALL YEAR 1

AFE100 UK Core IX	3
AES101	1
MA123 (UK Core VII)	4
UK Core Humanities (II)	3
CIS110/WRD110 (UK Core V)	3
TOTAL	**14**

SPRING YEAR 1

CHE105 (UK Core IV)	4
CHE111 (UK Core IV)	1
CIS/WRD 111 (UK Core VI)	3
BIO148	3
UK Core Global Dynamics (PLS 103)	3
TOTAL	**14**

FALL YEAR 2

BIO152 (prereq. C or > in BIO148)	3
ECO201	3
UK Core Social Sci (III)	3
WRD204 (GCCR)	3
PLS210 Life Processes of Plants	3
TOTAL	**15**

SPRING YEAR 2

PLS366 (Fall & SP, CHE105)	4
AEC302 (prereq ECO201 with C or better; F/Sp)	4
UK Core Art&Cre. (I)	3
STA296 (UK Core VIII, prereq MA123)	3
TOTAL	**14**

SUMMER – AES320 - AES Field Experience	**2**

FALL YEAR 3

ASC382	3
PLS386 (PLS210 and PLS366)	4
PPA400G (BIO148, 152 or PLS210)	3
ENT310, 320 or 340	3
TS course #1	3
TOTAL	**16**

SPRING YEAR 3

PLS470G (prereq PLS366, PLS386)	3
PLS/SAG390	3
PLS404 (prereq PLS386)	4
AES301 (prereq PLS 366)	3
TS course #2	3
TOTAL	**16**

***SUMMER –AES 399 - Internship**	**1**

FALL YEAR 4

ABT360 (Fall & Sp, BIO148/152, CHE105)	3
AS course #1	3
TS course #3	3
Free elective	3
Free elective	3
TOTAL	**15**

SPRING YEAR 4

AS course #2	3
AS course #3	3
AES490 Capstone	4
Free elective	3
TOTAL	**13**

120 total

*AES 395 Independent research in AES can be taken during the semester in lieu of AES 399 in the summer

PLS/AES 320 (2Cr)

AGRICULTURAL ECOSYSTEM SCIENCES FIELD EXPERIENCE

Semester: SUMMER
Credit Hours: 2
Meeting Days/Time/Location: 2 weeks prior to fall semester/ all day/Lexington & Princeton KY

Instructor Information

Coordinating Instructor: David H. McNear Jr.
Office Building & Room Number: N122S Ag Science Center North Bldg
Email: dave.mcnear@uky.edu
Office Phone: (859) 257-8627
Office Hours: Available upon request F2F, Zoom, Skype, Teams, or any other preferred mode
Preferred Method of Communication: Email is best for the most quick-response to questions. Phone calls, F2F, or Zoom appointments are best for more in-depth questions. For time-sensitive questions, call, leave a message with a call-back number, and you will receive a call back. Students should contact the coordinator again if they have not received a response within a few hours (phone call) or within 12 hours (email). Only in rare cases and on weekends might the coordinator not respond to students within 24 hours. If all else fails, contact Abbie Cain, abbie.cain@uky.edu, 859-218-0973.

Course Description

A 2-week summer field experience where students visit several CAFE farms, private farm operations, and Ag sector industries and businesses to learn from researchers, extension specialists, and agronomists demonstrating the fundamental principles of agronomic production and management of agroecosystem in support of a sustainable food, fiber, feed, and fuel production future.

Course Prerequisites

CHEM 105 General College Chemistry I, CHEM 111 General Chemistry Lab I, and BIO 152 Principles of Biology II, or consent of instructor

Skill Requirements

No specific technical/digital literacy skills are required.

Student Learning Outcomes

By the time you successfully complete this course, you should be able to:
1. *Develop* an appreciation for the diversity of agricultural production systems
2. *Comprehend* and practice skills related to the needs of modern agricultural production
3. *Engage* with participants in the agricultural sector to make lasting connections
4. *Consider* the agriculture disciplines experienced and *justify* your own career choice

Required Materials

All required lecture videos and readings are distributed free of charge via UK's Canvas learning management system (https://uk.instructure.com/). Submission portals for all graded assignments and links to the syllabus are also available via Canvas. The varied field experiences

we participate in, the assignments required, and the time of year the class is offered requires a variety of supplies to assure that you are adequately equipped to complete the assignments and comfortable while doing it. Those supplies in the table below with an asterisk are required; all others are optional per participant preference.

Supplies:

*1. Field Notebook	8. Insect repellent
*2. Pens, pencils, erasers	9. Day Pack
*3. Cell phone or camera, and charger	*10. Field clothes (boots, pants, rain gear, long sleeve shirt)
*4. Laptop, ipad, or similar device	11. Sunglasses
*5. Clipboard	12. Sunscreen
*6. Calculator	13. Snacks (for the longer days)
7. Water bottle	*14. a good attitude

* indicates required items

Technology Information and Requirements

Technology Requirements

Minimum technical requirements for UK courses and suggested hardware, software, and internet connections are available at ITS Student Hardware & Software Guidelines.

Technical Support

For account help, contact UK's Information Technology Customer Services online, by email, or by phone at 859-218-HELP (4357).

UK students that are unfamiliar with how to use or who experience problems with Canvas should visit http://guides.instructure.com, contact Canvas Support at 844-480-0838 (24/7 availability), or contact the instructor. Students may also contact the UK Information Technology Service Center (http://www.uky.edu/ITS or 859-218-4357). For general questions about online courses and programs at UK, contact: http://www.uky.edu/ukonline/.

Activities and Assignments

Course Assignments

Daily Assignments (40%): Daily experiences will be led by individual faculty, partner organizations, agronomists etc. who will often provide assignments involving analysis and interpretation of data collected while in the field, surveys, topic review, etc. Late work for these assignments will not be accepted. The mean points earned for all assignments will be used to calculate the grade for this category.

Digital Media Exercises (30%): A daily group blog post (complete with pictures, video's etc.) will be created describing the days activities. One group member will be assigned each day to produce the final blog product, but all students are required to participate in developing content (i.e. pictures, videos, verbiage, editing, etc.).

Recorded Final Presentation (20%): With direction and input from the coordinating faculty member, students must prepare a highly-polished recorded presentation that is 5-10 minutes long and that describes what they discovered as a result of their field experience in agriculture. They can use products generated from the blog posts (videos, interviews, pictures) for this production. The final video will be uploaded to Canvas as a .MOV, .MP4, or other similar file format.

Participation (10%): An aim of this course is to open your eyes to the diversity of agriculture, to get to know members in that industry, and to get to know your fellow classmates. For that to happen requires that you come in to this experience ready ask questions, get involved, and and importantly, for you to

Submission of Assignments

Unless specified otherwise by the coordinating faculty member, students will upload their work to Canvas by the due date and time specified on the syllabus.

Course Grading

Students who complete daily assignments, work cooperatively with their fellow classmates, and actively participating in the daily activities will receive the most benefit and best grade in this class. The course grading policy is as follows:

89.5 – 100%	Superior	A
79.5 – 89.4%	Good	B
69.5 – 79.4%	Acceptable	C
59.5 – 69.4%	Marginal	D
Below 59.5%	Fail – No credit	E

NOTE: Highest grade possible with unexcused absence: 1 day = B, 2 days=C, 3 days=D, 4 days=F.

Mid-term Grade

Midterm grades will be posted in myUK by the deadline established by the University Senate and published in the Academic Calendar.

Resources

Distance Learning Library Services (http//libraries .uky.edu/dlls); **email**: distancelearning@uky.edu ; **Phone:** 859-257-3377; Carla Cantagallo, Distance Learning Librarian, 859-218-1240

Tentative Course Schedule

The following is a tentative list of field visits and proposed assignments. The field experience will generally begin at 9 am (unless otherwise noted) and end at 5 pm. There will be an occasional evening social activity and in some instances, some assignments will need to be completed after or prior to a field day.

WK	Day		Activity	Assignment
	Sun., Aug. 6th		**STUDENTS RETRUN TO LEXINGTON**	
1	Mon., Aug. 7th	AM	**LOCATION:** UK Main Campus, Ag North **TOPIC:** *Experience Overview, Logistics, Introductions* **HOST:** **Dr. McNear** **ACTIVITY:** Review of agriculture in KY and the region **LOCATION**: UK Spindeltop Farm **TOPIC:** *Hemp Production/Climate Change Impacts on forage production* **HOST:** **Bob Pearce, Jim Nelson, Rebecca McCulley** **ACTIVITY:** Visit hemp plots and climate change project sites and discuss emerigng crops and climate change impacts on forage production	Document via video/notes
		LUNCH	**The Barn Door Grill - Bluegrass Stockyards**	
		PM	**LOCATION:** Bluegrass Stockyards **TOPIC:** *Finishing animals and animal processing* **HOST:** **Jim Akers, COO** **ACTIVITY:** Learn about how animals are finished and sold	Document via video/notes
	Tue., Aug. 8th	AM	**LOCATION:** Woodford Co. Farm Sheep Grazing **TOPIC:** *Pasture Evaluation and Management* **HOST:** **Ray Smith, Krista Lea** **ACTIVITY:** Learn all about grazing animal operations. Visit a ruminant grazing operation and determine forage composition and quality, AMU's etc. **NOTE:** download the iNaturalist App ahead of time for species identification	Document via video/notes. Collected data for pasture valuation
		LUNCH	**Lunch provided by Pin Oak – Questions and Discussion with Farm Manager**	
		PM	**LOCATION:** Partner grazing (horse or beef) operation **TOPIC:** *Pasture Evaluation and Management* **HOST:** **Ray Smith, Krista Lea** **ACTIVITY:** Learn all about grazing animal operations. Visit a ruminant grazing operation and determine forage composition and quality, AMU's etc.	Document via video/notes. Collected data for pasture valuation
	Wed., Aug 9th	AM	**LOCATION:** UK Spindletop Farm **TOPIC:** *Precision Agriculture, UAV Demonstrations* **HOST:** **Mike Sama (BAE), Jenni Fridgen,** **ACTIVITY:** Demonstration of UAV's, data collection type, data management, etc.	Document via video/notes.
		LUNCH	**TBD - Harrodsburg Area**	
		PM	**LOCATION:** Gary Brown Farm, Harrodsburg, KY **TOPIC:** Precisions planting and sprayer equipment overview, farm visits to discuss/demonstrate how precision tools are used to manage and make management decisions **HOST:** **Gary Brown (Farmer), Jeramiah & Fridgen (Advanced Agrilytics)** **ACTIVITY:** demonstration on precision technologies are used for data collection and managment	Document via video/notes.
	Thur., Aug 10th	AM	**LOCATION:** UK Main Spindletop Research Farm **TOPIC:** *Soil testing and fertilizer calculations* **HOST:** **Hanna Poffenbarger/Frank Sikora/Dave McNea**r **ACTIVITY:** learn about going from field sample, to test result, to making a recommendation	Document via video/notes. Collected data for pasture valuation
		LUNCH	**La Taquiza Taquiria Centro, 630 E Main St, Lexington KY 40508**	
		PM	**LOCATION:** UK Main Campus, Ag North **TOPIC:** *Soil testing and fertilizer calculations* **HOST:** **Frank Sikora/Poffenbarger** **ACTIVITY:** learn about going from field sample, to test result, to making nutrient recommendation	Document via video/notes. Collected data for pasture valuation
	Fri., Aug 11th	AM	**LOCATION:** Woodford Co. **TOPIC:** *Pasture pork, beef, chicken production* **HOST:** **Jim Mansfield** - Four Hills Farm for sheep, **Kevin Ellis** for Hogs **ACTIVITY:** Visit a variety of farms to learn about pasture raised beef, pork, sheep etc. destined for Marksbury processing facility	Document via video/notes.
		LUNCH	**Pasture** - 7907 Nicholasville Road Lancaster, KY 40444	
		PM	**LOCATION:** 7907 Nicholasville Road Lancaster, KY 40444 **TOPIC:** Humane animal processing, farm-to-market sales, appropriate scale **HOST:** **Preston Correl**l Marksbury farms **ACTIVITY:** Tour processing facility and learn about humane animal processing (Grandin principles), appropriate scale of production, farm-to-market, etc.	Document via video/notes.

	Sat., Aug 12th		**Free Day**	
	Sun., Aug 13th		**Transfer to KY Dam Village State Resort Park**	
2	**Mon., Aug 14th**	**AM**	**LOCATION:** Hunt Farms 36°39'55.4"N 87°31'59.0"W or 36.665389, -87.533056 **TOPIC:** **Tour of Row Crop Production operation** **HOST:** Brandon Hunt - Hunt Family Farms **ACTIVITY:** Tour of Hunt family farms - visit with one of the largest producers in KY	Document via video/notes.
		LUNCH	**LUNCH: At Hunt Farms**	
		PM	**LOCATION:** Sisk Farms, 6493 Sisk Road, Hopkinsville KY 42240, 270-348-1611 (1-2:15) & Lester Family Farms 36°51'43.3"N 87°40'48.7"W or 36.862035, -87.680181 (3:00-4:15) ; **TOPIC:** **Tour of farming operations** **HOST:** **Joseph Sisk** (siskfarm@bellsouth.net); **Micah Lester** (micah@lesterfamilyfarms.com) **ACTIVITY:** Overview of farming operations; controlled traffic; erosion managment and other best management practices; irrigation, etc	Document via video/notes.
	Tue., Aug 15th	**AM**	**LOCATION:** UK Research and Education Center, Princeton **TOPIC:** Pest Management (insects, pathogens, weeds) **HOST:** **Raul Villanueva** (ENT), **Kiersten Wise** (PPA), **Travis Legleiter** (Weeds; PLS) extension faculty **ACTIVITY:** Field scouting for plant pests (fungal pathogens, insects, weeds)	Document via video/notes.
		LUNCH	**LUNCH: Provided by UKREC**	
		PM	**LOCATION:** UK Research and Education Center, Princeton **TOPIC:** Field identification of plant pathogens **HOST:** ENT/PPA/PLS extension faculty **ACTIVITY:** In-lab insect, pathogen, weed ID	Document via video/notes.
	Wed., Aug 16th	**AM**	**LOCATION:** Sanger Farms, 94 West Hickman, KY 42050 **TOPIC:** Bottomland Farming Operations **HOST:** **Ben Rudy**, Fulton Co. Extension Agent; ben.rudy@uky.edu; Cell: (270) 577-0723 (w/ text); 2114 South 7th Street, Hickman KY 42050; **Henry Sanger** - Sanger farm tour **ACTIVITY:** Tour of the upper and lower bottoms, Sanger Farm operations tour, furrow irrigation, cotton, rice production, etc.	Document via video/notes.
		LUNCH	**LUNCH:** Provided by Corteva/ Amberg & Son Farms, 2880 State route 125 Hickman, KY 42050. 270 236-3643	
		PM	**LOCATION:** Jonathan Reynolds - Springhill Farms **TOPIC:** Bottomland Farming Operations **HOST:** **Ben Rudy**, Fulton Co. Extension Agent; ben.rudy@uky.edu; 270 236-2351, **Jonathan Reynolds** **ACTIVITY:** Farm operations tour, cover cropping, waterways, grain bins, etc.	Document via video/notes.
	Thur. Aug 17th	**AM**	**LOCATION:** Siemer Milling, Hopkinsville KY **TOPIC:** **Wheat Milling** **HOST:** **Carl Schwinke** (cschwinke@siemermilling.com) and Dave Jansen (Djansen@siemermilling.com) **ACTIVITY:** Learn about how wheat is received and milled	Document via video/notes.
		LUNCH	**Siemer Milling Company**	
		PM	**LOCATION:** Commonwealth Agri-Energy, 4895 Pembroke Rd, Hopkinsville, KY 42240; (270) 475-4415; http://www.commonwealthagrienergy.com/ **TOPIC:** **Ethanol Production** **HOST:** **Mick Henderson,** General Manager, mhenderson@kyethanol.com; Tammy Mitchell, Scheduling, tmitchell@kyethanol.com **ACTIVITY:** learn about corn-ethanol production, vertical integration, value-added Ag, etc.	Document via video/notes.
	Fri., Aug 18th	**AM**	**LOCATION:** KY DAM Village **TOPIC:** Work on vdeo Summary Presentations **HOST:** D. McNear **ACTIVITY:** Students will show the videos they created from each day of the field experience and we will reflect on what we saw and learned.	Document via video/notes.
		LUNCH	**On the way to Lexington**	
		PM	**LOCATION:** UK Main Campus, Ag North **TOPIC:** Final wrap-up, Video Summary Presentations **HOST:** Dr. McNear **ACTIVITY:** Presentations reflecting on the camp experience, pros/cons, etc. Open to all interested faculty, staff and students	Document via video/notes.

Attendance Policy

Unless specified otherwise, students that miss required assignments, exams, or other required interactions for excused reasons should inform the instructor as soon as possible but no later than one week following the period of excused absence (Senate Rules 5.2.5.2.3.3).

Behavior Policies

All participants in this course are expected to show consideration and respect for other students and their ideas and to meet appropriate standards of tolerance, decorum, and civility. Students are encouraged to discuss any grievances that they may have regarding the course with faculty member in charge and the coordinating instructor as soon as possible. Students who wish to dispute a course policy or grade on an assignment or exam must present their concerns to the coordinating instructor in writing, including a justification for a policy or grade change.

Official Communication

All official course communications are sent to students' official UK email accounts directly or via UK's learning management system (Canvas). Students should check their UK email accounts each weekday. To protect students' privacy, the instructor may not respond to email communications that do not originate from an official UK email address (e.g., first.last@uky.edu or first.last@g.uky.edu).

Field Rules

Alcohol Policy: No alcohol is allowed on University of Kentucky property. If caught with alcohol you will be suspended (i.e. sent home) from the summer field experience. **Please take this admonition seriously.**

Drug Policy: No illegal drugs are allowed on University of Kentucky property (field or classroom; on or off UK property). If caught with drugs you will be expelled from the field experience and, quite possibly, expelled from the University. **Please take this admonition seriously.**

Privacy Policy: No one will disturb your privacy in university provided housing at Princeton. However, the housing, including both the sleeping rooms and common areas, are open to inspection upon probable cause. Routine inspections are performed by UK employees on a weekly basis.

Smoking and Tobacco Policy: Smoking is not allowed on University of Kentucky property. Smoking or use of any tobacco products is not allowed during class (field or classroom; on or off UK property). Permission for use off of UK property may be granted during breaks.

Personal Pet Policy: Personal pets are not allowed

Medical Emergencies: In the event of a medical emergency, contact your instructor, or any of the staff. They will take the appropriate actions. For routine medical attention, there is a first aid kit will be availble. It is a good idea to have a small personal first aid kit with you in the field at all times. If you have a specific medical condition, such as allergies, please let the coordinating instructor know.

General University Senate Rules

Midterm Grades for Undergraduate Students (Senate Rules 6.1.3.1)

Midterm grades will be posted in myUK by the deadline established by the University Senate and published in the Academic Calendar.

Excused Absences (Senate Rules 5.2.5.2.1)

Senate Rules 5.2.5.2.1 defines the following as acceptable reasons for excused absences: 1. significant illness; 2. death of a family member; 3. trips for members of student organizations sponsored by an educational unit, trips for University classes, and trips for participation in intercollegiate athletic events; 4. major religious holidays; 5. interviews for graduate/professional school or full-time employment post-graduation; and 6. other circumstances found to fit "reasonable cause for nonattendance" by the instructor of record. Students should notify the professor of absences prior to class when possible.

If a course syllabus requires specific interactions (e.g., with the instructor or other students), in situations where a student's total EXCUSED absences exceed 1/5 (or 20%) of the required interactions for the course, the student shall have the right to request and receive a "W," or the Instructor of Record may award an "I" for the course if the student declines a "W." (Senate Rules 5.2.5.2.3.1)

If an attendance/interaction policy is not stated in the course syllabus or the policy does not include a penalty to the student, the Instructor cannot penalize the student for any unexcused absences. (Senate Rules 5.2.5.2.3.3)

Verification of Absences (Senate Rules 5.2.5.2.1)

Students may be asked to verify their absences in order for them to be considered excused. *Senate Rule 5.2.5.2.1* states that faculty have the right to request appropriate verification when students claim an excused absence due to: significant illness; death in the household, trips for classes, trips sponsored by an educational unit and trips for participation related to intercollegiate athletic events; and interviews for full-time job opportunities after graduation and interviews for graduate and professional school. (Appropriate notification of absences due to University-related trips is required prior to the absence when feasible and in no case more than one week after the absence.)

Programs with learning activities mandated by accreditation or licensure agencies may establish, as a matter of policy, educational consequences for students who have so many excused absences that they cannot complete the mandated learning activities. Pursuant to Senate Rules 6.1.1, the published program policies and individual course syllabi must describe these consequences, which may include the student being moved to a different graduation cohort.

Religious Observances (Senate Rules 5.2.5.2.1(4))

Students anticipating an absence for a major religious holiday are responsible for notifying the instructor in writing of anticipated absences due to their observance of such holidays.

Please check the course syllabus for the notification requirement. If no requirement is specified, two weeks prior to the absence is reasonable and should not be given any later. Information regarding major religious holidays may be obtained through the Ombud's website or calling 859-257-3737.

Make-Up Work (Senate Rule 5.2.5.2.2)

Except where prior notification is required, students missing any graded work due to an excused absence are responsible: for informing the Instructor of Record about their excused absence within one week following the period of the excused absence; and for making up the missed work. The instructor must give the student an opportunity to make up the work and/or the exams missed due to the excused absence, and shall do so, if feasible, during the semester in which the absence occurred. The instructor shall provide the student with an opportunity to make up the graded work and may not simply calculate the student's grade on the basis of the other course requirements, unless the student agrees in writing.

For students who add a class after the first day of classes and miss graded work, the instructor shall provide the student with an opportunity to make up the graded work (quiz, exam, homework, etc.). The instructor may not simply calculate the student's grade on the basis of the other course requirements, unless the student agrees in writing.

Excused Absences and W/I, All Students (Senate Rule 5.2.5.2.3.1)

If a student has excused absences for more than one-fifth of the required interactions for a course, the student can request a "W." If the student declines a "W," the Instructor of Record may award an "I" for the course.

Excused Absences Due to Military Duties (Senate Rule 5.2.5.2.3.2)

If a student must be absent for one-fifth or less of the required course interactions (e.g., class meetings) due to military duties, the following procedure apply:

1. Once a student is aware of a call to duty, the student shall provide a copy of the military orders to the Director of the Veterans Resource Center. The student shall also provide the Director with a list of her/his courses and instructors.
2. The Director will verify the orders with the appropriate military authority and on behalf of the military student, notify each Instructor of Record via Department Letterhead as to the known extent of the absence.
3. The Instructor of Record shall not penalize the student's absence in any way and shall provide accommodations and timeframes so that the student can make up missed assignments, quizzes, and tests in a mutually agreed upon manner.

Accommodations Due to Disability

If you have a documented disability that requires academic accommodations, please see me as soon as possible during scheduled office hours. In order to receive accommodations in this course, you must provide me with a Letter of Accommodation from the Disability Resource Center (DRC). The DRC coordinates campus disability services available to students with disabilities. Visit the DRC website, email the DRC, contact them by phone at

(859) 257-2754, or visit their office on the corner of Rose Street and Huguelet Drive in the Multidisciplinary Science Building, Suite 407.

Non-Discrimination Statement and Title IX Information

UK is committed to providing a safe learning, living, and working environment for all members of the University community. The University maintains a comprehensive program which protects all members from discrimination, harassment, and sexual misconduct. For complete information about UK's prohibition on discrimination and harassment on aspects such as race, color, ethnic origin, national origin, creed, religion, political belief, sex, and sexual orientation, please see the electronic version of UK's *Administrative Regulation 6:1* ("Policy on Discrimination and Harassment") . In accordance with Title IX of the Education Amendments of 1972, the University prohibits discrimination and harassment on the basis of sex in academics, employment, and all of its programs and activities. Sexual misconduct is a form of sexual harassment in which one act is severe enough to create a hostile environment based on sex and is prohibited between members of the University community and shall not be tolerated. For more details, please see the electronic version of *Administrative Regulations 6:2* ("Policy and Procedures for Addressing and Resolving Allegations of Sexual Assault, Stalking, Dating Violence, Domestic Violence, and Sexual Exploitation"). Complaints regarding violations of University policies on discrimination, harassment, and sexual misconduct are handled by the Office of Institutional Equity and Equal Opportunity (IEEO), which is located in 13 Main Building and can be reached by phone at (859) 257-8927. You can also visit the IEEO's website.

Faculty members are obligated to forward any report made by a student related to IEEO matters to the Office of Institutional Equity and Equal Opportunity. Students can *confidentially* report alleged incidences through the Violence Intervention and Prevention Center, Counseling Center, or University Health Services.

Academic Integrity– Prohibition on Plagiarism (Senate Rules 6.3.1)

Per University policy, students shall not plagiarize, cheat, or falsify or misuse academic records. Students are expected to adhere to University policy on cheating and plagiarism in all courses. The minimum penalty for a first offense is a zero on the assignment on which the offense occurred. If the offense is considered severe or the student has other academic offenses on their record, more serious penalties, up to suspension from the University may be imposed.

Plagiarism and cheating are serious breaches of academic conduct. Each student is advised to become familiar with the various forms of academic dishonesty as explained in the Code of Student Rights and Responsibilities. Complete information can be found on the Academic Ombud page. A plea of ignorance is not acceptable as a defense against the charge of academic dishonesty. It is important that you review this information as all ideas borrowed from others need to be properly credited.

Senate Rule 6.3.1 (see current *Senate Rules*) states that all academic work, written or otherwise, submitted by students to their instructors or other academic supervisors, is expected to be the result of their own thought, research, or self-expression. In cases where

students feel unsure about a question of plagiarism involving their work, they are obliged to consult their instructors on the matter before submission.

When students submit work purporting to be their own, but which in any way borrows ideas, organization, wording, or content from another source without appropriate acknowledgment of the fact, the students are guilty of plagiarism.

Plagiarism includes reproducing someone else's work (including, but not limited to a published article, a book, a website, computer code, or a paper from a friend) without clear attribution. Plagiarism also includes the practice of employing or allowing another person to alter or revise the work which a student submits as his/her own, whoever that other person may be, except under specific circumstances (e.g. Writing Center review or peer review) allowed by the Instructor of Record or that person's designee. Plagiarism may also include double submission, self-plagiarism, or unauthorized resubmission of one's own work, as defined by the instructor.

Students may discuss assignments among themselves or with an instructor or tutor, except where prohibited by the Instructor of Record (e.g. individual take-home exams). However, the actual work must be done by the student, and the student alone, unless collaboration is allowed by the Instructor of Record (e.g. group projects).

When a student's assignment involves research in outside sources or information, the student must carefully acknowledge exactly what, where and how he/she has employed them. If the words of someone else are used, the student must put quotation marks around the passage in question and add an appropriate indication of its origin. Making simple changes while leaving the organization, content, and phraseology intact is plagiaristic. However, nothing in these Rules shall apply to those ideas, which are so generally and freely circulated as to be a part of the public domain.

Please note: Any assignment you turn in may be submitted to an electronic database to check for plagiarism.

Academic Integrity – Prohibition on Cheating (Senate Rules 6.3.2)

Cheating is defined by its general usage. It includes, but is not limited to, the wrongfully giving, taking, or presenting any information or material by a student with the intent of aiding himself/herself or another on any academic work which is considered in any way in the determination of the final grade. The fact that a student could not have benefited from an action is not by itself proof that the action does not constitute cheating. Any question of definition shall be referred to the University Appeals Board.

Academic Integrity – Prohibition on Falsification/Misuse of Academic Records (SR 6.3.3)

Maintaining the integrity, accuracy, and appropriate privacy of student academic records is an essential administrative function of the University and a basic protection of all students. Accordingly, the actual or attempted falsification, theft, misrepresentation or other alteration or misuse of any official academic record of the University, specifically including

knowingly having unauthorized access to such records or the unauthorized disclosure of information contained in such records, is a serious academic offense. As used in this context, "academic record" includes all paper and electronic versions of the partial or complete permanent academic record, all official and unofficial academic transcripts, application documents and admission credentials, and all academic record transaction documents. The minimum sanction for falsification, including the omission of information, or attempted falsification or other misuse of academic records as described in this section is suspension for one semester.

Diversity, Equity, and Inclusion

The University of Kentucky is committed to our core values of diversity and inclusion, mutual respect and human dignity, and a sense of community (Governing Regulations XIV). We acknowledge and respect the seen and unseen diverse identities and experiences of all members of the university community. These identities include but are not limited to those based on race, ethnicity, gender identity and expressions, ideas and perspectives, religious and cultural beliefs, sexual orientation, national origin, age, ability, and socioeconomic status. We are committed to equity and justice and providing a learning and engaging community in which every member is engaged, heard, and valued.

We strive to rectify and change behavior that is inconsistent with our principles and commitment to creating a safe, equitable, and anti-racist environment. If students encounter such behavior in a course, they are encouraged to speak with the instructor of record or the college's diversity officer, who is charged with addressing concerns about diversity, equity, and inclusiveness. Students may also contact a faculty member within the department, program director, the director of undergraduate or graduate studies, the department chair, or the dean. To submit an official report of bias, hatred, racism, or identity-based violence, visit the Bias Incident Support Services website.

Advising-Mentoring model for Agricultural Ecosystem Sciences (AES)

The AES program was built on a model of faculty advising. The faculty advisor was responsible for both ensuring that students were taking the correct sequence of courses to earn their degree in the shortest amount of time, and mentoring the student by providing advice on credentials, career paths, possible internships, etc. With the university requiring a professional advisors (PA) model, we are now tasked with re-envisioning the role that the advisor plays for our students. This shouldn't be seen as a loss of faculty advisor relevancy, but instead, as an opportunity for the faculty mentor to provide greater focus on equipping our students with the other-than-coursework skills they need to be successful once they leave our program. Having a PA relieves the faculty member from having to figure out the nuts-and-bolts of course sequencing, prerequisites, etc., permitting greater focus on helping the students develop a professional portfolio aligned with their goals and interests. What follows is a 4-year mentoring plan laying out the expectations and defining the deliverables for both the mentor and mentee.

AES Mentoring program goals:

1. *Create emerging leaders*: Helping students identify and obtain professional skills needed to make them leaders in their field.
2. *Develop new skillsets*: assist students in meeting their career goals by identifying and honing new and existing capabilities.
3. *Prepare for the future:* help students identify and obtain relevant internships, assistantships, and/or permanent employment.

4-year mentoring and professional development plan

New students are assigned a faculty mentor in the second (spring) semester of their first year. Transfer students are assigned a mentor immediately upon entering the program. Alignment of student interests with faculty area of expertise is ideal but not necessary or practical given that this would result in inequitable distribution of mentees (i.e., we might have many more students interested in Ag Econ than we do in plant biology). Mentoring responsibilities transcend disciplines, so mentors in the AES program should consider themselves not as individuals, but as a part of a larger mentoring team. Mentors can consult with other mentors on discipline specific questions as needed. Mentees will meet with their mentor at least twice per academic year. A Qualtrics survey developed by the college will be completed after the mentee-mentor visit, and then routed to the PA. The survey alerts the PA that the mentor-mentee meeting has taken place and provides them with any necessary information. Only after the PA receives the survey will the student be permitted to schedule an advising appointment with the PA to pick and register for classes. Mentees are free to change mentor at any time as long as both current and new mentor agree.

Year 1 – conduct self-assessment and develop IDP

- Student assigned faculty mentor by AES DUS in second semester of freshman year or upon entering the program (transfers)
- In AES101, student learns about expectations of mentee-mentor relationship, conducts a self-assessment, and develops an individual development plan (IDP) (See Appendix) detailing their interests and skills, and outlining their short, medium, and long-term academic and professional goals.
- Students meet with faculty mentor at least once in the fall semester (likely in October during the advising period) to discuss the development plan and review goals.

- Mentor helps mentee to review IDP and prioritize professional development needs and creates action items (e.g., develop resume, personal statement, create LinkedIn page, research job interests/postings, identify skills needed, identify professional development opportunities, etc.) designed to help the mentee achieve their goals
- Faculty mentor-mentee meet again during spring advising window to review/refine development plan, goals, and action items. Identify professional goals for the summer (e.g., networking opportunities, experience working in a professional setting, gaining experience in public speaking, etc.).

Year 2- Revise IDP and identify skills needed and skill development opportunities

- Student meets with faculty mentor at least once in the fall semester (likely in October during the advising period) to discuss and review development plan and goals.
- Mentor helps mentee to review IDP and prioritize professional development needs and creates action items (e.g., develop resume, create LinkedIn page, research job interests/postings, identify skills needed, identify professional development opportunities, etc.) with strategies and timelines to obtaining needed skills
- Mentee-mentor attends career fairs and AES professional development workshop
- Faculty mentor-mentee meet again during spring advising window (March) to review/refine development plan, goals, and action items. Identify internship opportunities and professional goals for the summer (e.g networking opportunities, experience working in a professional setting, gaining experience in public speaking, etc.)
- If not done so already, identify program specialty areas (AS/TS) and plan out associated courses.

Year 3: Identification of internship and preparing for internship

- Student meets with faculty mentor at least once in the fall semester (likely in October during the advising period) to discuss and review development plan and goals.
- Mentor helps mentee to review IDP and prioritize professional development needs and assesses attainment of action items (e.g. develop resume, create LinkedIn page, research job interests/postings, identify skills needed, identify professional development opportunities, etc.)
- Mentee-mentor attends career fairs and AES professional development workshop
- Faculty mentor-mentee meet again during spring advising window (March) to review/refine development plan, goals, and action items. Discuss internship plans, ensure internship learning contract is completed, and review internship expectations and professional goals for the summer (e.g., networking opportunities, experience working in a professional setting, gaining experience in public speaking, etc.)

Year 4: Identification and applying for permanent employment, job interview practice

- Student meets with faculty mentor at least once in the fall semester (likely in October during the advising period) to discuss and review development plan and goals.
- Mentor helps mentee prioritize professional development needs, assesses attainment of action items, identifies employment/graduate school opportunities, sets timeline for submission of applications, provides supporting documentation (reference letters, recommendation on LinkedIn page, etc.)
- Encourage mentees to use University resources (e.g., Stuckert Career Center) and attend campus job fairs.

- Faculty mentor-mentee meet again during spring advising window (March) to review/refine development plan, goals, and action items. Discuss submitted job/graduate school applications, Identify additional opportunities,

Individual Development Plans (IDPs)

Individual Development Plans (IDPs) provide a planning template that identifies both professional and educational development opportunities for students to actively work towards during their baccalaureate years. IDPs are created to suit individual needs of development and career choice by intentionally developing skills across multiple connected (and planned) experiences (American Association of Colleges & Universities). This integrative-learning experience should be maintained and modified by the student and their mentor at each milestone of the student's academic career.

As the mentor, it is important to spend the time initially to create a structured process for your mentees. The process of creating an IDP structure for students can be time consuming on the front end but the extra time early on has a large positive impact on students' career development throughout their undergraduate careers.

An IDP can be one component of a broader mentoring experience, but specifically, in an IDP, a student will:

- Assess their knowledge, skills and abilities critically and authentically
- Explore and define the specific skills needed for the articulated goals
- Create semester and yearly plans to reach their academic/career goals
- Establish target dates to reach academic, research and professional milestones
- Collect artifacts of skills mastered for incorporation into other integrative experiences like developing an ePortfolio or resume
- Reflect on their progress towards their goals and milestones

The IDP for AES students will be developed as part of their first semester AES101 class using, in part, the guide found in the **Appendix** (*Building an Individual Development Plan*). One component of the IDP will be setting specific goals and a timeline to achieving those goals using the SMART goals strategy (**S**pecific, **M**easurable, **A**ttainable, **R**ealistic, **T**ime-bound). After students set their goals, the mentor will work with the mentee to decide on artifacts to collect as "proof" (i.e., measurable) that the milestones/goals have been accomplished. Examples of artifacts (and their potential sources) could be:

- CV/Resume (***started in AES101, updated in AES399/395***)
- Personal Statement or other reflective writings (***AES399/395 blog posts***)
- Informational interview transcripts or reflections (***AES395 supervisor interview***)
- Calendar, or list, of events attended or lead
- Certificates acquired (*e.g. Distillation, Wine & Brewing Studies; Drone pilots license, applicator license*)
- Minors earned (*e.g Ag Econ, Business Management, Pest Management*)
- Writing samples or projects depicting skill acquisition (***AES420 Capstone Project***)
- Conference booklets with the student's name published
- Photos of internships, service-learning programs, study abroad experiences, or other opportunities that provided significant value (***AES 320 video and photos, AES 395/399 project***)
- Digital stories of learning progression via video or maps (***AES320 video***)

Artifacts should then be collated and used to develop an ePortfolio, digital story, or other integrative-learning culminating experience to help display the student's achievements.

Resources/References:

- https://undergrad.ucf.edu/whatsnext/faculty-staff/resources/individual-development-plans-idps-for-undergraduate-students/
- https://myidp.sciencecareers.org/?AspxAutoDetectCookieSupport=1
- https://www.apa.org/education-career/guide/individual-development-plan/self-assessment
- https://medium.com/stem-and-culture-chronicle/building-your-individual-development-plan-idp-a-guide-for-undergraduate-students-f14feca9111c
- https://cdn.careerhub.students.duke.edu/wp-content/uploads/sites/128/2021/08/IDP-Template-for-Everyone.docx

Appendix

Building an Individual Development Plan

Individual Development Plans (IDPs) provide a way for you to plan how you will develop professionally and prepare for the next steps in your career. An IDP should be flexible enough to suit your interests and personal working style, and it should be rigid enough to ensure that you make active progress toward your goals.

IDP Steps

Step 1 Consider the skills, experiences, and qualities that are valued in your academic program(s) and in careers of interest

Step 2 Assess which of these skills, experiences, and qualities you want to improve long-term and short-term, and brainstorm specific experiences you can seek out

Step 3 Prioritize experiences to seek out and create SMART goals to ensure you make progress

Step 4 Discuss your IDP with mentors and others to gather feedback

Step 5 Implement your IDP and revisit it every 3-6 months

Step 1: How do you want to develop professionally?

Answer the following questions with as much specific detail as you can. You can also include learning more about something as a quality you want to develop. For example, you can add "explore careers in fertilizer sales" to your career list.

What skills are required to be a successful student? What qualities are most valued?

What careers are you considering after UK? What additional skills and qualities are valued in these careers?

Careers	Additional Skills & Qualities

Step 2: Setting Priorities and Gaining Experience

From the lists from Step 1, choose which skills, experiences, and qualities you want to develop in the short-term (the next 3-6 months) and which you want to build in the long-term (the next 1-2 years). Then, brainstorm different ways for you to gain experience in these areas.

Short-term Priorities

Skill/Quality	Potential Experiences

Long-term Priorities

Skill/Quality	Potential Experiences

Networking

Who Would Be A Helpful Contact?	Potential Ways to Meet

Career Exploration

What Careers Do You Want to Learn More About?	Potential Ways to Learn More

Self-Care

Activity, creativity, community, and spirituality

Ways You Care for Yourself	**Potential Ways to Learn More**

Step 3: SMART Goals

*SMART goals are **S**pecific, **M**easurable, **A**ccountable, **R**ealistic, and **T**ime-bound. Use the table below to outline your SMART goals to help you develop as a professional.*

Goal	**Specific**	**Measurable**	**Attainable**	**Relevant**	**Time-Bound**
e.g. I want to gain critical thinking skills	Engage in undergraduate research	Presenting or publishing research at a conference or in an undergraduate journal	Programs to present at happen in spring semester. Publishing takes several semesters in research.	Critical analysis and thinking skills are needed in many graduate programs I am looking to apply to by my senior year.	(1) Get started in research next semester (fall) to be able to present in the spring (2) Conduct research for 1-2 years to get closer to publishing
Goal	**Specific**	**Measurable**	**Attainable**	**Relevant**	**Time-Bound**
Goal	**Specific**	**Measurable**	**Attainable**	**Relevant**	**Time-Bound**
Goal	**Specific**	**Measurable**	**Attainable**	**Relevant**	**Time-Bound**

Step 4: Mentors' and Others' Feedback

Gathering input from mentors and others can help you gain insight and set more effective goals. You will be assigned a mentor from the AES steering committee members, but you are not limited to one. You can also include your research (AES395) advisor, other faculty members at UK and university staff, alumni and other professionals in careers of interest. Seek out a variety of formal and informal mentors who can provide insight on the skills and qualities you want to develop.

Who could you recruit as a mentor for your short-term and long-term goals? When could you meet with them to ask for feedback?

Potential Mentors	**When/How to Ask for Feedback**

Step 5: Implement and Revise

Start using your IDP. Be sure to set a reminder to revise your IDP every 3-6 months (this will occur each semester prior to course registration) and seek additional feedback from mentors and others. You will likely need to revise and adapt some goals to better suit your needs along the way, which is perfectly fine and is to be expected.

Overview

Contributors	**Academic**
Contributors	**Leadership / Campus Involvement / Volunteer**
Contributors	**Career & Professional Development**
Contributors	**Self-Care**
Contributors	**IDP Goal 1**
Contributors	**IDP Goal 2**
Contiburtors	**IDP Goal 3**

Contributors: who provides you with advice, feedback, support, mentorship for these activities? Who are you engaging with?

Notes:

Program-level Student Learning Outcomes Assessment Plan Template

Academic Degree Programs

University of Kentucky

INSTRUCTIONS

The faculty of each academic program, degree or certificate, are asked to complete this plan template during the 2019-20 academic year to guide assessment of the program-level student learning outcomes (PSLOs) during the upcoming cycle. Assessment plans are due to the Office of Strategic Planning & Institutional Effectiveness (OSPIE) no later than **April 15, 2020** and should be submitted to the appropriate college and program folder in SharePoint.

A Quick Start Guide and other documentation as well as dates for live training sessions are provided on the OSPIE website. Training resources and session topics range from an overview of the new assessment process to principles and practice for student learning outcome assessment. Questions can be directed to OSPIE staff.

Reading the Quick Start Guide prior to completing the new plan template is strongly encouraged.

ABOUT THE PROGRAM

College or School (*example: College of Arts & Sciences*)	M-G Collage of Agriculture Food and the Environment (CAFE)
Degree Type (*example: BA or MS*)	BS
Program Name (*example: History*)	AICU-Agriculture - Agricultural Ecosystem Sciences

Please provide the mission statement for the program. If one does not currently exist, provide the department or college mission statement.

The **goal of the AES program** is to equip students with the knowledge and skills required for the responsible stewardship of our agricultural production system. Responsible stewardship in the context of this program means the application of advanced methodologies to increase yields from, and the multifunctionality of, the current agricultural land base providing solutions that optimize the local, regional, and global benefits people gain from agricultural ecosystems. The need to sustainably produce food, fiber, feed, and fuel to satisfy the needs for an ever-growing global population in the face of a changing global climate while at the same time preserving or enhancing environmental integrity and resiliency

of our agricultural production systems presents one of the greatest challenges facing humanity. The American Society of Agronomy has recognized this, stating that agronomy's grand challenge for the 21st century is "to double global food, feed, fiber, and fuel production on existing farmland … with production systems that enable food security; use resources more efficiently; enhance soil, water, and air quality, biodiversity, and ecosystem health; and are economically viable and socially responsible." The Agricultural Ecosystem Sciences program will be at the forefront of preparing students to meet this grand challenge.

(Optional) Include any additional information about the program's history, development, or structure that may be beneficial in understanding the curriculum and how student learning is assessed.

The AES program was launched in 2019 as an incubator program under the AICU umbrella. The program starts with the UK Core requirements designed to build skills such as critical thinking, writing, reasoning, ethics, and global understanding that are necessary for our students to compete in a global marketplace, participate in democratic self-governance, and live a well-intentioned and meaningful life. Further, UK Core and pre-major requirements include coursework designed to develop a firm foundation in the basic sciences (chemistry, math, biology) that is essential for constructing a thorough understanding of the interrelated processes occurring in the agricultural ecosystem. The graduate composition and communication requirement will be satisfied by taking WRD 204 Technical Writing.

Following the UK Core and pre-major requirements, students will take coursework that will introduce them to several of the fundamental building blocks of agricultural production operations (plants, soils, animals) where they will develop a broad level of understanding of the individual components of a diversified farm production systems. Students will then move on to classes aimed at explaining how the fundamental farming system components are interrelated, how they are integrated into the greater ecosystem, and how understanding this interdependence is essential to the responsible stewardship of the food, fiber, feed, and fuel production system. To hone their skills into specific areas of interest, students will be required to choose courses in a Technical Specialization (TS) area and an Applied Specialization (AS) area described in detail in the next section.

ASSESSMENT CYCLE

All programs that do not have specialized accreditation and are not located in a department/college with a specialized accreditation should follow a 4-year PSLO assessment cycle. Programs that have specialized accreditation(s) or are within a college that has a comprehensive accreditation can develop an alternate PSLO and periodic review cycle in consultation with OSPIE.

Which cycle will the program being using?

☒ 4-year cycle [What does this look like?]

☐ Other (accredited programs/departments only)

If the program has selected "other" for the assessment and periodic review cycle, please append a copy of the proposed cycle and a brief justification to this plan.

ASSESSMENT COORDINATION AND RESOURCES

Individual(s) coordinating program-level student learning outcomes assessment

First and Last Name	Title/Position	Email
Dr. David H. McNear Jr.	Professor	dave.mcnear@uky.edu

Other individuals providing oversight, coordination, or support for assessment

First and Last Name	Title/Position
Dr. Erin Haramoto	Associate Professor
Dr. Hanna Poffenbarger	Associate Professor

(Optional) Other utilized resources for assessment (e.g. software such as rubrics or portfolios, evaluator stipends, etc.)

Scoring rubrics were created to assess each student learning outcome.

PROGRAM-LEVEL STUDENT LEARNING OUTCOMES

Please list the program-level student learning outcomes (PSLOs). If applicable, indicate which, if any, outcomes are required by your specialized accreditor(s) [What is this?]. Bachelor's degree programs must also indicate which outcome(s) map to the university's GCCR (Graduation Composition & Communication Requirement). The GCCR is not a requirement for certificates, graduate, or professional programs.

Space for up to 10 PSLOs has been provided below, but this does not imply that 10 outcomes are required. Program faculty should decide the appropriate number based on the design of the curriculum. Most programs have 3-8 outcomes, depending on the length of the program. If more than 10 lines are needed, either insert more lines into the table or submit a request to OSPIE@uky.edu for a template with additional lines for PSLOs.

PSLO #	**Program-level Student Learning Outcome Statement** (How should these be written?)	**Required by Specialized Accreditor(s)?**	**Mapped to GCCR?** (Undg degrees only)
Example	*Graduates will be able to critically evaluate scientific literature related to drugs and disease to enhance clinical decision-making.*	☐	☐

PSLO #	Program-level Student Learning Outcome Statement (How should these be written?)	Required by Specialized Accreditor(s)?	Mapped to GCCR? (Undg degrees only)
1	Students will be able to *describe* the various components of the agricultural ecosystem and effectively *explain* how each of these components work together to influence agricultural productivity, environmental quality and human dimensions.	☐	☐
2	Students will be able to *synthesize* information from a variety of sources to draw conclusions and *formulate* recommendations that consider economic, social, and environmental aspects of agricultural ecosystem sciences.	☐	☐
3	Students will *demonstrate* proficiency in the use of fundamental natural, biological, mathematical principles to *solve* problems relevant to agricultural ecosystem sciences.	☐	☐
4	Students will be able to individually, or operating as part of a multidisciplinary team, explain to a broad audience in oral, written, and visual formats the importance of agriculture and agriculturally related issues from multiple viewpoints	☐	☒
5		☐	☐
6		☐	☐

Please provide a brief description of the process used to develop or revise current PSLOs and the extent to which program faculty were involved. If applicable, provide discussion of any attempts to align PSLOs with professional or accreditation standards, employer expectations and job skills, graduate program curricula, etc. If PSLOs are taken directly from an accreditor, discuss whether (and how) the PSLO statements were reviewed by the faculty to ensure they were comprehensive.

The NRES curriculum assessment sub-committee will meet twice per year to evaluate assessment materials and modify them when necessary. The NRES steering committee meets frequently (3-4 times) throughout the year during which time the assessment sub-committee will solicit input and provide updates on assessment progress.

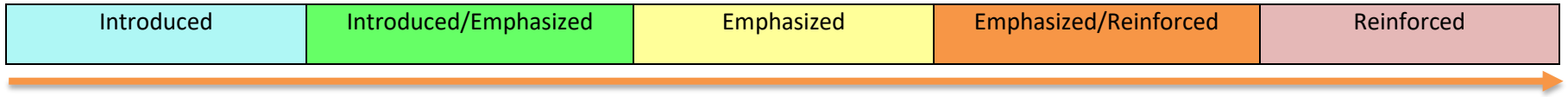
CURRICULUM MAP

Please create a map of the PSLOs to the curriculum. All required courses should be included in the left-hand column, and all PSLOs should span across the remaining columns. If desired, specific elective courses or elective "tracks" can be included (recommended). The purpose of the curriculum map is to show where each PSLO is emphasized within the curriculum. The level at which each PSLO is taught within a given course should be indicated as follows: introductory (I); reinforced (R); or mastery (M). Each PSLO should have at least an instance of I, R, and M across the curriculum, with the exception of certain graduate programs where introductory knowledge is provided at the undergraduate level. For assistance in developing a curriculum map, please visit the OSPIE website or contact the OSPIE team.

Learning Outcomes CURRICULUM Map **Agricultural Ecosystem Sciences (AES)** *(Version – Dec., 1 2023)*			**PSLO 1**	**PSLO 2**	**PSLO 3**	**PSLO 4**
UK Core	Freshman	AFE 100 Issues in Agriculture	----	I	I	I
Pre-major Requirements	Freshman	AES 101 Introduction to AES	* I/E	* E	----	I
	Freshman	MA 109 College Algebra **OR** MA 123 Elementary Calculus and Its Applications	----	----	I	----
	Freshman	CHE 105 General College Chemistry I **OR** CHE109/110	----	----	I	----
	Freshman	CHE 111 Laboratory to Accompany General Chemistry I	----	----	I	----
	Freshman	ECO 201 Principles in Economics I	----	I	* I	----
	Sophomore	WRD 204 Technical Writing	----		I	* I
	Sophomore	BIO 148 Principles of Biology I	I	----	I	----

		BIO 152 Principles of Biology II	I	- - - -	I	- - - -
		STA 296 Statistical Method and motivations **OR** STA 210	- - - -	- - - -	- - - -	- - - -
Program Core		PLS 210 Life Processes of Plants	I/E	I/E	E	- - - -
		AEC 302 Agricultural Management Principles	- - - -	I/E	* R	E
		PLS 366 Fundamentals of Soil Science	* E/R	* E/R	E	E
		AES 320 Agricultural Ecosystem Sciences Field Experience	* E/R	I	E	* E/R
	Junior	PS 386 Plant Production Systems	E	I	E/R	- - - -
		PLS 301 Microbes in Agronomy	E	I/E	R	- - - -
		ASC 382 Animal Production Principles	- - - -	I/E	R	- - - -
		PLS 390 Agroecology	R	* E/R	E	- - - -
		PLS 404 Integrated Weed Management	E	E	E	- - - -
		PPA 400 Principles of Plant Pathology	E	E	E	- - - -
		PLS 470G Soil Nutrient Management	E	* E/R	* R	- - - -
	Senior	ABT 360 Genetics	- - - -	- - - -	* E/R	R
		AES 490 Capstone in AES	* *R*	* * *R*	* *R*	* *R*
		AES 395 Independent Study Agricultural Ecosystem Sciences	*varies*	*varies*	*varies*	* E/R
		AES 399 Experiential Ed. In Agricultural Ecosystem Sciences	*varies*	*varies*	*varies*	* E/R

Key:



* Indicates a course from which an artifact will be collected for assessment as described in the table below.

ASSESSMENTS

Please complete the chart below by listing each assessment on a separate row, and including the requested information. Except for outcomes that focus on students' values or beliefs, at least 1 assessment should be direct. Ideally, all outcomes should have at least 2 assessments. If available, append a copy of the assessment measure/instrument (e.g. scoring rubric or sample questions) to this report. If a goal/target has already been set or can be set for a given measure/instrument, this should be included in the table. Otherwise, the program will need to determine and specify a target/goal when results are first reported for that instrument/measure. Note: space for only 15 instruments/measures have been provided. If space for additional assessment instruments/measures are needed, either insert additional rows into the table or contact OSPIE staff to receive a customized template with additional lines.

Assessment Instrument/ Measure Name	**PSLO(s) Mapped to**	**Assessment Type** (Direct or Indirect)	**Assessment Instrument/Measure Description** (What is this?)	**Assessment Instrument/Measure Rationale** (What is this?)	**Benchmark or Goal** (If Available) (What is this?)	**Course(s)** (If applicable)	**Rubric or Example Appended?**
Soil Microbiology Lab	1	Direct	Soil microbiology lab – involves an experiment on microbial respiration, interpretation of reaction stoichiometry and the calculation of CO_2-C evolution.		95% of students will earn a 3 or better on each criterion (on a 4-point scale)	PLS 366 Fundamentals of Soil Science	☒
What is an Ecosystem and What is Agriculture writing assignment	1	Direct	A writing assignment in which students explain their understanding of an ecosystem, what agriculture is and how they interact.	It does as the PSLO seeks to measure, demonstrates their ability to describe the components of the agricultural ecosystem	95% of students will earn a 3 or better on each criterion (on a 4-point scale)	**AES 101** Introduction to Agricultural Ecosystem Sciences	☒

Assessment Instrument/ Measure Name	**PSLO(s) Mapped to**	**Assessment Type** (Direct or Indirect)	**Assessment Instrument/Measure Description** (What is this?)	**Assessment Instrument/Measure Rationale** (What is this?)	**Benchmark or Goal** (If Available) (What is this?)	**Course(s)** (If applicable)	**Rubric or Example Appended?**
Pack a Day Video	1,4	Direct	A 3-5 minute video summarizing what was seen and what was learned on a day of the field experience.	The video requires that the students explain various components of the agricultural ecosystem.	95% of students will earn a 3 or better on each criterion (on a 4-point scale)	**AES 320** AES Field Experience	☒
Land Use Project	1,2	Direct	Student will select a 300-500 acre piece of land and make management and development decisions based on the using the soil science knowledge they gained over the semester	The land use project require that the students demonstrate their ability to draw conclusions and make recommendations based on an interdisciplinary understanding of natural and human systems principles and perspectives.	95% of students will earn a 3 or better on each criterion (on a 4-point scale)	**PLS 366** Fundamentals of Soil Science	☒
Article interpretation and presentation	2	Direct	Each student will lead a class discussion on a primary literature article and provide some study materials during a recitation period.	Students will draw conclusions considering economic, social, and environmental aspects of an agroecosystem issue	95% of students will earn a 3 or better on each criterion (on a 4-point scale)	**SAG/PLS/ENT 390** Agroecology	☒
Fertilizer Calculation Assignment	2,3	Direct	An assignment in which students take a soil test report and calculate a fertilizer recommendation using different fertilizer sources.	Students will demonstrate their proficiency and natural and mathematical principles (SLO 3)to draw conclusions and formulate recommendations (SO2)	95% of students will earn a 3 or better on each criterion (on a 4-point scale)	**PLS/NRE 470G**	☒

Assessment Instrument/ Measure Name	**PSLO(s) Mapped to**	**Assessment Type** (Direct or Indirect)	**Assessment Instrument/Measure Description** (What is this?)	**Assessment Instrument/Measure Rationale** (What is this?)	**Benchmark or Goal** (If Available) (What is this?)	**Course(s)** (If applicable)	**Rubric or Example Appended?**
Bulk Density & Soil Water lab report	3	Direct	A lab report in which students have to collected bulk density and infiltration measurements from field sites, perform calculations, make graphics, interpret data, and make recommendations		95% of students will earn a 3 or better on each criterion (on a 4-point scale)	**PLS 366** Fundamentals of Soil Science	☒
Career Project	4	Direct	Students will perform job market research and write a 3-5 page paper (minimum 4500 word minimum, double-spaced, 12 pt font, 1 inch margins)	Write and rewrite activity to make students proficient writers in their chosen field. WRD 204 is a GCCR approved course and maps to GCCR SLO 4.	95% of students will earn a 3 or better on each criterion (on a 4-point scale)	**WRD 204** Technical Writing	☒
Internship Video Summary and supervisor evaluation	4C	Direct/indirect	A recorded video summarizing the research or internship experience and a final evaluation from the direct supervisor.	Student use their journal prompts to make a video summarizing their research or internship experience		**AES 395/399** Research or Internship experience in AES	☒
Research paper and capstone presentation	4A,B	Direct	A research paper (minimum 4500 word minimum, double-spaced, 12 pt font, 1 inch margins) will be prepared based on the results of the research conducted/project undertaken. Data and results will be presented in tables and/or figures as appropriate.	Student works as part of a multidisciplinary team to develop a report on a local issue of interest and then effectively communicate their findings in a final written report, oral group presentation, and other visual formats to professionals and community stakeholders.	95% of students will earn a 3 or better on each criterion (on a 4-point scale)	**AES 490** Capstone in AES	☒

Assessment Instrument/ Measure Name	**PSLO(s) Mapped to**	**Assessment Type** (Direct or Indirect)	**Assessment Instrument/Measure Description** (What is this?)	**Assessment Instrument/Measure Rationale** (What is this?)	**Benchmark or Goal** (If Available) (What is this?)	**Course(s)** (If applicable)	**Rubric or Example Appended?**
AES 490 Capstone presentation	4A,C	indirect	Feedback from audience members/stakeholders at the NRE490 capstone project presentation.	The questionnaire from audience members and stakeholders will provide an assessment of how effective the student were at communicating their findings	95% of students will earn a 3 or better on each criterion (on a 4-point scale)	**AES490** Capstone in AES	☒

ASSESSMENT REPORTING CYCLE

Please complete the chart below by providing the requested information for each learning outcome. Note: space for up to 10 PSLOs has been provided. If space for additional PSLOs are needed, either insert additional rows into the table or contact the OSPIE staff to receive a customized template.

PSLO #	Semester/ Year(s) Data Collected	Year(s) Results Submitted to OSPIE (see Results Report Definition)	Year(s) Reflection Report Submitted to OSPIE (see Reflection Report Definition)	Year(s) Action Report Submitted to OSPIE (see Action Report Definition)
Example	*Fall / 2020*	*Summer 2021*	*Summer 2023*	*Summer 2024*
1	Fall/2021	Summer 2022	Summer 2024	Summer 2025
2	Fall/2021	Summer 2022	Summer 2024	Summer 2025
3	Fall/2022	Summer 2023	Summer 2024	Summer 2025
4	Fall/2022	Summer 2023	Summer 2024	Summer 2025

FEEDBACK AND SUPPORT ON PSLO ASSESSMENT PLAN

Each program has the option of receiving formative feedback on its new or revised PSLO assessment plan from OSPIE staff members. OSPIE staff can provide suggestions for improvement to learning outcome statements, overall assessment plan design, curriculum mapping, standard setting, individual assessment tools, etc. If your program would like to receive feedback on its assessment plan, please indicate below:

☒ Yes, we would like to receive feedback.

☐ No thank you, not at this time.

If there are questions the program director or faculty did not have the opportunity to ask prior to submission of the PSLO assessment plan, and you would like to schedule a brief consultation with OSPIE staff, please indicate below:

☐ Yes, we would like to schedule an individual or group consultation.

☐ No thank you, not at this time.

10. Appendices

LO1 *Rubric (Components of an Agricultural Ecosystem)*

#1— *Describe* components/*explain* how they work together to influence productivity, quality, and human dimensions

SLO Aspect	Master (5)	Apprentice (3)	Novice (3)	Recruit (1)
Describes components of an agricultural ecosystem	Illustrates masterful understanding of the components of an agricultural ecosystem	Illustrates good understanding of the components of an agricultural ecosystem	Fair understanding of the components of an agricultural ecosystem. Some components missing	Little evidence of a grasp of the components of an agricultural ecosystem
Explains how the components work together	Thoroughly explains how each of the critical agricultural ecosystem components works together	Demonstrates an acceptable level of how the critical agricultural ecosystem components work together. Some misalignment of component present.	Explains how only two or three of the components work together.	No explanation of how the components of an agricultural ecosystem work together.
Evaluates how the components working together influence agricultural productivity, ecosystem quality, and human dimensions	Influence of the components of an agricultural ecosystem on all aspect of are thoroughly evaluated	Influence of the components of an agricultural ecosystem on several aspect of are evaluated	Influence of the components of an agricultural ecosystem on aspect of are weakly evaluated	No explanation of the Influence of the components of an agricultural ecosystem are provided

LO2 Rubric (*Drawing Conclusions/Marking Recommendations*)

#2— Synthesize information, draw conclusions, and formulate recommendations

SLO Aspect	Master (5)	Apprentice (3)	Novice (3)	Recruit (1)
Identifies a focused Agricultural Ecosystem issue	Aspects of a focused agricultural ecosystem issue are well-articulated and appropriately weighted	Aspects of a focused agricultural ecosystem issue are partially explained and somewhat weighted	Aspects of a focused agricultural ecosystem issue are poorly explained and unfiltered as to their relative importance	Agricultural ecosystem issue named; however, no perceptible explanation or weighting of its aspects.
Evaluates potential solutions	Credibly presents a range of possible solutions to the agricultural ecosystem issue; convincingly displays a rich grasp of the complexities involved	Moderately presents a range of possible solutions to the agricultural ecosystem issue; displays some of the complexities involved	Presents only one or two possible solutions to the agricultural ecosystem issue; trivial explanation of the complexities involved	No solutions identified; no explanation of the complexities involved.
Provides and supports clear recommendations and/or conclusions for Agricultural Ecosystem issue	Recommendations clearly related to and effectively drawn from project definition and evaluation	Recommendations somewhat related to and partially drawn from project definition and evaluation	Recommendations unrelated to project definition and evaluation	No recommendations included.

***LO3** Rubric (Using fundamental natural, biological, mathematical principles to solve problems)*

#3 Using fundamental natural, biological, mathematical principles to solve problems

SLO Aspect	Master (5)	Apprentice (3)	Novice (3)	Recruit (1)
Demonstrated proficiency in fundamental natural, biological, mathematical principles used in agricultural ecosystem sciences	Illustrates masterful understanding of the fundamental natural, biological, and mathematical principles of agricultural ecosystems	Demonstrates a good understanding of the fundamental natural, biological, and mathematical principles of agricultural ecosystems	A mediocre understanding of the fundamental natural, biological, and mathematical principles of agricultural ecosystems	Little understanding of the fundamental natural, biological, and mathematical principles of agricultural ecosystems
Provides a an accurate solution to an Agricultural Ecosystem problem	Excellent use of fundamental principles to solve problems relevant to agricultural ecosystems	Good use of fundamental principles to solve problems relevant to agricultural ecosystems	Little use of the fundamental principles and an inaccurate solution to a problem relevant to agricultural ecosystems	Misuse of fundamental principles and incorrect solution to an agricultural ecosystems problem

***LO4** Rubric (Functioning as part of a multidisciplinary team, written and oral communication)*

#4A—Function in Multi-disciplinary Teams

SLO Aspect	Master (5)	Apprentice (3)	Novice (3)	Recruit (1)
Active processes to engage all team members are well-documented	Provides evidence of active steps to engage all team members in appropriate ways	Some evidence of active steps to engage all team members in appropriate ways	Modest evidence of active steps to engage all team members in appropriate ways	No evidence of active steps to engage all team members in appropriate ways
All team members fully engaged in full project process	No single student dominates the project's development or delivery; all students are actively engaged in their roles as part of the team	Obvious that a single student dominates the project's development or delivery; most students play their roles as part of the team	A single student dominates the project's development or delivery; other students play trivial roles	No evidence of team organization in project
Final product represents more substance, quality than would be expected of a product by the best single student	Project appears to be more than the "sum of its parts"; project is well-synthesized and well-calibrated for high impact	Project appears to be partitioned into components—work and presentation of each component is essentially independent—little obvious connection between aspects	Project appears to be incomplete, lacking coherence	Project may be identified; however little detectable synthesis and/or engagement

#4B—Communicate Agricultural Ecosystem Science Issues in Written Form

SLO Aspect	Master (5)	Apprentice (3)	Novice (3)	Recruit (1)
Title/abstract/summary/introduction provide clear entry to an important agricultural ecosystem-related issue	Agricultural ecosystem issue is well-described and placed in an authentic and relevant context; approach to issue is enticing and memorable	Agricultural ecosystem issue is somewhat well-described and reasonably well contextualized; approach to issue is routine, ordinary	Agricultural ecosystem issue is poorly described and not well-contextualized; approach to issue is distracting and/or opaque	Agricultural ecosystem issue is mentioned, but not described. Context not provided; approach to issue essentially absent
Writing reflects analysis, synthesis, assessment and/or interpretation of ideas and evidence	Writing flows from concept to concept, from idea to idea in a clear and understandable manner	Writing bounces around conceptually; ideas are somewhat understandable	Writing disorganized, jerky, unclear, hard to follow	Writing may present some “facts”, but bears no evidence of organization and/or interpretation
Organization and development lead naturally to recommendations and/or conclusions	Recommendations and/or conclusions follow naturally from, are clearly supported by the main text of the document	Recommendations and/or conclusions partially cohere with the main text of the document	Recommendations and/or conclusions stray significantly from the main text of the document	No obvious recommendations and/or conclusions

AES Program Assessment Rubrics, Dec 2023

#4C—Communicate Agricultural Ecosystem Issues in Visual/Oral Format

SLO Aspect	Master (5)	Apprentice (3)	Novice (3)	Recruit (1)
Project's goals and activities are made clear and relevant to agricultural ecosystem issues	Primary goals and core activities are not only presented but are also well-integrated	Primary goals and core activities are partially explained and integrated	Primary goals and core activities are poorly explained and integrated	No goals or core activities are mentioned
Visual materials and/or oral aspect enhance the communication of the project	Materials and/or presentation effectively communicate the essence of the project above and beyond a textual approach	Materials and/or presentation are somewhat helpful to communicate the essence of the project	Materials and/or presentation fail to communicate the essence of the project	Materials and/or presentation completely disconnected from the project
Project's approach and affect are thoroughly professional	Compelling professional approach that manages to appeal to a diverse audience	Somewhat professional approach; may not appeal to full range of a diverse audience	Incomplete, inaccurate, and/or unprofessional approach	Entirely unprepared for private or public presentation

IPSS Graduate Student Experience Survey 2022 – questions

These initial questions are included so we can assess the sample of students who complete the survey. Your answers in this section will be separated from your responses to the rest of the survey questions and will not be used for identification purposes.

- Please select your preferred gender identity:
- Please select your citizenship status:
- What is your home department?
- What degree are you currently pursuing?
- Will this be the final degree that you pursue?
- What was the main motivation in pursuing your current degree?
- What is the highest degree that you have earned to date?
- What was the general field for your bachelor's degree?
- What was the general field for any advanced degree you hold (Masters or PhD)?
- Type of degree granting institutions(s) (choose all that apply for bachelor's and advanced degrees):
  What was your age when you began the IPSS graduate program?
- What was your primary activity immediately prior to entering this program?
- What is your current status in your graduate program?
- What is your best estimate of how many years TOTAL (including any time off, such as a leave of absence) it will take to obtain your degree?
- Which of the following best describes your expectation for professional employment after you complete your degree?
- How would you categorize the type of employer you expect to work for immediately after you complete your graduate degree?
- When do you expect to graduate?

The following question block assesses how students choose the IPSS program:

- How did you hear about the IPSS program at University of Kentucky? (select all that apply)
- What resources did you use to learn more about the IPSS program at UK? (select all that apply)
- What feature of the IPSS program most appealed to you? (select all that apply)
- Did you visit campus prior to enrolling in the program?
- How important was a faculty member's digital presence (i.e. updated CV, bio page, or research page) in selecting a graduate program and potential advisors/committee members?
- Was the IPSS program at University of Kentucky your first choice in graduate programs?
- Why did you attend UK?

The following question block assesses orientation

- Did you attend an orientation specific to IPSS?
- If "yes" what was the year?

- Rate the following in terms of applicability to you (disagree, neutral, or agree)
    - The date and time of orientation was accessible to me
    - The information shared at orientation was relevant and timely to me
    - The reference materials provided helped me to navigate the program
    - I felt more confident about the path to degree completion after attending orientation
- What information would have been helpful to receive at orientation?
- My advisor encouraged me to attend orientation

The following question block assesses advising:

- I am aware that the latest IPSS handbook is available online. (Note: a checklist developed by the IPSS GSA will be available too!)
- The student handbook is clear, accurate, and up-to-date on processes and procedures.
- Are faculty well-informed about degree requirements?
- It is easy to find answers to questions I have about the University's processes for degree completion
- When you have a question about the IPSS program, from whom do you seek advice? (select all that apply)
- Who do you approach if you have a problem with your advisor? (select all that apply) Who do you aproach if you have a problem with others involved in your graduate career (ex. your committee, other faculty; select all that apply)

The following question block assesses coursework and scheduling: (NB: some edits have been made to shorten this document)

- Please rate your level of agreement on the following statements. (strongly agree, somewhat agree, neutral, somewhat disagree, strongly disagree)
    - I am satisfied with the number of courses available in the IPSS program
    - I am satisfied with the frequency of course offerings in the IPSS program
    - I am satisfied with the balance of course offerings between fall and spring semesters
    - I am satisfied with the variety of course offerings in the IPSS program
    - I have no difficulty scheduling 9 credit hours of relevant courses that contribute towards degree completion each semester
    - myUK accurately represents the courses recently offered in the IPSS program
    - The IPSS program integrates current developments in my field into coursework
- What courses would you like to see offered in the IPSS program?
- Have you had input into the design of your individual program of study?
- Have you taken any of the following courses: IPS 610, IPS 625, or PLS 772?
- If you took IPS 610 (Transdisciplinary communication in IPSS), IPS 625 (Transdisciplinary research in IPSS), or PLS 772 (Seminar in IPSS), who was the instructor ?

- Please rate your opinion of these courses (agree, somewhat agree, neutral, somewhat disagree, disagree):
    - IPS 610 was a useful course
    - IPS 625 was a useful course
    - PLS 772 was a useful course
- What were the most and least helpful aspect of IPS 610? Of IPS 625? Of PLS 772?
- Rate the extent to which these factors are an obstacle to your academic progress. (not an obstacle, a minor obstacle, a major obstacle)
    - Finances
    - Work commitments (for part-time students or those not on assistantships)
    - Family obligations
    - Availability of faculty
    - Program structure or requirements
    - Dissertation topic/research
    - Course scheduling
    - Immigration laws or regulations
    - Other

The following question block assesses the IPSS GSA

- I am aware that the IPSS program has a Graduate Student Association (IPSS GSA).
- Are you an active member of IPSS GSA?
- I am aware of the following resources provided by the IPSS GSA (yes/no):
    - Graduation regalia rental
    - Household lending library
- Please rate your agreement with the following statements. (strongly disagree, somewhat disagree, neutral, somewhat agree, strongly agree)
    - IPSS GSA offers professional development events that are relevant to me
    - There are enough professional development events offered annually
- What activities would you like to see provided by IPSS GSA in the future? (Select all that apply.)
    - Professional development visits with industry/potential employers
    - Social events
    - Service/volunteer projects
    - Professional development workshops (i.e. resume/CV building, mock interviews, public speaking, etc.)
    - "soft skills" workshops (i.e. teamwork, time management, stress management
    - Fundraising
    - Other _____
- Prioritize the following according to their perceived importance to your graduate program experience (Top = most important, Bottom = least important)
    - 3MT
    - IPSS GSA-sponsored professional development
    - Travel and research
    - Early career and alum seminar speaker

    - Fellow graduate student mentoring
    - Welcome BBQ
    - End of the academic year awards presentation and graduation celebration
    - Other
    -
- Are you currently mentoring any graduate students through the IPSS GSA's peer mentoring initiative?

How many students are you mentoring?

Do you have any suggestions to improve this process?

The following question block assesses travel opportunities.

- Have you participated in professional traveled since enrolling in IPSS?
- How many times have you traveled during your time in IPSS?
- My travel was to: (select all that apply)
    - Present at a conference or meeting
    - Attend a conference or meeting
    - Conduct research
- How was your travel funded? (Select all that apply.)
    - Grant money through my faculty advisor
    - Departmental grant/award
    - Travel grant through the IPSS program
    - Graduate Student Congress funding
    - IPSS GSA
    - Self-funded
    - I don't know

The following question block assesses the symposium

- I understand that I am required to participate annually in the IPSS Symposium (or another campus presentation that is open to the public)
- Overall, the symposium is a valuable experience (agree, somewhat agree, disagree)
- What is/are the most valuable aspects of the experience?
- Why is this not a valuable experience?
- What could make this more worthwhile?
- Please rate your level of agreement on the following statements. (strongly disagree, somewhat disagree, neutral, somewhat agree, strongly agree)
    - The day of the symposium is well organized
    - When I present, the feedback provided by judges is valuable

The following question block assesses communications

- Do you regularly read emails sent by the DGS, program, and/or department?
- What information would you like to be included that is currently not included in messages from the DGS?

- What information would you like to be included that is currently not included in messages from the department?

The following question block assesses mentoring

- Are you currently mentoring any undergraduate students?
- Please rate the following statements based on your experience. (true, neutral, false)
    - I find mentoring to be a beneficial activity for my professional development.
    - If given the opportunity, I would mentor an undergraduate student again (or for the first time)
    - Mentoring is a skill I find important to highlight on my resume/CV
    - I would benefit from specific training on mentoring skills

The following question block assesses overall satisfaction

- Please select a response according to your experience.
- Knowing what you do now, would you choose to pursue graduate studies again? (yes/no)
    - At this university
    - At another university
    - In this field
    - In any field
- I would recommend the IPSS program at the University of Kentucky to others. (agree, somewhat agree, neutral, somewhat disagree, disagree)
- If you could change one thing about your experience to make it more successful or fulfilling, what would it be?
- Rate the quality of your overall experience (poor, less than satisfactory, satisfactory, excellent)
    - Academic experience
    - Student life experience

Graduate Classes Taught by PSS Faculty			
Course Number	**Course Title**	**Instructor(s)**	**Hours**
IPS 610	TRANS-DISCIPLINARY COMMUNICATION IN IPSS	Brzozowski/Unrine	1
IPS 625	TRANS-DISCIPLINARY RESEARCH IN IPSS	Van Sanford/Downie	2
IPS 790	SUPERVISED RESEARCH AND STUDY IN IPSS	Wendroth	Variable (1-9)
PLS/NRE 468G	SOIL USE AND MANAGEMENT	Wendroth	3
PLS 470G/NRE 470G	SOIL NUTRIENT MANAGEMENT	Poffenbarger	3
PLS 502	ECOLOGY OF ECONOMIC PLANTS	Salmeron Cortasa	3
PLS 504	INTEGRATED WEED MANAGEMENT	Haramoto	4
PLS 510	FORAGE MANAGEMENT AND UTILIZATION	Henning	3
PLS 512	GRAINS AND OILSEEDS PRODUCTION	C Lee	3
PLS 514	GRASS TAXONOMY AND ID	Phillips	3
PLS 515	TURF MANAGEMENT	Munshaw – class has not made since 2014	3
PLS 531	FIELD SCHOOLS IN CROP PEST MANAGEMENT	Haramoto	2
PLS 533	HEMP PRODUCTION SYSTEMS	(Has not been offered – presume it would be Pearce)	3
PLS/TOX/CE 560	ECOTOXICOLOGY	Unrine	4
PLS 566	SOIL MICROBIOLOGY	Osburn	3
PLS 567	METHODS IN SOIL MICROBIOLOGY	Coyne	1
PLS 573	SOIL MORPHOLOGY & CLASSIFICATION	Shepard	3
PLS 575/576	SOIL PHYSICS/LAB	Wendroth	3/1
PLS 581	CHEMICAL ANALYSIS OF SOILS AND PLANTS	Unrine	4
PLS 597/ENT595	SP TOPS PSSC: ADVANCED AGROECOLOGY	Haramoto/Gonthier	3
PLS 597	SP TOPICS: POPULATION GENETICS LAB	Vasylivna Tsyusko	2
PLS 599	SP PROBLEMS IN PLANT & SOIL SCI	Henning/Haramoto/McNear	Variable (1-4)
PLS/BCH/BIO/PPA/MI 601	SPECIAL TOPICS IN MOLECULAR & CELLULAR GENETICS	Vasylivna Tsyusko/Smith	1
PLS 602	PRINCIPLES OF YIELD PHYSIOLOGY	Salmeron Cortasa	3
PLS 609	PLANT BIOCHEMISTRY	Hildebrand	3
PLS 615	ADVANCED PLANT GENETICS AND GENOMICS	Zhu	3
PLS 620	PLANT MOLECULAR BIOLOGY	Hunt	3
PLS/BIO/FOR 622	PHYSIOLOGY OF PLANTS I	Perry/Geneve/Downie	3
PLS/BIO/FOR 623	PHYSIOLOGY OF PLANTS II	Smalle	3

PLS 630	AGRI-ENVIRONMENTAL EXPERIMENTAL DESIGN AND ANALYSIS	Shepard	4
PLS 655	SPATIAL AND TEMPORAL STATISTICS	Wendroth	3
PLS 657	SEED BIOLOGY	Downie/Kawashima	3
PLS 660	ADVANCED SOIL BIOLOGY	(last offered 2018 – Coyne)	2
PLS 664	PLANT BREEDING I	Van Sanford	3
PLS 671	SOIL CHEMISTRY	Matocha	4
PLS 675	ECOSYSTEM NUTRIENT CYCLES	Poffenbarger	3
PLS 676	QUANTITATIVE INHERITANCE IN PLANT POPULATIONS	Van Sanford	3
PLS 697	SPECIAL TOPICS PLS:COVER CROPS AGROSYSTEMS	Haramoto	3
PLS 697	SPECIAL TOPICS: ECOSYSTEM ECOLOGY AND MODELING	Ren	3
PLS 712	ADVANCED SOIL FERTILITY	Grove	4
PLS 741	CLAY MINERALOGY	Matocha	3
PLS 772*	PLANT AND SOIL SCIENCE SEMINAR	Brzozowski	1
STO 650	CAPSTONE: SCIENCE TRANSLATION & OUTREACH	Henning	3

*IPS 610 and PLS 772 to be combined: IPS 610 will become a 2CR and PLS 772 will be removed.

Undergraduate Courses Taught by PSS Faculty			
Course Number	**Course Title**	**Instructor(s)**	**Hours**
ABT 201	SCIENTIFIC METHOD IN BIOTECHNOLOGY	Hunt	1
ABT 301	WRITING & PRESENTATION IN THE LIFE SCIENCES	Vasylivna Tsyusko	2
ABT 360	GENETICS	Brzozowski	3
ABT 395	INDEPENDENT STUDY IN BIOTECHNOLOGY	Vasylivna Tsyusko	3
ABT 396	RESEARCH EXPERIENCE IN BIOTECHNOLOGY	Kawashima	Variable (1-4)
ABT 495	EXPERIMENTAL METHODS IN BIOTECHNOLOGY	Moe	4
AES 101	INTRODUCTION TO AGRICULTURAL ECOSYSTEM SCIENCES	McNear	1
AES 320	AGRICULTURAL ECOSYSTEM SCIENCES FIELD EXPERIENCE	McNear	2
AES 490	SENIOR CAPSTONE IN AES	McNear/Henning	3
NRE 471	SENIOR PROBLEMS IN NATURAL RESOURCES ENVIRONMENTAL SCIENCES	Matocha	

PLS 103	PLANTS, SOILS, & PEOPLE: GLOBAL PERSPECTIVE	Smalle/Zhu	3
PLS 104	PLANTS, SOILS, & PEOPLE: SCIENCE PERSPECTIVE	D'Angelo/Phillips	3
PLS 210	THE LIFE PROCESSES OF PLANTS	Smalle/Baskin	3
PLS 220	INTRODUCTION TO PLANT IDENTIFICATION	Phillips	3
PLS/AES 301	FRONTIERS IN AGRICULTURAL ECOSYSTEM SCIENCES: MICROBIOMES	Coyne/Osburn (future)	3
PLS 302	CLIMATE CHANGE AND AGRICULTURE	Van Sanford/ Mizuta (future)	3
PLS 366	FUNDAMENTALS OF SOIL SCIENCE	McNear/Matocha	4
PLS/SAG 386	PLANT PRODUCTION SYSTEMS	Van Sanford/Phillips	4
PLS 389	WINE APPRECIATION	Barrett	3
PLS/SAG 390	AGROECOLOGY	Haramoto/Gonthier	3
PLS/AES 395	IND RESEARCH IN PLS & AES	McNear	Variable (1-4)
PLS 396	SOIL JUDGING	Shepard	Variable (1-2)
PLS/AES 399	EXP LEARNING IN PSS OR AES	McNear	Variable (1-4)
PLS 406	ADVANCED SOIL JUDGING	Shepard	1
PLS 408	TOBACCO	Pearce	3
PLS/AES/SAG 416G	COVER CROPS IN AGROECOSYSTEMS	Haramoto	3
PLS/NRE 468G	SOIL USE AND MANAGEMENT	Wendroth	3
PLS/NRE 470G	SOIL NUTRIENT MANAGEMENT	Poffenbarger	3
PLS 502	ECOLOGY OF ECONOMIC PLANTS	Salmeron Cortasa	3
PLS 504	INTEGRATED WEED MANAGEMENT	Haramoto	4
PLS 510	FORAGE MANAGEMENT AND UTILIZATION	Henning	3
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PLS/TOX/CE 560	ECOTOXICOLOGY	Unrine	4
PLS 566	SOIL MICROBIOLOGY	Osburn	3
PLS 567	METHODS IN SOIL MICROBIOLOGY	Coyne	1
PLS 573	SOIL MORPHOLOGY & CLASSIFICATION	Shepard	3
PLS 575/576	SOIL PHYSICS/LAB	Wendroth	3/1

PLS 581	CHEMICAL ANALYSIS OF SOILS AND PLANTS	Unrine	4
PLS 597/ENT 595	SP TOPS PSSC: ADVANCED AGROECOLOGY	Haramoto/Gonthier	3
PLS 597	SP TOPICS: POPULATION GENETICS LAB	Vasylivna Tsyusko	2
PLS 599	SP PROBLEMS IN PLANT & SOIL SCI	Henning/Haramoto/McNear	Variable (1-4)

January 2024

PSS Faculty On-Boarding Sessions:

	Topics Covered	Lead
Session 1	• Overview of front/business office staff and roles • Internal website - http://pss.ca.uky.edu/internal • Teaching, Grad School & status, Canvas, etc.	Rebecca
Session 2	• Hiring, supervising staff, postdocs, undergrads • Hiring grad students, IPSS policies • International folks & visas	Rebecca Sarah
Session 3	• Account basics (including Hatch/Multistate funds) & start-up spending • Intro to travel, purchasing, and reimbursement policies	Ellen Rebecca
Session 4	• Research office, RCR training, etc. • Grants, pre- and post-award • Tableau, Hatch proposal, Wethington Awards	Rebecca Ellen
Session 5	• Farm and greenhouse processes • Lab safety & emergency procedures • Building, campus safety	Rebecca
Session 6	• Promotion and tenure policies, procedures, and expectations • Statement of evidence • Annual performance reviews, DOE • Mentoring Committee	Rebecca

Initial Meeting:

- Parking
- Keys
- College on-boarding checklist
- Relocation expenses

RULES OF PROCEDURE OF THE FACULTY
DEPARTMENT OF PLANT AND SOIL SCIENCES
COLLEGE OF AGRICULTURE, FOOD AND ENVIRONMENT
UNIVERSITY OF KENTUCKY

These rules have been created and approved by the faculty of the Department of Plant and Soil Sciences of the College of Agriculture, Food and Environment pursuant to the authority granted by the Administrative and Governing Regulations of the University of Kentucky. These rules do not become effective until and unless approved as indicated by the signatures below and posted on the University Senate website. A modification to these rules must also be approved before the modifications take effect. A current copy of the approved rules for the Department of Plant and Soil Sciences is available in the Office of the Chair of the Department of Plant and Soil Sciences, the Office of the Dean of the College of Agriculture, Food and Environment, and is posted on the University Senate website.

February 26, 2019

_____

Date approved by the departmental faculty

_____ _____

Dr. Rebecca L. McCulley, Chair
Department of Plant and Soil Sciences

February 27, 2019

Date

_____ _____

Nancy M. Cox, Dean
College of Agriculture, Food and Environment

February 28, 2019

Date

RULES OF PROCEDURE OF THE FACULTY
DEPARTMENT OF PLANT AND SOIL SCIENCES
COLLEGE OF AGRICULTURE, FOOD AND ENVIRONMENT
UNIVERSITY OF KENTUCKY

I. PREFACE

These Rules of Procedure are intended to be consistent with the Rules of Procedure of the College of Agriculture, Food and Environment, the Governing and Administrative Regulations of the University of Kentucky, the laws of the Commonwealth of Kentucky, and the laws of the United States of America. In the event that these rules of procedure are inconsistent with or contrary to the above-mentioned regulations and laws, then those regulations and laws control.

II. DEFINITION OF DEPARTMENTAL FACULTY [GR VII E:5(a)]

1. The faculty of the Department of Plant and Soil Sciences is composed of:
   a. Regular Title series,
   b. Extension Title series,
   c. Research Title series,
   d. Special Title series,
   e. Lecturer Title series,
   f. Adjunct faculty,
   g. Faculty with a joint appointment in another department or college
   h. Part-time faculty, and
   i. Emeritus faculty.

2. The administrative leadership of the department is vested in the chair. The department chair is a member of the faculty and serves as chair of the faculty in the development of policies on such matters as academic requirements, courses of study, class schedules, undergraduate and graduate education, research, extension and service programs. The chair presides over all departmental meetings, except as he/she may delegate this function, and is an *ex officio* member of all departmental committees. He/she has administrative responsibility for implementing the department's program within the limits established by the Governing Regulations of the University, Policies of the University Senate, and the rules of the College of Agriculture, Food and Environment.

   The department chair is responsible for recommendations to the Dean of the College of Agriculture, Food and Environment on the appointment of new members of the department, promotions, reappointments, terminal appointments, decisions not to reappoint, post-retirement appointments and the granting of tenure, with appropriate faculty input according to procedures and criteria established by the university and college.

   The department chair is responsible for coordinating the periodic evaluation of department members by procedures and criteria established by the university and the College of Agriculture, Food and Environment.

3. Regular Title, Extension Title, Research Title, Special Title, and Lecturer Title series faculty have full voting privileges within the department. All other faculty are welcome to participate in faculty matters, but do not have a vote. There are no *ex-officio* members of the faculty.

III. FACULTY MEETINGS

Departmental faculty meetings shall be held biannually, but may be more frequent upon call of the chair. The chair or his/her designee will preside over all faculty meetings. A quorum for a meeting shall consist of one more than one-third of the members of the faculty. All meetings will follow the established university policy on open meetings. The faculty meeting schedule will be circulated to the department via email or listserv. Notice of meetings will be announced to the department and publicly posted at least two weeks in advance. Electronic announcements and postings meet this requirement.

Items for the agenda may be submitted to the chair in advance by faculty members. Proxy voting on agenda items previously circulated will be allowed provided it is granted in writing to another member of the faculty. Teleconference voting by faculty stationed at Princeton and Quicksand will be permitted.

Newly-introduced issues discussed at any meeting may not be voted upon on the same date. A vote taken to approve a major new policy and/or policy change shall occur only at the next upcoming faculty meeting subsequent to its initial introduction. The mechanism for voting is at the discretion of the department chair.

Any voting member may request the chair to call a special meeting by submitting the request in writing and briefly describing the issue(s) which the member wishes to be placed on the agenda. The chair may call the meeting within a one-month period.

Minutes will be taken at all faculty meetings and circulated to all members of the faculty prior to the next regularly scheduled meeting. Minutes will be posted on the department web site.

IV. ORGANIZATIONAL AND COMMITTEE STRUCTURE AND RESPONSIBILITIES

Coordinators appointed by the chair from the faculty or staff will provide service to the department.

Coordinator of Instruction - A coordinator of instruction will be appointed by the department chair. This faculty member will assume responsibility for record-keeping and reporting requirements related to instruction; with the Chair, will provide leadership in curriculum planning, development and revision; will oversee program assessment; will coordinate undergraduate advising; and will advise the chair on other matters related to departmental and multidisciplinary programs instruction.

Coordinator of Extension Programs - The extension coordinator will be appointed by the department chair. This faculty member will assume responsibility for record-keeping and reporting requirements related to Plant and Soil Sciences extension; will coordinate review of extension publications; with the chair, will provide leadership for development, planning and evaluation of extension activities; and will advise the chair on other matters related to Plant and Soil Sciences extension programs.

Facilities Coordinators - Members of the professional staff or faculty will be appointed by the chair to provide oversight of facilities management (e.g. Spindletop Farm Coordinator, Campus Facilities Coordinator, Equipment Coordinator, and Safety Coordinator). The facilities coordinators will be responsible for reports and records related to department facilities; with the chair will plan and coordinate required maintenance and improvement of department equipment, farm and greenhouse facilities; and will advise the chair on other matters related to facilities and equipment.

COMMITTEES

Advisory Committee - The advisory committee shall include the Director of Graduate Studies, the Extension and Instruction Coordinators, and the members of the Promotion and Evaluation committee. If the Director of Graduate Studies for the Integrated Plant and Soil Sciences graduate program is not a member of the faculty of the department, the chair may invite the DGS to participate in the advisory committee meeting regarding topics relevant to the graduate program. The chair may appoint additional faculty, staff or students to serve on a temporary or *ad hoc* basis. This committee will advise the chair on policy, procedure, preparation of budget requests and other matters.

Promotion and Evaluation Committee - Duties will be to assist and advise the chair on evaluation of faculty and professional staff, faculty promotion and tenure, and award nominations. The department chair will also chair this committee. This committee will include at least one representative from extension.

Undergraduate Programs Committee - Responsibilities include review and evaluation of undergraduate curricula, advising, student activities and other areas related to undergraduate education. The Undergraduate Program Committee will be chaired by the Coordinator of Instruction. Department faculty members serving on the steering committees of the college's interdisciplinary undergraduate programs will be appointed to this committee.

Facilities and Safety Committees - These committees will advise the chair on measures required for safe and efficient use of facilities; will allocate plot land; will provide routine oversight and supervision of specific facilities; and will develop plans for improvement of facilities. Faculty, professional and technical staff will be included on these committees.

Commodity Resource Groups - These groups will be responsible for identifying applied research and extension needs and opportunities related to specific commodities or resources. They will discuss opportunities for departmental coordination in these areas. They will review related extension and technical publications and recommend assignments for new or revised publications. They will be responsible for formulation of production recommendations, oversight of

variety and germplasm release, and other policy decisions assigned by the department chair.

Other Committees - Additional annually appointed and special committees may be established either by the department chair or by vote of the faculty.

V. APPOINTMENT TO DEPARTMENTAL COMMITTEES

The department chair shall appoint members to departmental committees. Appointments to departmental committees will be announced prior to September 15. Faculty may submit nominations to the chair or volunteer for committee appointments at any time. The department chair may appoint replacements for individuals who leave the unit during their term; such appointees will serve the remainder of the term of the individual vacating the position. Faculty, staff and students are eligible for reappointment to committees.

Terms of appointment will be one year (renewable), except for Coordinators and the Director of Graduate Studies which will be three years (renewable), and for the Promotion and Evaluation Committee the term will be two years with no more than four years of continuous service.

VI. APPOINTMENT, REAPPOINTMENT, PROMOTION, AND TENURE

[University of Kentucky Administrative Regulations 2:1-11 and 3:11]
[University of Kentucky Governing Regulations VIII and X]

Appointments, reappointments, terminal appointments, decisions not to reappoint, post-retirement appointments, granting of tenure, and promotion of the faculty are handled in accordance with the provisions set forth in the Governing and/or Administrative Regulations of the University and in accordance with the policies and procedures of the College of Agriculture, Food and Environment.

The department has adopted a “Statement on Evidences of Activity in Instruction, Research and Extension that are Appropriate for Use in Evaluation of Faculty Candidates for Promotion and Tenure” for the purpose of guiding faculty in their achievement of promotion and tenure.

For the two- and four-year reviews, the faculty member being reviewed will present an overview of his/her program to departmental faculty. The chair will then solicit senior faculty input regarding the junior faculty member’s performance. All specific input from senior faculty will remain confidential. The chair will perform and sign the evaluation after considering all input from the senior faculty of the department.

The Department of Plant and Soil Sciences prescribes to the university’s matrix of Minimum Consultation and Written Judgments that is a part of AR 2:1-1, Appendix 1. Written recommendations will be accepted, but not required, from emeritus faculty working on a post-retirement appointment. The faculty delegates to the chair the right to make recommendations on temporary appointments and

appointments at the Assistant Professor level or below, following consultation by the chair with the Advisory Committee or any appropriate search and screening committees, as stated in Administrative Regulation AR 2:1 and other regulations related to the appropriate faculty title series under Chapter 2 of the Administrative Regulations.

VII. DISTRIBUTION OF EFFORT

Near the beginning of each fiscal year, the chair in consultation with individual faculty members will develop and complete a Distribution of Effort (DOE) form to encompass the faculty member's major activities during that year. The DOE form shall acknowledge each faculty member's activities in research, instruction, service (Extension), administration, and professional development activities and relate to their assigned appointment in the Department of Plant and Soil Sciences.

Should there be disagreement on the DOE, the Dean will resolve any issues and his/her decision will be final. In case of a significant change in the faculty member's DOE during the review period, an appropriately revised agreement will be negotiated.

VIII. PERFORMANCE EVALUATION

Performance evaluation of the faculty is carried out in accordance with the policies and procedures of the College of Agriculture, Food and Environment and the university. Performance evaluation of all staff members will be carried out in accordance with the appropriate policies and procedures of the college relating to the position. The role of the chair and the Advisory Committee in this process is described above.

IX. MENTORING POLICY

During the first year of appointment of a non-tenured faculty member, regardless of tenure eligibility, the chair, following consultation with the appointee and potential mentors, may designate three faculty mentors. Faculty mentors are encouraged to be freely available for frequent advice, support and guidance to the non-tenured faculty member. Non-tenured faculty members are encouraged to consult often with mentors in individual or group discussions, but scheduling and organization of interaction shall be by mutual agreement of mentors and non-tenured faculty and will include at least one meeting with the mentoring committee each year. The chair will invite constructive input from mentors in review of progress towards tenure or promotion, and in overall evaluation of the non-tenured faculty member.

X. PEER REVIEW OF TEACHING

The department will conduct peer reviews of teaching. The primary objective is to recognize and spread excellent teaching strategies among members of the teaching faculty, using the mechanism of peer review to provide both the ideas and stimuli for such cooperative improvement. Each teaching faculty member will

be peer reviewed at least once every four years. Each regular course will be peer reviewed at least once every eight years. The department chair, or designated peer review coordinator, will select teaching faculty to be reviewed each semester. The faculty member to be reviewed will select a list of four faculty members from a pool of potential reviewers supplied by the review coordinator. The review coordinator will then appoint two of the four selected faculty members to review that individual's teaching efforts. The pool of potential reviewers will not include the department chair, however, this does not preclude the chair's right to make classroom visits by prior arrangement with the instructor. The full guidelines for the peer review of teaching may be found on the department's internal web page under PSS Administration.

University of Kentucky Department of Plant and Soil Sciences in the College of Agriculture, Food and Environment
Statement on Evidences of Activity in Instruction, Research and Extension That are Appropriate for Use in Evaluation of Faculty Candidates for Promotion and Tenure
Approved by Faculty October 30, 2009

University regulations establish criteria for promotion and tenure. These criteria are framed in terms of the expectation for excellence across all areas of assigned activity. Because faculty members in the Department of Plant and Soil Sciences vary greatly with regard to discipline area as well as their research, instruction and extension Distribution of Effort, specific evidences of activity to be considered in applying these criteria may vary greatly. The Department of Plant and Soil Sciences provides this statement of evidences, as required by GR VIII A.6, to guide the evaluation of a faculty member's activities for tenure/promotion. Evidences are described in the areas of 1) Scholarly Productivity, 2) Program Quality, Innovation and Impact, and 3) Collaborative Efforts, Professional Service and Leadership. These evidences will apply to a faculty member's appointment in any of our faculty title series. This statement was approved by a vote of the faculty, October 30, 2009, and added to the department's Rules of Procedure.

Scholarly Productivity

Evidence of scholarly productivity is most often documented by information delivery through written works. Examples of scholarly productivity include original research articles, translational or extension publications, works of synthesis (e.g. reviews, monographs, and textbooks), and publications about instruction and pedagogy, as appropriate to the faculty member's discipline and assignment. Other formats such as web-based applications, electronic resources, patent applications, and created products (e.g. plant cultivars) are also considered as evidence of scholarly work. Published abstracts and the associated presentations increase the visibility of the faculty member's program. In all cases, however, creative or original works that have been rigorously peer-reviewed will be given more weight. This applies to works derived from research, instruction, and extension assignments.

Delivery of formal classroom and electronic media courses which create student contact hours, advising, mentoring experiential education and undergraduate research projects, and support of student engagement including participation in organized student activities are evidences of instructional scholarly productivity not documented by written works.

For extension, many forms of information delivery in addition to printed and electronic media, including educational meetings, workshops, field days and individual responses and contacts, are evidence of scholarly productivity. Applied research and high impact demonstration activities will also be considered an important tool for gathering information and validation of principles important to Kentucky agriculture.

Quality, Innovation and Impact

The scholarly productivity evident in a faculty member's vitae should demonstrate that the overall program has a high degree of quality, innovation and impact in the research, instruction, or extension areas that are appropriate to the faculty member's discipline and assignment.

Research faculty members are expected to establish a coherent body of work, as opposed to an unrelated collection of activities. In the basic sciences this will be manifest as a focus on one or a small number of significant topics. For applied research, a broad, diverse portfolio of successful studies reflecting responsiveness to critical needs might constitute such a coherent body of work. For both basic and applied research, adaptation to changing priorities may be viewed as a component of an innovative, impactful program. For both basic and applied research, publication in highly selective, rigorously refereed outlets is an important metric of quality of scholarly works.

Instructional faculty will deliver high quality courses and/or other instructional resources/materials. Student evaluations of teaching are considered to be a valid, if approximate, index of teaching quality, particularly when considered in conjunction with other measures. Our department uses peer evaluation of classroom teaching as a formative process, rather than a summative metric, and as such it is considered an important teaching improvement activity. Professional development and teaching improvement activities are indicators of a commitment to quality instruction. Contributions to student success beyond formal classroom

activities are important, and success and achievement of students and advisees can be an additional measure of the impact of the teaching assignment.

Quality extension programs are characterized by responsiveness, direction and relevance; they are science and research based, and they employ creative, effective methods of education and communication. Outreach should be associated with high quality materials or works in relevant, appropriate, accessible outlets.

A demonstrated record of sustaining scholarly productivity through funding or support for the program as appropriate to the field is an important indicator of quality and innovation.

Indications of impact and their documentation will be specific to the discipline and the assignment in research, instruction, or extension. Invitations to present one's work and to review the work of others may be considered as evidence of the impact and standing of the faculty member. Documented benefits to stakeholders, e.g. changed practice, profit, or quality of life, can be an important measure, not just for extension programs but for all faculty activities.

Collaborative Efforts, Recognition, Professional Service and Leadership

Faculty members of a land grant institution are required to be highly accessible, responsive and interactive with peers, students and clientele. Departmental faculty members are expected to engage in collaborative work as appropriate to the advancement of both their and the university's programs.

Documentation of peer recognition may include significant awards, invitations to make presentations externally, service on regional/national panels or committees, editorial appointments, leadership positions in professional societies, as well as other indicators. Nationally competitive grants may be significant evidence of peer recognition in many fields.

Exceptional individual performance is typically associated with notable positive impact on the success of clientele, students, and colleagues through leadership and professional service. University, college or department level service may be offered as documentation of leadership in a major Distribution of Effort area (research, teaching, extension) or it may be evaluated as a special assignment, as agreed upon by the chair and the faculty member.

University of Kentucky
College of Agriculture, Food, and the Environment
Department of Plant and Soil Sciences

Date: January 17, 2020

POLICY ON GRADUATE STUDENT STIPENDS

Our current Departmental base stipends are $18,000/yr for MS and $21,000/yr for PhD students. This is what the Department pays for fully Department-funded students, and it is the minimum that we recommend faculty write into grants for student stipend support. It is recommended that stipend levels are considered for adjustment by a Department-level committee on at least a five-year time-step. The last one was conducted in January 2017.

When a faculty member has additional funds available to supplement graduate student stipends, it is recommended that this level be limited to +$5,000 over the base level. The justification for this is that $26,000 is at the upper end of stipends offered throughout campus, and because we would rather not create a significant level of disparity in pay across our graduate student population.

This being said, if a student received a grant/fellowship for >$26,000/yr, then they should certainly be able to receive whatever the fellowship amount may be.

This policy was discussed and approved by PSS faculty at the January 17, 2020 faculty meeting.

Rebecca L. McCulley
Professor & Chair
Department of Plant & Soil Sciences

Date: May 24, 2022

UPDATE TO GRADUATE STUDENT STIPENDS

On May 13, 2022, during a PSS Faculty Meeting, we discussed whether to raise our Departmental base stipends, given that we said above we would revisit the topic every five years. The Chair polled the Southern Agronomy Chairs multistate group to get data on stipend levels from comparable institutions. The Chair collected some stipend level information from other Departments in the College, and Dr. Unrine looked up the consumer price index for the time frame. We had a discussion of various options and decided to increase Departmental base stipends to $21,000/yr for MS and $23,000/yr for PhD (with a $1,000 increase upon passing of qualifying exam). This level will put us at the high end of our comparables, which seemed reasonable since we only adjust every five years.

As before, the Department agreed to limit additional pay to +$5,000 over the base level (ie, $26,000/yr for MS and $28,000-$29,000/yr for PhD (depending on qualifying status). Also, we agreed that if a student receives a fellowship that is above this level of funding, they are allowed to accept it.

We will implement the new base levels starting July 1, 2022, with a grandfather clause for existing students and students that may be supported on grants that are pending at present. PI's will be able to opt-in July 1, 2022 for students supported on grant money, if there are funds to do so. If adequate funds do not exist, then students will

remain at existing levels. Faculty agreed to use these base levels in grant budgets moving forward. For all Department supported students, the raise will go into effect July 1, 2022.

This policy was approved by all faculty in attendance May 13, 2022.