

**HLTSBS Program Assessment Report  
Horticulture Department  
University of Arkansas  
Academic Year 2023-2024**

**Department of Horticulture**

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**Department Mission**

The mission of the Department of Horticulture at The University of Arkansas is to conduct applied and basic research and support and enhance the Arkansas horticulture industries and to conduct high quality teaching and student research programs leading to B.S., M.S. and Ph.D. degrees in a diverse, equitable, and inclusive environment. Our department head and dedicated faculty and staff have set specific goals for executing our mission.

**Program Goals**

The goal of the Department of Horticulture is to serve the people of Arkansas and assist the nation and the world through education, research, and service. Through dedicated teaching, pursuit of knowledge and interaction with society, we seek to improve our contributions to the general welfare. The Department of Horticulture has, as perhaps no other department, a goal to create quality of life for all citizens – economic, aesthetic, and social well-being by educating students in horticultural and turfgrass sciences, conducting research that makes a difference, and to communicate those findings to industry and the public.

**General Learning Outcomes Being Assessed in This Report:**

**Written Communication Skills** – Written communication is the development of ideas in writing. Written communication involves learning to work in many genres and styles. Written communication abilities develop through iterative experiences across the curriculum.

**Oral Communication Skills** - Oral communication is a prepared, purposeful presentation designed to increase knowledge, to foster understanding, or to promote change in the listeners' attitudes, values, beliefs, or behaviors.

**Critical Thinking Skills** – The comprehensive exploration of issues, ideas, artifacts, and events before accepting or formulating an opinion or conclusion.

**Horticulture Specific Skills** - Appreciate and communicate the diverse impacts of horticulture on people and culture.

## **Assessment Measures for General Skills:**

### **Student Learning Outcome – Written Communication**

- (1) Achievement will be assessed using a written communication rubric on the required reflective essay where the student has reflected on the impact of previous course work on preparation for the internship experience.
- (2) This is a direct measure of student learning.

### **Student Learning Outcome – Oral Communication.**

- (1) Achievement will be assessed using an oral communication rubric during oral presentations where the student has compiled and evaluated the scientific literature as part of a class project and/or completed an independent research project as part of a special problems, research project or internship class.
- (2) This is a direct measure of student learning.

### **Student Learning Outcome – Critical Thinking Skills**

- (1) Achievement will be measured using a critical thinking VALUE rubric included in the department assessment plan.
- (2) This is a direct measure of student learning.

## **Assessment Measures for Discipline Specific Skills:**

Discipline Specific Skills Student Learning Outcome 4: Appreciate and communicate the diverse impact of horticulture on people.

Goal 1: Describe the various ways plants impact human well-being (mental, psychological, and restorative, physical, medicinal).

Goal 2: Describe and assess the influence of plants and their management on environmental sustainability, habitat restoration or low-impact development.

Goal 3: Quantify the economic importance of horticultural food crops in food systems.

Goal 4: Describe the social, spiritual, and cultural importance of plants to historical and contemporary communities.

Goal 5: Understand the connection between plants and diverse peoples for food, fiber, medicinal, and spiritual-faith systems.

### **Methodology:**

For this report two courses are assessed. HORT 2003 Principles of Horticulture (3 hrs.) for both the fall and spring semesters during the 2023-2024 academic year and HORT 472V (2 hrs.) HTLS Internship Assessment. HORT 2003 is a foundational course and is a required core course in the horticulture degree program. The course covers basic plant science concepts such as plant anatomy and morphology, water relations, photosynthesis, and nutrition before introducing the various components that make up the horticulture discipline. HORT 2003 is taught both in the fall and spring semesters and usually consists of underclassmen and new transfer students. HORT 2003 is a pre-requisite for most of the upper-level horticulture courses. HORT 472V (2 hr) is the assessment component of our capstone course composed of upper-level students, normally seniors within their last two semesters of completing their degree. This course is the assessment part of the required 3-hour internship requirement with

the other course being HORT 472V and meets the general education learning outcome (GELO) 6.1 requirement for the university student learning outcome (SLO) assessment plan and was assessed using the General Outlook Skills Student Learning Outcomes 1: Written Communication Skills, 2: Oral Communication Skills, and 3: Critical Thinking Skills. Data were used from the fall 2023 semester.

HORT 2003 Principles of Horticulture was assessed using the Horticulture Discipline Specific Skills: Learning Outcome 1: Written Communication Skills, 2: Oral Communication Skills, and 3: Critical Thinking Skills. Data were used from the fall and spring semester of the 2023-2024 academic year.

### **Written Communication Component Assessed:**

HORT 472V HTLS Internship Assessment: As part of the assessment requirement, students are required to prepare a 1500-word reflective essay as part of university requirements. The essay is intended as a reflection on how the students' classes taken prior to the internship prepared them for their internship. Conversely, it can also identify gaps in course content and the overall curriculum. The internship coordinator and/or internship advisor assess the written reports and identify areas of strength and weaknesses. The overall average score is reported in Table 1. Specific recommendations will be incorporated into the Summary of Findings section of this report.

HORT 2003 Principles of Horticulture: Students are required to gather materials and methods and collect data on a selected lab activity and prepare a written lab report. The written reports are assessed by the instructor. The overall average score for each semester being assessed is given in Table 2.

### **Oral Communication Skills Assessed:**

HORT 472V HTLS Internship Assessment: Students are required to prepare a professional oral seminar based on their internship experience. The expected duration is about 12 minutes and 3 minutes for questions. Three faculty members were randomly asked to evaluate and score each undergraduate presentation using a grading rubric developed to match the assessment plan criteria. The overall average score is reported in Table 1.

HORT 2003 Principles of Horticulture: The students are required to research and present an oral report on a topic assigned by the instructor. The instructor assesses each student's presentation. The overall average score for each semester being assessed is given in Table 2.

### **Critical Thinking Skills Components Assessed:**

HORT 472V HTLS Internship Assessment: Students are required to apply scientific methods and hypothesis testing to their internship experience and activities. Students are expected to demonstrate competencies in activities related to the internship experience. The overall average score is reported in Table 1.

HORT 2003 Principles of Horticulture: Students are required to apply scientific methods and hypothesis testing through a series of laboratory experiments and demonstrations. Students are assessed on their knowledge gained in critical thinking skills. The overall average score for each semester is given in Table 2.

**Acceptable and Ideal Targets for the General Outcome Skills: Student Learning Outcome -Written Communication.**

- (1) Acceptable target: Students must demonstrate skills in the continuum between Milestones 2 and 3 in the student learning outcomes for written communication, oral communications and critical thinking outlined in the rubrics.
- (2) Ideal target: Students will be able to demonstrate skills outlined in the Level 4 (Capstone) for oral communication.

**Acceptable and Ideal Targets for the General Outlook Skills: Student Learning Outcome-Oral Communication.**

- (1) Acceptable target: Students must demonstrate skills in the continuum between Milestones 2 and 3 in the student learning outcomes for written communication, oral communications and critical thinking outlined in the rubrics.
- (2) Ideal target: Students will be able to demonstrate skills outlined in the Level 4 (Capstone) for oral communication.

**Acceptable and Ideal Targets for the General Outlook Skills: Student Learning Outcome-Critical Thinking Skills.**

- (1) Acceptable target: Students must demonstrate skills in the continuum between Milestones 2 and 3 in the student learning outcomes for critical thinking outlined in the rubrics.
- (2) Ideal target: Students will be able to demonstrate skills outlined in the Level 4 (Capstone) for oral communication.

**Acceptable and Ideal Targets for the Discipline Specific Skills: Student Learning Outcome – Horticulture Discipline Specific Skills.**

- (1) Acceptable target: At the end of the course, students must demonstrate skills in the continuum between Levels (Milestones) 2 and 3.
- (2) Ideal target: Students will be able to demonstrate skills outlined in Levels 4 (Capstone).

**Information on Benchmarks and rubrics used are included in Attachments 1-4 at the end of this report.**

**Summary of Findings:**

**General Learning Outcomes (GELO 6.1 Capstone):**

HORT 472V. Four students were assessed during the fall 2023 semester. Data are reported in Table 1. All students reached the acceptable benchmark (2 to 3) with 6 students reaching level 4 (Capstone) for written communication and critical thinking skills. One student failed to meet the benchmark 1 level of acceptability for the oral component. The assessment rating for oral communication was 2.80 compared to 2.75 from last year's rating. All student oral presentations were held during the regularly scheduled seminar period for the Horticulture Department. The

student's internship presentations were held in person with audience participation mainly interacting via Zoom by instructor choice. Students were not required to give a practice session prior to the actual presentation. This was a departure from previous years and was mainly caused by scheduling conflicts with the instructor and the assigned classroom.

**Horticulture Discipline Specific Skills:**

Students assessed in HORT 2003 Principles of Horticulture ranged from true freshmen horticulture majors to seniors including several from multiple academic colleges at the U of A. Summarized data for HORT 2003 are given in Tables 2 and 3. Students were assessed on their ability to appreciate and communicate the diverse impacts of horticulture on people and culture.

For the two semesters assessed this academic year, both classes met the acceptable target goals as defined in the Horticulture Department Assessment Plan (Table 2 and Table 3).

Table1. Overall assessment data covering written, oral, and critical thinking components for student learning outcome scoring data for HORT 472V Internship Assessment during the fall semester of the 2023-2024 academic year.

Course Assessed: HORT 472V Internship Assessment	Number of Students Assessed	Overall Average Assessment Score*	Minimum Score Assessed	Maximum Score Assessed
Written Communication Component	10	3.40	2.0	4.0
Oral Communication Component	10	2.80	1.0	4.0
Critical Thinking Component	10	3.10	2.0	4.0

\*Average assessment score for this course is the overall course average based on a rubric rating scale of 0 (does not meet minimum student learning outcome goals for the written, oral, or critical thinking component, or the student failed to present a seminar for assessment) to 4 (mastery of the student learning outcome goals for written, oral, or critical thinking component).

Table 2. Horticulture Discipline Specific Skills student learning outcome scoring data for HORT 2003 Principles of Horticulture for the fall 2023 semester (n= 29 students).

Benchmark Level Distribution	Number of students at this benchmark	Percentage of class at this benchmark
Benchmark 4	13	44.8 %
Benchmark 3	13	44.8 %
Benchmark 2	3	10.4 %
Benchmark 1	0	0 %
Benchmark 0	0	0 %

Percentage assessment score for this course is the overall course average based on a rubric rating scale of 0 (does not meet minimum student learning outcome goals) to 4 (mastery of the student learning goals for discipline specific skills).

Table 3. Horticulture Discipline Specific Skills student learning outcome scoring data for HORT 2003 Principles of Horticulture for the spring 2024 semester (n= 39 students).

Benchmark Level Distribution	Number of students at this benchmark	Percentage of class at this benchmark
Benchmark 4	19	48.7 %
Benchmark 3	16	41.0 %
Benchmark 2	4	13.7 %
Benchmark 1	0	0 %
Benchmark 0	0	0 %

Percentage assessment score for this course is the overall course average based on a rubric rating scale of 0 (does not meet minimum student learning outcome goals for discipline specific skills) to 4 (mastery of the student learning goals for discipline specific skills).

### **Recommendations / Actions**

HORT472V Internship Assessment: General Student Learning Outcomes.

While students were required to present their capstone seminar in person this past fall, and generally did a good job of organizing and presenting information, students were not able to practice their seminars before their peers and the seminar instructor of record to gain feedback and insight. Program changes being made for the fall 2024 seminar series is that students will be required to meet regularly as a class to learn more about preparing and delivering a formal seminar. The internship coordinator and another instructor will lead this effort to better prepare the students. This action should lead to an improvement in helping students to achieve additional presentation skills.

HORT 2003 Principles of Horticulture: Horticulture Discipline Specific Skills.

For HORT 2003 the percentage of students reaching benchmark 2 and above was greater in the spring semester than in the fall semester. The instructor attributes this to regularizing Blackboard micro-lectures weekly instead of being randomly assigned. Weekly lecture quizzes were also conducted via Blackboard within a set time frame. The instructor's recommended actions for the upcoming academic year is to more evenly distribute the hard plant science course content across the semester to lessen the content on exam 2 which covers in-depth subject matter. Another recommendation is to have the students prepare a laboratory report early in the semester and provide feedback, and then prepare a laboratory report late in the semester and assess progress in critical thinking skills.

## ATTACHMENT 1

**Table 2. Oral Communication VALUE Rubric:** The definition of oral communication is a prepared, purposeful presentation designed to increase knowledge, to foster understanding, or to promote change in the listeners' attitudes, values, beliefs, or behaviors (*for more information, please contact [value@aacu.org](mailto:value@aacu.org)*).

	<b>Capstone 4</b>	<b>Milestones</b>		<b>Benchmark 1</b>
		3	2	
<b>Organization</b>	Organizational pattern (specific introduction and conclusion, sequenced material within the body, and transitions) is clearly and consistently observable and is skillful and makes the content of the presentation cohesive.	Organizational pattern (specific introduction and conclusion, sequenced material within the body, and transitions) is clearly and consistently observable within the presentation.	Organizational pattern (specific introduction and conclusion, sequenced material within the body, and transitions) is intermittently observable within the presentation.	Organizational pattern (specific introduction and conclusion, sequenced material within the body, and transitions) is not observable within the presentation.
<b>Language</b>	Language choices are imaginative, memorable, and compelling, and enhance the effectiveness of the presentation. Language in presentation is appropriate to audience.	Language choices are thoughtful and generally support the effectiveness of the presentation. Language in presentation is appropriate to audience.	Language choices are mundane and commonplace and partially support the effectiveness of the presentation. Language in presentation is appropriate to audience.	Language choices are unclear and minimally support the effectiveness of the presentation. Language in presentation is not appropriate to audience.
<b>Delivery</b>	Delivery techniques (posture, gesture, eye contact, and vocal expressiveness) make the presentation compelling, and speaker appears polished and confident.	Delivery techniques (posture, gesture, eye contact, and vocal expressiveness) make the presentation interesting, and speaker appears comfortable.	Delivery techniques (posture, gesture, eye contact, and vocal expressiveness) make the presentation understandable, and speaker appears tentative.	Delivery techniques (posture, gesture, eye contact, and vocal expressiveness) detract from the understandability of the presentation, and speaker appears uncomfortable.
<b>Supporting Material</b>	A variety of types of supporting materials (explanations, examples, illustrations, statistics, analogies, quotations from relevant authorities) make appropriate reference to information or analysis	Supporting materials (explanations, examples, illustrations, statistics, analogies, quotations from relevant authorities) make appropriate reference to information or analysis that generally supports	Supporting materials (explanations, examples, illustrations, statistics, analogies, quotations from relevant authorities) make appropriate reference to information or analysis that partially supports	Insufficient supporting materials (explanations, examples, illustrations, statistics, analogies, quotations from relevant authorities) make reference to information or analysis that minimally

	that significantly supports the presentation or establishes the presenter's credibility/authority on the topic.	the presentation or establishes the presenter's credibility/authority on the topic.	the presentation or establishes the presenter's credibility/authority on the topic.	supports the presentation or establishes the presenter's credibility/authority on the topic.
<b>Central Message</b>	Central message is compelling (precisely stated, appropriately repeated, memorable, and strongly supported.)	Central message is clear and consistent with the supporting material.	Central message is basically understandable but is not often repeated and is not memorable.	Central message can be deduced, but is not explicitly stated in the presentation.

*\*Evaluators are encouraged to assign a zero to any work sample or collection of work that does not meet benchmark (cell one) level performance.*



## ATTACHMENT 2

**Table 3. Critical Thinking VALUE Rubric:** The definition of critical thinking is a habit of mind characterized by the comprehensive exploration of issues, ideas, artifacts, and events before accepting or formulating an opinion or conclusion, and can be demonstrated in assignments that require students to complete analyses of text, data, or issues (*for more information, please contact [value@aacu.org](mailto:value@aacu.org)*).

	<b>Capstone 4</b>	<b>Milestones</b>		<b>Benchmark 1</b>
		3	2	
<b>Explanation of issues</b>	Issue/problem to be considered critically is stated clearly and described comprehensively, delivering all relevant information necessary for full understanding.	Issue/problem to be considered critically is stated, described, and clarified so that understanding is not seriously impeded by omissions.	Issue/problem to be considered critically is stated but description leaves some terms undefined, ambiguities unexplored, boundaries undetermined, and/or backgrounds unknown.	Issue/problem to be considered critically is stated without clarification or description.
<b>Evidence</b> <i>Selecting and using information to investigate a point of view or conclusion</i>	Information is taken from source(s) with enough interpretation/evaluation to develop a comprehensive analysis or synthesis. Viewpoints of experts are questioned thoroughly.	Information is taken from source(s) with enough interpretation/evaluation to develop a coherent analysis or synthesis. Viewpoints of experts are subject to questioning.	Information is taken from source(s) with some interpretation/evaluation, but not enough to develop a coherent analysis or synthesis. Viewpoints of experts are taken as mostly fact, with little questioning.	Information is taken from source(s) without any interpretation/evaluation. Viewpoints of experts are taken as fact, without question.
<b>Influence of context and assumptions</b>	Thoroughly (systematically and methodically) analyzes own and others' assumptions and carefully evaluates the relevance of contexts when presenting a position.	Identifies own and others' assumptions and several relevant contexts when presenting a position.	Questions some assumptions. Identifies several relevant contexts when presenting a position. May be more aware of others' assumptions than one's own (or vice versa).	Shows an emerging awareness of present assumptions (sometimes labels assertions as assumptions). Begins to identify some contexts when presenting a position.
<b>Student's position (perspective, thesis/hypothesis)</b>	Specific position (perspective, thesis/hypothesis) is imaginative, taking into account the complexities of an issue.	Specific position (perspective, thesis/hypothesis) takes into account the complexities of an issue. Others' points of view are acknowledged	Specific position (perspective, thesis/hypothesis) acknowledges different sides of an issue.	Specific position (perspective, thesis/hypothesis) is stated, but is simplistic and obvious.

	Limits of position (perspective, thesis/hypothesis) are acknowledged. Others' points of view are synthesized within position (perspective, thesis/hypothesis).	within position (perspective, thesis/hypothesis).		
<b>Conclusions and related outcomes (implications and consequences)</b>	Conclusions and related outcomes (consequences and implications) are logical and reflect student's informed evaluation and ability to place evidence and perspectives discussed in priority order.	Conclusion is logically tied to a range of information, including opposing viewpoints; related outcomes (consequences and implications) are identified clearly.	Conclusion is logically tied to information (because information is chosen to fit the desired conclusion); some related outcomes (consequences and implications) are identified clearly.	Conclusion is inconsistently tied to some of the information discussed; related outcomes (consequences and implications) are oversimplified.

*\*Evaluators are encouraged to assign a zero to any work sample or collection of work that does not meet benchmark (cell one) level performance.*

### ATTACHMENT 3

**TABLE 4. HORTICULTURE DISCIPLINE SPECIFIC SKILLS RUBRIC:** After completing the Horticulture B.S. students will have a technical Knowledge of horticulture, professional skills of communication, leadership, computing, critical thinking, problem solving, business, and analysis, and have perspectives related to horticulture.

Discipline Specific Skills	Level 1	Level 2	Level 3	Level 4
<b>Acquire, integrate, and apply knowledge of plant science to managed systems</b>	Develop working knowledge of multiple sources, including current and older literature, to find, evaluate, organize, and manage information related to horticultural systems.	Demonstrate competence with both laboratory and field-based technologies used in modern horticulture.	Apply concepts of plant biology, systematics, ecology, and genetics to manage and improve plants and their products.	Apply scientific methods to test hypothesis.
<b>Demonstrate interdisciplinary knowledge and competency in managing horticultural system.</b>	Assess soils, soil health, plant fertility, water and site limitations.	Assess potential and evaluate realized interactions with the abiotic and biotic environment in which plants are grown.	Recommend and use appropriate application methods, materials, and diagnostic skills for addressing soil constraints and irrigation, nutrient, stress, and pest management issues.	Apply principles of accounting, business law, labor, marketing and personnel management to a horticultural business and contribute to developing the various components of a business plan.
<b>Synthesize knowledge and use insight and creativity to better understand and improve plant systems.</b>	Anticipate and recognize problems, identify causes of those problems, identify viable solutions to the problems and evaluate actions and consequences of treatments and interventions.	Develop, identify and employ best management practices that lead to sustainable solutions and outcomes.	Understand how global issues including climate change, energy use, water availability, and/or food safety impact on sustainability of horticultural systems locally, regionally and globally.	
<b>Appreciate and communicate the diverse impacts of horticulture on people.</b>	Describe the various ways plants impact human well-being (mental: psychological and restorative; and physiological).	Describe and assess the influence of plants and their management on environmental sustainability habitat restoration or low-impact development.  Quantify the economic importance of plants in managed ecosystems and the impact of horticultural crops in food system.	Describe the social, spiritual and cultural importance of plants to historical and contemporary communities of people.	Communicate effectively with various audiences using oral, written and visual presentation skills and multi-media techniques
<b>Demonstrates professionalism and proficiency in skills that relate to horticulture.</b>	Acquire knowledge of a range of cultures, values, and political perspectives relevant for living in a global community.	Demonstrate a high level of personal and social responsibility.	Demonstrate leadership and the ability to collaborate and work in teams.	Plan, engage and learn from actions that demonstrate civic responsibility to community and society.  Develop a plan for life-long learning as it relates to career choice and professionalism.

*Evaluators are encouraged to assign a zero to any work sample or collection of work that does not meet Level 1 performance.*

## ATTACHMENT 4

Table 5. Benchmarks for achieving discipline specific skills.  
 Modified from: Pritts, M.P. and T. Park. 2013. Proposed Learning Outcomes for Four-year Horticulture Programs in the United States. HortTech. 23(2): 237-240.

Goals	Benchmarks			
	4	3	2	1
<b>Learning outcome 1: Acquire, integrate, and apply knowledge of plant science to managed systems</b>				
Goal 1. Use multiple sources, including current and older literature, to find, evaluate, organize, and manage information related to horticultural systems.	Publish an article on a plant based system with a thorough literature review.	Write a thorough literature review about a specific topic for classroom credit.	Write a term paper utilizing primary resources related to a horticultural topic.	Be able to identify primary and secondary information sources and differentiate between referred and non-referred sources.
Goal 2. Demonstrate competence with both laboratory and field-based technologies used in modern horticulture.	Present research findings at regional or national meetings / competitions.	Participate in faculty directed research programs incorporating laboratory or field technology.	Gain competence operating laboratory/ field technology through internships or work-related activities.	Perform laboratory exercises using laboratory equipment/ technology in horticulture courses.
Goal 3. Apply concepts of plant biology, systematics, ecology, and genetics to manage and improve plants and their products.	Conduct capstone research projects related to genetics, plant breeding, genomics, plant identification, and cultivar performance.	Develop a plant selection guide for use in specific horticultural systems as part of an in-class assignment.	Complete courses in fruit/vegetable crops, or landscape/ turf management and understand the selection and appropriate use of plant species or cultivars unique to those courses.	Complete at least one course in plant identification, taxonomy/systematics or genetics.
Goal 4. Apply scientific methods to test hypotheses.	Write, submit to peer or instructor evaluation, defend, a capstone research thesis. Give a public presentation of the work.	Write a research proposal and conduct a research project leading to a published or presented paper.	Write a research proposal and conduct a research project leading to a summary paper as a special topic.	Conduct classroom laboratory experiments with hypothesis testing, data collection and analysis and conclusions.
<b>Learning outcome 2: Demonstrate interdisciplinary knowledge and competency in managing horticultural systems</b>				
Goal 1. Assess soils, soil health, plant fertility, water, and site limitations.	Conduct capstone or special problems research related to soil-plant interaction, plant nutrition, plant-water relations	Participate in projects related to landscape management, or crop production practices. Internship	Complete classes that include site analysis and management for crop production systems. Complete	Complete a soil science or soil physics course.

Goals	Benchmarks			
	4	3	2	1
	including abiotic stress on site management.	focus on soil management, soil fertility, site assessment and design, or irrigation management.	classes in landscape planning and landscape/turf management which includes site assessment.	
Goal 2. Assess potential and evaluate realized interactions with the abiotic and biotic environment in which plants are grown	Conduct a capstone or special problems research project focused on plant-pest interactions or abiotic stressors.	Complete assigned classroom projects developing integrated pest management strategies.	Identify key insect pests and diseases associated with limitations to plant growth and development. Identify abiotic factors critical in production and landscape/turf management systems.	Complete principles of horticulture course. Complete courses in entomology, weed science or plant pathology.
Goal 3. Recommend and use appropriate application methods, materials, and diagnostic skills for addressing soil constraints and irrigation, nutrient, stress, and pest management issues	Complete a capstone or special problems research project related to soil management, remediation, landscape management, crop fertility, or pest management.	Participate in an internship focused on substrate/soil or pest management, irrigation design/ installation or product testing and sales.	Complete classroom projects in soil/substrate management, soil fertility and applying fertilizers, irrigation design and management, plant protection strategies and schedules.	Complete classes in principles of horticulture, soil science, soil fertility, entomology, weed science, or plant pathology. Student complete class in landscape management, greenhouse management, fruit production or vegetable production.
Goal 4. Apply principles of accounting, business law, labor, marketing, and personnel management to a horticultural business and contribute to developing the various components of a business plan.	Conduct a capstone or special problems research project developing a business plan for a start-up horticultural enterprise.	Conduct classroom projects related to developing the various components of a business plan.	Understand business models. Develop start-up and financing strategies, personnel management policies, marketing and sales strategies.	Complete courses in business management, business law, finance, marketing or entrepreneurship
<b>Learning outcome 3: Synthesize knowledge and use insight and creativity to better understand and improve plant systems</b>				
Goal 1. Anticipate and recognize problems, identify causes of those problems, quantify potential impacts, analyze options, identify viable solutions to the problems, and evaluate actions and consequences of treatments and interventions	Conduct a capstone or special problems research project related to testing or proposing a management system.	Participate in a service learning activity related to horticulture involving a multi-faceted approach to system management.	Complete classroom assignments related to critical analysis and decision making protocols on production or management systems.	Complete courses in plant pathology, entomology, weed science, soil fertility, landscape/turf management or controlled environments.

Goals	Benchmarks			
	4	3	2	1
Goal 2. Develop, identify, and employ best management practices that lead to sustainable solutions and outcomes.	The SUST minor capstone project is a horticulture related project; project is presented to the department.	Enroll in and complete the SUST or ENSC minor.	Complete a project or term assignment related to sustainable management plan development; develop a best practices management plan.	Complete a course related to horticultural or system sustainability.
Goal 3. Understand how global issues including climate change, energy use, water availability, and/or food safety impact the sustainability of horticultural systems locally, nationally, and globally.	Complete a SUST capstone project, an honors project, or special topic research project related to climate change, and the FEWS nexus of horticulture production.	Enroll in and complete the SUST or ENSC minor.	Complete a project or term assignment related to the impacts of climate change on horticulture production systems.	Complete a course related to horticultural or system sustainability.
<b>Learning outcome 4. Appreciate and communicate the diverse impacts of horticulture on people</b>				
Goal 1. Describe the various ways plants impact human well-being (mental: psychological and restorative; physical: medicinal and physiological).	Complete a research project investigating the relationship or influence of horticulture on human well-being.	Participate in a service learning project focused on human-plant interaction or recreational or sports fields.	Complete a course in environmental sociology or ethno-horticulture.	Complete a general survey class in horticulture.
Goal 2. Describe and assess the influence of plants and their management on environmental sustainability, habitat restoration or low-impact development (LID).	Complete a capstone project, honors project or special research project related to sustainability, habitat restoration or low-impact development.	Participate in classroom projects focused on sustainable practices and implementation.	Complete a course in environmental restoration, ecosystem assessment or landscape/turf management.	Complete a class assignment or learning module focused on restoration or sustainable practices related to horticulture.
Goal 3. Quantify the economic importance of plants in managed ecosystems and the impact of horticultural crops in food systems.	Complete a capstone project, honors project or special problems course investigating the production and post-harvest economics of a horticultural food crop.	Complete a written or visual presentation comparing and contrasting various worldwide food production systems focusing on horticultural crops.	Complete a course in environmental economics or food and agricultural marketing.	Complete a learning module focused on economically important food crops and associated production and distribution systems.
Goal 4. Describe the social, spiritual, and cultural importance of plants to historical and contemporary communities of people.	Complete and present a capstone, honors or special problems project investigating in role of plants in human culture.	Write a research paper on a specific culture or community and how plant interaction and use affected or	Complete a learning module on the role of ornamental, spiritual and medicinal plants in	Complete a general survey class in horticulture.

Goals	Benchmarks			
	4	3	2	1
		influenced that culture.	early and modern human culture.	
Goal 5. Communicate effectively with various audiences using oral, written, and visual presentation skills, and contemporary networking/social media technologies.	Create and publish content on a horticulture related topic using digital media.	Prepare and present horticulturally related content at a professional or industry meeting/ conference.	Complete a project or term assignment which is presented orally, written or through digital media.	Complete a communication intensive course.
<b>Learning outcome 5. Demonstrate professionalism and proficiency in skills that relate to horticulture</b>				
Goal 1. Acquire knowledge of a range of cultures, values, and political perspectives relevant for living in a global community.	Complete a study abroad experience or international internship.	Participate in a department or college associated international travel opportunity.	Complete a research paper on a topic associated with human-plant interactions and the effect on culture.	Complete a course in world or regional geography.
Goal 2. Demonstrate a high level of personal and social responsibility.	Leadership position in a collegiate organization involved in local community interactions.	Develop an action plan using horticulture to engage a local or regional community.	Complete a research project investigating the role of horticulture in modern urban and rural society.	Complete a humanities course in ethics or social work.
Goal 3. Demonstrate leadership and the ability to collaborate and work in teams.	Election to a regional or national undergraduate organization associated with a professional society.	Leadership position in a student club or university related organization.	Active participation in an undergraduate related club or collegiate organization.	Demonstrate leadership in class group projects or team building activities.
Goal 4. Plan, engage, and learn from actions that demonstrate civic responsibility to community and society.	Propose, design and implement a project relating to a socio-horticulture topic such as a community/school garden or horticulture therapy program.	Write a research paper evaluating the effectiveness and/or impact of a school or community garden on the targeted community.	Complete a course with a service learning component.	Complete a course module on horticulture-based outreach activities, opportunities and responsibilities on a local, regional or national level.
Goal 5. Develop a plan for life-long learning as it relates to career choice and professionalism.	Postgraduate involvement and leadership in professional or trade organizations.	Participate in regional or national professional meetings as an undergraduate.	Participate in extracurricular activities; attend seminars, trade shows or industry meetings relating to a career choice.	Student membership in a profession-related organization.