

AFNR Content Standards Alignment—Introduction to Agriculture, Food, and Natural Resources

The **AFNR Content Standards Alignment** aligns CASE 4 Learning (CASE) Concepts and Performance Objectives to the National AFNR Content standards and performance indicators developed by the National Council for Agricultural Education (The Council). In the CASE learning model, Concepts are key elements of understanding that students are expected to learn. Concepts are developed by a curriculum committee of content experts comprised of industry representatives, post-secondary educators, and secondary teachers. Performance Objectives are how students will demonstrate their understanding of the concept. All Concepts and Performance Objectives measure student competency of the AFNR Content Standards within each Pathway.

The AFNR Content Standards provide state agricultural education leaders and educators with a high-quality, rigorous set of standards to guide what students should know and be able to do after completing a program of study in each of the following AFNR Career Pathways:

- Career Ready Practices
- Foundational
- Agribusiness Systems
- Animal Systems
- Biotechnology Systems
- Education, Communication, and Leadership
- Environmental Sustainability Systems
- Food Products and Processing Systems
- Natural Resource Systems
- Plant Systems
- Power, Structural, and Technical Systems

DEFINITIONS: Within each pathway, the standards are organized and aligned to CASE curriculum as follows:

- **Standards** – These are the standards owned by Advance CTE and used here with permission. The standards defined the scope and guided the development of the updated indicators and CASE measurements.
- **Performance Indicators** – These statements distill each standard into more discrete indicators of the knowledge and skills students should attain through a program of study in this pathway. Attainment of the knowledge and skills outlined in the performance indicators is intended to demonstrate an acceptable level of proficiency with the related standard at the conclusion of a program of study in this area.
- **CASE Measurements** – These are CASE Concepts with bulleted Performance Objectives. Students carry out the Performance Objectives to show understanding of the Concept, which indicates attainment of each performance indicator. The beginning CASE measurements require students to remember, understand, identify, explain, and summarize information. The intermediate CASE measurements require students to apply, analyze, compare, distinguish, and examine information and scenarios. The advanced CASE measurements require students to assess, evaluate, justify, improve, and create.

The **Introduction to Agriculture, Food, and Natural Resources** curriculum measures student competencies in the AFNR Pathways included in this blueprint. For more information about the National AFNR Content Standards, visit The National Council for Agricultural Education’s website at <https://www.thencae.org/afnr-standards>.

CAREER READY PRACTICES STANDARD

CRP.04. Communicate clearly, effectively and with reason.

Career-ready individuals communicate thoughts, ideas and action plans with clarity, whether using written, verbal and/or visual methods. They communicate in the workplace with clarity and purpose to make maximum use of their own and others' time. They are excellent writers; they master conventions, word choice and organization, and use effective tone and presentation skills to articulate ideas. They are skilled at interacting with others; they are active listeners and speak clearly and with purpose. Career-ready individuals think about the audience for their communication and prepare accordingly to ensure the desired outcome.

PERFORMANCE INDICATOR	CASE MEASUREMENTS		
	Beginning	Intermediate	Advanced
CRP.04.01. Communicate using strategies that ensure clarity, logic, purpose and professionalism in formal and informal settings.		AFNR 2.1 Concept 1 People utilize multiple forms of verbal and nonverbal communication.	
		<ul style="list-style-type: none"> • Demonstrate verbal and non-verbal forms of communication in a charades-like game. • Identify and select appropriate attire for different activities. • Prepare a formal introduction 	
		AFNR 2.1 Concept 2 Voice, presence, and expression are used in communicating effectively.	
		<ul style="list-style-type: none"> • Present a formal introduction. • Practice effective public speaking characteristics. 	
PERFORMANCE INDICATOR	CASE MEASUREMENTS		
	Beginning	Intermediate	Advanced
CRP.04.02. Produce clear, reasoned, and coherent written and visual communication in formal and informal settings.	AFNR 1.1 Concept 2 Organization and record keeping are important to the success of an agricultural business.	AFNR 2.1 Concept 3 Speeches may be informative, persuasive, or special occasion.	
	<ul style="list-style-type: none"> • Develop and keep an Agriscience Notebook to record and store information. 	<ul style="list-style-type: none"> • Develop and present an informative speech. 	
	AFNR 2.2 Concept 1 People utilize multiple forms of communication in their daily lives.		
	<ul style="list-style-type: none"> • Work collaboratively to complete team building challenges. 		

CAREER READY PRACTICES STANDARD

CRP.05. Consider the environmental, social and economic impacts of decisions.

Career-ready individuals understand the interrelated nature of their actions and regularly make decisions that positively impact and/or mitigate negative impact on other people, organizations and the environment. They are aware of and utilize new technologies, understandings, procedures, materials and regulations affecting the nature of their work as it relates to the impact on the social condition, the environment and the profitability of the organization.

PERFORMANCE INDICATOR	CASE MEASUREMENTS		
	Beginning	Intermediate	Advanced
CRP.05.01. Assess, identify, and synthesize the information and resources needed to make decisions that positively impact the workplace and community.		AFNR 3.2 Concept 1 Classification of people, places, and things is a basic skill used in daily life, scientific research, and the agricultural industry.	
		<ul style="list-style-type: none"> Classify objects based on their physical characteristics. Categorize animals using physical characteristics. 	

CAREER READY PRACTICES STANDARD

CRP.07. Employ valid and reliable research strategies.

Career-ready individuals are discerning in accepting and using new information to make decisions, change practices or inform strategies. They use a reliable research process to search for new information. They evaluate the validity of sources when considering the use and adoption of external information or practices. They use an informed process to test new ideas, information and practices in their workplace situation.

PERFORMANCE INDICATOR	CASE MEASUREMENTS		
	Beginning	Intermediate	Advanced
CRP.07.01. Select and implement reliable research processes and methods to generate data for decision-making in the workplace and community.	AFNR 3.2 Concept 2 Proper and accurate data measurement and analysis is important for laboratory investigation.	AFNR 3.2 Concept 4 Scientific method is a systematic process used to solve a problem.	
	<ul style="list-style-type: none"> Use a Vernier equipment and sensors to collect data for an experiment. 	<ul style="list-style-type: none"> Design an experiment that uses a minimum of four science processes. Use an experiment to demonstrate the scientific processes and laboratory safety. 	

CAREER READY PRACTICES STANDARD

CRP.10. Plan education and career path aligned to personal goals.

Career-ready individuals take personal ownership of their own educational and career goals, and they regularly act on a plan to attain these goals. They understand their own career interests, preferences, goals and requirements. They have perspective regarding the pathways available to them and the time, effort, experience and other requirements to pursue each, including a path of entrepreneurship. They recognize the value of each step in the educational and experiential process, and they recognize that nearly all career paths require ongoing education and experience. They seek counselors, mentors and other experts to assist in the planning and execution of career and personal goals.

PERFORMANCE INDICATOR	CASE MEASUREMENTS		
	Beginning	Intermediate	Advanced
CRP.10.01. Identify career opportunities within a career cluster that match personal interests, talents, goals and preferences.		AFNR 7.1 Concept 2 People develop goals to achieve their dreams. <ul style="list-style-type: none"> Write a vision statement and develop personal goals. 	
PERFORMANCE INDICATOR	CASE MEASUREMENTS		
	Beginning	Intermediate	Advanced
CRP.10.03. Develop relationships with and assimilate input and/or advice from experts (e.g., counselors, mentors, etc.) to plan career and personal goals in a chosen career area.	AFNR 7.1 Concept 1 Agriculture plays an essential role in society and feeding the world. <ul style="list-style-type: none"> Write a brief outlining a plan to be proposed at a hearing on solving world hunger. Create a resume, cover letter, and job application for a specific agriculture career. Deliver a narrative about a researched agricultural career. 		

FOUNDATIONAL PATHWAY SKILLS STANDARD

FPS.02. Evaluate the nature and scope of the Agriculture, Food & Natural Resources Career Cluster and the role of agriculture, food and natural resources (AFNR) in society and the economy.

PERFORMANCE INDICATOR	CASE MEASUREMENTS		
	Beginning	Intermediate	Advanced
FPS.02.02. Examine the impact of AFNR on the local, state, national, and global society and economy.	AFNR 1.1 Concept 4 Production of agricultural commodities occurs within specific regions of the United States. <ul style="list-style-type: none"> Research top commodities produced in the United States and determine the costs of food to consumers. 		

FOUNDATIONAL PATHWAY SKILLS STANDARD

FPS.03. Examine and summarize the importance of health, safety and environmental management systems in AFNR workplaces.

PERFORMANCE INDICATOR	CASE MEASUREMENTS		
	Beginning	Intermediate	Advanced
FPS.03.02. Develop and implement a plan to maintain and improve health, safety, and environmental compliance and performance.	AFNR 3.1 Concept 2 Emergency equipment is essential in a laboratory and has specific uses.		
	<ul style="list-style-type: none"> • Locate and determine the purpose of emergency equipment items located in the classroom, laboratory, and shop facilities. 		
PERFORMANCE INDICATOR	CASE MEASUREMENTS		
	Beginning	Intermediate	Advanced
FPS.03.03. Apply health and safety practices to AFNR workplaces.		AFNR 3.1 Concept 3 Understanding and following procedures and rules are essential to maintaining a safe work environment.	
		<ul style="list-style-type: none"> • Work with classmates to draft a list of ten safety rules. 	
PERFORMANCE INDICATOR	CASE MEASUREMENTS		
	Beginning	Intermediate	Advanced
FPS.03.04. Use appropriate protective equipment and demonstrate safe and proper use of AFNR tools and equipment.		AFNR 3.1 Concept 4 Reading and understanding laboratory procedures are essential to conducting a laboratory experiment safely.	AFNR 3.1 Concept 1 Laboratory equipment has specific uses in scientific experiments.
		<ul style="list-style-type: none"> • Complete a laboratory exercise by following written procedures. 	<ul style="list-style-type: none"> • Identify and describe the uses of common laboratory equipment. • Collect data using laboratory equipment.
		AFNR 3.1 Concept 5 Mass, volume, temperature, and density are common laboratory measurements.	
		<ul style="list-style-type: none"> • Measure distance, volume, mass, temperature, and density using the appropriate tools and scale. 	

FOUNDATIONAL PATHWAY SKILLS STANDARD

FPS.05. Describe career opportunities and means to achieve those opportunities in each of the Agriculture, Food & Natural Resources career pathways.

PERFORMANCE INDICATOR	CASE MEASUREMENTS		
	Beginning	Intermediate	Advanced
FPS.05.01. Evaluate and implement the steps and requirements to pursue a career opportunity in each of the AFNR career pathways (e.g., goals, degrees, certifications, resumes, cover letter, portfolios, interviews, etc.).		AFNR 1.2 Concept 1 Employability skills, such as work ethic, timeliness, communication, and self-direction, are essential attributes for a successful career.	AFNR 7.1 Concept 3 Accurate record keeping is important to the success of an agricultural enterprise.
		<ul style="list-style-type: none"> Develop and maintain a career portfolio following a specific format. 	<ul style="list-style-type: none"> Review work from the year and complete the Career Portfolio.
PERFORMANCE INDICATOR	CASE MEASUREMENTS		
	Beginning	Intermediate	Advanced
FPS.05.02. Examine and choose career opportunities that are matched to personal skills, talents, and career goals in an AFNR pathway of interest.		AFNR 1.2 Concept 2 Agriculture is a broad field that encompasses many employment areas and offers a wide array of career opportunities.	
		<ul style="list-style-type: none"> Investigate the career opportunities available in agriculture. Classify careers according to categories in agriculture. Evaluate personal interests related to career pathways. 	

FOUNDATIONAL PATHWAY SKILLS STANDARD

FPS.06. Analyze the interaction among AFNR systems in the production, processing and management of food, fiber and fuel and the sustainable use of natural resources.

PERFORMANCE INDICATOR	CASE MEASUREMENTS		
	Beginning	Intermediate	Advanced
FPS.06.01. Examine and explain foundational cycles and systems of AFNR.	AFNR 1.1 Concept 1 Agriculture and natural resource systems provide the three basic human needs of food, clothing, and shelter.	AFNR 1.1 Concept 3 Agriculture is a broad field of study that includes agriculture systems, natural resource management, science, business, communication, and leadership.	
	<ul style="list-style-type: none"> Determine if their basic needs are met after simulating the collection of resources during different situations. 	<ul style="list-style-type: none"> Interpret types of activities associated with agriculture from a case study about an agricultural entrepreneur. 	

		<p>AFNR 4.3 Concept 1 The water cycle is an example of a naturally occurring system in which the substance can change form and location.</p> <ul style="list-style-type: none"> • Play a game to simulate the journey of a drop of water through the water cycle. • Write and illustrate a story about what they learned regarding the journey a drop of water takes through the water cycle. 	
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FOUNDATIONAL PATHWAY SKILLS STANDARD

FPS.07. Recognize the value of a Supervised Agricultural Experience (SAE) as Work-Based Learning.			
PERFORMANCE INDICATOR	CASE MEASUREMENTS		
	Beginning	Intermediate	Advanced
FPS.07.03. Define and summarize the foundational and immersion SAEs and the relationship between the two.			<p>AFNR 1.2 Concept 3 Supervised Agricultural Experiences (SAE) programs provide opportunities to explore potential career choices and develop professional career goals.</p> <ul style="list-style-type: none"> • Complete a Foundational Supervised Agricultural Experience.

FOUNDATIONAL PATHWAY SKILLS STANDARD

FPS.11. Evaluate the structure and value of agricultural education.			
PERFORMANCE INDICATOR	CASE MEASUREMENTS		
	Beginning	Intermediate	Advanced
FPS.11.03. Summarize the importance of the National FFA Organization within agricultural education.	<p>AFNR 1.2 Concept 4 The National FFA Organization offers members many opportunities to build necessary employment and life skills, such as leadership, personal character, and career options.</p> <ul style="list-style-type: none"> • Select FFA educational and personal growth opportunities meeting career interests. 		

FOUNDATIONAL PATHWAY SKILLS STANDARD

FPS.13. Analyze the structures and procedures to effectively and professionally run and manage a meeting.

PERFORMANCE INDICATOR	CASE MEASUREMENTS		
	Beginning	Intermediate	Advanced
FPS.13.01. Utilize parliamentary resources to solve problems of organizational management and operations.		AFNR 2.2 Concept 2 Parliamentary procedures are used to conduct orderly meetings. <ul style="list-style-type: none"> • Use proper parliamentary procedures to voice an opinion. • Demonstrate the proper procedures for making a main motion and an amendment. 	

FOUNDATIONAL PATHWAY SKILLS STANDARD

FPS.14. Evaluate opportunities to develop leadership, citizenship, and career skills.

PERFORMANCE INDICATOR	CASE MEASUREMENTS		
	Beginning	Intermediate	Advanced
FPS.14.03. Evaluate the importance and value of career skills.	AFNR 1.2 Concept 5 Career Development Events (CDE) and Leadership Development Events (LDE) expose students to opportunities in career exploration and leadership development. <ul style="list-style-type: none"> • Complete components of ten Career Development Events and Leadership Development Events. 		

ANIMAL SYSTEMS STANDARD

AS.03. Design and provide proper animal nutrition to achieve desired outcomes for performance, development, reproduction and/or economic production.

PERFORMANCE INDICATOR	CASE MEASUREMENTS		
	Beginning	Intermediate	Advanced
AS.03.02. Analyze feed rations and assess if they meet the nutritional needs of animals.	AFNR 5.5 Concept 1 The nutrients found in animal feed include protein, carbohydrates, fats, vitamins, minerals, and water. <ul style="list-style-type: none"> • Research the functions of six essential nutrients. • Classify feedstuffs according to their nutrient value. 		

ANIMAL SYSTEMS STANDARD

AS.04. Apply principles of animal reproduction to achieve desired outcomes for performance, development and/or economic production.

PERFORMANCE INDICATOR	CASE MEASUREMENTS		
	Beginning	Intermediate	Advanced
AS.04.03. Apply scientific principles to animal breeding.	AFNR 5.1 Concept 4 DNA is genetic material that combined with protein comprises the chromosomes found inside animal and plant cell nuclei.	AFNR 5.1 Concept 6 Offspring of animals and plants derive their genetic traits from both parents.	
	<ul style="list-style-type: none"> Extract the DNA bundles from strawberry tissue for observation. Construct a DNA model and demonstrate how DNA replication happens in a cell. 	<ul style="list-style-type: none"> Link similarities in characteristics to trace dog traits. 	
	AFNR 5.1 Concept 5 Genes are a combination of DNA segments that define animal and plant physical appearance.		
	<ul style="list-style-type: none"> Discover differences in the physical features of animals. 		

ANIMAL SYSTEMS STANDARD

AS.05. Evaluate environmental factors affecting animal performance and implement procedures for enhancing performance and animal health.

PERFORMANCE INDICATOR	CASE MEASUREMENTS		
	Beginning	Intermediate	Advanced
AS.05.01. Design and evaluate animal housing, equipment, and handling facilities for the major systems of animal production.	AFNR 5.5 Concept 2 Shelter helps animals control body temperature.		
	<ul style="list-style-type: none"> Conduct an experiment to demonstrate the effect of insulation on maintaining body heat. 		

ANIMAL SYSTEMS STANDARD

AS.06. Classify, evaluate and select animals based on anatomical and physiological characteristics.

PERFORMANCE INDICATOR	CASE MEASUREMENTS		
	Beginning	Intermediate	Advanced
AS.06.01. Classify animals according to taxonomic classification systems and use (e.g., agricultural, companion, etc.).			AFNR 5.4 Concept 1 Animals are classified by gender, age, and reproductive ability.
			<ul style="list-style-type: none"> Categorize animals by gender and species.

PERFORMANCE INDICATOR	CASE MEASUREMENTS		
	Beginning	Intermediate	Advanced
AS.06.02. Apply principles of comparative anatomy and physiology to uses within various animal systems.	AFNR 5.1 Concept 1 Animal and plant cells have many similarities, especially in regards to cell function; however, there are important structural differences between the two cell types.	AFNR 5.4 Concept 3 Body parts of animals vary among different species.	
	<ul style="list-style-type: none"> Identify and label a cell's parts, including each organelle's function. Determine structural differences between an animal and plant cell. 	<ul style="list-style-type: none"> Create a review game of the external anatomy of an animal that will be used to teach others. 	
	AFNR 5.1 Concept 2 The nucleus of an animal and a plant cell is important for several life sustaining processes, such as cell division and protein synthesis.	AFNR 5.5 Concept 3 Animals perceive potential dangers differently than humans.	
	<ul style="list-style-type: none"> Describe the structure and function of a cell's nucleus. 	<ul style="list-style-type: none"> Draw conclusions on the perceptions of stimuli based on observations of optical illusions. 	
	AFNR 5.4 Concept 2 Animals have a complex set of systems that must work together.	AFNR 5.5 Concept 4 Production and management of animals are based on anatomical and physiological characteristics.	
	<ul style="list-style-type: none"> Connect the internal body systems and their relationships using concept mapping software. 	<ul style="list-style-type: none"> Match characteristics of various animals to specialized practices related to animals. 	
PERFORMANCE INDICATOR	CASE MEASUREMENTS		
	Beginning	Intermediate	Advanced
AS.06.03. Select animals for specific purposes and maximum performance based on anatomy and physiology.		AFNR 5.4 Concept 4 Animals are selected based on the quality and correctness of anatomical structure and productive potential.	
		<ul style="list-style-type: none"> Compare objects to ideal criteria based on given priorities. Evaluate a class of market hogs based on specific priorities. 	

EDUCATION, COMMUNICATION, AND LEADERSHIP STANDARD

ECL.04. Develop a written communication plan using various communication methods (e.g. news releases, social media, speaking opportunities, blogs, podcasts, etc.) to convey a message to an intended AFNR audience.

PERFORMANCE INDICATOR	SAMPLE MEASUREMENTS		
	Beginning	Intermediate	Advanced
ECL.04.02. Identify, apply and demonstrate communication skills and methods per the communications plan.	AFNR 2.2 Concept 3 Teamwork is essential when solving many problems and completing group tasks. • Use group expectations and teamwork skills while working in a group.		

ENVIRONMENTAL SUSTAINABILITY SYSTEMS STANDARD

ESS.01. Use analytical procedures and instruments to manage environmental service systems.

PERFORMANCE INDICATOR	CASE MEASUREMENTS		
	Beginning	Intermediate	Advanced
ESS.01.01. Analyze and interpret laboratory and field cases in environmental sustainability systems.	AFNR 3.2 Concept 3 The pH scale is 0-14 where 0 is extremely acidic, 7 is neutral, and 14 is extremely basic. • Quantify the pH of a substance using Vernier equipment and a pH sensor.	AFNR 4.3 Concept 2 Land topography influences the distribution of water and pollutants. • Model and observe the flow of water over a landform. AFNR 4.3 Concept 3 Water pollution is caused by point and non-point sources. • Determine the spread of pollution from point and nonpoint sources.	

ENVIRONMENTAL SUSTAINABILITY SYSTEMS STANDARD

ESS.02. Evaluate the impact of public policies and regulations on environmental service system operations.

PERFORMANCE INDICATOR	CASE MEASUREMENTS		
	Beginning	Intermediate	Advanced
ESS.02.01. Interpret and evaluate the impact of laws, agencies, policies, practices, and consumer preferences affecting environmental service systems.	AFNR 6.2 Concept 4 Federal, state, county, and local laws govern how land can be used. • Discuss zoning and land use issues and present a persuasive debate at a mock town hall meeting.		

ENVIRONMENTAL SUSTAINABILITY SYSTEMS STANDARD

ESS.03. Develop proposed solutions to environmental issues, problems and applications using scientific principles of meteorology, soil science, hydrology, microbiology, chemistry and ecology.

PERFORMANCE INDICATOR	CASE MEASUREMENTS		
	Beginning	Intermediate	Advanced
ESS.03.01. Apply meteorology principles to environmental sustainability systems.		AFNR 4.2 Concept 2 Soil structure and soil texture are elements that affect soil function.	
		<ul style="list-style-type: none"> Quantify soil permeability to understand the relationship between soil particle size and rate of water filtration. 	
		AFNR 4.1 Concept 3 Soil erosion results in the loss of quality soil and is a concern in the study of mineral soils. <ul style="list-style-type: none"> Observe soil erosion caused by water. 	
PERFORMANCE INDICATOR	CASE MEASUREMENTS		
Beginning	Intermediate	Advanced	
ESS.03.02. Apply soil science and hydrology principles to environmental sustainability systems.	AFNR 4.1 Concept 1 Mineral matter, air, water, and organic matter are found in different proportions within a soil and define soil quality.	AFNR 4.1 Concept 2 Geographical features and environmental factors influence the formation process of soils and impact soil quality.	AFNR 4.2 Concept 1 Soil is comprised of three different sized mineral particles; sand, silt, and clay.
	<ul style="list-style-type: none"> Evaluate particle size and organic matter in a soil sample. 	<ul style="list-style-type: none"> Investigate the effects organic matter has on soil porosity and soil air holding capacity. Observe how slope of the land causes water to erode away soil. 	<ul style="list-style-type: none"> Conduct tests to determine soil texture by feel.
		AFNR 4.2 Concept 4 Soil horizons have varying structure, texture and color. <ul style="list-style-type: none"> Determine each horizon's texture, structure, and color within a soil profile. 	AFNR 4.2 Concept 3 The pH of a soil is affected by its buffering capacity. <ul style="list-style-type: none"> Design an experiment to test the buffering capacity of different soil textures.

ENVIRONMENTAL SUSTAINABILITY SYSTEMS STANDARD

ESS.04. Demonstrate the operation of environmental service systems (e.g., pollution control, water treatment, wastewater treatment, solid waste management and energy conservation).

PERFORMANCE INDICATOR	CASE MEASUREMENTS		
	Beginning	Intermediate	Advanced
ESS.04.04. Compare and contrast the impact of conventional and alternative energy sources on the environment and operation of environmental sustainability systems.		AFNR 6.1 Concept 1 Renewable and non-renewable energy sources, such as wind, solar, and biofuels, are currently being used in the United States.	AFNR 6.1 Concept 2 Agricultural commodities can be converted to alternative energy sources.
		<ul style="list-style-type: none"> Construct an educational display describing the relationship between agriculture and energy. 	<ul style="list-style-type: none"> Construct an educational display describing the relationship between agriculture and energy.
		AFNR 6.1 Concept 3 People depend on consumable forms of energy, such as fuel and electricity, which are used in everyday life.	AFNR 6.1 Concept 4 The efficiency of energy and the amount of energy produced varies among sources.
		<ul style="list-style-type: none"> Measure electricity from various sources in a circuit. Compare fuel consumption costs for agricultural production. 	<ul style="list-style-type: none"> Construct a solar energy system and compare the production of electricity under different light conditions. Compare the energy content of two common fuels used for energy production.

ENVIRONMENTAL SUSTAINABILITY SYSTEMS STANDARD

ESS.05. Use tools, equipment, machinery and technology common to tasks in environmental service systems.

PERFORMANCE INDICATOR	CASE MEASUREMENTS		
	Beginning	Intermediate	Advanced
ESS.05.01. Use technological and mathematical tools to map land, facilities, and infrastructure for environmental sustainability systems.		AFNR 6.2 Concept 2 Global Positioning System (GPS) is a method used to determine an exact location of a point on the earth using a coordinate system based on longitude and latitude readings.	
		<ul style="list-style-type: none"> Use three points to triangulate a location. Determine latitude, longitude, and altitude using a GPS unit. 	
PERFORMANCE INDICATOR	CASE MEASUREMENTS		
	Beginning	Intermediate	Advanced
ESS.05.02. Perform assessments of environmental conditions using		AFNR 6.2 Concept 3 Agriculturalists use Global Positioning System (GPS) and Geographic Information System (GIS) to	AFNR 4.3 Concept 4 Ecologists determine a water's quality by measuring temperature, pH, turbidity, dissolved oxygen, and total dissolved solids (TDS).

equipment, machinery, and technology.		improve agricultural production efficiencies and environmental quality.	<ul style="list-style-type: none"> • Evaluate water quality with sensors to quantify temperature, pH, turbidity, dissolved oxygen, and total dissolved solids. • Design an experiment determining drinking water quality. • Write a lab report explaining experimental findings.
		<ul style="list-style-type: none"> • Collect soil data and record the GPS coordinates of each soil location. • Use the Web Soil Survey to research information on each soil location. 	

FOOD PRODUCTS AND PROCESSING SYSTEMS STANDARD

FPP.01. Develop and implement procedures to ensure safety, sanitation and quality in food product and processing facilities.			
PERFORMANCE INDICATOR	CASE MEASUREMENTS		
	Beginning	Intermediate	Advanced
FPP.01.01. Distinguish between various food safety programs and management systems in food products and processing facilities.	AFNR 5.6 Concept 3 Food may be contaminated at many points while in route to the consumer.		
	<ul style="list-style-type: none"> • Observe and record growth of bacterial cultures. • Solve a problem related to foodborne illness outbreak. 		
PERFORMANCE INDICATOR	CASE MEASUREMENTS		
	Beginning	Intermediate	Advanced
FPP 01.02. Apply food safety and quality assurance procedures in the harvesting, handling and processing of food products.		AFNR 5.6 Concept 2 Food must be produced, transported, processed, and stored safely.	
		<ul style="list-style-type: none"> • Examine microbial growth from cooked ground meat samples when refrigerated, stored at room temperature, and freshly cooked. • Research the path a prepared food item takes through the food value chain and present their findings to the class. 	

FOOD PRODUCTS AND PROCESSING SYSTEMS STANDARD

FPP.02. Apply principles of nutrition, biology, microbiology, chemistry and human behavior to the development of food products.

PERFORMANCE INDICATOR	CASE MEASUREMENTS		
	Beginning	Intermediate	Advanced
FPP.02.01. Apply principles of nutrition and biology to develop food products that provide a safe, wholesome, and nutritious food supply for local and global food systems.	AFNR 5.6 Concept 1 Food is derived from animal and plant products.	AFNR 5.5 Concept 5 Protein sources can create ethical dilemmas for producers and consumers.	
	<ul style="list-style-type: none"> Document the plant and animal food products consumed in a twenty-four-hour period. 	<ul style="list-style-type: none"> Form an opinion on animals and plant-based protein. 	

NATURAL RESOURCE SYSTEMS STANDARD

NRS.01. Plan and conduct natural resource management activities that apply logical, reasoned and scientifically based solutions to natural resource issues and goals.

PERFORMANCE INDICATOR	CASE MEASUREMENTS		
	Beginning	Intermediate	Advanced
NRS.01.01. Examine natural resource availability and ecosystem function in a particular region.	AFNR 4.4 Concept 1 Energy flows from producers (plants) to consumers (animals).	AFNR 4.4 Concept 3 Ecosystems are an interaction between organisms and the environment in which the organisms live.	
	<ul style="list-style-type: none"> Simulate the flow of energy in an ecosystem. 	<ul style="list-style-type: none"> Research an ecosystem. Develop a model and poster depicting the ecosystem they studied. Record key points of ecosystems presented by classmates. 	
	AFNR 4.4 Concept 2 Plants and animals depend on each other for survival.		
	<ul style="list-style-type: none"> Observe the interdependence of plants and animals in a controlled environment. 		

PLANT SYSTEMS STANDARD

PS.01. Develop and implement a crop management plan for a given production goal that accounts for environmental factors.

PERFORMANCE INDICATOR	CASE MEASUREMENTS		
	Beginning	Intermediate	Advanced
PS.01.01. Determine the influence of environmental factors on plant growth.	AFNR 5.3 Concept 3 The three primary nutrients, nitrogen, phosphorus, and potassium are necessary for the healthy growth of plants.	AFNR 5.3 Concept 1 Plants require adequate amounts of water for survival, growth, and development.	AFNR 5.3 Concept 2 Environmental conditions influence plant production and management practices.

	<ul style="list-style-type: none"> • Research plant macronutrients and record the functions in plants and deficiency symptoms for each. 	<ul style="list-style-type: none"> • Determine the relationship between water availability and turgor pressure. 	<ul style="list-style-type: none"> • Calculate growing degree units for two locations to determine crop maturity. • Investigate the optimal growth range for a plant using one environmental factor. • Write a lab report and develop a poster to report findings on environmental conditions and plant growth.
		AFNR 5.3 Concept 4 pH affects the health and well-being of plants.	
		<ul style="list-style-type: none"> • Research the effect of pH on plant health. 	

PLANT SYSTEMS STANDARD

PS.02. Apply principles of classification, plant anatomy, and plant physiology to plant production and management.

PERFORMANCE INDICATOR	CASE MEASUREMENTS		
	Beginning	Intermediate	Advanced
PST.02.02. Apply knowledge of plant anatomy and the functions of plant structures to activities associated with plant systems.	AFNR 5.1 Concept 3 Microscopes are used to examine cells and cellular features.	AFNR 5.2 Concept 3 Flowers, consisting of four main parts, produce seeds for reproduction.	
	<ul style="list-style-type: none"> • Demonstrate the correct use of a microscope and prepare a slide to identify an onion cell's nucleus. 	<ul style="list-style-type: none"> • Construct a model depicting the parts of a complete flower. 	
	AFNR 5.2 Concept 1 Plants have roots, stems, leaves, and flowers, which are all vital to survival.		
	<ul style="list-style-type: none"> • Identify and sketch the four basic plant parts. • Describe the functions of plant parts. 		
PERFORMANCE INDICATOR	CASE MEASUREMENTS		
	Beginning	Intermediate	Advanced
PS.02.03. Apply knowledge of plant physiology and energy conversion to plant systems.	AFNR 5.2 Concept 4 Plants convert raw materials using the energy of the sun into sugar and oxygen.	AFNR 5.2 Concept 5 Plant cells use water, oxygen, and glucose to produce energy and metabolic by-products of carbon dioxide and water.	
	<ul style="list-style-type: none"> • Determine the presence of starch in plants that have received different light treatments. 	<ul style="list-style-type: none"> • Collect data on the rate of respiration and photosynthesis of plant leaves. 	

PLANT SYSTEMS STANDARD

PS.03. Propagate, culture and harvest plants and plant products based on current industry standards.

PERFORMANCE INDICATOR	CASE MEASUREMENTS		
	Beginning	Intermediate	Advanced
PS.03.02. Develop and implement a management plan for plant production.	AFNR 5.2 Concept 2 Seeds require moisture and warmth for germination.		
	<ul style="list-style-type: none"> Conduct a germination trial to determine the germination rate of bean seeds. 		

POWER, STRUCTURAL, AND TECHNICAL SYSTEMS STANDARD

PST.01. Apply physical science principles and engineering applications to solve problems and improve performance in AFNR power, structural and technical systems.

PERFORMANCE INDICATOR	CASE MEASUREMENTS		
	Beginning	Intermediate	Advanced
PST.01.02. Apply physical science and engineering principles to design, implement and improve safe and efficient mechanical systems in AFNR situations.		AFNR 6.3 Concept 1 English and metric linear measurement systems are two useful forms of measurement used every day.	
		<ul style="list-style-type: none"> Measure the length of objects using the English and metric system. Convert fraction inches to decimal inches. 	

POWER, STRUCTURAL, AND TECHNICAL SYSTEMS STANDARD

PST.04. Plan, build and maintain AFNR structures.

PERFORMANCE INDICATOR	CASE MEASUREMENTS		
	Beginning	Intermediate	Advanced
PST.04.02. Determine structural requirements, specifications, customer needs, and estimate costs for AFNR structures.	AFNR 6.3 Concept 2 The proper use of scale is important when drafting and designing project plans.		
	<ul style="list-style-type: none"> Use proportions to solve problems and determine dimensions of objects drawn to scale. Read three-view plans of three-dimensional birdhouses to match to bird criteria. 		

PERFORMANCE INDICATOR	CASE MEASUREMENTS		
	Beginning	Intermediate	Advanced
PST.04.03. Apply best practices and safety guidelines for use of hand and power tools associated with constructing and maintaining AFNR structures.	AFNR 6.3 Concept 3 Mechanical shop tools and materials have specific purposes.	AFNR 6.3 Concept 3 Mechanical shop tools and materials have specific purposes.	
	<ul style="list-style-type: none"> Identify 20 different tools. 	<ul style="list-style-type: none"> Use tools to build a project. 	
PERFORMANCE INDICATOR	CASE MEASUREMENTS		
	Beginning	Intermediate	Advanced
PST.04.04. Follow architectural and mechanical plans to construct, maintain and/or repair AFNR structures (e.g., material selection, site preparation and/or layout, surveying, electrical, plumbing, concrete/masonry, etc.).	AFNR 6.2 Concept 1 All property is legally defined and recorded based on a standardized regulatory system.	AFNR 6.3 Concept 4 Agricultural projects involve planning, design, construction, implementation, and evaluation.	
	<ul style="list-style-type: none"> Describe parcels of land using the rectangular survey system and the metes and bounds system. 	<ul style="list-style-type: none"> Write step-by-step directions and cost for a project. Develop complete project plans including researching, sketching, writing directions, and estimating a bill of materials. 	