## Agricultural and Environmental Systems Career Field

## Wildlife and Fisheries

**Subject Code: 010745**

**Outcome & Competency Descriptions**

**Course Description:**

Learners will apply the principles and practices of conservation and ecology to maintain, manage, and promote fish and wildlife populations. Students will learn proper animal identification, nutrition, morphology, physiology, and handling techniques of species common to the region. Throughout the course, learners will research and evaluate the interrelationship between animals and human activities on habitats and populations of fish and wildlife.

**Strand 1. Business Operations/21st Century Skills**

Learners apply principles of economics, business management, marketing and employability in an entrepreneur, manager and employee role to the leadership, planning, developing and analyzing of business enterprises related to the career field.

**Outcome: 1.1. Employability Skills**

Develop career awareness and employability skills (e.g., face-to-face, online) needed for gaining and maintaining employment in diverse business settings.

**Competencies**

1.1.2. Identify the scope of career opportunities and the requirements for education, training, certification, licensure and experience.

1.1.3. Develop a career plan that reflects career interests, pathways and secondary and postsecondary options.

1.1.4. Describe the role and function of professional organizations, industry associations and organized labor and use networking techniques to develop and maintain professional relationships.

1.1.5. Develop strategies for self-promotion in the hiring process (e.g., filling out job applications, resumé writing, interviewing skills, portfolio development).

1.1.7. Apply problem-solving and critical-thinking skills to work-related issues when making decisions and formulating solutions.

**Outcome: 1.2. Leadership and Communications**

Process, maintain, evaluate and disseminate information in a business. Develop leadership and team building to promote collaboration.

**Competencies**

1.2.1. Extract relevant, valid information from materials and cite sources of information.

1.2.2. Deliver formal and informal presentations.

1.2.3. Identify and use verbal, nonverbal and active listening skills to communicate effectively.

1.2.5. Communicate information (e.g., directions, ideas, vision, workplace expectations) for an intended audience and purpose.

1.2.12. Use technical writing skills to complete forms and create reports.

1.2.13. Identify stakeholders and solicit their opinions.

**Outcome: 1.3. Business Ethics and Law**

Analyze how professional, ethical and legal behavior contributes to continuous improvement in organizational performance and regulatory compliance.

**Competencies**

1.3.1. Analyze how regulatory compliance (e.g., United States Department of Agriculture [USDA], Food and Drug Administration [FDA], United States Department of Interior [USDI], Ohio Livestock Care Standards, water quality standards, local water regulations, building codes) affects business operations and organizational performance.

**Outcome: 1.4. Knowledge Management and Information Technology**

Demonstrate current and emerging strategies and technologies used to collect, analyze, record and share information in business operations.

**Competencies**

1.4.2. Select and use software applications to locate, record, analyze and present information (e.g., word processing, e-mail, spreadsheet, databases, presentation, Internet search engines).

**Outcome: 1.11. Principles of Business Economics**

Examine and employ economic principles, concepts and policies to accomplish organizational goals and objectives.

**Competencies**

1.11.8. Identify the relationships between economy, society and environment that lead to sustainability.

**Outcome: 1.12. Site and Personal Safety Procedures**

Follow site and personal safety procedures in specific situations with specialized tools and equipment, evaluate the situation and take corrective action.

**Competencies**

1.12.2. Interpret safety signs and symbols.

1.12.7. Select, use, store, maintain and dispose of personal protective equipment (PPE), appropriate to job tasks, conditions and materials.

1.12.8. Identify safety hazards and take corrective measures.

1.12.9. Identify, inspect and use safety equipment appropriate for the task.

1.12.10. Follow established procedures for the administration of first aid and contact emergency medical personnel when necessary.

**Strand 2. Animal Science**

Learners apply principles of animal anatomy, physiology, genetics, behavior, nutrition, and production to the research and development, selection and reproduction, health, and management of animals in domestic and natural environments.

**Outcome: 2.1. Nutrition**

Analyze, formulate, prepare, and administer a ration for a population of specific animal species based on economics, nutrition, and availability of feedstuffs and evaluate the feed’s effects on animals, and animal products.

**Competencies**

2.1.1. Identify the traditional and alternative types, compositions, quality, and compatibility of feedstuff, feed additives, and feed byproducts.

2.1.2. Describe the role of nutrients and the nutritional requirements of different animal life processes and species.

2.1.3. Collect a feedstuff sample and interpret the data to determine the quality.

2.1.4. Identify and address major nutrient deficiency and toxicity symptoms.

2.1.7. Calculate performance indicators (feed efficiency, average daily gain, minimum energy required) in relation to the cost, quality, and availability of feeds.

2.1.8. Select and determine feeding and watering practices and systems, based on the animal population, purpose, and requirement.

**Outcome: 2.2. Body Systems**

Describe the interrelationships of animal body systems with growth, development, health, maintenance, reproduction and production.

**Competencies**

2.2.1. Describe external anatomical parts and their functions within different species.

2.2.2. Compare and contrast the anatomical parts of the digestive system and describe their physiology within different species.

2.2.3. Identify anatomical components of nerve tissue and the nervous system, including regions of the brain, spinal nerves and the sympathetic and parasympathetic system, and describe their physiology.

2.2.4. Identify the anatomical components of the skeletal system, including the types and forms of bones and describe their physiology.

2.2.5. Identify the anatomical components of the musculature systems, including striated, cardiac and smooth muscle and describe their physiology.

2.2.6. Compare and contrast bone growth, muscle growth, and fat deposition in relation to developmental patterns.

2.2.7. Describe the components of the cardiovascular system and their functions, including factors affecting blood flow.

2.2.8. Identify and describe the physical characteristics, components and functions of blood.

2.2.9. Identify and describe the integumentary system (e.g., skin, hair, nails, wool, feathers), related structures, functions, and cycles.

2.2.10. Identify and describe the function and components of the respiratory system and pulmonary ventilation and the factors influencing respiratory rates.

2.2.11. Identify and describe the urinary system structures and functions, including excretion and osmoregulation.

2.2.12. Compare and contrast between the male and female reproductive system, structures and functions.

2.2.13. Describe the endocrine system, its structures, and the role of hormones.

2.2.14. Identify and describe the immune system and the lymphatic system’s role in immunity.

2.2.15. Identify the anatomy and describe the physiology of the mammary system.

**Outcome: 2.3. Care and Management**

Apply animal care, management and record procedures to ensure animal husbandry and welfare, including managing environmental conditions to ensure animal health and performance.

**Competencies**

2.3.1. Identify species-specific terminology (gender, age, and reproductive status).

2.3.2. Identify, classify, evaluate and select animal species or breeds for a desired outcome.

2.3.3. Determine the biotic and abiotic factors (e.g., air, ventilation) that impact on the animals’ environment.

2.3.4. Apply concepts of pest control and nuisance animal control, sanitation, and disinfection procedures for the animals’ care and management.

2.3.5.Perform species-specific animal identification techniques for traceability and records.

2.3.6. Calculate a facility or habitat's carrying capacity and its impact on animal health.

2.3.7. Identify and recognize predator-prey relationships and implement control measures.

2.3.9. Monitor and evaluate the quality of an animal’s habitat and implement corrective methods as needed.

**Outcome: 2.4. Recognizing Diseases and Disorders**

Evaluate animal conditions for species-specific diseases and disorders to assess an animal’s health and welfare.

**Competencies**

2.4.1. Identify common infectious and noninfectious causes of diseases and disorders within different species.

2.4.2. Identify abnormalities in the skeleton, body form, and functions and identify associated symptoms.

2.4.3. Describe the clinical signs that are associated with an abnormality caused by environmental factors (e.g. heat stress, standing condition, air quality).

2.4.4. Assess clinical signs of animals and identify diseases caused by microorganisms (e.g., parasites, viruses, bacteria, fungi, protozoa).

2.4.5. Describe zoonotic diseases and explain the health risk on humans and animals.

2.4.6. Implement disease prevention methods and procedures including the use of personal protective equipment.

**Outcome: 2.5. Animal Health**

Implement preventive measures, treatment, and maintenance options for species-specific diseases and disorders to improve an animal’s health and welfare.

**Competencies**

2.5.3. Recognize the preventative measures or treatments needed to maintain animal health.

**Outcome: 2.6. Population Management**

Manage reproduction practices in animal populations across habitats to achieve the desired outcomes and specific goals.

**Competencies**

2.6.1. Identify factors that lead to reproductive maturity and select animals for reproductive readiness.

2.6.6. Understand the rationale for selecting breeding methods (e.g., artificial insemination, embryo transfer, natural selection, selective breeding, invitro fertilization, cloning).

2.6.7. Describe requirements and environmental influences during different stages of gestation within different species.

2.6.8. Describe ethical and responsible animal population management practices (e.g., spaying, neutering, heat suppression, relocation, reintroduction, hunting, containment, culling, euthanasia).

**Strand 3.**  **Biotechnology**

Learners engage in the scientific process, learn fundamental processes using modern tools and laboratory techniques, adhere to safety protocols and bring a biotechnology product to the market.

**Outcome:  3.1.  Research and Experiments**

Use scientific methodology to conduct problem-based studies, develop products, and interpret results.

**Competencies**

3.1.1. Design a research plan, including the significance of the problem, purpose, hypotheses, objectives, appropriate controls, independent variables, dependent variables, methods of study and a list of materials.

3.1.3. Apply sampling methods that appropriately represent the population and implement procedures for systematic data collection.

3.1.8. Define the concepts of confidence intervals and significant figures.

3.1.10 Describe the relationships among variables using correlations and draw conclusions.

3.1.11. Draw conclusions based on observations and data analyses, recognizing that experimental results must be open to the scrutiny of others.

3.1.12. Prepare and present findings using scientific reports.

**Strand 5. Structural Engineering**

Learners apply principles of practice related to the management and maintenance of food, agriculture and natural resources systems.

**Outcome: 5.4. Surveying and Mapping**

Perform surveying procedures to construct a site plan.

**Competencies**

5.4.2. Interpret maps, topographic site plans, deeds and aerial or satellite imagery for site planning.

5.4.3. Perform site measurements.

5.4.4. Integrate map and surveying data into geographic information system (GIS) or computer aided design (CAD) software.

**Outcome: 5.5. Geographic Information Systems (GIS)**

Employ GIS computer applications to interpret data, maps, and land use.

**Competencies**

5.5.1. Interpret and evaluate the accuracy of digital imagery and aerial photography.

5.5.2. Explain map projections and the use of scales.

**Outcome: 5.15. Animal Behavior**

Apply management practices to assure animal welfare considering species-specific behaviors, human safety, social influences, public perception, and regulations associated with animal welfare.

**Competencies**

5.15.1. Understand social influences, public perception, and regulations that are associated with animal welfare.

5.15.2. Describe the adaptations and special senses (e.g., sight, hearing, smell, touch) of animals and how they contribute to animal behavior.

5.15.3. Identify and describe the innate behavioral patterns of animals.

5.15.4. Describe social relationships involved in behavioral adjustment and adaptation (e.g., animal-to-animal and human-to-animal interaction).

5.15.5. Interpret an animal’s intent based on its vocalization, body posture, and chemical means of communication.

5.15.7. Humanely handle, restrain, and move animals.

5.15.11. Identify methods to minimize animal stress and safety (physiology, psychological and nutritional).

5.15.12. Examine an animal to evaluate its general condition.

**Outcome: 5.16. Biosecurity**

Connect the sources and causes of contamination and develop protocols to implement biosecurity procedures.

**Competencies**

5.16.2. Identify activities and biological agents that contribute to the risk of acquiring or preventing a specific disease.

5.16.5. Implement biosecurity procedures to prevent cross-site contamination (e.g., proper use and disposal of personal protective equipment [PPE] from site to site, vehicle cleaning between farm and processing site).

5.16.7 Select bio-containment practices (e.g., quarantine, eradicate, showering into facilities) to manage pests and diseases.

**Strand 6. Environmental Science**

Learners apply earth, life, and physical sciences to the production, extraction, processing, protection, use, and renewal of both renewable and non-renewable resources.

**Outcome: 6.2. Water Quality**

Analyze, interpret, and manage the biological, chemical and physical properties of water quality.

**Competencies**

6.2.1. Assess and explain the interactions between human activities and the Earth’s hydrosphere (e.g., septic systems, desalinization, point and non-point source pollution).

6.2.2. Measure pH, dissolved oxygen (DO), biological oxygen demand (BOD), nitrogen and phosphorus in lentic and lotic waters to determine water quality.

6.2.3. Measure vegetation, temperature, turbidity, macroinvertebrate populations and bacterial quality of lentic and lotic waters to determine water quality.

6.2.4. Explain the hydrological cycle and how human and animal activity impacts the cycle.

6.2.5. Explain the biotic and abiotic factors affecting water quality.

6.2.6. Monitor and analyze water quality and quantity.

6.2.7. Identify and describe best management and industry (e.g., agriculture, timber production, construction) production practices that maintain or improve water quality.

**Outcome: 6.10. Ecosystems**

Evaluate biotic and abiotic components and relationships in ecosystems to apply restoration and conservation practices that maintain functionality.

**Competencies**

6.10.1. Describe ecological levels, including population, community, ecosystem, biome and biosphere.

6.10.2. Distinguish the flow of energy through ecosystems.

6.10.3. Identify and classify interactions among organisms, including predation, symbiosis and competition, to determine species interdependent relationships.

6.10.4. Describe the process of succession and its impact on ecosystems.

6.10.5. Connect biotic interactions with the abiotic environment.

6.10.6. Describe biogeochemical cycles (e.g., carbon, nitrogen, phosphorous, hydrological) and their roles in maintaining equilibrium in an ecosystem.

6.10.7. Identify interactions of ecosystems to differentiate biomes.

6.10.8. Select and implement restoration ecology practices to repair damaged ecosystems.

6.10.9. Determine the impact of native and non-native invasive species on ecosystems.

6.10.10. Describe the relationship between evolution and the ecosystem.

**Outcome: 6.11. Habitat Management and Restoration**

Develop a plan for the management and restoration of a specific habitat.

**Competencies**

6.11.1. Differentiate the properties and characteristics of habitats.

6.11.2. Examine sites and place them into ecological classifications.

6.11.3. Evaluate the current and historical (e.g., industrialism, agriculture, climate change) impacts of human interactions on ecosystems and on habitats.

6.11.4. Identify and differentiate extinct, endangered, extirpated, threatened, and species of concern.

6.11.5. Survey and monitor species within a habitat.

6.11.6. Explain the role of various stakeholders, including individuals, non-governmental organizations (NGOs), corporations, and governments in habitat restoration and conservation.

6.11.7. Implement techniques used in habitat management, mitigation, enhancement, and restoration.

6.11.8. Develop a management plan for the restoration and sustainability of a specific habitat using environmental practices that enhance biological diversity.