

# Plant and Soil (2025)

## PROFESSIONAL ORGANIZATIONS AND LEADERSHIP 1.0

### 1 Student Leadership in Career Technical Student Organizations (CTSO) and Professional Associations 1.1

- 1 Explore the role of professional organizations and/or associations in the Plant and Soil Science industry. 1.1.1
  - 2 Define the value, role, and opportunities provided through career technical student organizations. 1.1.2
  - 3 Engage in career exploration and leadership development. 1.1.3
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### 2 Supervised Agricultural Experience 1.2

- 1 Maintain Supervised Agriculture Experience (SAE) record books. 1.2.1
  - 2 Describe the proficiency award areas related to the SAE program area. 1.2.2
  - 3 Describe necessary steps to receive higher degrees in FFA. 1.2.3
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## PLANT ANATOMY AND IDENTIFICATION 2.0

### 1 Plant Anatomy 2.1

- 1 Describe the primary parts of a plant and their functions. 2.1.1
  - 2 Describe the parts of plant cells and their functions. 2.1.2
  - 3 Identify the three basic types of tissues found in a plant (i.e., dermal, vascular, ground) and their functions. 2.1.3
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### 2 Plant Identification 2.2

- 1 Describe the systems of plant classification. 2.2.1
  - 2 Differentiate between plant parts and modifications (e.g., roots, stems, leaves, flowers, fruits, seeds). 2.2.2
  - 3 Determine plant identification by using a dichotomous key. 2.2.3
  - 4 Identify common Idaho crops. 2.2.4
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## PLANT PROCESSES AND GROWTH AND DEVELOPMENT 3.0

### 1 Plant Processes 3.1

- 1 Differentiate among photosynthesis, respiration, transpiration and water/nutrient uptake. 3.1.1
- 2 Describe the process and purpose of photosynthesis, respiration, transpiration and water/nutrient uptake. 3.1.2
- 3 List factors that affect the rate of photosynthesis, respiration, transpiration, and water/nutrient uptake. 3.1.3

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## **2 Plant Growth and Development** 3.2

- 1 List the stages of plant growth and development (e.g., germination, vegetative growth, reproductive growth). 3.2.1
- 2 Describe environmental conditions affecting the vegetative growth of plants. 3.2.2
- 3 Describe asexual and sexual reproduction in plants. 3.2.3
- 4 Cultivate asexual and sexual reproduction in plants (e.g., grafting, tubers, cuttings, divisions, seeding, hand pollination). 3.2.4

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## **3 Classical Plant Breeding** 3.3

- 1 Describe methods and strategies of pollination. 3.3.1
- 2 Describe the selective plant breeding process. 3.3.2
- 3 Calculate heritability. 3.3.3
- 4 Interpret plant breeding data. 3.3.4

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## **SOIL AND WATER** 4.0

### **1 Introduction to Soils** 4.1

- 1 Describe the function of soil as it relates to plant growth, development, and maintenance. 4.1.1
- 2 Describe the factors that affect soil formation (e.g., climate, parent material, organisms, topography, time). 4.1.2
- 3 Classify physical properties of soil (e.g., texture, structure, color, profile). 4.1.3
- 4 Describe characteristics of the six types of soil structure (i.e., granular, blocky, platy, prismatic, columnar, massive). 4.1.4
- 5 Determine soil texture from a sample. 4.1.5
- 6 Determine how pH affects the soil. 4.1.6
- 7 Identify methods of amending soil pH. 4.1.7
- 8 Compare biotic and abiotic components of soil (e.g., organic matter, mineral matter, air space, water space). 4.1.8

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### **2 Soil Moisture Management** 4.2

- 1 Describe water movement through different soil textures. 4.2.1
- 2 Define key soil moisture terms (e.g., volumetric water content, water potential, water holding capacity, field capacity). 4.2.2
- 3 Identify methods of measuring soil moisture. 4.2.3

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### **3 Irrigation Management** 4.3

- 1 Identify the need for irrigation, including water holding capacity and soil moisture. 4.3.1
  - 2 Describe methods of irrigation (e.g., sources, delivery, equipment). 4.3.2
  - 3 Select irrigation methods for optimum production goals (e.g., equipment, crops, resource availability, economics). 4.3.3
  - 4 Describe Idaho's water law based on the appropriation doctrine and its significance in current state agriculture. 4.3.4
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### **4 Soil Health** 4.4

- 1 Identify characteristics of soil health (e.g., high organic matter, good soil structure, balanced pH, high biological activity, adequate nutrition). 4.4.1
  - 2 Describe methods for improving soil health (e.g., cover crops, reduced tillage, multiple species, strip till, compost). 4.4.2
  - 3 Describe the limitations associated with soil health practices (e.g., economics, manpower, sustainability, time, environment). 4.4.3
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## **PLANT NUTRITION** 5.0

### **1 Sources and Roles of Plant Nutrients** 5.1

- 1 Identify primary nutrients, secondary nutrients, and micronutrients. 5.1.1
  - 2 Differentiate the roles and functions of primary nutrients, secondary nutrients, and micronutrients in the plant. 5.1.2
  - 3 Identify the primary sources (i.e., plant available, nutrient form) of N-P-K-S. 5.1.3
  - 4 Describe nutrient uptake patterns (e.g. diffusion, interception, mass flow). 5.1.4
  - 5 Identify movement and losses of nutrients from agroecosystems. 5.1.5
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### **2 Plant Nutrient Deficiencies** 5.2

- 1 Identify common nutrient deficiencies in crops. 5.2.1
  - 2 Describe the common causes of nutrient deficiencies in crops. 5.2.2
  - 3 Diagnose nutrient deficiencies and common problems caused by biological pests. 5.2.3
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### **3 Soil and Plant Nutrients** 5.3

- 1 Demonstrate soil sampling techniques. 5.3.1
  - 2 Interpret Soil Analysis. 5.3.2
  - 3 Calculate nutrient removal rate by crop. 5.3.3
  - 4 Calculate fertilizer application and cost, based on soil analysis. 5.3.4
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## **INTEGRATED PEST MANAGEMENT 6.0**

### **1 Concepts and Principles of Integrated Pest Management 6.1**

- 1 Describe methods of integrated pest management (e.g., cultural, biological, mechanical, chemical). 6.1.1
  - 2 Identify elements of the disease triangle. 6.1.2
  - 3 Analyze economic thresholds of crop damage caused by disease, insects, and weeds. 6.1.3
  - 4 Describe the limitations associated with integrated pest management methods (e.g. resistance management, beneficial insects, eradication vs. control). 6.1.4
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### **2 Pest Identification 6.2**

- 1 Identify common Idaho weeds, insects, and diseases. 6.2.1
  - 2 Describe competition and economic losses caused by pests. 6.2.2
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## **EMERGING TECHNOLOGIES 7.0**

### **1 Advancements in Plant and Soil Technology 7.1**

- 1 Describe the improvements and limitations of genetic engineering. 7.1.1
  - 2 Describe the tools and techniques used for genetic modification (e.g., CRISPR, GMO, Roundup Ready, Liberty Link, Dicamba). 7.1.2
  - 3 Describe current industry automation and precision agriculture technologies. 7.1.3
  - 4 Describe advancements in fertilizers, chemical, and biologicals and their impacts on Good Agricultural Practices (GAP) and sustainability. 7.1.4
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## **CROP PRODUCTION OPERATIONS 8.0**

### **1 Crop Production 8.1**

- 1 Describe procedures in the production, harvesting, handling, processing, and storing of Idaho crops and crop products. 8.1.1
  - 2 Interpret general maturity and harvest-time guidelines for specific local plant products. 8.1.2
  - 3 Describe common marketing methods and shipping characteristics for Idaho crops. 8.1.3
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### **2 Operational Safety 8.2**

- 1 Describe personal protection equipment requirements. 8.2.1
- 2 Differentiate between safe and unsafe work practices. 8.2.2
- 3 Interpret chemical label directions and information on Safety Data Sheets (SDS). 8.2.3
- 4 Describe safety hazards associated with crop production equipment and related safety practices (e.g., lockout/tagout, emergency response, safety plan). 8.2.4