

# 2025 Plant and Soil

## Program Standards

### CONTENT STANDARD 1.0: PROFESSIONAL ORGANIZATIONS AND LEADERSHIP

Performance Standard 1.1: 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.
- 1.1.2 Define the value, role, and opportunities provided through career technical student organizations.
- 1.1.3 Engage in career exploration and leadership development.

Performance Standard 1.2: Supervised Agricultural Experience

- 1.2.1 Maintain Supervised Agriculture Experience (SAE) record books.
- 1.2.2 Describe the proficiency award areas related to the SAE program area.
- 1.2.3 Describe necessary steps to receive higher degrees in FFA.

### CONTENT STANDARD 2.0: PLANT ANATOMY AND IDENTIFICATION

Performance Standard 2.1: Plant Anatomy

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

Performance Standard 2.2: Plant Identification

- 2.2.1 Describe the systems of plant classification.
- 2.2.2 Differentiate between plant parts and modifications (e.g., roots, stems, leaves, flowers, fruits, seeds).
- 2.2.3 Determine plant identification by using a dichotomous key.
- 2.2.4 Identify common Idaho crops.

### CONTENT STANDARD 3.0: PLANT PROCESSES AND GROWTH AND DEVELOPMENT

Performance Standard 3.1: Plant Processes

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

Performance Standard 3.2: Plant Growth and Development

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

Performance Standard 3.3: Classical Plant Breeding

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

### CONTENT STANDARD 4.0: SOIL AND WATER

Performance Standard 4.1: Introduction to Soils

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

#### Performance Standard 4.2: Soil Moisture Management

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

#### Performance Standard 4.3: Irrigation Management

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

#### Performance Standard 4.3: 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).
- 4.4.2 Describe methods for improving soil health (e.g., cover crops, reduced tillage, multiple species, strip till, compost).
- 4.4.3 Describe the limitations associated with soil health practices (e.g., economics, manpower, sustainability, time, environment).

### CONTENT STANDARD 5.0: PLANT NUTRITION

#### Performance Standard 5.1: Sources and Roles of Plant Nutrients

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

#### Performance Standard 5.2: Plant Nutrient Deficiencies

- 5.2.1 Identify common nutrient deficiencies in crops.
- 5.2.2 Describe the common causes of nutrient deficiencies in crops.
- 5.2.3 Diagnose nutrient deficiencies and common problems caused by biological pests.

#### Performance Standard 5.3: Soil and Plant Nutrients

- 5.3.1 Demonstrate soil sampling techniques.
- 5.3.2 Interpret Soil Analysis.
- 5.3.3 Calculate nutrient removal rate by crop.
- 5.3.4 Calculate fertilizer application and cost, based on soil analysis.

### CONTENT STANDARD 6.0: INTEGRATED PEST MANAGEMENT

#### Performance Standard 6.1: Concepts and Principles of Integrated Pest Management

- 6.1.1 Describe methods of integrated pest management (e.g., cultural, biological, mechanical, chemical).



- 6.1.2 Identify elements of the disease triangle.
- 6.1.3 Analyze economic thresholds of crop damage caused by disease, insects, and weeds.
- 6.1.4 Describe the limitations associated with integrated pest management methods (e.g. resistance management, beneficial insects, eradication vs. control).

#### Performance Standard 6.2: Pest Identification

- 6.2.1 Identify common Idaho weeds, insects, and diseases.
- 6.2.2 Describe competition and economic losses caused by pests.

### CONTENT STANDARD 7.0: EMERGING TECHNOLOGIES

#### Performance Standard 7.1: Advancements in Plant and Soil Technology

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

### CONTENT STANDARD 8.0: CROP PRODUCTION OPERATIONS

#### Performance Standard 8.1: Crop Production

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

#### Performance Standard 8.2: Operational Safety

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