

***ORNAMENTAL HORTICULTURE/
GREENHOUSE MANAGEMENT
STANDARDS***



This document was prepared by:

Office of Career, Technical and Adult Education
Nevada Department of Education
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BUSINESS AND INDUSTRY VALIDATION

All CTE standards developed through the Nevada Department of Education are validated by business and industry through one or more of the following processes: (1) the standards are developed by a team consisting of business and industry representatives; or (2) a separate review panel was coordinated with industry experts to ensure the standards include the proper content; or (3) the adoption of nationally-recognized standards endorsed by business and industry.

The Ornamental Horticulture/Greenhouse Management standards were validated through active participation of business and industry representatives on the development team and validated through a complete review by an industry panel.

PROJECT COORDINATOR

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AGRICULTURE AND NATURAL RESOURCES

Program Requirements

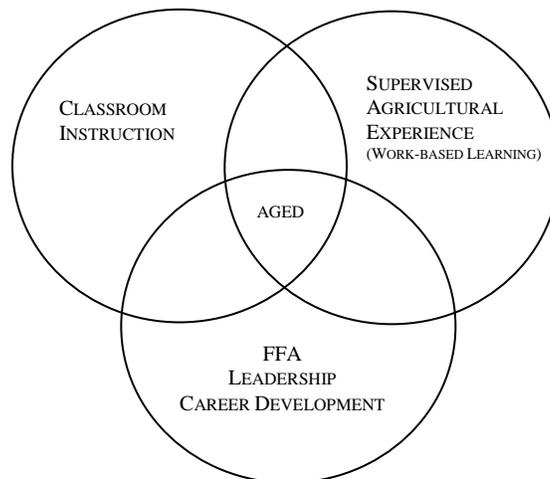
Occupations associated with agriculture production, natural resources, processing and distribution of food and fiber are important to the national interests and provide significant employment opportunities. Occupational education and training in agriculture and agri-business are essential to the continued economic health of Nevada and the nation, as it provides the needed competent and trained work force.

Agriculture education provides high school students with technical and specialized knowledge in production agriculture and natural resources as well as other specific agriculture occupations. The programs are designed to meet students' occupational objectives, interests, and abilities for entry into chosen occupations and can prepare them for advanced education and training. Agriculture education is a coordinated program of group and individual instructional activities consisting of classroom instruction, laboratory experiences, and leadership development. Integral to these activities are FFA (leadership development) and Supervised Agricultural Experience (work-based learning), Nevada Revised Statute 385.110. Federal/Public law#105-225 which was passed in August, 1998, states "Congress of the United States recognizes the importance of the FFA as an integral part of the program of Vocational Agriculture." All students enrolled in Agriculture Education will be recognized as members of the FFA organization. All secondary agriculture education programs and school districts will purchase a curriculum packet consisting of the New Horizons agriculture career and technical magazine, the FFA manual, and the Nevada Record Book on a yearly basis for every student enrolled in agriculture education in their program. Areas of study at the secondary level are divided into Agriculture Science and Specialized Advanced Agriculture Career and Technical Areas.

Agriculture and Society, Plant and Soil Science, Agriculture Mechanical Engineering and Technology, Animal Science, Leadership/FFA, Agriculture Business, Sales, Marketing and Supervised Agricultural Experience, Natural Resources, and Employability are included in the Agriculture Science introduction division.

Instruction in business/specialized agriculture provides training in specific occupational skills, duties, and tasks, as determined by the business and industry needs. Specialized career and technical agriculture programs will include, but are not limited to, the following: ornamental horticulture, floriculture design, turf and landscape management, equine science and technology, forestry technology, wildlife management and enforcement, food science and processing, feedlot management, animal science, veterinary science, agriculture power systems, natural resources and reclamation, mining science and operations, nursery and greenhouse management, landscape architecture, irrigation and chemical management, lawn care and maintenance, and agriculture construction.

NEVADA AGRICULTURE EDUCATION Model of Instruction



INTRODUCTION

The standards in this document are designed to clearly state what the student should know and be able to do upon completion of an advanced high school program for Ornamental Horticulture/Greenhouse Management. These standards are designed for a three-credit course sequence that prepares the student for a technical assessment directly aligned to the standards.

These exit-level standards are designed for the student to complete all standards through their completion of a program of study. These standards are intended to guide curriculum objectives for a program of study.

The standards are organized as follows:

Content Standards are general statements that identify major areas of knowledge, understanding, and the skills students are expected to learn in key subject and career areas by the end of the program.

Performance Standards follow each content standard. Performance standards identify the more specific components of each content standard and define the expected abilities of students within each content standard.

Performance Indicators are very specific criteria statements for determining whether a student meets the performance standard. Performance indicators may also be used as learning outcomes, which teachers can identify as they plan their program learning objectives.

The crosswalk and alignment section of the document shows where the performance indicators support the English Language Arts and the Mathematics Common Core State Standards, and the Nevada State Science Standards. Where correlation with an academic standard exists, students in the Ornamental Horticulture/Greenhouse Management program perform learning activities that support, either directly or indirectly, achievement of one or more Common Core State Standards.

All students are encouraged to participate in the career and technical student organization (CTSO) that relates to their program area. CTSOs are co-curricular national associations that directly enforce learning in the CTE classroom through curriculum resources, competitive events, and leadership development. CTSOs provide students the ability to apply academic and technical knowledge, develop communication and teamwork skills, and cultivate leadership skills to ensure college and career readiness.

The Employability Skills for Career Readiness identify the “soft skills” needed to be successful in all careers, and must be taught as an integrated component of all CTE course sequences. These standards are available in a separate document.

CONTENT STANDARD 1.0 : PRACTICE SAFETY IN THE ORNAMENTAL HORTICULTURE AND GREENHOUSE INDUSTRY

PERFORMANCE STANDARD 1.1 : PROPERLY PERFORM SAFE WORK PRACTICES

<p>1.1.1 1.1.2 1.1.3 1.1.4 1.1.5</p>	<p>Identify and properly use personal protection equipment Read, understand and follow label directions and MSDS Properly identify common hand tools and power equipment Safely use common hand tools and power equipment Complete worker protection handler verification card training</p>
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CONTENT STANDARD 2.0 : UNDERSTANDING PLANT ANATOMY**PERFORMANCE STANDARD 2.1 : UNDERSTAND ROOT ANATOMY**

- 2.1.1 Investigate the functions of roots in plants
- 2.1.2 Identify the parts of a root
- 2.1.3 Differentiate the two major types of root systems
- 2.1.4 Investigate specialized structures in roots

PERFORMANCE STANDARD 2.2 : UNDERSTAND STEM ANATOMY

- 2.2.1 List the functions of a stem
- 2.2.2 Recognize the external structures of a stem
- 2.2.3 Analyze the internal structures of a stem cell
- 2.2.4 Investigate specialized structures in stems

PERFORMANCE STANDARD 2.3 : UNDERSTAND LEAF ANATOMY

- 2.3.1 Name the main parts of a leaf
- 2.3.2 Compare common vein patterns found in leaves
- 2.3.3 List three functions of a leaf, including photosynthetic energy conversion
- 2.3.4 Differentiate major leaf arrangements
- 2.3.5 Investigate specialized cell structures in a leaf

PERFORMANCE STANDARD 2.4 : UNDERSTAND FLOWER ANATOMY

- 2.4.1 Label and describe the parts of a flower
- 2.4.2 Summarize the purpose of a flower
- 2.4.3 Distinguish between different types of flowers
- 2.4.4 Describe the difference between monocot and dicot flowers
- 2.4.5 Diagram the process of plant fertilization

CONTENT STANDARD 3.0 : UNDERSTANDING PLANT PHYSIOLOGY**PERFORMANCE STANDARD 3.1 : EXAMINE ENERGY CONVERSION IN PLANTS**

- | | |
|-------|--|
| 3.1.1 | Interpret the process of photosynthesis |
| 3.1.2 | Interpret the process of respiration |
| 3.1.3 | Compare the process of respiration to photosynthesis |

PERFORMANCE STANDARD 3.2 : EXAMINE TRANSPORT WITHIN A PLANT SYSTEM

- | | |
|-------|---|
| 3.2.1 | Compare the active and passive transport of minerals into and through the root systems to plant nutrition |
| 3.2.2 | Compare the structure and function of xylem and phloem cells and tissues |
| 3.2.3 | Describe the process of translocation |

PERFORMANCE STANDARD 3.3 : EXAMINE ENVIRONMENTAL REQUIREMENTS FOR PLANT GROWTH

- | | |
|-------|---|
| 3.3.1 | Examine the effects of light quality on plant growth (i.e., spectrum, foot candles) |
| 3.3.2 | Examine the effects of water quality on plant growth (i.e., pH, hardness) |
| 3.3.3 | Examine the effects of temperature on plant growth |

PERFORMANCE STANDARD 3.4 : RESEARCH PLANT GROWTH REGULATORS

- | | |
|-------|---|
| 3.4.1 | Compare the functions of plant hormones |
| 3.4.2 | Examine commercial uses for plant growth regulators |

PERFORMANCE STANDARD 3.5 : EXPLORE PLANT TROPISMS

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|-------|--|
| 3.5.1 | Investigate plant tropisms (e.g., photo, thigma or gravi-) |
|-------|--|

CONTENT STANDARD 4.0 : USE PLANT IDENTIFICATION SKILLS**PERFORMANCE STANDARD 4.1 : CATEGORIZE PLANTS**

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|-------|--|
| 4.1.1 | Correctly categorize common plants by life cycle (i.e., annuals, perennials, etc.) |
| 4.1.2 | Correctly categorize plants by growth habits (i.e., mounding, trailing, etc.) |
| 4.1.3 | Utilize resources to establish plant suitability for a selected site (i.e., Hardiness Zone Maps, Heat Zone Maps) |
| 4.1.4 | Identify common plants by botanical and common names |

CONTENT STANDARD 5.0 : EXPLORE GROWING MEDIA**PERFORMANCE STANDARD 5.1 : UNDERSTAND SOIL TEXTURE AND STRUCTURE**

- | | |
|-------|---|
| 5.1.1 | List the components of soil |
| 5.1.2 | Describe the concept of soil texture and its importance |
| 5.1.3 | Classify the texture of a soil sample |
| 5.1.4 | Identify various soil structures, their formation, and importance in agriculture production |

PERFORMANCE STANDARD 5.2 : EXPLORE SOILLESS GROWING MEDIA

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|-------|---|
| 5.2.1 | Identify the components and source of soilless growing media |
| 5.2.2 | Describe the functions of growing media |
| 5.2.3 | Determine desirable properties of growing media (i.e., drainage, organic matter, micro-organisms) |
| 5.2.4 | Evaluate the advantages and disadvantages of soilless media |

PERFORMANCE STANDARD 5.3 : EXPLORE CHEMICAL CHARACTERISTICS OF GROWING MEDIA

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|-------|--|
| 5.3.1 | Test and determine pH level of various growing media |
| 5.3.2 | Interpret pH test results of a growing media sample |
| 5.3.3 | Test and determine the electrical conductivity (EC) of various growing media |
| 5.3.4 | Interpret EC test results of a growing media sample |
| 5.3.5 | Interpret soil test results and make recommendation accordingly |

CONTENT STANDARD 6.0 : EXPLORE PLANT NUTRITION**PERFORMANCE STANDARD 6.1 : EXPLORE FERTILIZER FORMULATION**

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|-------|---|
| 6.1.1 | Identify the components of a fertilizer and their role in the biochemical cycle |
| 6.1.2 | Interpret a fertilizer label |
| 6.1.3 | Categorize methods of application (i.e., granular, time released, injector, foliar) |
| 6.1.4 | Develop a fertilizer management plan for a greenhouse crop |

PERFORMANCE STANDARD 6.2 : EXPLORE THE FUNCTION OF PLANT NUTRIENTS

- | | |
|-------|--|
| 6.2.1 | Correlate plant symptoms to the appropriate nutritional deficiency |
| 6.2.2 | Correlate plant symptoms to the appropriate plant toxicity |

CONTENT STANDARD 7.0 : EXPLORE INTEGRATED PEST MANAGEMENT (IPM)**PERFORMANCE STANDARD 7.1 : DESCRIBE INTEGRATED PEST MANAGEMENT**

- | | |
|-------|---|
| 7.1.1 | Define Integrated Pest Management (IPM) |
| 7.1.2 | Summarize the benefits of IPM |

PERFORMANCE STANDARD 7.2 : EXPLORE COMMON PESTS AND DISEASES

- | | |
|-------|---|
| 7.2.1 | Identify types of plant pests and diseases |
| 7.2.2 | Identify weed, insect, rodent, and fungi pests |
| 7.2.3 | Differentiate between infectious and noninfectious diseases |

PERFORMANCE STANDARD 7.3 : EXPLAIN PROCEDURES FOR THE SAFE HANDLING , USE AND STORAGE OF PESTICIDES

- | | |
|-------|---|
| 7.3.1 | Identify and utilize appropriate safety measures when applying pesticides |
| 7.3.2 | Interpret pesticide labels |
| 7.3.3 | Explain procedures for storing and disposing of pesticides |
| 7.3.4 | Evaluate environmental and consumer concerns regarding pest management and biodiversity |
| 7.3.5 | Mix pesticides according to label directions |
| 7.3.6 | Explore requirements for obtaining pesticide applicator licenses |

CONTENT STANDARD 8.0 : DEMONSTRATE PLANT PROPAGATION**PERFORMANCE STANDARD 8.1 : UNDERSTAND PROPAGATION BY SEED**

- | | |
|-------|---|
| 8.1.1 | Diagram the process of seed germination |
| 8.1.2 | Identify the conditions needed for seed germination |
| 8.1.3 | Compare the methods of seed preparation |
| 8.1.4 | Demonstrate techniques for sowing seeds |
| 8.1.5 | Determine germination percent |

PERFORMANCE STANDARD 8.2 : UNDERSTAND ASEXUAL PROPAGATION

- | | |
|-------|---|
| 8.2.1 | Summarize optimum conditions for asexual propagation |
| 8.2.2 | Demonstrate techniques used to propagate plants by cutting |
| 8.2.3 | Demonstrate techniques used to propagate plants by division |
| 8.2.4 | Demonstrate techniques used to propagate plants by separation |
| 8.2.5 | Demonstrate techniques used to propagate plants by layering |

CONTENT STANDARD 9.0 : GROWING GREENHOUSE CROPS**PERFORMANCE STANDARD 9.1 : PREPARE FOR CROP PRODUCTION**

- | | |
|-------|---|
| 9.1.1 | Plan a growing schedule to maximize the production of a greenhouse facility |
| 9.1.2 | Utilize best management practices when spacing greenhouse crops |
| 9.1.3 | Select appropriate containers and medium for a greenhouse crop |

PERFORMANCE STANDARD 9.2 : PERFORM GROWTH MAINTENANCE PROCEDURES

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|-------|---|
| 9.2.1 | Compare and contrast hard and soft pinches |
| 9.2.2 | Pinch plants using best management practices |
| 9.2.3 | Demonstrate proper watering techniques |
| 9.2.4 | Develop a plant lighting schedule for a greenhouse crop |
| 9.2.5 | Develop a fertilizer schedule for a greenhouse crop |

PERFORMANCE STANDARD 9.3 : PERFORM TRANSPLANTING

- | | |
|-------|---|
| 9.3.1 | Identify the proper stage of plant growth for transplanting |
| 9.3.2 | Select appropriate plants for transplanting |
| 9.3.3 | Demonstrate transplanting procedures to industry standards |

PERFORMANCE STANDARD 9.4 : PREPARE PLANTS FOR SALE

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|-------|---|
| 9.4.1 | Compare hardening processes |
| 9.4.2 | Prepare plants for sale using best management practices |

CONTENT STANDARD 10.0 : EXPLORE GREENHOUSE BUSINESS CONCEPTS**PERFORMANCE STANDARD 10.1 : EXPLAIN THE BASICS OF MARKETING IN THE GREENHOUSE INDUSTRY**

- | | |
|--------|---|
| 10.1.1 | Compare and contrast advertising methods |
| 10.1.2 | Define the purpose for developing a marketing plan |
| 10.1.3 | Create a horticulture business display to a target market |

PERFORMANCE STANDARD 10.2 : UNDERSTAND THE PRINCIPLES OF SALES

- | | |
|--------|---|
| 10.2.1 | Compare and contrast the relationship between marketing and selling |
| 10.2.2 | Calculate markup |
| 10.2.3 | Complete a sales ticket |

CONTENT STANDARD 11.0 : EXPLORING PLANT TECHNOLOGIES**PERFORMANCE STANDARD 11.1 : EXPLORE SELECTIVE PLANT BREEDING**

- | | |
|--------|--|
| 11.1.1 | Describe the selective plant breeding process |
| 11.1.2 | Explain how to estimate the heritability of certain traits |
| 11.1.3 | Predict the genotypes and phenotypes from monohybrid and dihybrid crosses using a Punnett Square |
| 11.1.4 | Describe sex determination, linkage, crossover, and mutation |
| 11.1.5 | Describe how biotechnology tools are used to monitor and direct plant breeding |

PERFORMANCE STANDARD 11.2 : EXAMINE GENETIC ENGINEERING OF PLANTS

- | | |
|--------|---|
| 11.2.1 | Explain the advantages and disadvantages for genetic manipulation of plants |
| 11.2.2 | Identify transgenic plants on the market |

PERFORMANCE STANDARD 11.3 : DESCRIBE MICROPROPAGATION TECHNIQUES

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|--------|--|
| 11.3.1 | Define micropropagation and its importance |
| 11.3.2 | Explain applications of micropropagation |
| 11.3.3 | Describe procedures used in micropropagation |

PERFORMANCE STANDARD 11.4 : EXPLORE HYDROPONIC TECHNIQUES

- | | |
|--------|---|
| 11.4.1 | Define hydroponics and its importance to society |
| 11.4.2 | Explain applications of hydroponics |
| 11.4.3 | Describe procedures used in hydroponic plant production |

CONTENT STANDARD 12.0 : EXPLORE CAREER OPPORTUNITIES IN HORTICULTURE**PERFORMANCE STANDARD 12.1 : EXPLORE CAREERS IN HORTICULTURE**

- | | |
|--------|--|
| 12.1.1 | Research potential careers in ornamental horticulture and plant science |
| 12.1.2 | Prepare a list of employability skills for a career in the horticulture industry |
| 12.1.3 | Research additional industry certifications available |

CONTENT STANDARD 13.0 : PARTICIPATE IN LEADERSHIP TRAINING THROUGH MEMBERSHIP IN FFA

PERFORMANCE STANDARD 13.1 : RECOGNIZE THE TRAITS OF EFFECTIVE LEADERS AND PARTICIPATE IN LEADERSHIP TRAINING THROUGH INVOLVEMENT IN FFA

- | | |
|--------|--|
| 13.1.1 | Expand leadership experience by serving as a chapter officer or on a committee |
| 13.1.2 | Exhibit leadership skills by demonstrating proper parliamentary procedure |
| 13.1.3 | Participate in a career skill development event at least at the local level |

PERFORMANCE STANDARD 13.2 : UNDERSTAND THE IMPORTANCE OF SCHOOL AND COMMUNITY AWARENESS

- | | |
|--------|--|
| 13.2.1 | Participate in a school improvement or community development project |
|--------|--|

CONTENT STANDARD 14.0 : DESCRIBE THE RELATIONSHIP BETWEEN A SUPERVISED AGRICULTURAL EXPERIENCE (SAE) AND PREPARATION OF STUDENTS FOR A CAREER IN AGRICULTURE

PERFORMANCE STANDARD 14.1 : MAINTAIN A SUPERVISED AGRICULTURAL EXPERIENCE

- | | |
|--------|--|
| 14.1.1 | Accurately maintain SAE record books |
| 14.1.2 | Apply for proficiency award related to SAE program area |
| 14.1.3 | Actively pursue necessary steps to receive higher degrees in FFA |

**CROSSWALKS AND ALIGNMENTS OF
ORNAMENTAL HORTICULTURE/GREENHOUSE MANAGEMENT STANDARDS
AND THE COMMON CORE STATE STANDARDS,
THE NEVADA SCIENCE STANDARDS,
AND THE COMMON CAREER TECHNICAL CORE STANDARDS**

CROSSWALK (ACADEMIC STANDARDS)

The crosswalk of the Ornamental Horticulture/Greenhouse Management Standards shows links to the Common Core State Standards for English Language Arts and Mathematics and the Nevada Science Standards. The crosswalk identifies the performance indicators in which the learning objectives in the Ornamental Horticulture/Greenhouse Management program support academic learning. The performance indicators are grouped according to their content standard and are crosswalked to the English Language Arts and Mathematics Common Core State Standards and the Nevada Science Standards.

ALIGNMENTS (MATHEMATICAL PRACTICES)

In addition to correlation with the Common Core Mathematics Content Standards, many performance indicators support the Common Core Mathematical Practices. The following table illustrates the alignment of the Ornamental Horticulture/Greenhouse Management Standards Performance Indicators and the Common Core Mathematical Practices. This alignment identifies the performance indicators in which the learning objectives in the Ornamental Horticulture/Greenhouse Management program support academic learning.

CROSSWALK (COMMON CAREER TECHNICAL CORE)

The crosswalk of the Ornamental Horticulture/Greenhouse Management Standards shows links to the Common Career Technical Core. The crosswalk identifies the performance indicators in which the learning objectives in the Ornamental Horticulture/Greenhouse Management program support the Common Career Technical Core. The Common Career Technical Core defines what students should know and be able to do after completing instruction in a program of study. The Ornamental Horticulture/Greenhouse Management Standards are crosswalked to the Agriculture, Food, and Natural Resources Career Cluster™ and the Plant Systems Career Pathway.

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**CROSSWALK OF ORNAMENTAL HORTICULTURE/GREENHOUSE MANAGEMENT
STANDARDS
AND THE COMMON CORE STATE STANDARDS**

**CONTENT STANDARD 1.0: PRACTICE SAFETY IN THE ORNAMENTAL HORTICULTURE AND
GREENHOUSE INDUSTRY**

Performance Indicators	Common Core State Standards and Nevada Science Standards
1.1.2	English Language Arts: Reading Standards for Literacy in Science and Technical Subjects RST.11-12.9 Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible.

CONTENT STANDARD 2.0: UNDERSTANDING PLANT ANATOMY

Performance Indicators	Common Core State Standards and Nevada Science Standards
2.1.4	Science: Life Science L.12.B.1 Students know cell structures and their functions.
2.2.4	Science: Life Science L.12.B.1 Students know cell structures and their functions.
2.3.5	Science: Life Science L.12.B.1 Students know cell structures and their functions.

CONTENT STANDARD 3.0: UNDERSTANDING PLANT PHYSIOLOGY

Performance Indicators	Common Core State Standards and Nevada Science Standards
3.1.1	<p>English Language Arts: Writing Standards for Literacy in Science and Technical Subjects WHST.11-12.9 Draw evidence from informational texts to support analysis, reflection, and research.</p> <p>English Language Arts: Reading Standards for Literacy in Science and Technical Subjects RST.11-12.9 Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible.</p> <p>Science: Physical Science P.12.A.7 Students know that, in chemical reactions, elements combine in predictable ratios, and the numbers of atoms of each element do not change.</p>
3.1.2	<p>English Language Arts: Writing Standards for Literacy in Science and Technical Subjects WHST.11-12.9 Draw evidence from informational texts to support analysis, reflection, and research.</p> <p>English Language Arts: Reading Standards for Literacy in Science and Technical Subjects RST.11-12.9 Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible.</p> <p>Science: Physical Science P.12.A.7 Students know that, in chemical reactions, elements combine in predictable ratios, and the numbers of atoms of each element do not change.</p>
3.1.3	<p>English Language Arts: Writing Standards for Literacy in Science and Technical Subjects WHST.11-12.2 Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes.</p> <p>English Language Arts: Reading Standards for Literacy in Science and Technical Subjects RST.11-12.9 Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible.</p> <p>Science: Physical Science P.12.A.7 Students know that, in chemical reactions, elements combine in predictable ratios, and the numbers of atoms of each element do not change.</p>
3.2.1	<p>English Language Arts: Reading Standards for Literacy in Science and Technical Subjects RST.11-12.1 Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account.</p> <p>English Language Arts: Writing Standards for Literacy in Science and Technical Subjects WHST.11-12.2 Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes.</p> <p>WHST.11-12.2d Use precise language, domain-specific vocabulary and techniques such as metaphor, simile, and analogy to manage the complexity of the topic; convey a knowledgeable stance in a style that responds to the discipline and context as well as to the expertise of likely readers.</p> <p>Science: Earth and Space E.12.C.3 Students know elements exist in fixed amounts and move through solid earth, oceans, atmosphere and living things as part of biogeochemical cycles.</p>
3.2.2	<p>English Language Arts: Writing Standards for Literacy in Science and Technical Subjects WHST.11-12.2d Use precise language, domain-specific vocabulary and techniques such as metaphor, simile, and analogy to manage the complexity of the topic; convey a knowledgeable stance in a style that responds to the discipline and context as well as to the expertise of likely readers.</p> <p>Science: Life Science L.12.B.1 Students know cell structures and their functions.</p>

3.3.1	<p>English Language Arts: Writing Standards for Literacy in Science and Technical Subjects WHST.11-12.7 Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation.</p> <p>Science: Nature of Science N.12.A.4 Students know how to safely conduct an original scientific investigation using the appropriate tools and technology.</p> <p>Science: Life Science L.12.C.1 Students know relationships of organisms and their physical environment.</p>
3.3.2	<p>English Language Arts: Writing Standards for Literacy in Science and Technical Subjects WHST.11-12.7 Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation.</p> <p>Science: Life Science L.12.C.3 Students know the amount of living matter an environment can support is limited by the availability of matter, energy, and the ability of the ecosystem to recycle materials.</p>
3.3.3	<p>English Language Arts: Writing Standards for Literacy in Science and Technical Subjects WHST.11-12.7 Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation.</p>
3.4.1	<p>English Language Arts: Writing Standards for Literacy in Science and Technical Subjects WHST.11-12.7 Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation.</p>

CONTENT STANDARD 4.0: USE PLANT IDENTIFICATION SKILLS

Performance Indicators	Common Core State Standards and Nevada Science Standards
4.1.1	English Language Arts: Writing Standards for Literacy in Science and Technical Subjects WHST.11-12.9 Draw evidence from informational texts to support analysis, reflection, and research. Science: Life Science L.12.D.1 Students know organisms can be classified based on evolutionary relationships.
4.1.2	English Language Arts: Writing Standards for Literacy in Science and Technical Subjects WHST.11-12.9 Draw evidence from informational texts to support analysis, reflection, and research.
4.1.3	English Language Arts: Writing Standards for Literacy in Science and Technical Subjects WHST.11-12.9 Draw evidence from informational texts to support analysis, reflection, and research. Science: Life Science L.12.C.4 Students know the unique geologic, hydrologic, climatic, and biological characteristics of Nevada's bioregions.
4.1.4	English Language Arts: Language Standards L.11-12.2b Spell correctly.

CONTENT STANDARD 5.0: EXPLORE GROWING MEDIA

Performance Indicators	Common Core State Standards and Nevada Science Standards
5.1.1	Science: Earth and Space E.12.C.5 Students know soil, derived from weathered rocks and decomposed organic material, is found in layers.
5.1.3	English Language Arts: Writing Standards for Literacy in Science and Technical Subjects WHST.11-12.8 Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the strengths and limitations of each source in terms of the specific task, purpose, and audience; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and overreliance on any one source and following a standard format for citation.
5.1.4	Science: Earth and Space E.12.C.5 Students know soil, derived from weathered rocks and decomposed organic material, is found in layers.
5.2.1	Science: Earth and Space E.12.C.4 Students know processes of obtaining, using, and recycling of renewable and non-renewable resources.
5.2.4	English Language Arts: Writing Standards for Literacy in Science and Technical Subjects WHST.11-12.8 Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the strengths and limitations of each source in terms of the specific task, purpose, and audience; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and overreliance on any one source and following a standard format for citation.
5.3.2	English Language Arts: Reading Standards for Literacy in Science and Technical Subjects RST.11-12.8 Evaluate the hypotheses, data, analysis, and conclusions in a science or technical text, verifying the data when possible and corroborating or challenging conclusions with other sources of information. English Language Arts: Speaking and Listening Standards SL.11-12.4 Present information, findings, and supporting evidence, conveying a clear and distinct perspective, such that listeners can follow the line of reasoning, alternative or opposing perspectives are addressed, and the organization, development, substance, and style are appropriate to purpose, audience, and a range of formal and informal tasks.
5.3.4	English Language Arts: Speaking and Listening Standards SL.11-12.4 Present information, findings, and supporting evidence, conveying a clear and distinct perspective, such that listeners can follow the line of reasoning, alternative or opposing perspectives are addressed, and the organization, development, substance, and style are appropriate to purpose, audience, and a range of formal and informal tasks.

CONTENT STANDARD 6.0: EXPLORE PLANT NUTRITION

Performance Indicators	Common Core State Standards and Nevada Science Standards
6.1.1	<p>Science: Earth and Space E.12.C.3 Students know elements exist in fixed amounts and move through solid earth, oceans, atmosphere and living things as part of biogeochemical cycles.</p>
6.1.2	<p>English Language Arts: Reading Standards for Literacy in Science and Technical Subjects RST.11-12.9 Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible.</p>
6.1.4	<p>English Language Arts: Reading Standards for Literacy in Science and Technical Subjects RST.11-12.3 Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks; analyze the specific results based on explanations in the text.</p> <p>English Language Arts: Writing Standards for Literacy in Science and Technical Subjects WHST.11-12.2d Use precise language, domain-specific vocabulary and techniques such as metaphor, simile, and analogy to manage the complexity of the topic; convey a knowledgeable stance in a style that responds to the discipline and context as well as to the expertise of likely readers.</p> <p>WHST.11-12.4 Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.</p>
6.2.1	<p>English Language Arts: Reading Standards for Literacy in Science and Technical Subjects RST.11-12.9 Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible.</p> <p>Science: Life Science L.12.B.3 Students know disease disrupts the equilibrium that exists in a healthy organism.</p>
6.2.2	<p>English Language Arts: Reading Standards for Literacy in Science and Technical Subjects RST.11-12.9 Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible.</p>

CONTENT STANDARD 7.0: EXPLORE INTEGRATED PEST MANAGEMENT (IPM)

Performance Indicators	Common Core State Standards and Nevada Science Standards
7.2.1	Science: Life Science L.12.B.3 Students know disease disrupts the equilibrium that exists in a healthy organism.
7.2.3	Science: Life Science L.12.B.3 Students know disease disrupts the equilibrium that exists in a healthy organism.
7.3.1	English Language Arts: Reading Standards for Literacy in Science and Technical Subjects RST.11-12.3 Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks; analyze the specific results based on explanations in the text.
7.3.2	English Language Arts: Reading Standards for Literacy in Science and Technical Subjects RST.11-12.4 Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 11–12 texts and topics.
7.3.3	English Language Arts: Reading Standards for Literacy in Science and Technical Subjects RST.11-12.3 Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks; analyze the specific results based on explanations in the text.
7.3.4	English Language Arts: Writing Standards for Literacy in Science and Technical Subjects WHST.11-12.8 Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the strengths and limitations of each source in terms of the specific task, purpose, and audience; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and overreliance on any one source and following a standard format for citation. Science: Life Science L.12.C.2 Students know how changes in an ecosystem can affect biodiversity and biodiversity’s contribution to an ecosystem’s stability.
7.3.5	English Language Arts: Reading Standards for Literacy in Science and Technical Subjects RST.11-12.3 Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks; analyze the specific results based on explanations in the text.

CONTENT STANDARD 8.0: DEMONSTRATE PLANT PROPAGATION

Performance Indicators	Common Core State Standards and Nevada Science Standards
8.1.1	<p>English Language Arts: Reading Standards for Literacy in Science and Technical Subjects RST.11-12.3 Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks; analyze the specific results based on explanations in the text.</p>
8.2.1	<p>English Language Arts: Writing Standards for Literacy in Science and Technical Subjects WHST.11-12.8 Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the strengths and limitations of each source in terms of the specific task, purpose, and audience; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and overreliance on any one source and following a standard format for citation.</p> <p>English Language Arts: Speaking and Listening Standards SL.11-12.4 Present information, findings, and supporting evidence, conveying a clear and distinct perspective, such that listeners can follow the line of reasoning, alternative or opposing perspectives are addressed, and the organization, development, substance, and style are appropriate to purpose, audience, and a range of formal and informal tasks.</p>

CONTENT STANDARD 9.0: GROWING GREENHOUSE CROPS

Performance Indicators	Common Core State Standards and Nevada Science Standards
9.1.1	English Language Arts: Reading Standards for Literacy in Science and Technical Subjects RST.11-12.3 Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks; analyze the specific results based on explanations in the text.
9.2.1	English Language Arts: Speaking and Listening Standards SL.11-12.4 Present information, findings, and supporting evidence, conveying a clear and distinct perspective, such that listeners can follow the line of reasoning, alternative or opposing perspectives are addressed, and the organization, development, substance, and style are appropriate to purpose, audience, and a range of formal and informal tasks.
9.2.4	English Language Arts: Reading Standards for Literacy in Science and Technical Subjects RST.11-12.3 Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks; analyze the specific results based on explanations in the text.
9.2.5	English Language Arts: Reading Standards for Literacy in Science and Technical Subjects RST.11-12.3 Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks; analyze the specific results based on explanations in the text.

CONTENT STANDARD 10.0: EXPLORE GREENHOUSE BUSINESS CONCEPTS

Performance Indicators	Common Core State Standards and Nevada Science Standards
10.1.1	English Language Arts: Reading Standards for Literacy in Science and Technical Subjects RST.11-12.5 Analyze how the text structures information or ideas into categories or hierarchies, demonstrating understanding of the information or ideas.
10.2.1	English Language Arts: Writing Standards for Literacy in Science and Technical Subjects WHST.11-12.1c Use words, phrases, and clauses as well as varied syntax to link the major sections of the text, create cohesion, and clarify the relationships between claim(s) and reasons, between reasons and evidence, and between claim(s) and counterclaims. English Language Arts: Reading Standards for Literacy in Science and Technical Subjects RST.11-12.5 Analyze how the text structures information or ideas into categories or hierarchies, demonstrating understanding of the information or ideas.
10.2.3	English Language Arts: Language Standards L.11-12.2b Spell correctly.

CONTENT STANDARD 11.0: EXPLORING PLANT TECHNOLOGIES

Performance Indicators	Common Core State Standards and Nevada Science Standards
11.1.1	<p>English Language Arts: Speaking and Listening Standards SL.11-12.4 Present information, findings, and supporting evidence, conveying a clear and distinct perspective, such that listeners can follow the line of reasoning, alternative or opposing perspectives are addressed, and the organization, development, substance, and style are appropriate to purpose, audience, and a range of formal and informal tasks.</p> <p>Science: Life Science L.12.A.1 Students know genetic information passed from parents to offspring is coded in the DNA molecule.</p>
11.1.2	<p>English Language Arts: Writing Standards for Literacy in Science and Technical Subjects WHST.11-12.4 Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.</p> <p>Science: Life Science L.12.A.5 Students know how to predict patterns of inheritance.</p>
11.1.3	<p>English Language Arts: Writing Standards for Literacy in Science and Technical Subjects WHST.11-12.8 Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the strengths and limitations of each source in terms of the specific task, purpose, and audience; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and overreliance on any one source and following a standard format for citation.</p> <p>Science: Life Science L.12.A.5 Students know how to predict patterns of inheritance.</p>
11.1.4	<p>English Language Arts: Speaking and Listening Standards SL.11-12.4 Present information, findings, and supporting evidence, conveying a clear and distinct perspective, such that listeners can follow the line of reasoning, alternative or opposing perspectives are addressed, and the organization, development, substance, and style are appropriate to purpose, audience, and a range of formal and informal tasks.</p> <p>Science: Life Science L.12.A.4 Students know several causes and effects of somatic versus sex cell mutations.</p>
11.1.5	<p>English Language Arts: Speaking and Listening Standards SL.11-12.4 Present information, findings, and supporting evidence, conveying a clear and distinct perspective, such that listeners can follow the line of reasoning, alternative or opposing perspectives are addressed, and the organization, development, substance, and style are appropriate to purpose, audience, and a range of formal and informal tasks.</p> <p>Science: Nature of Science N.12.B.4 Students know scientific knowledge builds on previous information.</p>
11.2.1	<p>English Language Arts: Reading Standards for Literacy in Science and Technical Subjects RST.11-12.9 Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible.</p> <p>Science: Nature of Science N.12.B.1 Students know science, technology, and society influenced one another in both positive and negative ways.</p> <p>N.12.B.2 Students know consumption patterns, conservation efforts, and cultural or social practices in countries have varying environmental impacts.</p> <p>N.12.B.3 Students know the influence of ethics on scientific enterprise.</p>
11.3.1	<p>English Language Arts: Reading Standards for Literacy in Science and Technical Subjects RST.11-12.9 Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible.</p>

11.3.2	<p>English Language Arts: Speaking and Listening Standards SL.11-12.4 Present information, findings, and supporting evidence, conveying a clear and distinct perspective, such that listeners can follow the line of reasoning, alternative or opposing perspectives are addressed, and the organization, development, substance, and style are appropriate to purpose, audience, and a range of formal and informal tasks.</p>
11.3.3	<p>English Language Arts: Speaking and Listening Standards SL.11-12.4 Present information, findings, and supporting evidence, conveying a clear and distinct perspective, such that listeners can follow the line of reasoning, alternative or opposing perspectives are addressed, and the organization, development, substance, and style are appropriate to purpose, audience, and a range of formal and informal tasks.</p>
11.4.1	<p>English Language Arts: Reading Standards for Literacy in Science and Technical Subjects RST.11-12.9 Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible.</p> <p>Science: Nature of Science N.12.B.2 Students know consumption patterns, conservation efforts, and cultural or social practices in countries have varying environmental impacts.</p>
11.4.2	<p>English Language Arts: Speaking and Listening Standards SL.11-12.4 Present information, findings, and supporting evidence, conveying a clear and distinct perspective, such that listeners can follow the line of reasoning, alternative or opposing perspectives are addressed, and the organization, development, substance, and style are appropriate to purpose, audience, and a range of formal and informal tasks.</p>
11.4.3	<p>English Language Arts: Speaking and Listening Standards SL.11-12.4 Present information, findings, and supporting evidence, conveying a clear and distinct perspective, such that listeners can follow the line of reasoning, alternative or opposing perspectives are addressed, and the organization, development, substance, and style are appropriate to purpose, audience, and a range of formal and informal tasks.</p>

CONTENT STANDARD 12.0: EXPLORE CAREER OPPORTUNITIES IN HORTICULTURE

Performance Indicators	Common Core State Standards and Nevada Science Standards
12.1.1	English Language Arts: Writing Standards for Literacy in Science and Technical Subjects WHST.11-12.7 Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation.

CONTENT STANDARD 13.0: PARTICIPATE IN LEADERSHIP TRAINING THROUGH MEMBERSHIP IN FFA

Performance Indicators	Common Core State Standards and Nevada Science Standards
13.1.1	English Language Arts: Speaking and Listening Standards SL.11-12.1b Work with peers to promote civil, democratic discussions and decision-making, set clear goals and deadlines, and establish individual roles as needed.
13.1.2	English Language Arts: Speaking and Listening Standards SL.11-12.1b Work with peers to promote civil, democratic discussions and decision-making, set clear goals and deadlines, and establish individual roles as needed.
13.2.1	English Language Arts: Speaking and Listening Standards SL.11-12.1b Work with peers to promote civil, democratic discussions and decision-making, set clear goals and deadlines, and establish individual roles as needed.

CONTENT STANDARD 14.0: DESCRIBE THE RELATIONSHIP BETWEEN A SUPERVISED AGRICULTURAL EXPERIENCE (SAE) AND PREPARATION OF STUDENTS FOR A CAREER IN AGRICULTURE

Performance Indicators	Common Core State Standards and Nevada Science Standards
14.1.1	English Language Arts: Language Standards L.11-12.2b Spell correctly.
14.1.2	English Language Arts: Writing Standards for Literacy in Science and Technical Subjects WHST.11-12.4 Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.

**ORNAMENTAL HORTICULTURE/GREENHOUSE MANAGEMENT STANDARDS
AND THE COMMON CORE MATHEMATICAL PRACTICES**

Common Core Mathematical Practices	Ornamental Horticulture/Greenhouse Management Performance Indicators
1. Make sense of problems and persevere in solving them.	3.1.1 5.3.1, 5.3.3
2. Reason abstractly and quantitatively.	3.1.1, 3.1.2 5.3.1, 5.3.3 11.1.2
3. Construct viable arguments and critique the reasoning of others.	
4. Model with mathematics.	6.1.2 7.3.5 8.1.5 9.1.1, 9.2.5 10.2.2, 10.2.3 14.1.1, 14.1.2
5. Use appropriate tools strategically.	3.3.1, 3.3.2, 3.3.3 5.3.1, 5.3.3 7.3.5 10.2.3 14.1.1, 14.1.2
6. Attend to precision.	5.3.1, 5.3.3 6.1.3 7.3.5 10.2.3 14.1.1, 14.1.2
7. Look for and make use of structure.	3.1.1, 3.1.2
8. Look for and express regularity in repeated reasoning.	6.1.4

**CROSSWALKS OF ORNAMENTAL HORTICULTURE/GREENHOUSE
MANAGEMENT STANDARDS
AND THE COMMON CAREER TECHNICAL CORE**

Agriculture, Food & Natural Resources Career Cluster™ (AG)	Performance Indicators
1. Analyze how issues, trends, technologies and public policies impact systems in the Agriculture, Food & Natural Resources Career Cluster™.	7.1.1, 7.1.2 11.1.1-11.1.5 11.2.1, 11.2.2 11.3.1-11.3.3
2. 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.	13.2.1
3. Examine and summarize the importance of health, safety and environmental management systems in AFNR businesses.	1.1.1, 1.1.2, 1.1.5 6.1.4, 6.2.1, 6.2.2 7.1.1, 7.3.1, 7.3.3, 7.3.4
4. Demonstrate stewardship of natural resources in AFNR activities.	7.3.4
5. Describe career opportunities and means to achieve those opportunities in each of the Agriculture, Food & Natural Resources Career Pathways.	12.1.1-12.1.3 14.1.1-14.1.3
6. Analyze the interaction among AFNR systems in the production, processing and management of food, fiber and fuel and the sustainable use of natural resources.	9.4.2 10.1.2, 10.1.3, 10.2.1
Plant Systems Career Pathway (AG-PL)	Performance Indicators
1. Develop and implement a crop management plan for a given production goal that accounts for environmental factors.	5.3.1-5.3.4 6.1.4, 6.2.1, 6.2.2
2. Apply the principles of classification, plant anatomy and plant physiology to plant production and management.	2.1.1-2.1.4, 2.2.1-2.2.4 2.3.1-2.3.5, 2.4.1-2.4.4 3.1.1-3.1.3, 3.2.1-3.2.3 3.3.1-3.3.3, 3.4.1, 3.4.2 3.5.1; 4.1.1-4.1.4
3. Propagate, culture and harvest plants and plant products based on current industry standards.	8.1.1-8.1.5, 8.2.1-8.2.5 9.1.1-9.1.3, 9.2.1-9.2.5 9.3.1-9.3.3, 9.4.1-9.4.2 11.3.1-11.3.3
4. Apply principles of design in plant systems to enhance an environment (e.g., floral, forest, landscape and farm).	9.4.2