HORTICULTURE SCIENCE STANDARDS

This document was prepared by:

Office of Career, Technical and Adult Education
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NEVADA STATE BOARD FOR CAREER AND TECHNICAL EDUCATION

CTE MISSION STATEMENT:

The Office of Career, Technical and Adult Education is dedicated to developing innovative educational opportunities for students to acquire skills for productive employment and lifelong learning.

NEVADA DEPARTMENT OF EDUCATION

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ACKNOWLEDGEMENTS

The development of Nevada Career and Technical standards and assessments is a collaborative effort sponsored by the Office of Career, Technical and Adult Education at the Department of Education and the Career and Technical Education Consortium of States. The Department of Education relies on teachers and industry representatives who have the technical expertise and teaching experience to develop standards and performance indicators that truly measure student skill attainment. Most important, however, is recognition of the time, expertise and great diligence provided by the writing team members in developing the Career and Technical Standards for Horticulture Science.

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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 Horticulture Science standards were validated through the active participation by business and industry on the development team.

PROJECT COORDINATOR

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AGRICULTURE AND NATURAL RESOURCES
Program Requirements

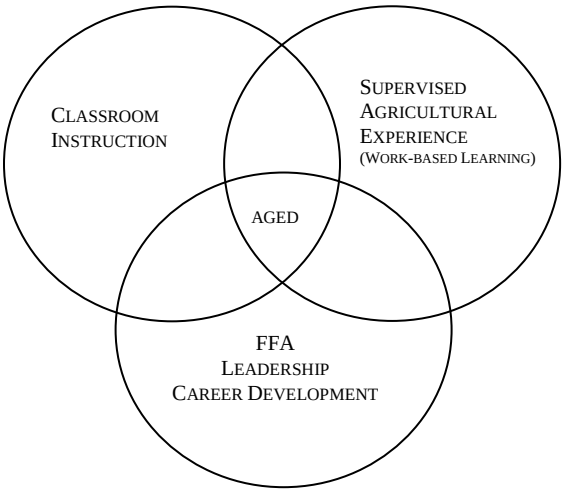
Occupations associated with agriculture production, natural resources, processing and distribution of food and fiber are important to the national interests and provide significant employment opportunities. Occupational education and training in agriculture and agri-business are essential to the continued 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 Agriculture 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 Horticulture Science program. 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 Mathematics Common Core State Standards, and the Nevada State Science Standards. Where correlation with an academic standard exists, students in the Horticulture Science 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: EXAMINE THE ROLE OF AGRICULTURE AND SOCIETY	
PERFORMANCE STANDARD 1.1: RECOGNIZE THE ROLE OF AGRICULTURE IN SOCIETY	
1.1.1	Assess how agriculture supports daily life
1.1.2	Explain that agriculture is a science
1.1.3	Describe how agricultural products are traded around the globe
1.1.4	Describe the various components of the agriculture industry
1.1.5	Discuss the role of modern agriculture in basic human nutrition
1.1.6	List agricultural products used to provide food, clothing, and human shelter
PERFORMANCE STANDARD 1.2: UNDERSTAND THE HISTORY OF PRODUCTION AGRICULTURE	
1.2.1	Compare agriculture's role in developing civilizations
1.2.2	Organize the major technological developments that have occurred in agriculture
1.2.3	Interpret historical events and trends that have led to the development of today's agriculture industry, emphasizing horticulture
PERFORMANCE STANDARD 1.3: EXPLORE THE WORLD FOOD SUPPLY	
1.3.1	Analyze the impact of agriculture on the local, state, national, and world economies
1.3.2	Explain the role of government in the world's food supply

CONTENT STANDARD 2.0: DEVELOP LEADERSHIP AND COMMUNICATION SKILLS THROUGH PARTICIPATION IN FFA	
PERFORMANCE STANDARD 2.1: UNDERSTAND THE HISTORY AND ORGANIZATION OF FFA	
2.1.1	Summarize how, when, and why the National FFA Organization was founded
2.1.2	Describe the mission and strategies, colors, motto, parts of the emblem, and organizational structure of the National FFA Organization
2.1.3	Recite and explain the meaning of the FFA Creed
2.1.4	Explain the purpose of FFA's Program of Activities and describe its committee structure
PERFORMANCE STANDARD 2.2: UNDERSTAND THE OPPORTUNITIES IN FFA	
2.2.1	Describe how FFA develops leadership skills, personal growth, and career success
2.2.2	Identify major state and national activities and awards available to FFA members
2.2.3	Compete in at least one Career Development Event at the local level
PERFORMANCE STANDARD 2.3: PROPERLY USE SKILLS IN PARLIAMENTARY PROCEDURE	
2.3.1	List three reasons why parliamentary procedure is used in meetings
2.3.2	List five classifications of motions
2.3.3	Properly perform ten procedures of parliamentary law
PERFORMANCE STANDARD 2.4: UNDERSTAND THE IMPORTANCE OF SCHOOL AND COMMUNITY AWARENESS	
2.4.1	Discuss the meaning and importance of community service
2.4.2	Identify and describe some community service organizations
2.4.3	Explain how FFA members can become involved in community improvement and development, and plan an activity

CONTENT STANDARD 3.0: DEVELOP A SUPERVISED AGRICULTURAL EXPERIENCE (SAE) PROGRAM	
PERFORMANCE STANDARD 3.1: UNDERSTAND THE BENEFITS OF AN SAE PROGRAM	
3.1.1	Relate the importance of goals and career ladders in successful careers
3.1.2	Define supervised agricultural experience
3.1.3	Explain the benefits of supervised agricultural experience programs
3.1.4	Compare the difference between entrepreneurship and placement SAEs
3.1.5	Differentiate between exploratory SAEs and research and experimentation SAEs
PERFORMANCE STANDARD 3.2: UNDERSTAND THE BENEFITS OF SAE RECORDS	
3.2.1	Analyze the importance of keeping records of an SAE program
3.2.2	Investigate the types of financial records needed to support a chosen SAE program
3.2.3	Complete the procedures for making entries in SAE records
3.2.4	Explain how to summarize and analyze SAE records

CONTENT STANDARD 4.0: EXPLORING THE HORTICULTURE INDUSTRY	
PERFORMANCE STANDARD 4.1: UNDERSTAND THE HORTICULTURE INDUSTRY	
4.1.1	Define horticulture and describe its relationship to science and technology
4.1.2	Differentiate the three major segments of the horticulture industry
4.1.3	Analyze activities included in the ornamental horticulture industry
PERFORMANCE STANDARD 4.2: DESCRIBE THE IMPORTANCE OF DIFFERENT AREAS OF THE HORTICULTURE INDUSTRY	
4.2.1	Describe the popularity of horticulture
4.2.2	Appraise the importance of the ornamental horticulture industry
4.2.3	Assess the importance of the olericulture industry
4.2.4	Assess the importance of the pomology industry
PERFORMANCE STANDARD 4.3: EXPLORE HORTICULTURE CAREERS	
4.3.1	Investigate how to prepare for a horticulture career
4.3.2	Compare and contrast horticulture jobs and careers
PERFORMANCE STANDARD 4.4: PRACTICE SAFETY IN HORTICULTURE PRACTICES	
4.4.1	Understand the importance of safety in horticulture
4.4.2	Identify and properly use personal protective equipment
4.4.3	Practice safety precautions necessary when handling, applying, and storing chemicals

CONTENT STANDARD 5.0: EXPLORING SCIENTIFIC INVESTIGATION IN AGRICULTURE	
PERFORMANCE STANDARD 5.1: DESIGN AND CONDUCT AGRICULTURAL RESEARCH	
5.1.1	List the steps of the scientific method
5.1.2	Explain the steps in conducting research in agriculture and conduct an appropriate research project
PERFORMANCE STANDARD 5.2: REPORT AGRICULTURAL RESEARCH	
5.2.1	Organize the major parts of a research report, using appropriate graphs and models
5.2.2	Construct the general guidelines for preparing a research report
5.2.3	Explain how to include proper tables and figures in a research report
5.2.4	Write a research paper, including all parts listed above
PERFORMANCE STANDARD 5.3: UNDERSTAND SCIENTIFIC MEASUREMENT	
5.3.1	Describe the systems of measurement used in this country
5.3.2	Determine the metric prefixes and units used for measuring length, volume, weight, temperature, and area
5.3.3	Convert from one system of units to another system of units
PERFORMANCE STANDARD 5.4: USE LABORATORY TOOLS AND EQUIPMENT	
5.4.1	Identify and properly use personal protection equipment (PPE)
5.4.2	Describe safety in agriscience laboratories
5.4.3	Demonstrate the proper use of common agriscience equipment
5.4.4	Classify the major parts of a microscope
5.4.5	Show the proper use and care of a microscope
PERFORMANCE STANDARD 5.5: EXPLORE CAREERS IN AGRICULTURAL SCIENCE	
5.5.1	Identify basic career information related to agricultural science
5.5.2	Name several agricultural science careers

CONTENT STANDARD 6.0: UNDERSTAND BASIC PLANT PROCESSES	
PERFORMANCE STANDARD 6.1: IDENTIFY DIFFERENT PLANT CLASSIFICATION SYSTEMS	
6.1.1	Discuss the classification and naming of plants, and identify structural components used for classification
6.1.2	Distinguish the major groups of plants
6.1.3	Contrast the classification of plants by life cycle
PERFORMANCE STANDARD 6.2: IDENTIFY PARTS AND FUNCTIONS OF PLANT CELLS	
6.2.1	Label the parts of a plant cell
6.2.2	Differentiate between a plant and animal cell
6.2.3	Explain the function of plant cell organelles
PERFORMANCE STANDARD 6.3: UNDERSTAND PLANT PHYSIOLOGY	
6.3.1	Analyze the process of photosynthesis and understand its chemical formula and processes
6.3.2	Examine the process of cellular respiration and understand its chemical formula and processes
6.3.3	Investigate plant growth processes
6.3.4	Connect why photosynthesis and respiration are important to human beings

CONTENT STANDARD 7.0: UNDERSTANDING PLANT ANATOMY	
PERFORMANCE STANDARD 7.1: UNDERSTAND ROOT ANATOMY	
7.1.1	Investigate the functions of roots in plants
7.1.2	Identify the parts of a root
7.1.3	Differentiate the two major types of root systems
PERFORMANCE STANDARD 7.2: UNDERSTAND STEM ANATOMY	
7.2.1	List the functions of a stem
7.2.2	Recognize the external structures of a stem
7.2.3	Analyze the internal structures of a stem
PERFORMANCE STANDARD 7.3: UNDERSTAND LEAF ANATOMY	
7.3.1	Name the main parts of a leaf
7.3.2	Compare common vein patterns found in leaves
7.3.3	List three functions of a leaf, including photosynthetic energy conversion
7.3.4	Differentiate major leaf arrangements
PERFORMANCE STANDARD 7.4: UNDERSTAND FLOWER ANATOMY	
7.4.1	Label and describe the parts of a flower
7.4.2	Summarize the purpose of a flower
7.4.3	Distinguish between different types of flowers
7.4.4	Describe the difference between monocot and dicot flowers

CONTENT STANDARD 8.0: UNDERSTAND THE ROLE OF SOILS IN HORTICULTURE	
PERFORMANCE STANDARD 8.1: UNDERSTAND SOIL TEXTURE AND STRUCTURE	
8.1.1	List the components of soil
8.1.2	Describe the concept of soil texture and its importance
8.1.3	Determine the texture of a soil sample
8.1.4	Classify soil structure, its formation through weathering, and its importance
PERFORMANCE STANDARD 8.2: UNDERSTAND MOISTURE-HOLDING CAPACITY	
8.2.1	Describe moisture-holding capacity of soils and its relationship to the water cycle
8.2.2	Explain what determines a soil's moisture-holding capacity
PERFORMANCE STANDARD 8.3: UNDERSTAND GROWING MEDIA COMPONENTS	
8.3.1	Appraise the components of a soilless mix
8.3.2	Evaluate the advantages and disadvantages of soilless medium

CONTENT STANDARD 9.0: DEMONSTRATE PLANT PROPAGATION	
PERFORMANCE STANDARD 9.1: UNDERSTAND SEXUAL REPRODUCTION	
9.1.1	State the importance of plant propagation in regards to horticulture production and its effects on society
9.1.2	Compare the difference between sexual and asexual propagation
9.1.3	Identify and list the major parts of a seed
9.1.4	List the function of each major part of a seed
9.1.5	Describe and observe the process of seed germination
9.1.6	Describe the process of fertilization and pollination
PERFORMANCE STANDARD 9.2: DEMONSTRATE PROPAGATION BY CUTTINGS	
9.2.1	Describe leaf and leaf-bud cuttings and demonstrate how they are used to propagate plants
9.2.2	Demonstrate the three types of stem cuttings
9.2.3	Explain how root cuttings are prepared for propagation
9.2.4	Recognize factors that determine the success of rooting of cuttings

CONTENT STANDARD 10.0: UNDERSTAND PLANT GROWTH REQUIREMENTS	
PERFORMANCE STANDARD 10.1: UNDERSTAND THE NUTRITIONAL REQUIREMENTS OF HORTICULTURAL CROPS	
10.1.1	Differentiate between macronutrients and micronutrients
10.1.2	Measure pH and describe how it is modified
10.1.3	Identify the components of a fertilizer and their role in the biogeochemical cycles
10.1.4	Evaluate the methods of applying fertilizers to horticultural crops
PERFORMANCE STANDARD 10.2: UNDERSTAND THE ENVIRONMENTAL REQUIREMENTS FOR PLANT GROWTH	
10.2.1	Describe the effect of light on plants
10.2.2	Research a plant's temperature needs
10.2.3	Identify how the quality of air affects plants
10.2.4	Explain how the quality of water affects plants
10.2.5	Determine a plant's water needs based on scientific investigation

CONTENT STANDARD 11.0: EXPLORE CULTIVATION OF PLANTS

PERFORMANCE STANDARD 11.1: UNDERSTAND PRODUCTION OF BEDDING PLANTS

11.1.1	Describe the importance, impact and scope of the bedding plant industry
11.1.2	List the factors involved in getting bedding plants started
11.1.3	Demonstrate production practices used in growing bedding plants
11.1.4	Identify major bedding plants in Nevada

PERFORMANCE STANDARD 11.2: UNDERSTAND PRODUCTION OF POTTED PLANTS

11.2.1	Identify the factors involved in producing potted annuals
11.2.2	Discuss the factors involved in propagating perennials
11.2.3	Compare production practices used in forcing perennial plants to flower
11.2.4	Identify major annuals and perennials in Nevada

PERFORMANCE STANDARD 11.3: DEMONSTRATE PROPER TRANSPLANTING TECHNIQUE

11.3.1	Perform root pruning appropriately
11.3.2	Identify and apply proper root hormones using nursery industry standards
11.3.3	Properly select appropriate plants for transplanting based on industry standards for predicted success
11.3.4	Perform transplanting using appropriate nursery industry standards

CONTENT STANDARD 12.0: UNDERSTAND THE BUSINESS OF HORTICULTURE	
PERFORMANCE STANDARD 12.1: UNDERSTAND THE BASIC PRINCIPLES OF MARKETING HORTICULTURAL CROPS	
12.1.1	Recognize opportunities in high-wage, high-skill career opportunities in horticultural business, sales, and marketing
12.1.2	Explain the law of supply and demand in today's economy
PERFORMANCE STANDARD 12.2: UNDERSTAND THE BASIC PRINCIPLES OF HORTICULTURAL SALES AND SERVICE	
12.2.1	List and describe five steps of the agricultural sales process
12.2.2	Define the types of customers and the purchasing process
12.2.3	Compare and contrast the features and benefits of a product
PERFORMANCE STANDARD 12.3: UNDERSTAND THE PRINCIPLES OF BUSINESS MANAGEMENT CONCEPTS	
12.3.1	Create an agricultural budget
12.3.2	Construct a business agreement
12.3.3	Maintain a single-entry journal
12.3.4	Create a current and capital inventory list
12.3.5	Maintain a daily business calendar
12.3.6	Develop a net-worth statement
PERFORMANCE STANDARD 12.4: IDENTIFY AND UNDERSTAND THE USE OF TOOLS AND EQUIPMENT NECESSARY IN THE HORTICULTURAL INDUSTRY	
12.4.1	Demonstrate the use of personal/group safety while working in a horticultural setting
12.4.2	Identify and select appropriate tools needed for a given procedure
12.4.3	Use various systems and tools used in the horticulture industry

CONTENT STANDARD 13.0: UNDERSTAND THE RELATIONSHIP BETWEEN HORTICULTURE AND THE ENVIRONMENT	
PERFORMANCE STANDARD 13.1: EXPLORE URBAN FORESTRY AND LANDSCAPING	
13.1.1	Define urban forestry
13.1.2	Summarize the benefits of urban forests and urban trees on the environment and society
13.1.3	Explain urban forest management issues
13.1.4	Identify the effects of humans on the environment
PERFORMANCE STANDARD 13.2: DESCRIBE ENVIRONMENTAL IMPACTS OF HORTICULTURE	
13.2.1	Identify the urban and rural impacts of pesticide and fertilizer use
13.2.2	Identify pollutants and contaminants in air, water and soil and their environmental impact
13.2.3	Perform water quality testing and analyze the result's environmental impact
PERFORMANCE STANDARD 13.3: IDENTIFY METHODS OF RECLAMATION AND HABITAT RESTORATION	
13.3.1	Identify degraded habitat and predict the cause of the condition
13.3.2	Create a list of appropriate plants for habitat reclamation and restoration, maintaining the biodiversity of the habitat

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CROSSWALK AND ALIGNMENTS OF HORTICULTURE SCIENCE 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 Horticulture Science 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 Horticulture Science 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 Horticulture Science Standards Performance Indicators and the Common Core Mathematical Practices. This alignment identifies the performance indicators in which the learning objectives in the Horticulture Science program support academic learning.

CROSSWALK (COMMON CAREER TECHNICAL CORE)

The crosswalk of the Horticulture Science Standards shows links to the Common Career Technical Core. The crosswalk identifies the performance indicators in which the learning objectives in the Horticulture Science 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 Horticulture Science Standards are crosswalked to the Agriculture, Food & Natural Resources Career Cluster™ and the Plant Systems Career Pathways.

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CROSSWALK OF HORTICULTURE SCIENCE STANDARDS AND THE COMMON CORE STATE STANDARDS

CONTENT STANDARD 1.0: EXAMINE THE ROLE OF AGRICULTURE AND SOCIETY

Performance Indicators	Common Core State Standards and Nevada Science Standards
1.1.2	**Science: Nature of Science** N.12.B.1 Students know science, technology, and society influenced one another in both positive and negative ways. N.12.B.2 Students know consumption patterns, conservation efforts, and cultural or social practices in countries have varying environmental impacts. N.12.B.4 Students know scientific knowledge builds on previous information.
1.1.3	**Science: Nature of Science** N.12.B.1 Students know science, technology, and society influenced one another in both positive and negative ways. N.12.B.2 Students know consumption patterns, conservation efforts, and cultural or social practices in countries have varying environmental impacts.
1.1.5	**Science: Life Science** L.12.C.1 Students know relationships of organisms and their physical environment.
1.1.6	**Science: Life Science** L.12.C.1 Students know relationships of organisms and their physical environment.
1.2.1	**Science: Nature of Science** N.12.B.1 Students know science, technology, and society influenced one another in both positive and negative ways. N.12.B.2 Students know consumption patterns, conservation efforts, and cultural or social practices in countries have varying environmental impacts. N.12.B.3 Students know the influence of ethics on scientific enterprise. N.12.B.4 Students know scientific knowledge builds on previous information.
1.2.2	**Science: Nature of Science** N.12.B.4 Students know scientific knowledge builds on previous information.
1.2.3	**Science: Nature of Science** N.12.B.3 Students know the influence of ethics on scientific enterprise. N.12.B.4 Students know scientific knowledge builds on previous information. **English Language Arts: Reading Standards for Literacy** RST.9-10.1 Cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations or descriptions.

CONTENT STANDARD 2.0: DEVELOP LEADERSHIP AND COMMUNICATION SKILLS THROUGH PARTICIPATION IN FFA

Performance Indicators	Common Core State Standards and Nevada Science Standards
2.1.1	**English Language Arts: Reading Standards for Literacy** RST.9-10.4 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 9-10 texts and topics. **English Language Arts: Writing Standards for Literacy** WHST.9-10.4 Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.
2.1.2	**English Language Arts: Writing Standards for Literacy** WHST.9-10.2d Use precise language and domain-specific vocabulary to manage the complexity of the topic and convey a style appropriate to the discipline and context as well as to the expertise of the likely reader. **English Language Arts: Speaking and Listening** SL.9-10.4 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
2.1.3	**English Language Arts: Speaking and Listening** 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.
2.2.1	**English Language Arts: Writing Standards for Literacy** WHST.9-10.4 Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience. WHST.9-10.9 Draw evidence from informational texts to support analysis, reflection, and research.

CONTENT STANDARD 3.0: DEVELOP A SUPERVISED AGRICULTURAL EXPERIENCE (SAE) PROGRAM

Performance Indicators	Common Core State Standards and Nevada Science Standards
3.1.4	**English Language Arts: Writing Standards for Literacy** WHST.9-10.2d Use precise language and domain-specific vocabulary to manage the complexity of the topic and convey a style appropriate to the discipline and context as well as to the expertise of the likely reader.
3.1.5	**English Language Arts: Writing Standards for Literacy** 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. WHST.9-10.8 Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the usefulness of each source in answering the research question; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and following a standard format for citation.
3.2.1	**Science: Nature of Science** N.12.A.1 Students know tables, charts, illustrations and graphs can be used in making arguments and claims in oral and written presentations.
3.2.4	**English Language Arts: Writing Standards for Literacy** WHST.9-10.8 Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the usefulness of each source in answering the research question; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and following a standard format for citation. **English Language Arts: Speaking and Listening Standards** SL.9-10.4 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. SL.9-10.5 Make strategic use of digital media (e.g., textual, graphical, audio, visual, and interactive elements) in presentations to enhance understanding of findings, reasoning, and evidence and to add interest.

CONTENT STANDARD 4.0: EXPLORING THE HORTICULTURE INDUSTRY

Performance Indicators	Common Core State Standards and Nevada Science Standards
4.1.1	**Science: Nature of Science** N.12.B.1 Students know science, technology, and society influenced one another in both positive and negative ways.
4.1.2	**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.
4.1.3	**English Language Arts: Writing Standards for Literacy** WHST.9-10.4 Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.
4.2.3	**English Language Arts: Writing Standards for Literacy** WHST.9-10.8 Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the usefulness of each source in answering the research question; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and following a standard format for citation.
4.2.4	**English Language Arts: Writing Standards for Literacy** WHST.9-10.8 Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the usefulness of each source in answering the research question; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and following a standard format for citation.
4.4.3	**Science: Nature of Science** N.12.A.4 Students know how to safely conduct an original scientific investigation using the appropriate tools and technology.

CONTENT STANDARD 5.0: EXPLORING SCIENTIFIC INVESTIGATION IN AGRICULTURE

Performance Indicators	Common Core State Standards and Nevada Science Standards
5.1.2	**Science: Nature of Science** N.12.A.1 Students know tables, charts, illustrations and graphs can be used in making arguments and claims in oral and written presentations. N.12.A.2 Students know scientists maintain a permanent record of procedures, data, analyses, decisions, and understandings of scientific investigations. N.12.A.3 Students know repeated experimentation allows for statistical analysis and unbiased conclusions. N.12.A.4 Students know how to safely conduct an original scientific investigation using the appropriate tools and technology. N.12.A.5 Students know models and modeling can be used to identify and predict cause-effect relationships. N.12.A.6 Students know organizational schema can be used to represent and describe relationships of sets. **English Language Arts : Writing Standards for Literacy** WHST.9-10.2 Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes.
5.2.1	**Science: Nature of Science** N.12.A.1 Students know tables, charts, illustrations and graphs can be used in making arguments and claims in oral and written presentations. N.12.A.2 Students know scientists maintain a permanent record of procedures, data, analyses, decisions, and understandings of scientific investigations. N.12.A.3 Students know repeated experimentation allows for statistical analysis and unbiased conclusions. N.12.A.5 Students know models and modeling can be used to identify and predict cause-effect relationships.
5.2.2	**Science: Nature of Science** N.12.A.1 Students know tables, charts, illustrations and graphs can be used in making arguments and claims in oral and written presentations. N.12.A.2 Students know scientists maintain a permanent record of procedures, data, analyses, decisions, and understandings of scientific investigations. N.12.A.3 Students know repeated experimentation allows for statistical analysis and unbiased conclusions. N.12.A.5 Students know models and modeling can be used to identify and predict cause-effect relationships. N.12.A.6 Students know organizational schema can be used to represent and describe relationships of sets.

5.2.4	**English Language Arts: Speaking and Listening** SL.11-12.2 Integrate multiple sources of information presented in diverse formats and media (e.g., visually, quantitatively, orally) in order to make informed decisions and solve problems, evaluating the credibility and accuracy of each source and noting any discrepancies among the data. **English Language Arts: Writing Standards for Literacy** WHST.9.10.7 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. WHST.9-10.8 Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the usefulness of each source in answering the research question; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and following a standard format for citation.
5.4.1	**Science: Nature of Science** N.12.A.4 Students know how to safely conduct an original scientific investigation using the appropriate tools and technology.
5.4.2	**Science: Nature of Science** N.12.A.4 Students know how to safely conduct an original scientific investigation using the appropriate tools and technology.
5.4.5	**Science: Nature of Science** N.12.A.4 Students know how to safely conduct an original scientific investigation using the appropriate tools and technology.

CONTENT STANDARD 6.0: UNDERSTAND BASIC PLANT PROCESSES

Performance Indicators	Common Core State Standards and Nevada Science Standards
6.1.1	**Science: Life Science** L.12.D.1 Students know organisms can be classified based on evolutionary relationships. **Science: Nature of Science** N.12.A.6 Students know organizational schema can be used to represent and describe relationships of sets.
6.2.1	**Science: Life Science** L.12.B.1 Students know cell structures and their functions.
6.2.2	**Science: Life Science** L.12.B.1 Students know cell structures and their functions.
6.2.3	**Science: Life Science** L.12.B.1 Students know cell structures and their functions
6.3.1	**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. **English Language Arts: Writing Standards for Literacy** WHST.9-10.8 Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the usefulness of each source in answering the research question; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and following a standard format for citation.
6.3.2	**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. **English Language Arts: Writing Standards for Literacy** WHST.9-10.8 Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the usefulness of each source in answering the research question; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and following a standard format for citation.

CONTENT STANDARD 7.0: UNDERSTANDING PLANT ANATOMY

Performance Indicators	Common Core State Standards and Nevada Science Standards
7.3.3	**Science: Physical Science** P.12.C.2 Students know energy forms can be converted.

CONTENT STANDARD 8.0: UNDERSTAND THE ROLE OF SOILS IN HORTICULTURE

Performance Indicators	Common Core State Standards and Nevada Science Standards
8.1.3	**English Language Arts Writing Standards for Literacy** WHST.9-10.2 Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes. **English Language Arts: Writing Standards for Literacy** WHST.9-10.8 Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the usefulness of each source in answering the research question; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and following a standard format for citation.
8.1.4	**Science: Earth Science** E.12.C.5 Students know soil, derived from weathered rocks and decomposed organic material, is found in layers. **English Language Arts: Writing Standards for Literacy** WHST.9-10.8 Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the usefulness of each source in answering the research question; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and following a standard format for citation.
8.2.1	**English Language Arts: Reading Standards for Literacy** RST.9-10.1 Cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations or descriptions. **Science: Earth Science** E.12.C.4 Students know processes of obtaining, using, and recycling of renewable and non-renewable resources.
8.3.2	**English Language Arts: Writing Standards for Literacy** WHST.9-10.8 Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the usefulness of each source in answering the research question; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and following a standard format for citation.

CONTENT STANDARD 9.0: DEMONSTRATE PLANT PROPAGATION

Performance Indicators	Common Core State Standards and Nevada Science Standards
9.1.1	**Science: Nature of Science** N.12.B.1 Students know science, technology, and society influenced one another in both positive and negative ways.
9.1.5	**English Language Arts: Speaking and Listening** 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. **English Language Arts: Writing Standards for Literacy** WHST.9-10.8 Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the usefulness of each source in answering the research question; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and following a standard format for citation.

CONTENT STANDARD 10.0: UNDERSTAND PLANT GROWTH REQUIREMENTS

Performance Indicators	Common Core State Standards and Nevada Science Standards
10.1.3	**Science: Earth Science** 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. E.12.C.4 Students know processes of obtaining, using, and recycling of renewable and non-renewable resources.
10.1.4	**English Language Arts: Writing Standards for Literacy** WHST.9-10.4 Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience. **English Language Arts: Reading Standards for Literacy** RST.9-10.3 Translate quantitative or technical information expressed in words in a text into visual form (e.g., a table or chart) and translate information expressed visually or mathematically (e.g., in an equation) into words.
10.2.1	**Science: Earth Science** E.12.A.1 Students know the Sun is the major source of Earth's energy, and provides the energy driving Earth's weather and climate. **Science: Physical Science** P.12.C.2 Students know energy forms can be converted.
10.2.4	**English Language Arts: Speaking and Listening** 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.
10.2.5	**Science: Nature of Science** N.12.A.4 Students know how to safely conduct an original scientific investigation using the appropriate tools and technology.

CONTENT STANDARD 11.0: EXPLORE CULTIVATION OF PLANTS

Performance Indicators	Common Core State Standards and Nevada Science Standards
11.1.1	**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.
11.1.4	**Science: Life Science** L.12.C.4 Students know the unique geologic, hydrologic, climatic, and biological characteristics of Nevada's bioregions.
11.3.1	**Science: Nature of Science** N.12.A.4 Students know how to safely conduct an original scientific investigation using the appropriate tools and technology. N.12.A.5 Students know models and modeling can be used to identify and predict cause-effect relationships.
11.3.2	**Science: Nature of Science** N.12.A.4 Students know how to safely conduct an original scientific investigation using the appropriate tools and technology. N.12.A.5 Students know models and modeling can be used to identify and predict cause-effect relationships.
11.3.3	**Science: Nature of Science** N.12.A.5 Students know models and modeling can be used to identify and predict cause-effect relationships.
11.3.4	**Science: Nature of Science** N.12.A.5 Students know models and modeling can be used to identify and predict cause-effect relationships.

CONTENT STANDARD 13.0: UNDERSTAND THE RELATIONSHIP BETWEEN HORTICULTURE AND THE ENVIRONMENT

Performance Indicators	Common Core State Standards and Nevada Science Standards
13.1.1	**English Language Arts: Writing Standards for Literacy** WHST.9-10.9 Draw evidence from informational texts to support analysis, reflection, and research.
13.1.2	**Science: Nature of Science** N.12.B.1 Students know science, technology, and society influenced one another in both positive and negative ways. N.12.B.2 Students know consumption patterns, conservation efforts, and cultural or social practices in countries have varying environmental impacts.
13.1.4	**Science: Life Science** L.12.C.1 Students know relationships of organisms and their physical environment. L.12.C.2 Students know how changes in an ecosystem can affect biodiversity and biodiversity's contribution to an ecosystem's stability. **Science: Nature of Science** N.12.B.1 Students know science, technology, and society influenced one another in both positive and negative ways. N.12.B.2 Students know consumption patterns, conservation efforts, and cultural or social practices in countries have varying environmental impacts.
13.2.1	**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. **Science: Nature of Science** N.12.B.1 Students know science, technology, and society influenced one another in both positive and negative ways. N.12.B.2 Students know consumption patterns, conservation efforts, and cultural or social practices in countries have varying environmental impacts.
13.2.2	**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.
13.2.3	**Science: Nature of Science** N.12.A.4 Students know how to safely conduct an original scientific investigation using the appropriate tools and technology. N.12.B.2 Students know consumption patterns, conservation efforts, and cultural or social practices in countries have varying environmental impacts.
13.3.1	**Science: Nature of Science** N.12.B.1 Students know science, technology, and society influenced one another in both positive and negative ways.
13.3.2	**Science: Life Science** L.12.C.1 Students know relationships of organisms and their physical environment. L.12.C.2 Students know how changes in an ecosystem can affect biodiversity and biodiversity's contribution to an ecosystem's stability.

ALIGNMENT OF HORTICULTURE SCIENCE STANDARDS AND THE COMMON CORE MATHEMATICAL PRACTICES

Common Core Mathematical Practices	Horticulture Science Performance Indicators
1. Make sense of problems and persevere in solving them.	
2. Reason abstractly and quantitatively.	5.3.2, 5.3.3
3. Construct viable arguments and critique the reasoning of others.	2.3.3
4. Model with mathematics.	3.2.3, 3.2.4 5.3.3; 6.3.1, 6.3.2 12.3.1, 12.3.3, 12.3.6 13.2.3
5. Use appropriate tools strategically.	3.2.2, 3.2.3 5.2.3 12.3.1, 12.3.3, 12.3.6; 13.2.3
6. Attend to precision.	3.2.3, 3.2.4 5.2.3; 5.3.3 12.3.1, 12.3.3, 12.3.6 13.2.3
7. Look for and make use of structure.	3.2.4 5.3.2 6.3.1, 6.3.2 13.2.3
8. Look for and express regularity in repeated reasoning.	

CROSSWALKS OF LANDSCAPE DESIGN AND 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™.	1.1.1, 1.1.3; 1.3.1, 1.3.2 4.1.1
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.	1.3.1-1.1.3; 2.4.1-2.4.3 12.1.1, 12.1.2, 12.2.1 13.1.2, 13.1.4
3. Examine and summarize the importance of health, safety and environmental management systems in AFNR businesses.	1.1.1, 1.1.5, 1.1.6; 1.3.1 1.3.2; 4.1.1-4.1.3 5.4.1-5.4.3 10.2.1-10.2.5; 12.4.1 13.1.2, 13.1.4 13.2.1-13.2.3; 13.3.1 13.3.2
4. Demonstrate stewardship of natural resources in AFNR activities.	2.4.1-2.4.3; 3.2.1-3.2.4 13.1.1, 13.1.2, 13.1.4 13.2.1-13.2.3
5. Describe career opportunities and means to achieve those opportunities in each of the Agriculture, Food & Natural Resources Career Pathways.	3.1.1-3.1.5; 3.2.1-3.2.4 4.1.1-4.1.3; 4.3.1, 4.3.2
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.	1.1.1; 11.2.1-11.2.3 11.3.1-11.3.4

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.	11.1.1-11.1.4 11.2.1-11.2.4 11.3.1-11.3.4
2. Apply the principles of classification, plant anatomy and plant physiology to plant production and management.	6.1.1-6.1.3; 6.2.1-6.2.3 6.3.1-6.3.4; 7.1.1-7.1.3 7.2.1-7.2.3; 7.3.1-7.3.4 7.4.1-7.4.4; 9.1.2-9.2.5
3. Propagate, culture and harvest plants and plant products based on current industry standards.	11.2.1, 11.2.2, 11.2.3
4. Apply principles of design in plant systems to enhance an environment (e.g., floral, forest, landscape and farm).	