

Energy & Natural Resources Endorsement

Specifications, Competencies & Requirements

PURPOSE

This endorsement is meant for certified teachers interested in teaching **Energy & Natural Resources** courses. It attaches to a current Utah Educator License with a license area of concentration in **Secondary** Education.

Upon attachment of this endorsement to a Utah educator license, educators are approved to teach courses as outlined in the current school year USBE Assignment Requirements.

The most up-to-date course assignments and codes can be found on the USBE website by navigating to [Administrative & School Supports](#) and selecting the appropriate “**20XX–20XX Assignments Requirement**” link under CACTUS Codes & Data for SYXX (updated annually by school year).

Applicants and LEAs should refer to this resource as the master list for current approved courses and assignment codes associated with this endorsement.

ENDORSEMENT TYPES

Prerequisite

Demonstrate an understanding of Career and Technical Education (CTE) basics.
CTE Knowledge

Associate Level Requirements

Applicants must complete **THREE** of the following competency requirements. The associate level endorsement is valid for up to three school years before it expires. Associate-level endorsements are non-renewable.

- Clean & Alternative Energy
- Conservation & Land Management
- Ecological Research & Development
- Environmental Protection
- Resource Extraction
- The National FFA Organization & Supervised Agricultural Experiences (SAE)
- Agricultural Literacy
- Lab-Based Methods

Professional Level Requirements

The applicant must meet **ALL** the competency areas listed above.



COMPETENCY DETAILS & DESCRIPTIONS

Prerequisite

1. CTE Knowledge

Demonstrate an understanding of CTE basics:

- Explain how CTE links learning to specific Utah industries and what its main goals are.
- Know the licenses and endorsements needed to teach specific CTE courses.
- Describe how CTE is organized into clusters and pathways at the state, district (LEA), and school levels, and how this helps students succeed after graduation.
- Locate and use the state's strands and standards in lesson plans.
- Explore CTE student organizations (CTSOs) and professional groups and explain how they support students and teachers.
- Explain how advisory boards, with industry members, make sure programs meet job market needs and maintain safe learning environments.
- Understand the basics of securing funding, planning for the future of the program, and participating in the state Program of Quality Review (PQR) to ensure program excellence.

Select one of the following options:

- **USBE Course:** [CTE Orientation](#)
- **Complete THREE years of full-time CTE Teaching in Utah**
- **Currently hold a professional-level CTE endorsement**

Endorsement Competencies

2. Clean & Alternative Energy

Demonstrate basic understanding, terminology, and procedures for ALL the following:

1. Environmental Factors on Plant Growth

- Analyze how light, temperature, water, and soil composition affect plant development.
- Design and conduct experiments to test environmental variables on plant health.
- Interpret data to recommend adjustments for optimal plant growth in various settings.

2. Sustainability in Agriculture

- Define sustainable agriculture and its environmental, economic, and social dimensions.
- Compare sustainable and conventional practices, such as crop rotation, cover cropping, and integrated pest management.
- Develop a sustainability plan for a farm, garden, or greenhouse operation.

3. Soil Science Principles

- Identify soil components (sand, silt, clay, organic matter) and their properties.
- Interpret soil test results to determine pH, nutrient levels, and texture.
- Recommend soil amendments to improve fertility, structure, and water retention.

4. Aquaponics

- Explain the principles of aquaponics, including the nitrogen cycle and symbiotic relationships.
- Design or maintain a small-scale aquaponics system, balancing fish and plant needs.
- Monitor water quality and system health using appropriate tools and techniques.

5. Water Monitoring

- Use tools to measure water quality indicators, such as pH, turbidity, and dissolved oxygen.
- Interpret water test results to assess environmental or agricultural impacts.
- Develop a water monitoring plan for a farm, greenhouse, or natural area.

6. Greenhouse Crop Production Techniques

- Operate greenhouse systems, including temperature, humidity, and irrigation controls.
- Select and manage crops suited for greenhouse production.
- Monitor plant health and growth in a controlled environment.

7. Safety Practices

- Identify and use personal protective equipment (PPE) for agricultural and environmental tasks.
- Follow safety protocols for tools, chemicals, and equipment.
- Recognize and respond to environmental hazards, such as heat stress, chemical exposure, or water contamination.

Select **one** of the following options:

- **A bachelor's or higher degree in Energy** or a degree in Agricultural Education, Agricultural Technology and Automation, Interdisciplinary Studies (Ag), Agricultural Systems Technology (Agricultural Operations Emphasis), or General Studies (Agriculture)
- **Pass the Praxis: Agriculture (5701) Exam**
- **CASE Institute:** [Natural Resources and Ecology](#)
- **College Course:** Transcripts showing a passing grade of a relevant course similar to (choose one):
 - GEO 3150 - Energy in the Twenty-First Century
 - PHYS 3150 - Energy in the Twenty-First Century
 - ETEC 3020 - Energy System
 - MAE 5450 - Hybrid Energy

3. Conservation & Land Management

Demonstrate basic understanding, terminology, and procedures for ALL the following:

1. Range Management

- Identify native and invasive plant species in rangeland ecosystems.
- Evaluate grazing systems and their impact on plant health and soil conservation.
- Develop a basic range management plan for livestock or wildlife use.

2. Forestry Management

- Identify tree species and their ecological or commercial uses.
- Explain forest management practices, including thinning, harvesting, and reforestation.
- Assess forest health and recommend conservation strategies.

3. Nursery Practices

- Propagate plants using seeds, cuttings, and division in a nursery setting.
- Maintain nursery stock through proper watering, fertilization, and pest control.
- Prepare plants for sale or transplant, including labeling, packaging, and customer education.

4. Plant Selection and Installation

- Select plants based on site conditions, such as soil type, sunlight, and climate.
- Design a planting plan that meets aesthetic, functional, and environmental goals.
- Demonstrate proper installation techniques to ensure plant health and landscape success.

Select **one** of the following options:

- **A bachelor's or higher degree in Natural Resources** or a degree in Agricultural Education, Agricultural Technology and Automation, Interdisciplinary Studies (Ag), Agricultural Systems Technology (Agricultural Operations Emphasis), or General Studies (Agriculture)
- **Pass the Praxis: Agriculture (5701) Exam**
- **CASE Institute:** [Natural Resources and Ecology](#)
- **College Course:** Transcripts showing a passing grade of a relevant course similar to (choose one):
 - WILD 3500 - Introduction to Rangeland Management

- WILD 4000 - Principles of Rangeland Management

4. Ecological Research & Development

Demonstrate basic understanding, terminology, and procedures for ALL the following:

1. Scientific Method

- Define and apply the steps of the scientific method, including observation, hypothesis, experimentation, data collection, and conclusion.
- Design and conduct agricultural experiments using controlled variables and replicable procedures.
- Analyze and interpret data to draw evidence-based conclusions and communicate findings.

2. Role of Research, Development, and Technology in Agriculture

- Explain how scientific research and innovation have advanced agricultural productivity and sustainability.
- Identify examples of agricultural technologies, such as precision farming, biotechnology, and automation.
- Evaluate the impact of research and development on food systems, environmental health, and global agriculture.

3. Examples of Scientific Work

- Explore real-world case studies of agricultural research and innovation.
- Identify careers in agricultural science, including plant pathology, soil science, and ag engineering.
- Summarize the contributions of scientists and researchers to solving agricultural challenges.

Select **one** of the following options:

- **A bachelor's or higher degree in Natural Resources** or a degree in Agricultural Education, Agricultural Technology and Automation, Interdisciplinary Studies (Ag), Agricultural Systems Technology (Agricultural Operations Emphasis), or General Studies (Agriculture)
- **Pass the Praxis: Agriculture (5701) Exam**
- **CASE Institute:** [Natural Resources and Ecology](#)
- **College Course:** Transcripts showing a passing grade of a relevant course, like (choose one):
 - WILD 2200 - Ecology of our Changing World
 - WILD 3810 - Wildlife Population Ecology

5. Environmental Protection

Demonstrate basic understanding, terminology, and procedures for ALL the following:

1. Natural Resources

- Classify natural resources as renewable, nonrenewable, or inexhaustible.
- Explain the role of natural resources in agriculture, energy, and environmental systems.
- Evaluate the impact of human activity on resource availability and ecosystem health.

2. Plant Installation and Maintenance

- Demonstrate proper planting techniques for trees, shrubs, and herbaceous plants.
- Perform routine maintenance tasks, such as watering, fertilizing, pruning, and mulching.
- Identify and correct common plant care issues, including pests, diseases, and nutrient deficiencies.

Select **one** of the following options:

- **A bachelor's or higher degree in Natural Resources** or a degree in Agricultural Education, Agricultural Technology and Automation, Interdisciplinary Studies (Ag), Agricultural Systems Technology (Agricultural Operations Emphasis), or General Studies (Agriculture)

- **Pass the Praxis: Agriculture (5701) Exam**
- **CASE Institute:** [Natural Resources and Ecology](#)
- **College Course:** Transcripts showing a passing grade of a relevant course similar to WILD 2400 - Wildland Resource Techniques

6. Resource Extraction

Demonstrate basic understanding, terminology, and procedures for ALL the following:

1. Types of Resource Extraction

- Understand major extraction industries: mining (coal, minerals), oil and gas, forestry, and water.
- Explain extraction methods (e.g., surface mining, hydraulic fracturing, clear-cutting, aquifer pumping).

2. Geological and Ecological Foundations

- Identify the natural formations and ecosystems where resources are located.
- Understand how geology, soil composition, and hydrology influence extraction feasibility.

3. Environmental Impact

- Analyze the effects of extraction on soil, water, air, and biodiversity.
- Understand reclamation, erosion control, and pollution mitigation strategies.

4. Regulations and Compliance

- Be familiar with local, state, and federal regulations (e.g., EPA, BLM, USFS).
- Understand permitting processes, environmental impact assessments (EIAs), and compliance reporting.

5. Economic and Social Considerations

- Explain the role of extraction in local and global economies.
- Evaluate the social impacts on communities, including Indigenous lands, rural economies, and labor markets.

6. Sustainability and Resource Management

- Understand the principles of sustainable extraction and resource conservation.
- Evaluate renewable vs. nonrenewable resource use and long-term availability.

7. Technology and Innovation

- Stay current with emerging technologies in extraction (e.g., remote sensing, automation, carbon capture).
- Understand how innovation can reduce environmental impact and improve efficiency.

8. Ethics and Stewardship

- Recognize ethical considerations in land use, environmental justice, and community impact.
- Promote responsible decision-making and long-term thinking in resource management.

9. Safety and Risk Awareness

- Understand the physical risks associated with extraction (e.g., cave-ins, chemical exposure, equipment hazards).
- Be familiar with industry-standard safety protocols and emergency response procedures.

Select ***one*** of the following options:

- **A bachelor's or higher degree in Natural Resources**
- **Pass the Praxis: Agriculture (5701) Exam**
- **CASE Institute:** [Natural Resources and Ecology](#)
- **College Course:** Transcripts showing a passing grade of a relevant course like APEC 3012 - Introduction to Natural Resource Economics

7. The National FFA Organization & Supervised Agricultural Experience (SAE)

Demonstrate basic understanding, terminology, and procedures for ALL the following:

1. Role of FFA in Agricultural Education

- Explain the three-component model of agricultural education: classroom/laboratory instruction, supervised agricultural experience (SAE), and FFA.
- Describe the mission and vision of the National FFA Organization and its connection to student success.
- Identify how FFA supports leadership, personal growth, and career success through agricultural education.

2. Opportunities in FFA

- Explore local, state, and national FFA programs, including leadership conferences, conventions, and service projects.
- Identify opportunities for involvement in chapter activities, committees, and officer roles.
- Set personal goals for participation in FFA events that align with career interests and leadership development.

3. FFA Degrees, Awards, and Career Development Events (CDEs)

- List and describe the five FFA degrees (Discovery, Greenhand, Chapter, State, American) and their requirements.
- Identify available CDEs and LDEs and explain how they relate to agricultural career pathways.
- Track progress toward awards and degrees using record books and goal-setting tools.

4. Personal, Leadership, and Career Skills through FFA Participation

- Demonstrate leadership skills through public speaking, teamwork, and decision-making in FFA activities.
- Develop a personal growth plan that includes FFA participation, SAE goals, and career exploration.
- Reflect on how FFA experiences contribute to employability skills, such as communication, responsibility, and initiative.

5. Personal and Leadership Development through FFA

- Participate in leadership development events (LDEs) such as Creed Speaking, Parliamentary Procedure, or Job Interview.
- Create and deliver presentations that demonstrate confidence, clarity, and purpose.
- Engage in service-learning or community outreach projects that build empathy, citizenship, and leadership capacity.

6. Role of SAE in Agricultural Education

- Explain the purpose of SAE as one of the three components of agricultural education (classroom, FFA, SAE).
- Describe how SAE supports career exploration, skill development, and real-world application of classroom learning.
- Identify how SAE connects to FFA awards, degrees, and career pathways.

7. Types of SAE Programs

- Differentiate between the types of SAE programs, including:
 - Foundational
 - Placement/Internship
 - Ownership/Entrepreneurship
 - Research (Experimental or Analytical)
 - School-Based Enterprise
 - Service Learning
- Select an SAE type that aligns with personal interests, career goals, and available resources.

8. Planning an SAE Program

- Develop an SAE plan that includes goals, a timeline, a budget, and expected outcomes.
- Identify resources and support systems, such as mentors, facilities, and materials.
- Set measurable goals for skill development, income, hours worked, or knowledge gained.

9. Maintaining and Using SAE Records

- Use an approved record-keeping system (e.g., AET or paper-based) to track hours, income, expenses, and learning reflections.
- Update records regularly to reflect progress and changes in the SAE.
- Use SAE records to complete applications for FFA degrees, awards, and scholarships.

10. Maintenance and Expansion of SAE Programs

- Evaluate SAE progress using records, feedback, and self-reflection.
- Identify opportunities to expand or improve the SAE, such as increasing scope, adding responsibilities, or diversifying experiences.
- Revise goals and plans based on challenges, successes, and new interests.

11. Work-Based Learning Activities through SAE

- Participate in real-world agricultural experiences that develop technical and employability skills.
- Demonstrate workplace readiness skills, such as punctuality, communication, and problem-solving.
- Reflect on how SAE experiences contribute to career exploration and decision-making.

Select one of the following options:

- **Pass the Praxis: Agriculture (5701) Exam**
- **College Course:** Transcripts showing a passing grade of a relevant course similar to ASTE 3620 - Managing the FFA and SAE Programs

8. Agricultural Literacy

Demonstrate basic understanding, terminology, and procedures for ALL the following:

1. Agriculture in Daily Life

- Identify agricultural products used in everyday life, including food, clothing, shelter, and fuel.
- Explain the connection between agriculture and community well-being, including jobs, economy, and environment.
- Recognize how personal choices impact agriculture, such as food purchasing, waste, and sustainability.

2. Agriculture Curriculum

- Describe the purpose of agricultural education in developing career, leadership, and life skills.
- Identify key areas of study within agriculture, such as animal science, plant science, agribusiness, and environmental systems.
- Connect classroom learning to real-world agricultural applications through projects, labs, and community involvement.

3. Historical and Global Perspectives of Food Systems and Their Global Variations

- Compare historical food systems and how they have evolved over time.
- Identify global variations in food production and consumption, including cultural, economic, and environmental influences.
- Analyze how global trade, technology, and policy affect food availability and security.

4. Fundamental Components of Food and Balanced Diets, Food Transformation Processes, and Food Safety Concerns

- Identify the components of a balanced diet, including macronutrients and micronutrients.
- Explain how raw agricultural products are transformed into food, including processing, packaging, and distribution.

- Recognize food safety practices from farm to table, including sanitation, labeling, and storage.
5. Plant Growth, Major Crops, and Production Practices
- Describe the stages of plant growth and the environmental factors that influence development.
 - Identify major crops grown locally, nationally, and globally, and their uses.
 - Demonstrate knowledge of production practices, such as planting, irrigation, pest control, and harvesting.
6. Animal Products in Agriculture
- Identify animal products used for food (meat, dairy, eggs), fiber (wool, leather), and byproducts (gelatin, pharmaceuticals).
 - Explain how animals are raised and processed for agricultural use.
 - Evaluate the role of animal agriculture in food systems, sustainability, and global trade.

Select **one** of the following options:

- **A bachelor's or higher degree in General Agriculture**
- **Pass the Praxis: Agriculture (5701) Exam**
- **Agricultural Literacy Certification:** [NCAL Certification](#)
- **College Course:** Transcripts showing a passing grade of a relevant course, like (choose one):
 - ASTE 2900 - Food Matters: Ethics, Economics, and the Environment
 - ASTE 2910 - Sustainability through Global Citizenship

9. Lab-Based Methods

Demonstrate basic understanding, terminology, and procedures for ALL the following:

1. Instructional Excellence in Secondary Agricultural Education
 - Integrate FFA and SAE into classroom instruction to enhance student learning and career readiness.
2. Laboratory Management in Ag Education
 - Establish and maintain a positive, respectful learning environment in lab settings.
 - Implement routines and procedures that promote safety, efficiency, and student responsibility.
 - Manage materials, equipment, and student behavior to maximize instructional time.
3. Safety and Risk Management in Agricultural Laboratories
 - Develop and enforce safety protocols for all lab and shop activities.
 - Conduct safety training and maintain documentation for students and staff.
 - Identify and mitigate potential hazards in agricultural labs, greenhouses, and outdoor learning spaces.
4. Instructional Strategies for CTE Labs and Cross-Curricular Integration
 - Design and implement lab-based instruction that reinforces academic and technical skills.
 - Integrate core subjects (math, science, literacy) into agricultural lessons and projects.
 - Collaborate with other educators to create interdisciplinary learning experiences.

Select **one** of the following options:

- **Microcredential (coming 2026)**
- **College Course:** Transcripts showing a passing grade of a relevant course like ASTE 3240 - Teaching in Laboratory Settings