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 will be approved to teach the following USBE courses:

Aquaculture
Natural Resource Science 1
Natural Resource Science 2

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 <u>one</u> 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