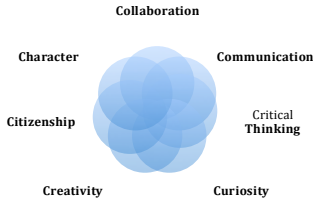
Content Area Agriscience **DRAFT**	**Course:** Sustainable Food Production Year B	**Grade Level: 11/12**
	**R14 The Seven Cs of Learning** 	

Unit Titles	**Length of Unit**
• *Aquatic Invasive Species*	4-6 Weeks
• *Aquaculture Structures and Equipment*	5-7 Weeks
• *Mariculture*	3-5 Weeks
• *Health and Nutrition of Aquatic Animals*	5-7 Weeks
• Supervised Agricultural Experience (SAE) Proficiencies	1-2 weeks
• *Carp, Salmonids, Tilapia, and Channel Catfish*	4-6 weeks
• *Advanced Water Chemistry*	3-5 weeks
• *Careers*	2-3 weeks

Strands	Course Level Expectations
Maintenance and Safety	• Students will be responsible for managing the greenhouses where they will use basic woodworking, plumbing, and hand tools. In addition, students need to come physically prepared to perform fieldwork in all weather conditions. They will manage the garden and greenhouse in hot conditions, monitor fish systems where they will get wet and dirty, and walk throughout the facilities in the wintertime.
Water	• Water management is a constant throughout this course. Knowing how to manage water parameters will ensure aquatic species health and production, as well as maximize crop yields
Aquaculture Equipment	• Aquaculture involves the use of many tools and types of rearing containers. It is essential to know how and when to use equipment, as well as troubleshooting facilities that are needed for specific animals.
Animal Health	• Each aquaculture animal requires specific management practices. Knowing what each species needs and how to diagnose ailments and trouble hoot can help maximize production.

Unit Title	Aquatic Invasive Species	Length of Unit	4-6 weeks

Inquiry Questions (Engaging & Debatable)	● What aquatic species are native to Connecticut watersheds? ● What does it mean to be an invasive specie? ● How do aquatic invasive species affect aquatic ecosystems?
Standards*	CT-AQ.04.02.01.c. Implement a biosecurity plan for an aquaculture production operation. CT-AQ.08.01.01.c. Apply sustainable principles and practices to aquaculture production and management CT-AQ.08.02.01.c. Establish and maintain favorable environmental conditions for aquatic species growth and performance.
Unit Strands & Concepts	Aquatic invasive species have made their way into many of Connecticut's watersheds, some which have been introduced by humans. Their presence can alter ecosystems and native species. Ecosystem interaction, invasive species identification and removal, kayaking techniques, fish and plant classification, habitat alteration, resource competition, altered food chain
Vocabulary	Invasive species, eutrophication, eurasion watermilfoil, zebra mussel, acidification

* CT Agricultural Science and Technology Education Standards

Unit Title	Aquatic Invasive Species	Length of Unit	4-6 Weeks

Critical Content: My students will **Know**…	Key Skills: My students will be able to **(Do)**…
• identification of Connecticut native and non native aquatic plants and animals • effects of various invasive species on aquatic ecosystems • the definition of invasive species	• distinguish invasive from non-invasive species • demonstrate canoeing techniques • demonstrate invasive species removal • describe the myriad of affects that aquatic invasive species have on an ecosystem

Assessments:	• Formative assessment on invasive species identification • Performance assessment on collection of organisms • Unit Test
Teacher Resources:	❖ Various Primary Resources ❖ Parker, Rick. Aquaculture Science. 2nd Edition. Delmar Publishers Inc. 2002

Unit Title	Aquaculture Structures and Equipment	Length of Unit	5-7 weeks

Inquiry Questions **(Engaging & Debatable)**	● In what types of facilities are fish cultured? ● How does recirculating aquaculture compare with pond aquaculture? ● What factors must be considered when designing an aquaculture facility? ● What biological and environmental concerns are there associated with aquaculture?
Standards	CT-AQ.07.03.02.c. Select equipment and implement handling procedures and improvements to enhance production efficiency of aquatic species. CT-AQ.07.02.01.c. Implement a program to assure the safety of animal products. CT-AQ.07.03.02.c. Select equipment and implement handling procedures and improvements to enhance production efficiency of aquatic species.
Unit Strands & Concepts	Aquaculture is one of the newest and fastest growing areas in agriculture. New facilities and equipment are constantly being engineered and knowing the basic methods will help prepare students in working with them recirculating aquaculture, extensive aquaculture, site selection, aquaculture equipment
Key Vocabulary	cage culture, stratification, flow index, levee, paddlewheel, watershed, topography, seine

Unit Title	Aquaculture Structures and Equipment	Length of Unit	5-7 Weeks

Critical Content: My students will **Know**…	Key Skills: My students will be able to **(Do)**…
• steps in determining where cage culture is ideal • the necessary equipment and containers to start an aquaculture operation • how and when to manage water quality parameters in large aquaculture operations	• distinguish between different types of pond culture • identify factors in site selection • define tank and raceway culture • list advantages and disadvantages of each type of culture • trouble shoot recirculating systems • identify equipment used in hatchery, nursery, aquarium, and commercial production

Assessments:	• Formative assessment on Aquaculture structures and equipment • Performance assessments • Unit Test
Teacher Resources:	❖ Various Primary Resources ❖ Parker, Rick. Aquaculture Science. 2nd Edition. Delmar Publishers Inc. 2002

Unit Title	Aquarium Management	Length of Unit	3-5 weeks

Inquiry Questions **(Engaging & Debatable)**	● What factors need to be considered when starting an aquarium? ● What species of fish thrive in aquariums? ● What is the scale of the ornamental fish industry in the USA and across the globe? ● What species of fish are farmed for aquariums?
Standards	CT-AQ.12.01.01.b. Describe characteristics of water that influence the biosphere and sustain life. CT-AQ.07.04.01.b. Evaluate an aquaculture facility to determine if standards have been met. CT-AQ.08.02.01.c. Establish and maintain favorable environmental conditions for aquatic species growth and performance.
Unit Strands & Concepts	Aquariums and ornamental aquaculture is a multi-million dollar business in the United States. Managing aquaculture on this smaller scale requires more attention to detail, different equipment, and different fish. Water quality in aquariums, fish selection, aquatic plant production, waste management in aquariums
Vocabulary	Cichlids, algae, powerhead, protein skimmer, ocean salts, refractometer, live-bearer, egg scatterer

Unit Title	Aquarium Management	Length of Unit	3-5 weeks

Critical Content: My students will **Know**…	Key Skills: My students will be able to **(Do)**…
● when to safely add fish to an aquarium ● what starter equipment is necessary for an aquarium ● water quality parameters and their effects on certain fish species ● what fish do well in aquarium production	● set up an aquarium ● monitor and maintain water quality ● identify common fish species used in aquariums ● identify common aquatic plants used in aquariums ● safely clean aquariums

Assessments:	• Formative assessment on aquariums • Quiz on ornamental fish • Unit test
Teacher Resources:	❖ Various Primary Resources ❖ Parker, Rick. Aquaculture Science. 2nd Edition. Delmar Publishers Inc. 2002

Unit Title	Health of Aquatic Animals	Length of Unit	5-7 weeks

Inquiry Questions (Engaging & Debatable)	• What diseases are common in aquaculture and aquarium production? • What physical and behavioral signs can be used to tell if a fish is sick? • What treatments can be used to fight and cure disease?
Standards	CT-AQ.08.02.01.c. Establish and maintain favorable environmental conditions for aquatic species growth and performance. CT-AQ.08.01.01.c. Apply sustainable principles and practices to aquaculture production and management. CT-AQ.07.02.01.c. Implement a program to assure the safety of animal products. CT-AQ.04.01.02.a. Identify common diseases, parasites and physiological disorders that affect aquatic species.
Unit Strands & Concepts	Pathogens are an issue in almost all areas of agriculture. Knowing how to identify and treat them can ensure best production and management. Fish health management, stressors of fish, disease identification and management, fish vaccinations
Vocabulary	Transmission, virus, bacteria, fungus, visceral, antibodies, mortality, transmission

Unit Title	Health of Aquatic Animals	Length of Unit	5-7 Weeks

Critical Content: My students will **Know**…	Key Skills: My students will be able to **(Do)**…
• how to identify a stressed fish by behavioral signs • management measures for preventing disease outbreaks • terms associated with disease conditions • names of common aquaculture pathogens	• calculate and apply different treatments to production tanks • dissect fish and identify internal structures related to diseases • identify fungal, viral, and bacterial infections with the use of microscopes

Assessments:	• Formative assessment on fish health • Unit test
Teacher Resources:	❖ Various Primary and Industry Resources ❖ Parker, Rick. Aquaculture Science. 2nd Edition. Delmar Publishers Inc. 2002

Unit Title	SAE Proficiencies	Length of Unit	1-2 weeks

Inquiry Questions (Engaging & Debatable)	• How does record keeping relate to evaluation of goals? • How does a student quality growth? • How does a student describe and document success?
Standards	**CCTC Career Ready Practices (CRP):** **CRP.01. Act as a responsible and contributing citizen and employee.** **CRP.01.01**. Model personal responsibility in the workplace and community **CRP.01.02** Evaluate and consider the near-term and long-term impacts of personal and professional decisions on employers and community before taking action. **CRP.01.03.** Identify and act upon opportunities for professional and civic service at work and in the community. **CRP.02. Apply appropriate academic and technical skills.** **CRP.02.01.** Use strategic thinking to connect and apply academic learning, knowledge and skills to solve problems in the workplace and community. **CRP.02.02.** Use strategic thinking to connect and apply technical concepts to solve problems in the workplace and community.
Unit Strands & Concepts	Financial Reporting, how to prepare and Present, Effective Writing, How to Determine Success Record keeping, Descriptive writing, Evaluation of goals and success,
Key Vocabulary	Proficiency, financial report, income, expenses, career success, placement, scope, expenditures, gross earnings, net earnings, liabilities, net worth

Unit Title	SAE Proficiencies	Length of Unit	1-2 Weeks

Critical Content: My students will **Know**…	Key Skills: My students will be able to **(Do)**…
• utilize AET • describe and explain the student's' SAE • calculate hours worked and money earned • list skills and identify growth • calculate gross and net income • evaluate goals	• create a comprehensive PowerPoint presentation • create a expense report and earning report • write descriptive paragraphs • assemble a collage • create a professional resume • describe and quality success

Assessments:	• Formative and Interim Assessments • Summative: Final Submission of Proficiency Application. Grades with the National FFA rubric • Performance Assessment: SAE Multimedia Presentation
Teacher Resources:	❖ Various Primary and Industry Resources

Unit Title	Management Practices of Finfish	Length of Unit	4-6 weeks

Inquiry Questions **(Engaging & Debatable)**	● What range of species can be cultured in aquaculture? ● How do management practices compare between species? ● How does fish management change from egg to adult? ● How do life cycles of different fish compare?
Standards	CT-AQ.08.01.01.c. Apply sustainable principles and practices to aquaculture production and management. CT-AQ.08.02.01.c. Establish and maintain favorable environmental conditions for aquatic species growth and performance. CT-AQ.07.03.02.c. Select equipment and implement handling procedures and improvements to enhance production efficiency of aquatic species. CT-AQ.07.02.01.c. Implement a program to assure the safety of animal products.
Unit Strands & Concepts	One of the foundations of aquaculture in addition to water management is fish management. Breeding, stocking, and harvesting are all widely practiced in the industry. Broodstock management, harvesting methods, stocking rates, fry and fingerling management, nursery and hatchery production
Vocabulary	Anadromous, catadromous, detritus, eyed egg, fry, fingerling, milt, mouthbrooder, salmonid, oreochromus, volumetric displacement, stocking, spawning

Unit Title	Management Practices of Finfish	Length of Unit	4-6 Weeks

Critical Content: My students will **Know**…	Key Skills: My students will be able to **(Do)**…
• the purpose and function of hatcheries, nurseries, and growout facilities • management guidelines for different species • life cycles of commonly cultures fish species	• artificially spawn tilapia in the genus oreochromus • identify the sex of tilapia, trout, and salmon • calculate stocking rates using volumetric displacement

Assessments:	• Formative Assessment on Management Practices • Performance Assessment • Unit Test
Teacher Resources:	❖ Various Primary and Industry Resources ❖ Parker, Rick. Aquaculture Science. 2nd Edition. Delmar Publishers Inc. 2002

Unit Title	Advanced Water Chemistry	Length of Unit	3-5 weeks

Inquiry Questions (Engaging & Debatable)	● Why is water quality the most important factor in aquaculture? ● How can water quality be measured and maintained? ● What water quality parameters must be measured in aquaculture? ● How can certain treatments be calculated before adding to water? ● How do certain anions and cations affect aquaculture production?
Standards	CT-AQ.08.01.01.c. Apply sustainable principles and practices to aquaculture production and management. CT-AQ.08.02.01.c. Establish and maintain favorable environmental conditions for aquatic species growth and performance.
Unit Strands & Concepts	The most important variable in aquaculture is water. Knowing its chemical properties can ensure the most efficient aquaculture production. Nitrogen Cycle, effects of aquatic plants and carbon dioxide, pH interactions, effects of total dissolved solids in water, dissolved gases in water
Vocabulary	Nitrification, oxidation, ammonification, anaerobic, turbidity, alkalinity, hardness

Unit Title	Advanced Water Chemistry	Length of Unit	3-5 Weeks

Critical Content: My students will **Know**…	Key Skills: My students will be able to **(Do)**…
• each water quality parameter that must be measured in aquaculture • interactions between each water quality parameter • ideal levels for each water quality parameter • why aquatic solutions change chemically	• Perform water quality test using industry test kits and tools • Calculate treatments for volumes of water • Discuss the importance of oxygen in water quality management • Describe the importance of nitrogen compounds in water quality management

Assessments:	● Formative assessment on water quality terms ● Performance Assessments ● Unit test
Teacher Resources:	❖ Parker, Rick. Aquaculture Science. 2nd Edition. Delmar Publishers Inc. 2002 ❖ Various Primary resources

Unit Title	Careers	Length of Unit	2-3 weeks

Inquiry Questions (Engaging & Debatable)	• What types of careers are available in aquaculture and sustainability? • What types of educational options are available to pursue careers in aquaculture and sustainability?
Standards	**Cluster Skills (CS):** **CS.01.01.01.c** Work independently and in group settings to accomplish a task **CS.02.02.02.c** Present oneself appropriately in various settings **CS.02.03.03.b** Develop skills required for a specific career **CS.06.02.01.a** Use proper safety practices/personal protective equipment **CS.08.01.01.c** Use tools and equipment appropriately to complete a specific task. **Animal Systems (AS):** **AS.02.01.02.a.** Research and summarize the challenges involved in working with animals and resources available to overcome them (e.g., tools, technology, equipment, facilities, animal behavior signals, etc.). **AS.05.02.01.a.** Identify and summarize the general standards that must be met in facilities for animal production (e.g., environmental, zoning, etc.)
Unit Strands & Concepts	Career PowerPoint presentation, Career Pathways, educational options, graduate research
Vocabulary	Aquaculture, Sustainability, Associate's degree, Bachelor's degree, Master's Degree, Ph.D

Unit Title	Careers	Length of Unit	2-3 Weeks

Critical Content: My students will **Know**…	Key Skills: My students will be able to **(Do)**…
• what types of degrees are required to attain certain employment • what pathways they can choose in the fields of aquaculture and sustainability • jobs available regionally in the United States and world	• create a PowerPoint presentation describing the field they choose • describe the kinds of jobs in the United States and world related to aquaculture

Assessments:	• Career Presentation
Teacher Resources:	❖ Various Primary Resources