

**Course Title: Aquatic Biology**

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| <b>Unit: 1</b> | <b>Career Opportunities</b> |
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| <b>Content Standard(s) and Depth of Knowledge Level(s):</b> | <p>Students will:</p> <ol style="list-style-type: none"> <li>1. Describe various aquatic career opportunities.</li> </ol> |
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| <b>Learning Objective(s) and Depth of Knowledge Level(s):</b> | <p>Students will:</p> <ol style="list-style-type: none"> <li>1. List areas of aquaculture occupations.</li> <li>2. Describe the nature of jobs in those occupations.</li> <li>3. Describe the education and experience necessary to enter and in aquaculture occupations.</li> </ol> |
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| <b>Essential Question(s):</b> | Why learn about careers in Aquaculture? |
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| <b>Content Knowledge</b>  | <b>Suggested Instructional Activities Rigor &amp; Relevance Framework (Quadrant)</b>  | <b>Suggested Materials, Equipment and Technology Resources</b>   |
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| <p>I. Five Areas of Aquaculture Occupations</p> <ol style="list-style-type: none"> <li>A. Supplies &amp; Service</li> <li>B. Producing</li> <li>C. Inspecting and monitoring</li> <li>D. Marketing</li> <li>E. Research &amp; development</li> </ol> <p>II. Aquaculture Occupation Experience</p> <ol style="list-style-type: none"> <li>A. High School</li> <li>B. Technical School</li> <li>C. Community College</li> <li>University</li> </ol> | <p><b>Lecture with PowerPoint</b></p> <p><b>10+2 Discussion</b></p> <p><b>Homework</b></p> <p><b>Guided Practice</b></p> <p><b>Graphic Organizers</b></p> <p><b>Case studies</b></p> <p><b>Research</b></p> | <p>Textbooks</p> <p>Resource Books</p> <p><a href="http://www.aquanic.org/">http://www.aquanic.org/</a></p> <p><a href="http://www.bls.gov">www.bls.gov</a></p> <p><a href="http://www.aces.edu/dept/fisheries/education/">http://www.aces.edu/dept/fisheries/education/</a></p> <p><a href="http://www.aces.edu/dept/fisheries/education/">http://www.aces.edu/dept/fisheries/education/</a></p> <p><a href="http://ag.arizona.edu/azaqua/links.html">http://ag.arizona.edu/azaqua/links.html</a></p> |

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| <p>III. Define Work</p> <ul style="list-style-type: none"> <li>A. Employment</li> <li>B. Benefits of Work</li> </ul> <p>IV. Define Career Ladder</p> <ul style="list-style-type: none"> <li>A. Occupation vs. Career vs. Job</li> </ul> <p>V. Define entrepreneurship</p> <p>VI. Define Placement</p> <p>VII. Clustering occupations based on the nature of the work</p> <ul style="list-style-type: none"> <li>A. Professional</li> <li>B. Managerial</li> <li>C. Technical</li> <li>D. Skilled</li> <li>E. Semi-Skilled</li> <li>F. Unskilled</li> </ul> <p>VIII. Factors considered in selecting an occupation</p> <ul style="list-style-type: none"> <li>A. Interests</li> <li>B. Abilities</li> <li>C. Education and training requirements</li> <li>D. Nature of the work</li> <li>E. Earnings</li> <li>F. Location of the occupation</li> <li>G. Future</li> <li>H. Family ties</li> </ul> | <p><b>Worksheets</b></p> <p><b>Flashcards</b></p> <p><b>Guest Speakers</b></p> | <p><a href="http://www.careeronestop.org/ExploreCareers/SelfAssessments/FindAssessments.aspx">http://www.careeronestop.org/ExploreCareers/SelfAssessments/FindAssessments.aspx</a></p> <p>Reference Books</p> <p>Computers</p> <p>Internet</p> <p>Printer</p> <p>Handouts</p> <p>Teacher designed materials</p> <p><a href="http://en.wikipedia.org/wiki/Aquaculture">http://en.wikipedia.org/wiki/Aquaculture</a></p> <p><a href="http://animals.howstuffworks.com/animal-facts/aquaculture.htm">http://animals.howstuffworks.com/animal-facts/aquaculture.htm</a></p> <p><a href="http://www.aquaculturemag.com/">http://www.aquaculturemag.com/</a></p> |
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| <b>Unit Assessment:</b> | Teacher Observations, Tests, Performance Tasks, Projects, Posters, Quizzes, Demonstrations, Oral Presentations |
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| <b>Unit/Course CTSO Activity:</b> | FFA Supervised Agriscience Experience (SAE)<br>FFA Proficiency Awards |
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**Unit/Course  
Culminating  
Product:**

Have students prepare posters or presentations depicting various aquaculture occupations.

**Course/Program Credential(s):**  Credential  Certificate  Postsecondary Degree  University Degree  
 Other:

**Course Title: Aquatic Biology**

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| <b>Unit: 2</b> | <b>Safety</b> |
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| <b>Content Standard(s) and Depth of Knowledge Level(s):</b> | Students will:<br>2. Explain safety concepts related to aquatic biology. |
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| <b>Learning Objective(s) and Depth of Knowledge Level(s):</b> | Students will:<br>1. List potential hazards in an aquaculture facility.<br>2. Describe strategies to minimize hazards.<br>3. Demonstrate safe behavior. |
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| <b>Essential Question(s):</b> | What is important about SAFETY? |
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| <b>Content Knowledge</b>  | <b>Suggested Instructional Activities Rigor &amp; Relevance Framework (Quadrant)</b>                        | <b>Suggested Materials, Equipment and Technology Resources</b>   |
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| I. Food Quality and safety<br>A. HACCP<br>(hazard analysis critical control point)<br>B. United States Food and Drug Administration (FDA)<br>C. Food Safety Issues<br><br>II. Chemical Safety<br>A. Material Data Safety Sheet (MSDS) | <b>Lecture with PowerPoint</b><br><br><b>Inquiry</b><br><br><b>Guest Speakers</b><br><br><b>Note-taking</b> | <b>Computer</b><br><b>Printer</b><br><b>Internet</b><br><br><b>Handouts</b><br><br><b>Teacher Designed materials</b><br><br><b>Textbooks</b> |
| III. Physical Hazards in Aquaculture<br>A. Electrical Safety<br>B. Slow Moving Vehicle (SMV)<br>C. Tractors   | <b>Projects</b><br><br><b>Research</b>  | <b>Reference Books</b><br><br><b>Virtual Library</b>   |

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| <ol style="list-style-type: none"> <li>1. Roll Over Protection System (ROPS)</li> <li>2. PTO Operated Equipment <ol style="list-style-type: none"> <li>a. Boom Truck Operation</li> <li>b. Boating Safety</li> <li>c. Handling Fish</li> </ol> </li> </ol> <p>IV. Basic First Aid</p> <p>A. Personal Protective Equipment (PPE)</p> <ol style="list-style-type: none"> <li>1. Eye Protection</li> <li>2. Hearing Protection</li> <li>3. Body &amp; Skin Protection</li> <li>4. Respiratory Protection</li> <li>5. Water Hazards</li> </ol> <p>V. Facility Design</p> | <p><b>Position Paper</b></p> <p><b>SWOT Analysis</b></p> <p><b>Homework</b></p> | <p><a href="http://en.wikipedia.org/wiki/Aquaculture">http://en.wikipedia.org/wiki/Aquaculture</a></p> <p><a href="http://animals.howstuffworks.com/animal-facts/aquaculture.htm">http://animals.howstuffworks.com/animal-facts/aquaculture.htm</a></p> <p><a href="http://aquanic.org/asap/white_pages/drugs.pdf">http://aquanic.org/asap/white_pages/drugs.pdf</a></p> <p><a href="http://www.fda.gov/cvm/aqualibtoc.htm">http://www.fda.gov/cvm/aqualibtoc.htm</a></p> <p><a href="http://www.cdc.gov/nasd/menu/topic/aquaculture.html">http://www.cdc.gov/nasd/menu/topic/aquaculture.html</a></p> <p><a href="http://en.wikipedia.org/wiki/MSDS">http://en.wikipedia.org/wiki/MSDS</a></p> |
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| <b>Unit Assessment:</b> | Teacher Observations, Tests, Performance Tasks, Projects, Posters, Quizzes, Demonstrations, Oral Presentations |
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| <b>Unit/Course CTSO Activity:</b> | FFA Career Development Events<br>FFA SAE |
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| <b>Unit/Course Culminating Product:</b> | Students will create a portfolio of safety equipment and practice used in Aquaculture Careers. |
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| <p><b>Course/Program Credential(s):</b>   <input type="checkbox"/> Credential   <input type="checkbox"/> Certificate   <input type="checkbox"/> Postsecondary Degree   <input checked="" type="checkbox"/> University Degree</p> <p><input type="checkbox"/> Other:</p> |
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| <p>systems.</p> <p>III. History of Roman Aquaculture</p> <p>A. Begin in 100 BC</p> <p>B. Species included trout and mullet</p> <p>C. Used both freshwater and saltwater species</p> <p>IV. Similarities in Aquaculture &amp; Agriculture.</p> <p>A. Aquaculture involves:</p> <ol style="list-style-type: none"> <li>1. Fishing</li> <li>2. Holding</li> <li>3. Feeding</li> <li>4. Husbandry</li> <li>5. Breeding</li> <li>6. Domestication</li> </ol> <p>B. Agriculture involves:</p> <ol style="list-style-type: none"> <li>1. Hunting</li> <li>2. Holding</li> <li>3. Feeding</li> <li>4. Husbandry</li> <li>5. Breeding</li> <li>6. Domestication</li> </ol> | <p>Graphic Organizers</p> <p>Research</p> <p>Position Papers</p> <p>Oral Presentations</p> | <p>Computer</p> <p>Printer</p> <p>Internet</p> <p>Textbook</p> <p>Reference Book</p> <p>Handouts</p> <p>Teacher Designed Materials</p> |
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| <b>Unit Assessment:</b> | Teacher Observations, Tests, Performance Tasks, Projects, Posters, Quizzes, Demonstrations, Oral Presentations |
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| <b>Unit/Course CTSO Activity:</b> | FFA Public Speaking<br>FFA Career Development Events<br>SAE |
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| <b>Unit/Course Culminating Product:</b> | Students could be organized into groups or pairs to present a report or presentation on effect that aquaculture as had on different regions of the world. |
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| <b>Course/Program Credential(s):</b> <input type="checkbox"/> Credential <input type="checkbox"/> Certificate <input type="checkbox"/> Postsecondary Degree <input checked="" type="checkbox"/> University Degree<br><input type="checkbox"/> Other: |  |



**Course Title: Aquatic Biology**

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| <b>Unit: 4</b> | <b>Aquatic Species</b> |
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| <p><b>Content Standard(s) and Depth of Knowledge Level(s):</b></p> | <p>Students will:</p> <ol style="list-style-type: none"> <li>4. Classify aquatic species using scientific nomenclature.             <ul style="list-style-type: none"> <li>• Describing characteristics of various species of aquatic life</li> <li>• Identifying exotic, invasive, and indigenous aquatic species</li> <li>• Identifying microscopic and aquatic organisms using dichotomous keys</li> </ul> </li> <li>5. Describe types of aquatic animal production in the United States.             <ul style="list-style-type: none"> <li>• Comparing the aquaculture pond to natural aquatic ecosystems, including recreational fish ponds</li> </ul> </li> <li>6. Classify characteristics of ectothermic animals.             <ul style="list-style-type: none"> <li>• Describing roles of various aquatic organisms in aquaculture</li> </ul> </li> </ol> |
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| <p><b>Learning Objective(s) and Depth of Knowledge Level(s):</b></p> | <p>Students will:</p> <ol style="list-style-type: none"> <li>1. Describe characteristics used to classify aquatic species.</li> <li>2. Explain reasons for classification.</li> <li>3. Develop an information file on different aquatic species</li> </ol> |
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| <p><b>Essential Question(s):</b></p> | <p>What would be required to cultivate different aquatic species for production?</p> <p>Why is farming aquatic crops (animal &amp; plants) considered more productive than terrestrial crops?</p> |
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| Content Knowledge  | Suggested Instructional Activities Rigor & Relevance Framework (Quadrant) | Suggested Materials, Equipment and Technology Resources   |
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| <p>Ectothermic animals</p> <ol style="list-style-type: none"> <li>1. Body temperature same as environment</li> <li>2. No energy used to regulate body temperature</li> <li>3. Energy goes into growth</li> </ol> | <p>Brainstorming</p> <p>Flashcards</p> <p>Guest Speakers</p>              | <p><a href="http://en.wikipedia.org/wiki/Aquaculture">http://en.wikipedia.org/wiki/Aquaculture</a></p> <p><a href="http://animals.howstuffworks.com/animal-facts/aquaculture.htm">http://animals.howstuffworks.com/animal-facts/aquaculture.htm</a></p> |

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| <p>I. Common Aquaculture Species</p> <ul style="list-style-type: none"> <li>A. Baitfish</li> <li>B. Carp</li> <li>C. Crawfish</li> <li>D. Ornamental/Tropical Aquaculture</li> <li>E. Plant Aquaculture</li> <li>F. Catfish</li> <li>G. Red Drum</li> <li>H. Salmon</li> <li>I. Saltwater Shrimp</li> <li>J. Shellfish</li> <li>K. Striped Bass</li> <li>L. Sturgeon</li> <li>M. Tilapia</li> <li>N. Trout</li> <li>O. Walleye</li> <li>P. Yellow Perch</li> <li>Q. Other</li> </ul> | <p>Homework</p> <p>Lecture</p> <p>Instructional Technology</p> <p>Note-taking</p> <p>Oral presentations</p> <p>Ten plus two</p> <p>Worksheets</p> <p>Research</p> <p>Work-Based Learning</p> | <p>Textbook</p> <p>Reference Books</p> <p>Support Materials</p> <p>Teacher Designed Materials</p> <p>Handouts</p> <p>Videos</p> <p>LCD Projector</p> <p>Computers</p> <p>Printers</p> <p>Websites</p> <p>Internet</p> |
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| <p><b>Unit Assessment:</b></p> | <p>Teacher Observations, Tests, Performance Tasks, Projects, Posters, Quizzes, Demonstrations, Oral Presentations</p> |
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| <p><b>Unit/Course CTSO Activity:</b></p> | <p>FFA SAE<br/>FFA Proficiency Awards<br/>FFA Career Development Events</p> |
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| <p><b>Unit/Course Culminating Product:</b></p> | <p>Students will either create a portfolio of aquatic species or complete research and give a presentation on species.</p> |
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| <p><b>Course/Program Credential(s):</b>   <input type="checkbox"/> Credential   <input type="checkbox"/> Certificate   <input type="checkbox"/> Postsecondary Degree   <input checked="" type="checkbox"/> University Degree<br/> <input type="checkbox"/> Other:</p> |
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**Course Title: Aquatic Biology**

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| <b>Unit: 5</b> | <b>Water Management</b> |
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| <b>Content Standard(s) and Depth of Knowledge Level(s):</b> | <p>Students will:</p> <ol style="list-style-type: none"> <li>7. Describe concepts of diffusion and osmosis related to aquatic organisms.<br/>Examples: gill function, counter and current gas exchange</li> <li>8. Interpret water quality data related to natural and artificial aquatic environments.<br/>Examples: temperature, dissolved oxygen, ammonia, nitrate, nitrite, pH             <ul style="list-style-type: none"> <li>• Managing water quality parameters</li> </ul> Examples: analysis, treatment</li> </ol> |
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| <b>Learning Objective(s) and Depth of Knowledge Level(s):</b> | <p>Students will:</p> <ol style="list-style-type: none"> <li>1. Explain why water is important in aquaculture.</li> <li>2. Describe the properties of water.</li> <li>3. Explain the qualities of water for aquaculture.</li> <li>4. Explain how changes in water affect aquatic life.</li> <li>5. Conduct water quality tests.</li> <li>6. Calculate volume of different shape tanks.</li> <li>7. Explain ways of wastewater disposal in aquaculture.</li> <li>8. Identify regulations that apply to wastewater disposal.</li> <li>9. List and explain sources of aquaculture pollution.</li> </ol> |
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| <b>Essential Question(s):</b> | Why is the quality of water used in aquaculture important to the organisms being grown? |
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| <b>Content Knowledge</b>  | <b>Suggested Instructional Activities Rigor &amp; Relevance Framework (Quadrant)</b> | <b>Suggested Materials, Equipment and Technology Resources</b>   |
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| I. Water provides the following in aquaculture: <ol style="list-style-type: none"> <li>A. Oxygen source</li> <li>B. Food source</li> <li>C. Excretory site</li> <li>D. Temperature regulation</li> <li>E. Constant contact with organism</li> <li>F. Haven for disease</li> </ol> | Application Cards<br><br>Discussion<br><br>Case Studies                              | <a href="http://en.wikipedia.org/wiki/Aquaculture">http://en.wikipedia.org/wiki/Aquaculture</a><br><br><a href="http://animals.howstuffworks.com/animal-facts/aquaculture.htm">http://animals.howstuffworks.com/animal-facts/aquaculture.htm</a> |

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| <p>II. Physical Properties of Water</p> <p>III. Forms of Water</p> <ul style="list-style-type: none"> <li>A. Liquid</li> <li>B. Gas</li> <li>C. Solid</li> </ul> <p>IV. Qualities of water for aquaculture:</p> <ul style="list-style-type: none"> <li>A. Temperature</li> <li>B. Salinity</li> <li>C. Dissolved gases</li> <li>D. Dissolved solids</li> <li>E. Wastes</li> <li>F. pH</li> <li>G. Living aquatic organisms</li> <li>H. Plant</li> <li>I. Animal</li> </ul> <p>V. Water Management Practices to Improve Water Quality</p> <p>VI. How water changes cause stress:</p> <ul style="list-style-type: none"> <li>A. Shock Stress</li> <li>B. Chronic Stress</li> <li>C. Acute Stress</li> <li>D. Sources of Water <ul style="list-style-type: none"> <li>1. Precipitation</li> <li>2. Oceans</li> <li>3. Lakes</li> <li>4. Rivers/Streams</li> <li>5. Springs</li> <li>6. Wells</li> <li>7. Industrial effluent</li> <li>8. Municipal systems</li> </ul> </li> <li>E. Considerations in Selecting a Water Source. <ul style="list-style-type: none"> <li>1. Cost</li> <li>2. Availability</li> <li>3. Quality</li> <li>4. Reliability</li> </ul> </li> </ul> <p>VII. Calculating Volume in Tanks</p> | <p>Experiments</p> <p>Flash Cards</p> <p>Group Investigation</p> <p>Guest Speakers</p> <p>Homework</p> <p>Instructional Technology</p> <p>Laboratory</p> <p>Lecture</p> <p>Note-Taking</p> <p>Observation Logs</p> <p>Oral Presentations</p> <p>Problem Based Learning</p> <p>Portfolio</p> <p>Research</p> <p>Worksheets</p> | <p>Textbooks</p> <p>Reference Books</p> <p>Support Materials</p> <p>Handouts</p> <p>Software</p> <p>Videos</p> <p>Lab Equipment</p> <p>Lab Supplies</p> <p>Computers</p> <p>Printers</p> <p>Web sites</p> <p>Internet</p> <p>Email</p> |
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| <p>VIII.Sources of Waste Water in Aquaculture</p> <p>A. Concerns of waster water disposal and aquaculture</p> <p>B. Treating and disposal of wastewater</p> |  |  |
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| <p><b>Unit Assessment:</b></p> | <p>Teacher Observations, Tests, Performance Tasks, Projects, Posters, Quizzes, Demonstrations, Oral Presentations</p> |
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| <p><b>Unit/Course CTSO Activity:</b></p> | <p>FFA Career Development Event<br/>FFA SAE<br/>FFA Proficiency Award</p> |
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| <p><b>Unit/Course Culminating Product:</b></p> | <p>Students will conduct water quality testing and formulate data information into sets to be analyzed.</p> |
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| <p><b>Course/Program Credential(s):</b> <input type="checkbox"/> Credential <input type="checkbox"/> Certificate <input type="checkbox"/> Postsecondary Degree <input checked="" type="checkbox"/> University Degree<br/><input type="checkbox"/> Other:</p> |
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| <b>Unit: 6</b> | Health & Sanitation |
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| <b>Content Standard(s) and Depth of Knowledge Level(s):</b> | <p>Students will:</p> <ol style="list-style-type: none"> <li>1. Diagnose major diseases and their causes in aquaculture environments.</li> <li>2. Describe preventive measures for aquatic predators and pests.</li> </ol> |
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| <b>Learning Objective(s) and Depth of Knowledge Level(s):</b> | <p>Students will:</p> <ol style="list-style-type: none"> <li>1. Outline fish health management.</li> <li>2. List behavior signs of sick fish.</li> <li>3. List common physical signs of sick fish.</li> <li>4. Calculate treatments for aquaculture.</li> <li>5. Describe the immunization of fish in aquaculture.</li> <li>6. Discuss common diseases caused by pathogenic viruses and bacteria.</li> <li>7. Name and describe common parasites in aquatic species.</li> <li>8. List and discuss diseases with treatment in aquatic species.</li> <li>9. Construct a plan of action to prevent loss from aquatic predators and pest.</li> </ol> |
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| <b>Essential Question(s):</b> | Why should the health and sanitation of aquatic species in aquaculture be a concern to you? |
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| <b>Content Knowledge</b>   | <b>Suggested Instructional Activities Rigor &amp; Relevance Framework (Quadrant)</b> | <b>Suggested Materials, Equipment and Technology Resources</b>   |
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| <ol style="list-style-type: none"> <li>I. Types of Stress               <ol style="list-style-type: none"> <li>A. Chemical Stress</li> <li>B. Biological Stress</li> <li>C. Physical Stress</li> <li>D. Procedural Stress</li> </ol> </li> <li>II. Protective Barrier Against Infection               <ol style="list-style-type: none"> <li>A. Mucus</li> <li>B. Scales &amp; skin</li> </ol> </li> </ol> | <p>Application Cards</p> <p>Discussion</p> <p>Case Studies</p> <p>Experiments</p>    | <p><a href="http://en.wikipedia.org/wiki/Aquaculture">http://en.wikipedia.org/wiki/Aquaculture</a></p> <p><a href="http://animals.howstuffworks.com/animal-facts/aquaculture.htm">http://animals.howstuffworks.com/animal-facts/aquaculture.htm</a></p> <p><a href="http://library.thinkquest.org/22403/data/diseases/disease.html">http://library.thinkquest.org/22403/data/diseases/disease.html</a></p> |

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| <p>C. Inflammation<br/>D. Antibodies</p> <p>III. Effect of Stress on Protective Barriers</p> <p>A. Prevention of Stress &amp; Diseases</p> <ol style="list-style-type: none"> <li>1. Infectious Diseases <ol style="list-style-type: none"> <li>a. Parasitic</li> <li>b. Bacterial</li> <li>c. Viral</li> <li>d. Fungal</li> </ol> </li> <li>2. Parasitic Diseases <ol style="list-style-type: none"> <li>a. Tapeworms</li> <li>b. Trichodiniasis</li> <li>c. Ichthyo-phthiriasis</li> <li>d. Monogenetic Flukes</li> <li>e. Anchor Parasites</li> <li>f. Costiasis Disease</li> <li>g. Fish Lice</li> <li>h. Fish Grubs (Larval Flukes)</li> <li>i. Black Spot Grub</li> </ol> </li> <li>3. Bacterial Diseases <ol style="list-style-type: none"> <li>a. Bacteremia (Hemorrhagic Septicemia)</li> <li>b. Columnaris Disease</li> <li>c. Enteric Redmouth</li> <li>d. Enteric Septicemia of Catfish</li> <li>e. Ulcer disease of Goldfish</li> <li>f. Chilodonelliasis</li> </ol> </li> </ol> <p>IV. Viral Diseases</p> <p>A. Channel Catfish Virus Disease (CCVD)</p> <ol style="list-style-type: none"> <li>1. Infectious Hematopietic Necrosis (IHN)</li> <li>2. Noninfectious Diseases <ol style="list-style-type: none"> <li>a. Oxygen Starvation</li> <li>b. Alkalosis</li> </ol> </li> </ol> | <p>Flash Cards</p> <p>Group Investigation</p> <p>Guest Speakers</p> <p>Homework</p> <p>Instructional Technology</p> <p>Laboratory</p> <p>Lecture</p> <p>Note-Taking</p> <p>Observation Logs</p> <p>Oral Presentations</p> <p>Problem Based Learning</p> <p>Portfolio</p> <p>Research</p> <p>Worksheets</p> | <p><a href="http://www.seaweb.org/resources/aquaculturecenter/issue_disease.php">http://www.seaweb.org/resources/aquaculturecenter/issue_disease.php</a></p> <p><a href="http://www.merckvetmanual.com/mvm/index.jsp?cfile=htm/bc/170414.htm">http://www.merckvetmanual.com/mvm/index.jsp?cfile=htm/bc/170414.htm</a></p> <p><a href="http://www.aquanic.org/publicat/usda_rac/efs/srac/473fs.pdf">http://www.aquanic.org/publicat/usda_rac/efs/srac/473fs.pdf</a></p> <p><a href="http://aquanic.org/publicat/state/il-in/as-459.pdf">http://aquanic.org/publicat/state/il-in/as-459.pdf</a></p> <p><a href="http://aquanic.org/publicat/usda_rac/efs/srac/474fs.pdf">http://aquanic.org/publicat/usda_rac/efs/srac/474fs.pdf</a></p> <p><a href="http://srac.tamu.edu/">http://srac.tamu.edu/</a></p> <p>Textbooks</p> <p>Reference Books</p> <p>Support Materials</p> <p>Handouts</p> <p>Software</p> <p>Videos</p> <p>Lab Equipment</p> <p>Lab Supplies</p> <p>Computers</p> <p>Printers</p> <p>Web sites</p> <p>Internet</p> |
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| <ul style="list-style-type: none"> <li>c. Acidosis</li> <li>d. Nutritional Deficiency</li> <li>e. Poisoning</li> <li>f. Brown Blood Disease</li> <li>g. Gas Bubble Disease</li> <li>h. Genetic Abnormalities</li> </ul> <p>3. Disease Treatment</p> <ul style="list-style-type: none"> <li>a. Dip</li> <li>b. Flush</li> <li>c. Prolonged (Bath or Indefinite)</li> <li>d. Feeding</li> <li>e. Injections</li> </ul> <p>V. Aquatic Predators and Pest</p> <ul style="list-style-type: none"> <li>A. Avian Predators</li> <li>B. Mammal Predators</li> <li>C. Aquatic Predators</li> </ul> |  | Email |
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| <b>Unit Assessment:</b> | Teacher Observations, Tests, Performance Tasks, Projects, Posters, Quizzes, Demonstrations, Oral Presentations |
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| <b>Unit/Course CTSO Activity:</b> | FFA Career Development Events<br>FFA SAE<br>FFA Proficiency Awards |
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| <b>Unit/Course Culminating Product:</b> | Students will develop information brochures and posters on aquatic diseases and predators. |
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| <b>Course/Program Credential(s):</b> <input type="checkbox"/> Credential <input type="checkbox"/> Certificate <input type="checkbox"/> Postsecondary Degree <input checked="" type="checkbox"/> University Degree<br><input type="checkbox"/> Other: |
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**Course Title: Aquatic Biology**

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| <b>Unit: 7</b> | <b>Biotechnology</b> |
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| <b>Content Standard(s) and Depth of Knowledge Level(s):</b> | <p>Students will:</p> <p>11. Identify contributions of biotechnology to aquaculture.<br/>         Examples: gene probes for diagnosing viral infections in shrimp, polymerase chain reactions (PCR) for detecting bacterial pathogens in seafood shipments</p> |
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| <b>Learning Objective(s) and Depth of Knowledge Level(s):</b> | <p>Students will:</p> <ol style="list-style-type: none"> <li>1. Define Aquatic Biotechnology .</li> <li>2. Identify reasons why biotechnology is needed in aquaculture.</li> <li>3. List examples of genetic and nongenetic biotechnology techniques which benefit aquaculture production.</li> <li>4. Name and discuss examples of aquatic biotechnology that benefit human health.</li> </ol> |
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| <b>Essential Question(s):</b> | Does aquatic biotechnology help humans? |
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| <b>Content Knowledge</b>  | <b>Suggested Instructional Activities Rigor &amp; Relevance Framework (Quadrant)</b>                                     | <b>Suggested Materials, Equipment and Technology Resources</b>  |
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| 1. Aquatic Biotechnology <ul style="list-style-type: none"> <li>A. Reason for Biotechnology in Aquaculture               <ol style="list-style-type: none"> <li>1. Increased reproductive capacity</li> <li>2. Genetic Engineering</li> <li>3. Drug usage</li> <li>4. Transgenic animals</li> </ol> </li> <li>B. Benefits to Humans               <ol style="list-style-type: none"> <li>1. Increase Food Production</li> </ol> </li> </ul> | Application Cards<br><br>Discussion<br><br>Case Studies<br><br>Experiments<br><br>Flash Cards<br><br>Group Investigation | <a href="http://en.wikipedia.org/wiki/Aquaculture">http://en.wikipedia.org/wiki/Aquaculture</a><br><br><a href="http://animals.howstuffworks.com/animal-facts/aquaculture.htm">http://animals.howstuffworks.com/animal-facts/aquaculture.htm</a><br><br>Textbooks<br><br>Reference Books<br><br>Support Materials |

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| <ul style="list-style-type: none"> <li>2. Medical Research <ul style="list-style-type: none"> <li>a. vaccines</li> <li>b. pharmaceuticals</li> <li>c. tissue engineering</li> </ul> </li> <li>3. Materials</li> <li>4. Environment</li> </ul> | <ul style="list-style-type: none"> <li>Guest Speakers</li> <li>Homework</li> <li>Instructional Technology</li> <li>Laboratory</li> <li>Lecture</li> <li>Note-Taking</li> <li>Observation Logs</li> <li>Oral Presentations</li> <li>Problem Based Learning</li> <li>Portfolio</li> <li>Research</li> <li>Worksheets</li> </ul> | <ul style="list-style-type: none"> <li>Handouts</li> <li>Software</li> <li>Videos</li> <li>Lab Equipment</li> <li>Lab Supplies</li> <li>Computers</li> <li>Printers</li> <li>Web sites</li> <li>Internet</li> <li>Email</li> </ul> |
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| <b>Unit Assessment:</b> | Teacher Observations, Tests, Performance Tasks, Projects, Posters, Quizzes, Demonstrations, Oral Presentations |
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| <b>Unit/Course CTSO Activity:</b> | <ul style="list-style-type: none"> <li>FFA Career Development Events</li> <li>FFA SAE</li> <li>FFA Proficiency Awards</li> </ul> |
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**Unit/Course  
Culminating  
Product:**

Students will conduct a debate on the pros and cons of biotechnology use in aquaculture.

**Course/Program Credential(s):**  Credential  Certificate  Postsecondary Degree  University Degree  
 Other:

**Course Title: Aquatic Biology**

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| <b>Unit: 8</b> | <b>Aquaculture Issues</b> |
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| <b>Content Standard(s) and Depth of Knowledge Level(s):</b> | <p>Students will:</p> <p>12. Trace biogeochemical cycles through the environment, including water, carbon, oxygen, phosphorus, and nitrogen.</p> <ul style="list-style-type: none"> <li>• Relating natural disasters and climate changes to the dynamic equilibrium of ecosystems</li> </ul> <p>13. Identify agencies responsible for the development of effluent limitations, guidelines, and standards for aquatic production.</p> <ul style="list-style-type: none"> <li>• Identifying effluent treatment methods</li> </ul> <p>14. Identify potential land and water use conflicts in the aquaculture industry.</p> <p>15. Recognize problems with sustainability in aquaculture production.</p> |
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| <b>Learning Objective(s) and Depth of Knowledge Level(s):</b> | <p>Students will:</p> |
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| <b>Essential Question(s):</b> |  |
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| Content Knowledge                    | Suggested Instructional Activities Rigor & Relevance Framework (Quadrant)         | Suggested Materials, Equipment and Technology Resources  |
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| I. Country of Origin Labeling (COOL) | <p>Application Cards</p> <p>Discussion</p> <p>Case Studies</p> <p>Experiments</p> | <p><a href="http://aquanic.org/images/slides/COOLFinalRule%20Presentation%2010-14-04.pdf">http://aquanic.org/images/slides/COOLFinalRule%20Presentation%2010-14-04.pdf</a></p> <p><a href="http://www.seaweb.org/resources/documents/reports_crossroads.pdf">http://www.seaweb.org/resources/documents/reports_crossroads.pdf</a></p> <p><a href="http://en.wikipedia.org/wiki/Aquaculture">http://en.wikipedia.org/wiki/Aquaculture</a></p> |

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|  | Flash Cards              | <a href="http://animals.howstuffworks.com/animal-facts/aquaculture.htm">http://animals.howstuffworks.com/animal-facts/aquaculture.htm</a><br><a href="http://aquanic.org/images/slides/slides.htm">http://aquanic.org/images/slides/slides.htm</a> |
|  | Group Investigation      | Textbooks  |
|  | Guest Speakers           | Reference Books  |
|  | Homework                 | Support Materials  |
|  | Instructional Technology | Handouts   |
|  | Laboratory               | Software   |
|  | Lecture                  | Videos   |
|  | Note-Taking              | Lab Equipment  |
|  | Observation Logs         | Lab Supplies   |
|  | Oral Presentations       | Computers  |
|  | Problem Based Learning   | Printers   |
|  | Portfolio                | Web sites  |
|  | Research                 | Internet   |
|  | Worksheets               | Email  |

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| <b>Unit Assessment:</b> | Teacher Observations, Tests, Performance Tasks, Projects, Posters, Quizzes, Demonstrations, Oral Presentations |
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| <b>Unit/Course CTSO Activity:</b> | FFA Career Development Events<br>FFA SAE<br>FFA Proficiency Awards |
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| <b>Unit/Course<br/>Culminating<br/>Product:</b> |  |
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| <b>Course/Program Credential(s):</b> <input type="checkbox"/> Credential <input type="checkbox"/> Certificate <input type="checkbox"/> Postsecondary Degree <input checked="" type="checkbox"/> University Degree<br><input type="checkbox"/> Other: |
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