1. Desired Term: Spring 2008

2a. Course abbreviation and Number:
   EDST E1009

2b. Abbreviated Title:
   (No more than 25 characters, including spaces)
   Aquatic Ecology

4. Number of Units: 3

5. Billing Units: 0 ($30)

6. Allowed Student Levels: UG X GR X EE X (Default is to check all three levels)

7. Grading Method:
   [ ] Normal (N) (Default is Letter Grade +/-. Students may request Credit/No Credit)
   [ ] Normal Plus Report-in-Progress (NP) (As for Normal, also allows Report in-Progress)
   [ ] Credit/No Credit Only (C)
   [ ] Credit/No Credit or Report-in-Progress Only (CP)

8. Mode of Instruction:
   (See pages 17-23 at http://www.calstate.edu/cim/data-elem
dic/APDB-Transaction-DED-SectionY.pdf for definitions of
the Course Classification Numbers)

<table>
<thead>
<tr>
<th>Type of Instruction</th>
<th>Number of Credit Units</th>
<th>Instructional Mode (Course Classification Number)</th>
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<tbody>
<tr>
<td>Lecture</td>
<td>3</td>
<td>C-02</td>
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<td>Activity</td>
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<td>Lab</td>
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9. Attributes: Course Requires Consent for Enrollment? [ ] Yes X No
   Faculty [ ] Credential Analyst [ ] Dean [ ] Program/Department - Director/Chair

   Prerequisites: ____________________________
   Co-requisites: ____________________________

10. Does this course impact other discipline(s)? (If there is any uncertainty as to whether a particular discipline is affected,
    check "yes" and obtain signature.) [ ] Yes X No
     If "yes", obtain signature(s). Any objections should be signed in writing and attached to this form.

     [ ] Support [ ] Oppose
     Discipline ____________________________ Signature ____________________________ Date ____________________________
     [ ] Support [ ] Oppose
     Discipline ____________________________ Signature ____________________________ Date ____________________________

Important: Please Complete

1. Instructor: Kathy Norman

2. Extension Course Proposal Form (attached)

SIGNATURES: (COLLEGE LEVEL)

Kathy Norman 2/4/08
1. Program Director/Chair

Marilyn 2/4/08
2. College Dean (or Designee)

SIGNATURES: (UNIVERSITY LEVEL)

[Signature] 02/04/08
3. Date of Extended Studies (or Designee)

[Signature] 2/4/08
4. Vice President for Academic Affairs (or Designee)
Aquatic Ecology Edited Syllabus 2007

Faculty Name: Arlyn Christopherson

Phone: 510.636.8636

Email Address: arlync@pacbell.net

Course Title: Aquatic Ecology

Course Description: This 5-week course is designed for teachers of grades 4–9. Students will compare aquatic environments, investigate the dynamics of ecological interactions, and address the impact of human activity. Students will read a variety of course content materials and perform weekly assignments, including one to two discussion board activities per week. These activities will comprise approximately 45 hours of "student seat time." Students taking the course for 3 graduate credits will also complete a 10-15 page Action Research Paper.

Course Delivery: Critical to the professional-development experience of teachers today is learning to function effectively in an online learning environment, one that is destined to expand in the future. Aquatic Ecology is an online course completed in five weeks, with an additional one-week grace period for submitting assignments, if necessary. Although students may work on assignments offline, all course content, links to supplementary information, interaction among students in the class, in-depth class discussions, assessments, submission of assignments, and interaction with the instructor are carried out online, through email and the course site. This online format is designed for educators who need access to professional development on a flexible schedule and who are in different locations worldwide. Not all participants in this course will earn college credit; some are earning CEUs or auditing. Students earning college credit are required to participate in advanced discussions and complete all assignments, including an Action Research Paper investigating a self-chosen aquatic ecosystem.

Course Objectives/Outcomes: Each Topic's content addresses main science concepts with illustrative examples, inquiry activity ideas, resource extensions, opportunities to learn more, and connections to teaching and learning.

Performance Objectives:
In this course students will:
1. Describe and compare three or more contrasting aquatic habitats.
2. Relate physical conditions and biological processes to the dynamics of aquatic ecosystems.
3. Describe and give at least one example for at least six kinds of adaptations that enhance survival of organisms in aquatic ecosystems.
4. Evaluate the impact of human activities on aquatic ecosystems and find at least one example in their own localities.
5. Demonstrate the ability to find specific content-related online resources that support an instructional unit, including resources that provide background information for the teacher, information that can be used with children in an active learning setting, and resources that can be recommended for supplementary use outside the classroom.
6. Present an Action Research Project to the class that includes concepts from the Course Content.

Lesson Plans

Topic One: Aquatic Habitats
This course introduces the wide variety of aquatic ecosystems in the world and investigates physical conditions in these environments. Physical conditions such as light, salinity, motion of water, substrates, temperature, and the presence or absence of nutrients, dissolved gases, and other factors may limit growth or stimulate "blooms" of organisms.

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Major Ideas:
A. Earth's Aquatic Ecosystems. Introduces major aquatic ecosystems, showing the
distribution of water on Earth.
B. Salinity and Currents. Looks at salinity, water in motion, substrates, and other variables
in the physical environment.
C. Water Properties, Heat, and Temperature. Explains heat and temperature conditions of
water in terms of heat sinks, reflection and absorption of solar heat, and convection
currents.
D. Light in Water. Clarifies how light penetrates and is absorbed by water, affects biological
cycles, and is produced by some organisms in the system.
E. Dissolved Gases. Investigates the complex variables that affect the solubility of gases in
water, as well as the roles certain gases play in aquatic ecology.
F. Nutrients Needed. Focuses on key nutrients as limiting factors in organism population
sizes. Reviews the nitrogen cycle as it applies to aquatic ecosystems.
G. When Conditions Change. Presents examples of physical changes that occur in aquatic
environments and their effects on aquatic communities.
H. Become an Ecosystem Expert! Provides guidelines for completing the Action Research
Project, and includes a list of suggested aquatic ecosystems to help students choose
their individual or team specialty.

Topic One Assignments:
a) Read the Course Documents for Topic One.
b) Declare the nature of the credit sought – Graduate, CEU, or Audit.
c) Take the quiz for this topic
d) Create a Home Page and include three favorite science web sites.
e) Identify a variety of local aquatic ecosystems on a map.
f) Choose an aquatic ecosystem for the Action Research Paper and submit the
report topic and preliminary findings to the Instructor.
g) Post comments on the appropriate Discussion Boards.

Topic Two: Energy Flow in Aquatic Ecosystems
Students investigate solar energy, photosynthesis, and interactions involving energy flow through
aquatic food chains, webs, and pyramids. Students learn about producers, consumers,
decomposers, and processes such as biodeposition, decomposition, and algal blooms that have
extended effects.

Major Ideas:
A. Following the Flow. Traces energy as it flows from producers through several levels of
consumers and decomposers. Accounts for certain biological processes that cause
energy to be lost to the environment as heat. Briefly introduces chemosynthesis in
specialized organisms. Explores methods of monitoring biological productivity from
space.
B. Food Chains, Webs, and Pyramids. Distinguishes food chains from food webs and
presents pyramids as models of trophic levels within a community. Discusses differences
between biomass pyramids on land and those in open waters.
C. Photosynthesis. Explains chemical processes involved in photosynthesis and discusses
chemosynthesis as an alternative to photosynthesis
D. Plankton. Investigates the role(s) of plankton in aquatic ecology, mobility of planktonic
organisms, and planktonic effects on climate. Includes virtual field sampling.
E. Plants and Seaweed. Looks at a variety of aquatic plants and seaweeds, from duckweed
to bull kelp. Includes their commercial uses as well as their interactions within aquatic
communities.
F. Biodeposition. Shows how nutrients reach bottom-dwellers, partly due to filter feeders in
the upper water layers.
G. Decomposers. Presents the vital roles of decomposers in the recycling of essential
nutrients in the ecosystem.
H. Bad Algal Day. Explains what happens when planktonic algae undergo blooms, and
considers natural and manmade causes.
Topic Two Assignments:
   a) Read the Course Documents for Topic Two.
   b) Take the Topic Two quiz
   c) Reply to at least two of the Discussion prompts that appear in their own Discussion Board.
   d) Thoughtfully respond to at least two of the answers posted by other students.
   e) Continue work on the Action Research Project; consider the energy flow within the chosen aquatic ecosystem by describing it and/or preparing a diagram to include in the final report.

Topic Three: Types of Aquatic Ecosystems
Students take a closer look at ecological dynamics in lakes, streams, wetlands, estuaries, bays, intertidal zones, and special areas with extreme conditions, and examine aquatic communities that have distinguishing environmental characteristics. Students compare equivalent communities in different global locations that may contain different species; the organisms often exhibit parallel adaptations to similar environmental challenges.

Major Ideas:
   A. Monitoring Ecosystems. Presents examples of physical and biological parameters important in collecting baseline data and monitoring the state of aquatic environments.
   B. Lakes. Describes thermal and saline characteristics of lakes and compares their sometimes complex circulation patterns.
   C. Stream Ecology. Looks at characteristics of flow velocity on streambed and the adaptations of organisms to finding nutrients—and to avoid being washed away by fast flows!
   D. Wetlands. Reveals the variety of wetland types and their often-ignored importance. Invites the investigation if specific sites, in person or online.
   E. Estuaries. Explains the richness of estuaries and outlines their roles in increasing productivity in the oceans.
   F. Intertidal Ecology. Introduces the rich variation in conditions and diversity—the challenges and advantages—of each intertidal zone on its inhabitants.
   G. Exploring Monterey Bay. Leads a virtual underwater field trip to Monterey Bay on the central California coast, investigating the dynamics of this productive ecosystem.
   H. X-treme Ecology. Describes communities adapted to extreme conditions, including very cold or hot, dark, anaerobic, salty, deep, fast, or frequently changing.

Topic Three Assignments:
   a) Read the Course Documents for Topic Three.
   b) Take the Topic Three quiz.
   c) React to at least one of the Topic Three "Hot Discussions" prompts on the new discussion board. Respond to at least one colleague’s posting.
   d) Make substantial progress on your Action Research Paper. Reread the folders with the guidelines for the project and report.

Topic Four: Adaptations and Interactions
Students focus on organisms’ adaptations and survival strategies, interactions among species and between communities and the environment, and the effects of environmental change; adaptations and behaviors that maintain life functions leading to successful reproduction are varied, dynamic, and complex.

Major Ideas:
   a) Where the Aquatic Things Are. Describes the zonation within aquatic environments and some of the dynamics of species distribution.
   b) Competing—or Not. Considers factors leading to success through competition, or through avoiding competition.
   c) Innate Behavior. Discusses several examples of “hard-wired” behaviors that emerge in response to environmental cues.
   d) Responses to Change. Reviews ways in which individuals and species in the biological community respond to change in the environment. Presents a starter set of examples.

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e) When Species Meet. Considers a variety of interactions between species, some beneficial, some harmful, some neutral.
f) Protective Strategies. Considers many physical attributes and behaviors that improve chances for survival. Includes an explanation of countershading.
g) Mobility. Gives examples to illustrate advantages and disadvantages of being mobile or sessile.
h) The Bottom Line. Addresses a wide variety of critical strategies that have evolved to ensure successful reproduction.

Topic Four Assignments:
  a) Read the Course Documents for Topic Four.
  b) Take the Topic Four quiz.
  c) Complete and post the 10-15 page Action Research Paper by the end of the fourth week so that all students can read the reports and respond to them during Week Five.
  d) Respond to the Topic 4-5 “Raging Debates” prompts posted on the Discussion Board.
  e) Respond fully to at least 2 “debatable” statements and reply thoughtfully to at least 2 colleagues’ responses. (Note that these response-assigments run for 2 weeks.)

Topic Five: Keeping Aquatic Ecosystems Healthy
Students conclude the course by addressing human impacts on aquatic environments and their ecology. Opportunities to address action-oriented issues are included. As humans, and part of the natural world, students possess a level of consciousness and behavioral control that makes them responsible for their impact on aquatic ecosystems. Rational decision-making depends on a clear understanding of science concepts and access to information.

Major Ideas:
  a) Human Impacts 101. Looks at several ways in which humans impact aquatic environments, sometimes inadvertently. Includes resources for online research.
  b) Problems and Solutions. Approaches challenges for decision-making and debate through examples, scenarios and their consequences, and questions about environmental problems. Includes a number of resources to arrive at underlying science concepts.
  c) Managing Resources. Addresses the economic need to use resources now and also have the resources available in the future. Looks at potentially successful strategies for managing aquatic resources.
  d) Oh Dam! Probes environmental complexities related to dams and other man-made features affecting aquatic environments.
  e) Fun in the Water. Explores the pros and cons of recreation and tourism centered on or around rivers, lakes, reefs, lagoons, and other aquatic environments.
  f) Water Quality issues. Considers the ripple effect of change in water quality, with an emphasis on essential needs of humans.
  g) Conservation. Generates reasons for efforts to conserve aquatic environments and their communities, and encourages online visits to a number of organizations working on these issues.
  h) Public Education. Expands on opportunities to learn about aquatic ecosystems beyond the classroom and school curriculum, through virtual field trips, online periodicals, library print resources, and experiencing the real thing—out in the environment itself.

Topic Five Assignments:
  a) Read the Course Documents for Topic Five.
  b) Take the final exam, which covers all 5 Topics.
  c) Complete the JASON Course survey.
  d) Read the Action Research Reports completed by other students and post a formal review of at least two of those that contrast with yours. Include (in any order) how this aquatic ecosystem compares with yours, comment on features or sections of the report that you particularly appreciated, and tell how this Report might contribute to school science teaching and learning.
  e) Continue reacting to Topic 4-5 Raging Debates on the Discussion Board and respond to at least two postings by other students.
f) Post an example of an issue related to aquatic ecology that is being discussed or has recently appeared in the news in your area. Indicate (briefly) how this issue might be integrated into your science program.

Texts (required readings): Course Content documents found in Blackboard.

Bibliography (required and optional readings): Students are linked to a rich set of more than 40 online sites embedded in the weekly content documents. During the course, over 30 more web sites, articles, or books and other printed matter related to the weekly discussions, are recommended by the instructor or posted by fellow students. In addition, more than 50 websites specific to the course are accessible through the external links feature. The content information, tutorials, and scholarly reports provided, represent government agencies, environmental organizations, academic institutions, and other expert groups.

Student Evaluation Process:

Students are assessed through weekly on-line discussions, a series of Discussion Board questions, quizzes, a final exam, and the Action Research Project. Not all students seek college credit; some earn CEUs or audit. Students taking the course for 3 graduate credits will complete a 10 - 15 page Action Research Paper. Students may earn 30 points through substantive participation in weekly discussions and Discussion Board questions; 15 points through other assignments, 20 points on quizzes, 10 points on the final exam, and 25 points on the completed Action Research Paper.

* Students not taking the course for graduate credit do not have to complete the Research Paper and must obtain at least 70 points to pass the course

* Students taking the course for graduate credit will be graded according to the Plus/Minus Grading Scale:

- A+ 97-100
- A 94 - 96.99
- A- 90 - 93.99
- B+ 87 - 89.99
- B 84 - 86.99
- B- 80 - 83.99
- C+ 77 - 79.99
- C 74 - 76.99
- C- 70 - 73.99
- D 69 - 69.99
- F 60 >

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Education:
University of California: BS in Public Health Microbiology, 1959
California State University, Hayward: Elementary Teaching Credential, 1971
Mills College, Oakland: MA in Education, 1983

Professional Affiliations:
American Association for the Advancement of Science (AAAS)
California Science Teachers Association (CSTA)
National Science Teachers Association (NSTA)
Natural Sciences Guild, Oakland Museum of California

Background:
Public Health Microbiologist: CA State Department of Public Health, 1959-1961
Laboratory Technologist: U.C. School of Public Health, 1967-1970
Teacher: Oakland Unified School District 1971-1987, grades 4-8
Education Director: The Oakland Zoo, 1987-2000
Education Consultant, 2001 to present
Instructor, JASON Academy, 2002 to present
Senior Instructor, Cambridge College, teaching Aquatic Ecology through JASON Academy (Feb/Mar 2004)

Curriculum Design and Workshops for Teachers
- "Rainforest Trivia": science/math activities for grades 5-8, designed as an introduction to a rain forest unit
- Rainforest Workshop: multidisciplinary, for K-5 teachers
- "Using the Zoo as a Learning Resource": a program for preservice teachers exploring the variety of educational opportunities at the zoo
- "Evidence for Evolution": activities to use in grades 4 and above
- "Monkey Business": for teachers of grades 5-8, to look at Primates at the zoo to discover the primate pattern, differences between monkeys and apes and where humans fit in.
- "There are Treasures at Your Zoo": for teachers of grades 2-8 to show how the Treasure Hunt format can be adapted to multiple ages and cognitive levels for learning about adaptations, habitats, endangered species and animal behavior.
- "Biodiversity Workshop": for teachers of grades 4-8, a three-day workshop to explore this understudied concept.
- "Suitcase for Survival": conservation activities for teachers of K-8
- "Food & Features": predator/prey form and function for teachers of 5-8

Written Work:
- Book reviews in AAAS' Science Books & Films, The Science Teacher, Forum (Newsletter of AAZK), and NSTA Reviews
- Articles, children's activity pages and light editing for roar! The Voice of The Oakland Zoo, 1983 to 2000
- Article, "A Treasure Hunt at the Zoo", Science & Children, V.18, N 6, 3/81