



Benefiting commercial aquaculture,
Conserving natural resources

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COMMISSIONER OF AGRICULTURE

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Aquaculture Resource Guide for Educators



Introduction

Aquaculture in the classroom? Perhaps this is a new idea for you, or perhaps you've already considered such a project. In fact, many Florida schools have already discovered the multitude of benefits that result when students and teachers work together to study, produce, and market aquatic products. Whether they be food fish, ornamental species, aquatic plants, or any of the many other organisms cultured as a vital part of Florida's economy, there are endless opportunities for career exploration and hands-on learning in the areas of biology, math, chemistry, language arts, technology, marketing, and business management. These programs may be adapted to any scale, for all ages and budgets.

The *Aquaculture Resource Guide for Educators* is a tool to help you get started with and gather support for a school aquaculture project. In the following pages, you will find information, ideas, tips, contacts and resources, based on the experiences and suggestions of schools with existing aquaculture programs.

So jump right in and see how your classroom comes alive when you just add water!



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Cooperating Educators:

Gene Dulac Susan Swartzfager
Deland Middle FFA Wildwood Middle School



www.floridaaquaculture.com



Resources for School Aquaculture Programs

Aquaculture Certification

Florida Dept. of Agriculture and Consumer Services
Division of Aquaculture
www.floridaaquaculture.com
Phone: 850-488-4033
1203 Governor's Square Blvd, 5th Floor
Tallahassee, FL 32301

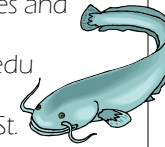
Field Trips & Career Shadowing

Contact the Florida Division of Aquaculture for a list of certified aquaculturists in your area.



Food Fish Information

University of Florida (IFAS)
Department of Fisheries and Aquatic Sciences
<http://fishweb.ifas.ufl.edu>
Phone: 352-392-9617
7922 Northwest 71st St.
Gainesville, FL 32606



Harbor Branch Oceanographic Institute

Aquaculture Center for Training, Education & Demonstration
<http://www.fau.edu/hboi/>
Phone: 772-465-2400
5600 US 1 North
Ft. Pierce, FL 34946

Ornamental Fish Information

University of Florida (IFAS)
Tropical Aquaculture Laboratory
<http://tal.ifas.ufl.edu/index.htm>
Phone: 813-671-5230
1408 24th Street Southeast
Ruskin, FL 33570

Mote Marine Laboratory

Aquaculture Research & Development
www.mote.org
Phone: 800-691-MOTE
1600 Ken Thompson Parkway
Sarasota, FL 34236

Shellfish Information

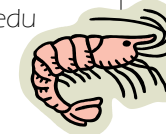
University of Florida (IFAS)
Cedar Key Field Station
<http://fishweb.ifas.ufl.edu>
Phone: 352-543-5057
P.O. Box 89, Cedar Key, FL 32625



Florida Aquaculture Association
www.flaa.org
Phone: 863-293-5710
P.O. Box 1519
Winter Haven, FL 33882

Shrimp & Bait Fish Information

University of Florida (IFAS)
Indian River Research & Education Center
<http://www.irrec.ifas.ufl.edu>
Phone: 772-468-3922
2199 South Rock Road
Ft. Pierce, FL 34945



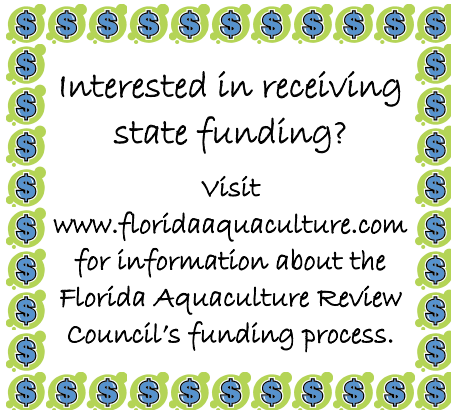
Florida Ag in the Classroom
www.agtag.org
Phone: 352-846-1391
P.O. Box 110015
Gainesville, FL 32611

www.agtag.org

Funding School Aquaculture Projects

Funding Sources

- School system (aquaculture projects may be covered by science, vocational, FFA, or other existing program budgets)
- Grants
- School fundraisers
- Donations
- Aquaculture product sales



Grant Tips

- Don't just wait for that one large grant that could fund your entire program. Look for smaller grant opportunities to help build your program step by step.
- Be sure to follow all application specifications listed by the grantors, which may include margin sizes, font sizes, etc.
- In your grant application, clearly explain how your project meets the goals of the granting agency - not just your own goals.
- Be concise, but include as much detailed information as possible, including budgets, timelines, and supporting research.
- When calculating matching funds, include any volunteer hours that will be provided by students, teaching staff, outside help, etc.
- Take pictures throughout your project to send to your grantors. Evidence of previous successes may help when seeking support in the future.
- Check out websites like www.schoolgrants.org for more information.
- If at first you don't succeed, try, try again! If your project is rejected initially, ask for reviewer comments to see how to improve next time.



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Florida Aquaculture

- 2005 Florida aquaculture sales totaled \$75 million.
- 3,010 water acres split up between 359 farms were used for Florida aquaculture in 2005.
- 43% of fish consumed worldwide are raised on fish farms, a large increase from only 9% in 1980.
- Includes:
 - Ornamental Fish
 - Food Fish
 - Alligators/Reptiles
 - Aquatic Plants
 - Clams and Oysters
 - Shrimp

Aquaculture Education Benefits Schools:

- Sense of ownership and responsibility.
- Technical and hands-on skills gained.
- Field trips and lab opportunities.
- Community involvement.
- Reinforces science, math, business and marketing.
- Do science rather than learn science.
- Fulfills many Sunshine State Standards.



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Sunshine State Standards

Language Arts: **LA.A.1.** Uses the reading process effectively. **LA.A.2.** Constructs meaning from a wide variety of texts. **LA.B.1.** Uses the writing process effectively. **LA.B.2.** Writes to communicate ideas effectively. **LA.C.1,2 &3.** Uses listening, viewing and speaking strategies effectively.

Mathematics: **MA.A.1,2&3.** Understands the different ways numbers are represented, number systems, and the effects of operations on numbers and the relationships among these operations. **MA.A.4.** Uses estimation in problem solving. **MA.B.1.** Measures quantities in the real world and uses measures to solve problems. **MA.B.2.** Compares, contrasts and converts within systems of measurement. **MA.B.3.**

Estimates measurements in real world problems. **MA.B.4.** Selects and uses appropriate units and instruments for measurement. **MA.C.1.** Describes, draws, identifies and analyzes 2 and 3 dimensional shapes.

MA.D.1. Describes, analyzes and generalizes a wide variety of patterns, relations and functions. **MA.D.2.** Uses expressions, equations, inequalities, graphs and formulas to represent and interpret situations.

MA.E.1. Uses the tools of data analysis for managing information.

MA.E.2. Identifies patterns and makes predictions using probability and statistics. **MA.E.3.** Uses statistics methods to make inferences and valid arguments.

Science: **SC.B.1.** Recognizes that energy may be changed in form with varying efficiency. **SC.D.1** Recognizes that processes in the atmosphere, biosphere and hydrosphere interact to shape Earth. **SC.D.2.** Understands the need for protection of the Earth. **SC.F.1.** Describes patterns of structure and function in living things. **SC.F.2.** Understands the process and importance of genetic diversity. **SC.G.1.** Understands the competitive, interdependent, cyclic nature of living things in the environment. **SC.G.2.** Understands the consequences of using limited resources. **SC.H.1.** Uses scientific processes and habits to problem solve. **SC.H.3.** Understands that science and technology are interwoven and interdependent.

Social Studies: **SS.A.1.** Understands historical chronology and the historical perspective. **SS.A.2, 3, 4,&5.** Understands the world from beginning to the time of the Renaissance, Western and Eastern civilization, U.S. history to 1880 and from 1880 to present day. **SS.B.1.** Understands the world in spatial terms. **SS.B.2.** Understands the interactions of people and the physical environment. **SS.D.1.** Understands how scarcity requires choices about uses of resources.

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Schools with Existing Aquaculture Programs

Cocoa High School
321-632-5300

Species: tilapia

Dan McCarty Middle School
561-468-5714

Species: tilapia

Deland Middle School
386-822-5678

Species: tilapia, sturgeon, koi

East Bay High School
813-671-5134

Species: ornamental fish

Everglades City School
239-377-9800

Species: redbfish

Hernando High School
352-797-7015

Species: game fish, shrimp...

John Ferguson High School
305-408-2700

Species: tilapia, catfish

Loften High School
352-955-6839

Species: catfish, ornamental fish

Louis S. Sheffield Elementary
904-696-8758

Species: tilapia, catfish

Maynard Evans High School
407-522-3400

Species: tilapia, catfish

Northport Middle School
772-340-4700

Species: tilapia

Polk County Alt. Education
863-413-2948

Species: redbfish, barramundi, tilapia, catfish, cobia

Sanford Middle School
407-320-6150

Species: tilapia

Stranahan High School
954-765-6800

Species: tilapia, African cichlids

Vernon High School
850-535-2046

Species: channel catfish

Wildwood Middle School
352-748-1510

Species: redbfish, catfish, ornamental fish, sturgeon

William H. Turner Technical Arts High School
305-696-6721

Species: tilapia

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Success Stories

East Bay High School - Hillsborough County

Program Started: 1999

Funding Sources: fish sales, Perkins and Workforce grants

Built by students in 1999, the East Bay Aquaculture Academy is a challenging, hands-on program with many benefits for the students that participate. The Academy curriculum prepares students for a successful transition into college or the workplace, by integrating subjects like science, math, business, social science, and communications, and by providing opportunities for college credit and scholarship.



As a guide, the program uses the state teaching standards developed by the Department of Education's Agriscience and Natural Resources Division. For aquaculture, the state offers two career technical education course guidelines: Aquaculture II and III.

Leading this program at East Bay High School is Mr. Michael Yates. He advises teachers that want to start an aquaculture program to get proper training and background in agriscience and natural resources, and recruit support both within and outside of the school. Projects of this scale require a lot of time and effort, so business partners, secretaries, advisors, parents, and volunteers all help to make the job more feasible.



Like many other schools with aquaculture programs, East Bay has also built field trips into the curriculum. Trips to local streams, fish farms, research and academic facilities, businesses, and aquariums keep students actively engaged in the program, while forming connections to real world opportunities.

For more information about the East Bay Aquaculture Academy,

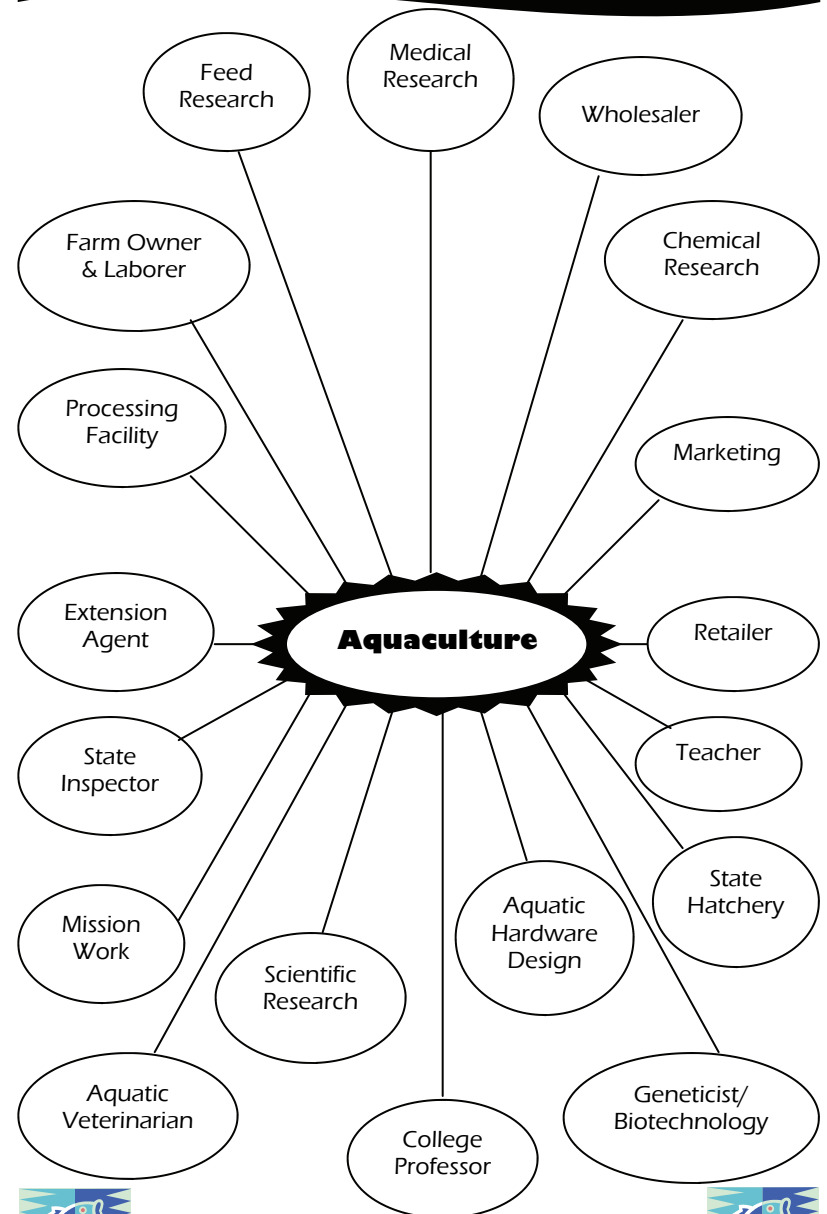
visit: www.sdhc.k12.fl.us/~eastbay.high.



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Careers in Aquaculture



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Integrating Aquaculture into the Classroom

General Tips:

1. Start Small.
2. Enlist Help (Aquaculture is a 24 hour job!).
3. Train Yourself (Use IFAS and research for information).
4. Contact Farms and Schools for Information.

Small Tank System

Product examples:

Ornamental fish (freshwater or marine), coral, live rock

Requires:

Tanks, Filtration, Aeration, Organisms and Food

Approx. \$250/tank setup



Poly Tank or Vault System

Product examples:

Ornamental fish (freshwater/marine), coral, live rock, shellfish, foodfish

Requires:

Vaults or Tanks, Filtration, Aeration, Organisms and Food

Approx. \$2,000/poly tank setup



Pond System

Product examples:

Ornamental fish (freshwater/marine), foodfish, shrimp

Requires:

Land and Pond Excavation, Organisms, Food, Aeration and Seine Net

Setup costs vary



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Success Stories

Wildwood Middle School - Sumter County

Program Started: 2005

Funding Sources: Florida Dept. of Agriculture and Consumer Services

Guided by Agriscience teacher Ms. Susan Swartzfager, Wildwood Middle School is quickly becoming a model for bringing aquaculture into the classroom.

With funding from the state through the Aquaculture Review Council, Wildwood now includes an indoor catfish facility, as well as outdoor pools for raising sturgeon. As the project develops, Ms. Swartzfager hopes to enhance educational opportunities through water quality monitoring, observation of fish behavior, and development of a website to share project results. You can read more about Wildwood's aquaculture program at www.floridaaquaculture.com/publications/Issue_48.pdf.



DeLand Middle School - Volusia County

Program Started: 1988

Funding Sources: fish sales, Volusia County Schools, private donations, FFA, Florida Dept. of Agriculture and Consumer Services



This project started with one tank of 250 tilapia, and a goal of teaching students about business economics. Since then, the project has grown to include 3 outdoor ponds and several indoor tanks with about 15,000 tilapia and 75 sturgeon, and the school is able to sell enough tilapia each year to support the entire program!

DeLand's two species of sturgeon are being raised for research purposes. By varying temperature, feeding rates, and water chemistry, Mr. Dulac's students are discovering the keys to the successful culture of sturgeon.

Mr. Dulac hopes to expand this project by starting an aquaculture program at DeLand High School, so that FFA students may continue their exploration of aquaculture at a higher academic level. For more information about aquaculture at DeLand, visit: www.osetrasturgeon.com.



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