Treating Fish Parasites with Hydrogen Peroxide
By Roy Yanong and Eric Curtis

Hydrogen peroxide (HP) is well known as a disinfectant for wounds in people. However, for many years HP has also been used for various purposes in aquaculture. For example, if added to water, HP will increase the amount of oxygen present.

One commonly used dosage for increasing oxygen content is 1 mL of 15% HP per 20 liters of water. This works because when HP breaks down, it forms oxygen gas and water.

More importantly, HP has been used in bath treatments against many different disease-causing organisms.

One of the first published reports of this use is from 1922. Over the past several years, HP has been given more attention by the aquaculture community for the treatment of external parasites, bacteria, and fungi on many different life stages of fish. Most of the available information so far has been based on studies of food fish.

What is hydrogen peroxide?
Hydrogen peroxide is a strong oxidizer; it is similar in its chemical

Continued on page 3.
Student Involvement at UF

Undergraduate and graduate students are an important part of the teaching, research, and extension programs at the University of Florida. Student involvement is highlighted in each issue of WaterWorks.

Sky Notestein grew up in Gainesville, Florida and therefore was somewhat familiar with the Chassahowitzka River only 80 miles away, flowing into the Gulf of Mexico. However, after spending nearly 15 months exploring and analyzing water samples from that river, he knows a great deal more about it—one of Florida’s most scenic treasures. His work and research will lead to a master’s degree in May.

Starting out with a bachelor’s degree in Wildlife Ecology and Conservation in 1997, Sky began research on the river in 1998. Since the Chassahowitzka is a spring-fed river, there were legitimate concerns that harmful nitrate (nitrogen) were entering the river through the Florida aquifer, itself a source of rising concentrations in recent years.

Sky collected biological data during five quarterly sampling periods in an effort to better understand the relationships between surface water nutrients (nitrate in particular) and the vegetative characteristics of the river. Physical, chemical and biological data were also collected.

One of the more interesting findings from Sky’s thesis work is that phosphorus may play a more important role in the river’s ecology than was previously recognized. By growing periphyton on glass slides in the field, Sky soon found that adding phosphorous greatly increased the growth rate of algae. The addition of nitrate (nitrogen) did not.

The data that were collected provide much-needed insight into the factors that influence the abundance and distribution of macrophytes, macroalgae and periphyton in the system, and should be of interest to a broad group of environmental scientists and resource managers concerned with the problems facing Florida’s spring-fed waterbodies.

“The work helps provide important baseline data for water quality parameters in this region,” Sky said. “It will help to identify relationships between chemical, physical and biological factors in the river. I certainly enjoyed working in the field, often by myself, exploring and sampling up and down that river.”

Sky is now assisting Dr. Tom Frazer with Project COAST, a new coastal monitoring program coordinated through the Department of Fisheries and Aquatic Sciences. It’s a good thing he enjoys field work, as he will be collecting water chemistry data at the mouth of 13 Florida rivers.
Continued from page 1.

Effects to formalin and potassium permanganate. To put it crudely, it "burns." But unlike formalin, hydrogen peroxide is considered much safer. However, at high concentrations, as found in some of the available commercial solutions, it can be harmful to people who do not use proper precautions. (It is capable of burning the skin or eyes.)

As mentioned earlier, after a period of time, HP breaks down into water and oxygen gas. This is one reason that the Food and Drug Administration (FDA) presently considers HP an aquaculture drug of “low regulatory priority.” In fact, more formal field trials are currently underway examining its effectiveness and safety for use in fish against fungi, bacteria, and parasites.

Sources of Hydrogen Peroxide

HP is available through most aquaculture supply companies. One manufacturer is Elf Altochem North America, Inc., (Woodstock, TN). Concentrated solutions, with approximately 35% active ingredient, are typically used. However, as long as you increase the amount proportionately, you can probably also use over-the-counter HP from your local store. These are usually only 3% active ingredient.

It’s also available in dry form (Sodium Peroxyhydrate) from Solvay Interox® in Houston, Texas. The dry form becomes HP once water is added. However, this type of HP is specifically labeled for use as an algaecide. And because the dry form is not pure HP, the reaction that occurs when it dissolves will also release chemicals that tend to increase the pH of the water.

Therapy vs Toxicty

There are many different doses suggested in the literature for use in aquarium fish. However, because there are hundreds of species of ornamental fish produced in Florida, certain factors must be taken into account when using HP. For starters, it can be very toxic to some species, and certain life stages may be more sensitive. Increasing temperature seems to increase the potential toxicity. Dosage and duration of treatment will also determine whether fish being treated will live or die.

HP also causes mortalities if levels are too high, primarily by damaging the gills. Therefore, toxic effects will often be seen related to gill damage, as indicated by gasping near the surface, or increased ventilation rates.

One research group (Rach, et al. 1997) recommended 50-250 ppm for up to an hour. However, this group only studied food and game fish, tested with a water temperature of about 54 degrees Fahrenheit.

The dosages reported for aquarium fish range from 30,000 ppm for 10 minutes, 5000 ppm for 5 minutes, or 300 ppm for 10-15 minutes—basically all over the board. (The 30,000 ppm dosage proved deadly in many cases.) Such a wide range is probably due to different species being tested, a variety of parasites being eliminated, and different water quality conditions, including temperature.

At the request of several producers, we began to examine HP for use specifically in ornamental fish at the University of Florida’s Tropical Aquaculture Laboratory. Although we have only examined a few groups of fish so far, we would like to share our current findings with you.

Preliminary Findings

Hydrogen Peroxide Residual Concentrations

Contrary to popular belief, in water with relatively low organic content, we found that after nine hours, even in tanks with aeration (but without fish), the concentration of HP did not decrease significantly. After 3 days, the concentration of HP decreased by only about 50 percent. Of course, any increase in organic loading will change these numbers, but the bottom line is that HP does not break down as quickly as some may think. Water changes are required after treatment.

Summary

We have not examined the economics of using HP vs. traditional chemicals. Also, more effort needs to be made to examine the effectiveness for use against fungal disease of eggs. As mentioned earlier, results do look promising. We’ll keep you informed.

If you do decide to use HP, be sure to try it on a small number of fish first. Please feel free to share your successes and/or failures with us.

For more details on the HP project, including dosage effects for various species such as tetras, cherry barbs, and zebra danios, or if you have questions about any other fish health related issues, please feel free to contact us at:

UF/IFAS Tropical Aquaculture Laboratory
813/671-5230

Note: The mention of manufacturers’ names is purely for informational use. No endorsement of their product is directly or indirectly implied.
catching their limit, a total of 972 fish were taken home. Each child received a certificate of participation with his or her name on it, a Junior Fishing License, a poster, and a goody bag. A big thank you goes to FWCC for all of their help!

Donations for the goody bags were provided by PureFishing, the Florida Department of Agriculture and Consumer Services Bureau of Seafood and Aquaculture Marketing, USDA Wildlife Services, and The Catfish Institute. The next Kids’ Fishing Day is scheduled at SMADF for Saturday, April 7.

Goldfish Rush

On Oct. 7 the District II 4-H “Gold Rush” program kicked off at SMADF. Participants in the program picked up aquarium supplies and spent the day learning about goldfish biology, aquarium setup, water quality, and nutrition.

Over the next six months, students will raise their own goldfish, test water quality, and record their observations and experience in preparation for county and district events to be held in the spring. For more information, call Debbie Britt Pouder 850-674-3184.

SeaGrant Seminars

On Nov. 28, Sea Grant agent Marella Crane and the Miami-Dade Extension office hosted a Sea Science Career Day. Over 40 high school kids attended the event. Marella invited speakers from the following programs: the Miami Seaquarium, Officer Snook, Pelican Harbor, University of Miami, DERM and the Youth Fishing Foundation.

Chris gave a brief talk about the role of extension, how to prepare for a career, and what constitutes a typical work day. Speakers urged attendees to persevere and follow their dreams. The spokeswoman for Seaquarium gave the audience tips on internships and job responsibilities at the public aquarium, ranging from public relations to dolphin trainer.

The creator of Officer Snook, a water pollution prevention program that is for all ages, offered her story as an inspiration to overcome adversity. Pelican Harbor’s speaker thrilled kids with her live pelican, while discussing her role as a volunteer saving pelicans that were entangled in nets.

A dive instructor from the University of Miami discussed the valuable skills he taught researchers so they could conduct underwater research safely.

A Habitat Restoration Specialist from DERM showed the audience photographs of his projects, while telling them how to network and build contacts for the future.

The last speaker, from the Youth Fishing Foundation, showed a video on free fishing clinics for inner-city youth and spoke about the benefits of volunteering.

All guests were able to tour the new research vessel Walton Smith, which features the latest in ocean research technology. Her crew led groups of ten guests on a detailed, 15-minute tour of the ship.

A post-event survey found that 45% of the attendees became seriously interested in pursuing a similar career as a result of the presentations.

Chris Brooks 305/248-3311 ext 230

Food and Resource Enconomics Department (FRED) Gainesville

Work continues on several projects concerning marine aquaculture and/or marine fisheries management.

A USDA-funded project focused on developing inventory management software for hard clam growers is nearly completed.

The draft version of the package will be field-tested with a small group of growers in the near future. It will allow growers to keep track of how clams planted on a given lease site progress from nursery seed to harvest-able market clams.

It also provides a running total on mortality, standing inventory, expenses, and earnings. A continuously updated map of the lease site can also be maintained with the software.

Another project funded by FRED will be assessing the economic impact of the hard clam culture industry on regional and
statewide economies. A telephone survey of all shellfish wholesalers who handle cultured hard clams is nearing completion. This information will be used to determine how the clam culture industry effects expenditures, incomes, jobs, and economic output in three regions of the state, and the state in total.

♦ Work also continues on a Florida Sea Grant-funded project to assess the market acceptance and financial feasibility of cultured sturgeon. This project involves a number of IFAS faculty, including Andy Lazur in Blountstown and Fred Wirth (IRREC-Fort Pierce).

♦ An assessment of the financial characteristics of mud minnow culture will be completed early this year. Interest is growing with respect to the small-scale culture of mud minnows for the live, marine baitfish market. The study will allow prospective growers to determine whether or not the culture process is a wise investment decision. A recent Florida Sea Grant/FDACS study has shown that the market for mud minnows as a live bait is very strong within certain regions and seasons in Florida.

Chuck Adams
352/392-1826  ex. 223

Shellfish Aquaculture

Cedar Key

Shellfish Aquaculture Extension Program Expands

The most significant recent increases in Florida aquaculture have occurred in clam farming, with 1999 sales of $15.9 million, almost tripling those reported in 1995.

Over the past five years, increased collaboration between the university and the clam farming community has been beneficial to both. Unfortunately, extension efforts have been limited to a multi-county area.

With this in mind, goals for this year’s extension program include:
1) Establishing a network within counties where clam farming is ongoing, by working with county marine agents;
2) Expanding the multi-county shellfish aquaculture advisory committee to a state-wide committee;
3) Conducting educational workshops, demonstrations and providing research results to other areas of the state.

Proposed workshop topics for 2001:

♦ Introduction to remote water quality monitoring systems and weather stations to be deployed at lease areas in six counties (e.g., CLAMMRS).

♦ Clam Crop Software—distribution and explanation of simplified computerized spreadsheets for maintaining crop inventories, for recording planting and harvesting activities, for calculating yields and crop times, and for tracking farm income and expenses.

♦ Enhanced Seed Production—application of genetic breeding practices and remote setting techniques for hatchery and nursery operators.

Pilot Crop Insurance Program - review and evaluation of policy provisions during the second year of the pilot phase.

Leslie Sturmer
352/543-5057

Hillsborough College Scholarships

Hillsborough Community College continues to expand their aquaculture education program, preparing students for undergraduate or graduate level studies, or for apprenticeships throughout the state and even internationally.

Some 21 students from Latin America and the Caribbean have accepted two-year scholarships to study aquaculture at Hillsborough Community College, with a stated purpose of going back to their countries to produce foodfish.

Funded by the Cooperative Association of States for Scholarship (CASS), the students receive a 24-month visa to stay in Florida. They will be housed in Brandon. Though they can’t work in the U.S., they will have a stipend and a full-time coordinator to take care of them.

The students will take remedial English classes since most don’t speak English. Aquaculture classes will be taught in English, and the program is sponsored by Georgetown University and the U.S. Agency for International Development.

Those who graduate will earn an Associate degree in Aquaculture, or a College Credit Certificate. Eighty percent of the students are from rural areas, and half are women. All have completed high school and demonstrated leadership abilities. They represent the Dominican Republic, El Salvador, Guatemala, Haiti, Honduras, Jamaica, Nicaragua, and Panama.

New Publication

A new book entitled Aquatic Resources has recently been made available to anyone interested in aquatic education. Authored by Dr. Bill Falls and three other professors at Hillsborough College, the 250-page publication stresses aquatic awareness, understanding, and uses for educational purposes. It was funded by the National Council for Agriculture Education, and sub-funded through USDA. There are five major sections including Aquatic Resources, Physical, Chemical, and Biological factors affecting aquatic systems; Aquatic Ecology; Aquatic Resource Issues; and Aquatic Careers.

Aquatic Resources covers fisheries, not just aquaculture, including fresh and saltwater. Other items include an extensive glossary with aquatic terms, software videos, web sites, slides, and other useful curricula.

The book is available from the National Council for Agriculture Education at $20, by calling 1-800-772-0935.

Bill Falls
813/253-7881
When fish become sick or die, diagnosis of the problem is much easier if clients are able to give a good historical account of the events prior to submitting their fish or water to the laboratory. In the previous issue of WaterWorks (Vol 4 No 4), the importance of keeping good records was discussed, including questions commonly asked by the diagnostician. Here, we detail the proper methods used to submit a water and/or fish sample to a diagnostic laboratory.

**Submission of a water sample**

Fish spend their entire life in water, which means when a fish gets sick, that environment must be tested. No matter how clean you think your water is, no matter what your water source is, or that your system is flow-through, you must have recent records of your water quality parameters (e.g., temperature, pH, ammonia, nitrite, dissolved oxygen) or submit a water sample for analysis. A good diagnostic laboratory will first test the water for any deviation in quality.

When submitting a water sample for analysis, a few simple yet important procedures must be followed. First, water should be sampled as soon as the fish begins to act abnormal and before water changes are initiated. A clean container (approximately one quart), thoroughly rinsed of any foreign matter or soap residue, should be utilized. If the system in question is a pond, it is important to submerge the container under the water and place the cap on the container beneath the surface. This removes any air bubbles, which could interfere with the dissolved oxygen measurement. (Ideally, dissolved oxygen and temperature should be measured at the pond, and if the pond is large, at multiple depths and locations.) If there are multiple systems involved, samples from each will be needed. In cage culture, water should be sampled inside as well as outside the cage.

The water sample should be separate from the fish sample. The water that the fish are brought in will not correctly reflect what is occurring in your system. The chemistry of the water, which includes pH and ammonia, will change remarkably during transport. For example, while the fish is being transported to the diagnostic laboratory, its metabolic activities (i.e., respiration, excretion) will cause the pH to decrease and the ammonia to increase in the shipping water.

It is important to label all samples with pertinent information, such as client’s name, sample location, depth, and the time of collection. Keep the water sample in cold storage once collected. When shipping water, place the sample on ice or ice packs. A Styrofoam cooler in a cardboard shipping carton works well for shipping overnight to a diagnostic facility.

**Submission of a fish sample**

The best fish samples for diagnostic evaluation are the fish that are near death (moribund) or showing signs of distress. Dead fish are rarely acceptable for diagnostic tests. However, if the fish are in good condition, that is, their eyes are clear and the gills are red, they may have some value. If they are obviously decomposed or extremely smelly, do not submit. It is also important to submit a representative number of each species involved. Usually three to five fish will be sufficient. This ensures an accurate diagnosis of the population as a whole.

If the fish are alive and appear to be able to make the trip to the laboratory, place them into well-aerated water in a heavy ply plastic bag (fish shipping bag or commercial freezer bag), and a Styrofoam cooler to regulate temperature. This can then be placed in a cardboard shipping carton and shipped overnight. If the fish are dead or will not make the transport, the fish should be kept moist with wet paper towels in a heavy ply plastic bag. Keep the sample cold, packed with ice in a Styrofoam cooler and shipping carton. It is important not to freeze the sample, especially if tissues are to be submitted for histopathology (examination of tissues for disease processes at the microscopic level).

There are commercial overnight carriers that will take live and dead fish, if they are properly packed as mentioned above. Also, most diagnostic facilities require prior notification that a sample is being shipped to their laboratory. This ensures a contact person will be there to receive the shipment and be able to work it up in an expedient manner. Listed below are a number of laboratories in Florida that are qualified to diagnose fish diseases. Contact the one closest to you for further information.

Samples that are hand delivered to a laboratory should also be properly transported. Notify the laboratory you are coming with the sample, keep live fish in a bucket with a battery-operated aerator or a plastic bag with well-oxygenated water, and moribund/dead fish wrapped in wet paper towels in a plastic bag on ice in a cooler. Parasites could fall off and changes in bacteria load (i.e., decomposition) set in quickly, so following the above protocol will aid in the correct diagnosis.

**UF/IFAS Laboratories**

<table>
<thead>
<tr>
<th>Dept. Fisheries &amp; Aquatic Sciences</th>
<th>7922 NW 71st St.</th>
<th>Gainesville, FL 32653-3071</th>
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<tbody>
<tr>
<td>(352) 392-9617, ext. 229 or 230</td>
<td>(305) 248-3311 ext. 230</td>
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**Tropical Aquaculture Laboratory**

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<tr>
<th>1408 24th St. SE</th>
<th>Ruskin, FL 33570</th>
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<td>(813) 671-5230</td>
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**Sam Mitchell Aquaculture Demonstration Farm**

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<tr>
<th>Route 2, Box 754</th>
<th>Blountstown, FL 32424</th>
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<td>(850) 674-3184</td>
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**Miami-Dade County Extension Office**

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<th>18710 SW 288 St.</th>
<th>Homestead, FL 33030-2309</th>
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<td>(305) 248-3311 ext. 230</td>
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**FL Dept. of Agriculture & Consumer Services (DACS)**

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<tr>
<th>Kissimmee Diagnostic Laboratory</th>
<th>2700 N. Bermuda Ave.</th>
<th>Kissimmee, FL 34741</th>
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<td>(407) 846-5200</td>
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**Live Oak Diagnostic Laboratory**

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<tr>
<th>P.O. Drawer O</th>
<th>Live Oak, FL 32060</th>
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<td>(904) 362-1216</td>
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*Limited Service Laboratory (No veterinarian on-site)
Native and Exotic Catfish in Florida

By Jeff Hill

This is the first of two installments covering how to differentiate native and exotic catfish, providing information on exotic catfish in Florida.

Peninsular Florida (St. Johns and Withlacoochee Rivers and south) is home to seven native freshwater and two native marine catfishes. At least four exotic freshwater catfish species have become established in this area since the 1960s. Exotic means a species that comes from another country.

Florida’s native catfish species are readily recognizable as catfish, having prominent barbels (whiskers) smooth, scaleless skin, and a single hard spine in the dorsal fin and each pectoral (side) fin.

The native freshwater species belong to the bullhead catfish family (Ictaluridae) and include the familiar channel catfish (Ictalurus punctatus), commonly grown in aquaculture or farm ponds for food or recreational fishing.

Other bullhead catfish in peninsular Florida include Brown Bullhead Ameiurus nebulosus, Snail Bullhead A. brunneus, Yellow Bullhead (A. natalis), and White Catfish (A. catus). Additionally, there are two small (less than six inch) catfish species called madtoms, which inhabit peninsular Florida—Speckled Madtom (Noturus leptacanthus) and Tadpole Madtom (N. gyrinus).

Two sea catfishes (family Ariidae), hardhead catfish (Arius felis) and gafftopsail catfish (Bagre marinus), also enter coastal rivers. Based on the exotic species currently present in Florida, any catfish lacking armored plates or hard, rough skin and having a spine in the dorsal fin is likely native to peninsular Florida.

Labyrinth Catfish (Family Clariidae)

Florida is home to a single species of labyrinth catfish, the famous Walking Catfish Clarias batrachus. Native to south and southeast Asia, Walking Catfish is now established throughout the southern half of peninsular Florida. It was first found in Broward County in the late 1960s, having escaped from an ornamental fish farm. Other introductions may also have occurred in Hillsborough County.

Walking Catfish is easily identified as a catfish by its prominent barbels and smooth, scaleless skin. Of all the exotic catfishes in Florida, this species is the most likely to be confused with native species. It is best distinguished by the dorsal fin. In native catfish, the dorsal fin is short and possesses a stout spine. The walking catfish’s dorsal fin lacks spines and is extremely long, extending about three quarters of the fish’s length. The anal fin is also very long. There are, however, spines in each pectoral fin.

The walking catfish reaches lengths of 24 inches, but is usually much smaller in Florida, perhaps 14 inches. Original walking catfish in Florida were albinos, but they quickly reverted to a more normal solid gray or grayish-brown color. There are four pairs of barbels (whiskers) around the mouth. The eyes are small, the skin extremely slimy.

This is a voracious predator of small fish, grass shrimp and crayfish. They are often active at night. This species builds a nest where the female deposits the eggs. The male or both parents guard the eggs and free-swimming fry. In Asia, walking catfish apparently breed in newly flooded areas, but little is known about reproduction in Florida.

In Florida they’re found in marshes, ponds, prairies, lakes and canals. Able to breathe air, they’re considered to be an obligate air breather, which means they must have air. In fact, they will drown if unable to reach the surface.

Walking catfish are true to their name, capable of crossing substantial overland distances to reach new areas. They walk by wiggling along the ground aided by stout, pectoral spines, and as a result can easily invade new territory. Although little research has been conducted, they may have a large, adverse impact on native species, due to their predatory habits and high population densities in some habitats. They appear to be most important in ephemeral pond or marshes (ones that dry up and refill periodically). This species is an important food fish in Asia, but is not valued in Florida.
Florida LAKEWATCH has a hard-earned and successful reputation for using volunteers to collect reliable water chemistry data from Florida lakes. Because of this, state legislators were convinced during this past legislative session that the same level of success could be achieved for Florida’s saltwater environments. As a result, funding has been made available to expand our scope to include monitoring of estuaries, bays, and offshore waters around the state.

The new saltwater component is being called Project COAST (Coastal Assessment Team) and volunteers will be sampling the same LAKEWATCH parameters (i.e., total phosphorus, total nitrogen, total chlorophyll and water clarity), plus a few additional items that are significant to marine environments—such as salinity and color.

Dr. Tom Frazer, Assistant Professor at UF’s Department of Fisheries and Aquatic Sciences, will be co-directing the coastal monitoring efforts along with LAKEWATCH director Dr. Daniel Canfield.

With initial funding provided by both the Suwannee and Southwest Florida Water Management Districts, Tom and several research biologists began gathering preliminary water chemistry data along Florida’s Gulf of Mexico coastline, from Weeki Wachee to Steinhatchee in 1996.

Now that Project COAST has earned legislative support and funding, Frazer and his staff will be teaming up with LAKEWATCH to train and assist volunteers along more than 1350 miles of the Florida coastline.

It’s an exciting time for Florida LAKEWATCH/Project COAST. With a large and growing database for freshwater lakes, the expansion to coastal waters was a natural progression.

LAKEWATCH program leader Mark Hoyer says that he and his staff are looking forward to working with Project COAST volunteers as they continue to build on one of the largest and most successful water monitoring programs and databases in the country.

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A Toast to Project COAST

Anyone interested in participating in the LAKEWATCH/Project COAST program is encouraged to call the UF/IFAS Department of Fisheries and Aquatic Sciences at: 1-800-LAKEWATCH (525-3928)