COOPERATIVE EXTENSION PROGRAM
University of Arkansas at Pine Bluff

Arkansas Aquafarming

University of Arkansas at Pine Bluff, United States Department of Agriculture, and County Governments Cooperating

Vol. 22, No. 2, Summer 2005

Practical Measures to Prevent the Spread of Bacterial and Viral Disease on Fish Farms

Jo Sadler
Extension Fish Health Specialist
Andy Goodwin
Extension Fish Pathologist

It is common knowledge that fish disease caused by bacteria or viruses spreads from pond to pond or from farm to farm by the transfer of infected fish. Other potential carriers or vectors of disease include any water, animal, person or equipment that had contact with infected fish. To avoid the introduction of new diseases onto a farm simply block contact with potential vectors of disease or decontaminate potential vectors with cleaning and disinfection prior to contact. These same practices will prevent the spread of disease between ponds or vats if there are sick fish present on a farm.

Fish

Wild fish, fish from other farms, or fish returned to the farm after being handled off-farm are potential sources of disease. Inspect fish for known diseases before bringing them onto the farm. Quarantine new fish in ponds or facilities separated from the rest of the farm by the greatest practical distance and as far away as possible from existing broodfish stocks. Effective quarantine must involve the full range of seasonal water temperature fluctuations. Winter quarantine for a disease that only occurs in warm water is not effective.

Water

The safest water for fish production is water pumped straight from a well to the pond. Water recirculated within a farm from pond to pond is not likely to be the source of new pathogens but may enable

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Clean and rinse trucks and other equipment and allow time to dry before re-use.

Extension Contacts

Larry Dorman
Extension Fisheries Specialist
870-265-8055/870-489-1115
ldorman@uaex.edu
Martha Fitts
Extension Assistant
870-265-8055
mfitts@uaex.edu
Andy Goodwin
Extension Fish Pathologist
870-575-8137/870-540-7811
agoodwin@uaex.edu
David Heikes
Extension Aquaculture Specialist
870-575-8143/870-489-1083
dheikes@uaex.edu
Wes Neal
Assistant Professor, Small Impoundments
870-575-8136
wneal@uaex.edu
Melanie Newman
Extension Associate
501-676-3124
mnewman@uaex.edu
Steeve Pomerleau
Research Associate (Aquaculture Verification)
870-575-8139/870-692-3709
spomerleau@uaex.edu
Jo Sadler
Extension Fish Health Specialist
501-676-3124/870-489-1544
jsadler@uaex.edu
George Selden
Extension Aquaculture Specialist
870-512-7837/870-540-7805
gselden@uaex.edu
Nathan Stone
Extension Fisheries Specialist
870-575-8138/870-540-7810
nstone@uaex.edu
Hugh Thomforde
Extension Aquaculture Specialist
501-676-3124/870-692-3398
hthomforde@uaex.edu

Web address:
www.uaex.edu/aqfi/

Table 1: Cleaning and disinfecting methods for use against Bacteria and Viruses.

Item	Method
people (hands, skin, hair)	Scrub clean with soapy water. Rinse and dry.
clothes	Clean with soapy water. Rinse with water. Then soak in bleach or Virkon (as per instructions). Rinse. Dry.
plastic buckets, rubber boots, waders, wet suits	Scrub clean with a strong detergent then rinse with water and disinfect with appropriate disinfectant such as Virkon (as per instructions) or 200 ppm Iodine (1/3 cup of iodine solution with 1% active ingredient per gallon of water) Then dry.
netting (dip nets, seine nets)	Clean with a detergent. Rinse and dry. OR Clean and immerse in 1000 ppm sodium hypochlorite solution (1/3 cup of sodium hypochlorite solution with 6% active ingredient per gallon of water) for six hours. Then rinse in fresh water and dry. OR Immerse in a 40 ppm solution of calcium hypochlorite (1/4 teaspoon of calcium hypochlorite powder with 10% active ingredient per gallon) for 5 minute. Rinse and dry. OR 200 – 250 ppm Iodine (250ppm = 0.4 cups of iodine solution with 1% active ingredient per gallon of water). Rinse and dry. OR 50 ppm Formalin (2 teaspoons of 37% formaldehyde per gallon of water) Rinse and dry. OR 1% Sodium Hydroxide (1/3 cup of sodium hydroxide solution with 50% active ingredient per gallon of water). Rinse and dry.
transport tanks	Scrub clean with detergent. Rinse and spray with 200-250 ppm Iodine. Rinse and dry.
vehicles and transport trucks	Remove all solid debris and loose equipment. Clean the outside of vehicle and transport tanks at an automated car-wash. Clean, rinse and disinfect the inside surfaces of transport tanks, including aeration equipment, pipework and pumps inside transport tanks with iodine. Rinse and dry.
pond bottom mud, pond surfaces	Drain all water. Remove all fish and vegetation. Add lime and dry. OR Add 1% sodium hydroxide. Dry for several days.
pond water	Most, but not all, viruses and bacteria may be killed by adding hydrated lime to raise water pH up to 11 for at least 1 hour.
infected fish	Harvest or Cull. Store and transport dead fish in leak proof containers such as harvest bins double lined with plastic bags. For disposal, cover the dead fish with lime and bury them in a 6ft deep hole at an appropriate disposal site
wooden structures (pallets, platforms and sluice gates)	Wood is a porous material so disinfection is difficult. Burn or bury contaminated wooden structures, or transport them off-site.

Please note: The dilutions listed in this table are only correct for the percentage of active ingredient specified here for each product. The required dilution rate of a product will change according to its active ingredient content. Please consult your extension specialist if you need assistance with determining product dilutions and measurement.

Continued from page 1

existing pathogens to accumulate. River water is the least desirable source of water because it probably contains pathogens not already on the farm. If river water must be used, pump it through a fine filter and hold it in fish-free ponds for a period of time before use.

Animals

There are a number of animals that live in or move around fish ponds and can potentially carry fish diseases. Of these animals, birds are the highest in number. There is evidence that birds can transmit bacteria and viruses through their droppings. Birds also drop fish from one body of water into another. To reduce this problem use the most effective legal means to discourage birds from visiting farm ponds. Talk about this with your local Extension agent or USDA-APHIS animal control specialist.

Equipment

Fish diseases are easily transferred on wet slime-laden equipment. The risk of infection from contact with fresh slime is almost as high as the risk of transferring disease with new fish. As a practical measure toward disease protection, dry equipment before each use. Drying kills many fish pathogens. Better yet, use warm soapy water to clean equipment before drying. For best results in killing pathogens on equipment, however, you must clean, disinfect and dry equipment before it is used elsewhere on or off the farm. This is especially critical for equipment that has been used to handle, harvest or transport sick fish.

There are some important things to consider when cleaning and disinfecting equipment effectively. Scrubbing equipment clean is very important because some disinfectants will not work effectively in the presence of dirt and organic matter such as fish mucous. Cleaning must involve thorough scrubbing of the surface using a brush and detergent followed by rinsing to remove the dirt and detergent residue. Then apply an appropriate disinfectant and allow it to remain long enough to kill the disease organisms. Rinsing after disinfecting ensures that there are no residues left behind and drying the surface in the sun is an effective way to destroy bacteria or viruses that may have survived.

The choice of chemical cleaner or disinfectant is critical. Consider the type of germ you're trying to control, the type of equipment you are disinfecting, and the cost and safety of the chemical. Some types of viruses may be killed easily by detergents alone, whereas others are very hard to kill and require very specific disinfectants. Similarly, some bacteria are very hard to kill. However, most can be killed with common bactericidal agents such as an iodine or hypochlorite solution. Most bacteria and viruses can be killed using a single broad spectrum disinfectant such as sodium hydroxide (a strong alkali), formalin (an aldehyde), chlorine, iodine or a peroxide product (such as Virkon).

It is important to remember that some chemical agents may leave toxic residues or have negative effects on the equipment being cleaned and disinfected. Some agents stain equipment (such as iodine) whereas others (like hypochlorite) are corrosive to metals and netting, and are also toxic to fish. Neutralize hypochlorite with sodium thiosulfate. Consult with your Extension fish health specialist to determine the best choice of cleaning and disinfecting agents to use on your farm. Some basic guidelines are provided in Table 1 on page 2.

An excellent general practice is to use warm soapy water to scrub equipment clean and then dry the equipment thoroughly before re-use. Clean and rinse trucks, seines, and other equipment used for fish from another facility or from the wild and allow time to dry before re-use. The use of an additional broad spectrum disinfectant on cleaned equipment will provide further disease protection to your fish stocks.

Asian Soybean Rust, Fungicides and Fish Farming

George Selden and Andy Goodwin, Extension Specialists, UAPB Aquaculture/Fisheries Center
Ples Spradley and Rick Cartwright, Extension Specialists, U of A Division of Agriculture, Cooperative Extension Service

A new fungal disease of soybeans may reappear again this summer in Arkansas. If so, there will be an increased use of fungicides, and fish farmers may face new risks from drift of these compounds.

The Asian soybean rust fungus, *Phakopsora pachyrhizi,* was first reported in Japan in 1902. It was initially limited to tropical and subtropical areas of Asia and Australia, but in 1994 was reported in Hawaii, then Zimbabwe in 1998 and Paraguay in 2001. This aggressive soybean rust has now spread over much of sub-Saharan Africa and is found in most of the soybean-producing regions of Brazil, as well as Argentina, Bolivia and Columbia.

In countries where Asian soybean rust is established, losses range from 10 percent to 80 percent. In the fall of 2004, the Asian soybean rust was found in Louisiana and other Gulf Coast and southeastern states, including Arkansas. As of May 2005, its presence has been confirmed in several counties in Florida.

Spores of Asian soybean rust are easily spread by the wind. Although the soybean rust fungus is not known to survive the freezing conditions which are routinely experienced in the central and northern areas of the United States, it may be able to survive the winter months in the southern U.S. living on other plants, including kudzu. Reintroduction could then occur every year when spores are carried north on wind currents and storms.

If the disease does appear in Arkansas this season, soybean producers will be allowed to use a variety of new fungicides on section 3 or section 18 labels. While many of these compounds are vital in the war against rust disease, some of these fungicides can also be effective killers of fish, zooplankton and algae.

Twenty-seven fungicides have been approved or have approval pending by the EPA (see Table 1). The active ingredients in these fungicides fall into four fungicide chemical classes. They are strobilurins (azoxystrobin, pyraclostrobin), triazoles (tebuconazole, propiconazole, mycobutanil, tetraconazole, flutriafol, flusilazole, metconazole, cyporconazole), aromatic nitriles (chlorothalonil) and dicarboximides (famoxadone). While the toxicity of the various active ingredients to most of the species of fish cultured in Arkansas has not been determined, data from previous studies involving other fish (usually rainbow trout and bluegill) are helpful. Researchers measure a compound's toxicity by determining how much of the active ingredient is required to kill 50 percent of the fish in an aquarium over a 96-hour period (LC_{50}). This number is used to estimate the potential danger of these compounds.

The first step in estimating the risk is to calculate the amount of active ingredient that would be applied to each acre of land according to the label instructions. With this information, it is possible to calculate the concentration of active ingredient that would result if a full field dose was applied accidentally to a pond (a "worst case scenario") with an average depth of three feet. This concentration is then compared to the concentration known to kill fish. If a full field dose would kill fish when applied to a pond, then the compound is very risky. If it takes a lot more than the full field dose to kill fish, then the risk is minimal.

Of the fungicides that might be applied in Arkansas this summer, it is unlikely that any problems will be caused by fungicides containing active ingredients from the triazole or dicarboximide fungicide classes or one of the strobilurins, azoxystrobin. A full field dose of any of these compounds is not expected to kill fish. However, other fungicides containing the strobulirin, pyraclostrobin or the aromatic nitrile, chlorothalonil, are more risky.

Pyraclostrobin is the active ingredient in Headline. The published toxicity of pyraclostrobin to fish ranges from 0.0062-0.0114 ppm (the LC_{50}) but the full field dose in a pond would produce concentrations from 0.012-0.024 ppm. Thus, it would potentially take only one-half the full field dose to kill fish. Chlorothalonil, the active ingredient in Bravo Weatherstik, Echo 720, Echo Ultimate, Equus 720 SST, and Equus DF, has a published toxicity range of 0.044-0.062 ppm, but the full field dose would result in a pond concentration of 0.1262 ppm. This compound is also toxic at one-half of the full field dose. Over-spray (that is, drift) at the full rate in even a portion of a pond might create a temporary "hot spot" with enough fungicide to kill fish. Clearly, the use of fungicides containing chlorothalonil or those that contain pyraclostrobin as the sole active ingredient must only be used when conditions indicate little or no drift onto a fish pond.

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When considering the effects of a pesticide on fish it is also important to remember that the toxicity numbers used in our calculations are concentrations that kill one-half of the fish. This is not the same thing as a concentration that is safe for fish. Lower mortality or sub-lethal effects may occur at concentrations far lower. It should also be remembered that younger fish are more susceptible to fungicide over-spray than adult fish; as a result, small fish are at a greater risk. In addition, the toxicity numbers that we use are mostly from studies using trout and bluegill. If drift occurs, the species in the culture pond may be more sensitive or less sensitive.

Spraying of a fungicide, or any other pesticide, around ponds or fish farms should only be done under conditions where significant overspray is unlikely. While most fungicides are generally safe when used properly, fish exposure should be avoided. Special care should be used if fungicides containing pyraclostrobin (Headline) or chlorothalonil (Bravo Weatherstik, Echo 720, Echo Ultimate, Equus 720SST or Equus DF) are applied near fish ponds due to their high potential to cause fish loss. Use Table 1 to help make treatment decisions.

Researchers at UAPB are currently conducting trials to determine the LC_{50} for some of the species cultured in Arkansas.

Table 1

Fungicide	Active Ingredient(s)	Amt A.I./Application	LC_{50} Fish	LC_{50} Daphnia	LC_{50} Algae
Quadris	Azoxystrobin	0.0123-0.0307 ppm	0.47-1.1 ppm	0.259 ppm	0.057-10 ppm
Headline	**Pyraclostrobin**	**0.012- 0.024 ppm**	**0.0062-0.0114 ppm**	**0.0157 ppm**	0.152 ppm
Quilt	Azoxystrobin +	0.014-0.020 ppm	0.47-1.1 ppm	0.259 ppm	0.057-10 ppm
	Propiconazole	0.008-0.012 ppm	4.3-6.4 ppm	3.2-10.2 ppm	4.3-6.4 ppm
Stratego	Trifloxystrobin +	0.005-0.10 ppm	0.014ppm	0.025 ppm	0.037 ppm
	Propiconazole	0.005-0.010 ppm	4.3-6.4 ppm	3.2-10.2 ppm	4.3-6.4 ppm
Folicur 3.6F	Tebuconazole	0.0103-0.0138 ppm	4.4-8.7 ppm	11.8 ppm	1.64-7.1 ppm
Tilt	Propiconazole	0.0138-0.0276 ppm	4.3-6.4 ppm	3.2-10.2 ppm	4.3-6.4 ppm
Propimax	Propiconazole	0.0138-0.0276 ppm	4.3-6.4 ppm	3.2-10.2 ppm	4.3-6.4 ppm
Bumper	Propiconazole	0.0138-0.0276 ppm	4.3-6.4 ppm	3.2-10.2 ppm	4.3-6.4 ppm
Laredo EC	Mycobutanil	0.0077-0.0153 ppm	2.2-3.9 ppm	10.2 ppm	0.91-2.6 ppm
Laredo EW	Mycobutanil	0.0077-0.0153 ppm	2.2-3.9 ppm	10.2 ppm	0.91-2.6 ppm
Domark 230 ME	Tetraconazole	0.0073-0.0109 ppm	4.3-4.8 ppm	3.0 ppm	
Bravo Weatherstik	**Chlorothalonil**	**0.138-0.208 ppm**	**0.044-0.062 ppm**	**0.070 ppm**	0.21 ppm
Echo 720	**Chlorothalonil**	**0.138-0.230 ppm**	**0.044-0.062 ppm**	**0.070 ppm**	0.21 ppm
Echo Ultimate	**Chlorothalonil**	**0.138-0.229 ppm**	**0.044-0.062 ppm**	**0.070 ppm**	0.21 ppm
Equus 720 SST	**Chlorothalonil**	**0.138-0.221 ppm**	**0.044-0.062 ppm**	**0.070 ppm**	0.21 ppm
Equus DF	**Chlorothalonil**	**0.126-0.145 ppm**	**0.044-0.062 ppm**	**0.070 ppm**	0.21 ppm
Impact*	Flutriafol	0.007 ppm	61-77 ppm	67 ppm	12 ppm
Punch*	Flusilazole	0.0126 ppm	1.2-1.7 ppm	3.4 ppm	
Charisma*	Flusilazole +	0.008 ppm	1.2-1.7 ppm	3.4 ppm	0.566 ppm
	Famoxadone	0.007 ppm	0.11 ppm,	0.0157 ppm	
Caramba*	Metconazole	0.006-0.007 ppm	2.2 ppm	4.2 ppm	1.7 ppm
Operetta*	Pyraclostrobin +	0.006-0.007 ppm	0.0062-0.0114 ppm	0.0157 ppm	0.152 ppm
	Metconazole	0.007-0.009 ppm	2.2 ppm	4.2 ppm	1.7 ppm
Alto*	Cyproconazole	0.0343-0.051 ppm	18-24 ppm	21-31 ppm	0.077 ppm
Quadris Extra	Azoxystrobin +	0.003 ppm	0.47-1.1 ppm	0.259 ppm	0.057-10 ppm
	Cyproconazole	0.006 ppm	0.16-0.35 ppm	0.14 ppm	0.077 ppm
JAU6476*	Prothioconazole	0.174-0.214 ppm	4.02 ppm	2.9 ppm	12.7 ppm
Headline-Carmaba	Pyraclostrobin +	0.004 ppm	0.0062-0.0114 ppm	0.0157 ppm	0.152 ppm
Co-Pack*	Metconazole	0.007 ppm	2.2 ppm	4.2 ppm	1.7 ppm
Headline SBR	Pyraclostrobin +	0.011 ppm	0.0062-0.0114 ppm	0.0157 ppm	0.152 ppm
	Tebuconazole	0.009 ppm	4.4-8.7 ppm	11.8 ppm	1.64-7.1 ppm

* Requests for these fungicides are pending and may not be available during 2005.

Baitfish Research Verification Program Update

Steeve Pomerleau, Project Coordinator

The last of the 2004 Baitfish Research Verification Program (BRVP) ponds were recently harvested. A total of six juvenile golden shiner ponds were monitored from fry stocking in spring 2004 through many partial harvests to the final harvest in spring 2005. The intensive monitoring resulted in a comprehensive database of water quality, stocking and harvesting data that provides good estimates of survival, yield, growth and feed conversion ratios from commercial ponds.

Management strategies varied among verification ponds and differed partially from Extension recommendations. Recommended management practices were followed fairly closely in the A-series ponds, and yielded 1,390 and 1,695 lb/ac. Stocking rates were approximately one million fry per acre, aeration rates were close to 0.5 hp/ac, but feeding rates were lower then recommended.

The program called for feeding to satiation twice daily, starting at 5 lb/ac/day on stocking day and progressively increasing the rate to 15-25 lb/ac/day by the end of the growing period. These relatively heavy feeding rates will increase yields and the size of fish harvested. However, producers are well aware that stocking and feeding rates must not focus solely on maximum growth. Markets require a variety of sizes, and demand for different sizes varies seasonally. Adjustments must be made to meet specific marketing goals. Our goal was to produce over 500 lb/ac of juvenile golden shiners at 1 lb/1,000-count, and this was clearly met in the A-ponds, with yields twice as high and fish that reached an average sizes of over 1 lb/1,000 by August.

Yields from ponds C1 and C2 also approached our goal, with 752 and 687 lb/ac and fish that reached an average size of over 1 lb/1,000 by August. However, feeding rates never reached our recommended levels. Higher feeding rates would have shortened the time for fish to reach target size and yield.

Fish from pond B1 did not reach the target size of 1 lb/1,000. Fry were stocked at three times the recommended level, feeding rates were half the recommended levels, and the production period was only 60 days. As a result fish reached an average size of only 0.3 lb/1,000.

Overall survival ranged from 69 to 93 percent. The average was 77 percent. No incidences of diseases or fish mortality were observed during the production period.

In 2005 we are monitoring two new golden shiner ponds. More in-depth information and up-to-date data from the BRVP is available on the Aquaculture Research Verification web site at www.uaex.edu/aquaculture. Contact Steeve Pomerleau at (870) 692-3709 for more information.

Selected production characteristics of ponds monitored through the 2004 Baitfish Research Verification Program.

		Ponds					
Characteristics	Units	A1	A2	B1	B2 *	C1	C2
Pond size	acre	2.4	4.5	10.0	10.0	12.0	15.8
Aeration capacity	hp/ac	0.5	0.3	0.0	1.0	0.8	0.6
Stocking	million fry/acre	1.04	0.95	3.07	1.89	1.03	0.75
Stocking date		05/11/04	05/12/04	05/13/04	05/14/04	05/29/04	06/12/04
Production period	days	189	204	60		312	292
Yield	lb/ac	1,390	1,695	636		752	687
Survival	%	73	93	79		69	70
FCR	lb of feed / lb of fish	0.8	0.7	0.5		0.4	0.3
Total feed fed	lb/ac	1,049	1,177	330		265	190
Total aeration	hours/ac	1,580	1,093	0		116	84
Aeration efficiency	Lb fish / hp-hr	0.7	1.2	0.0		0.7	0.9

* Data analyses was not completed at the time the article went to press.

Converting from Aquaculture to Recreational Fishing Ponds – Habitat!

Wes Neal, Assistant Professor of Small Impoundments

I have received a number of requests for advice on how to convert aquaculture ponds into recreational fishing ponds for friends, family, communities, or profit. The typical enquiry is from a person who recently purchased a farm, someone who wants to scale back production, or from someone who wants to increase recreational qualities of the property. Aquaculture ponds can make excellent recreational ponds with a minimal amount of effort and expense. However, as with all private fisheries, you can only expect to receive yields in proportion to your investments.

The key obstacle in conversion to recreational fishing is the lack of underwater structure in aquaculture ponds. Aquaculture ponds are designed for efficient removal of fish. They are shallow, uniform in depth, and designed to be easily seined. While this habitat-poor environment can support abundant fish populations, it can make for a relatively lackluster fishing experience. Remember that catching fish is only part of the experience – esthetics play an important role as well. Which is more pleasing – casting mindlessly into an open expanse of water? Or carefully casting around a sunken log where you feel sure that a "big boy" is waiting to "inhale" your bait!? In a pond with limited fish-attracting structure fish are widely dispersed and there are no clues available to guide you to the best fishing spots. Fish will aggregate around underwater structures, making it easier to locate and catch them.

The simplest way to add structure to a pond is to place brush, trees, rock piles, or artificial materials in localized areas within casting distance of the bank. Old Christmas trees set upright in cement blocks work well, and are readily available just after the holidays. Some people use tires or PVC structures or even old cars (but drain the oil and other fluids please!). The key is to create distinct units of structure. For smaller items, pile them on top of one another or tie them together so that they are three dimensional with lots of nooks and crannies for fish to hide.

If you can drain the pond and have access to heavy equipment, consider contouring the pond to provide a more diverse topography. The best recreational fishing ponds average about 6 feet deep with limited areas of water 8 to 10 feet deep. All areas of the pond should be at least 2 to 3 feet deep to minimize the problem of weed infestation. While you are on the tractor,

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Upcoming Events

Fish Games – fourth annual event promoting aquaculture and fisheries – high schools please send students. September 29, Aquaculture and Fisheries Center, University of Arkansas at Pine Bluff, Pine Bluff, Arkansas. Cassandra Hawkins-Byrd, (870) 543-8123.

Catfish Farmers of Arkansas, and Arkansas Catfish Promotion Board – mid-year meeting, October 6, Aquaculture and Fisheries Center, University of Arkansas at Pine Bluff, Pine Bluff, Arkansas. Bo Collins, (501) 673-4059.

Catfish Processors Conference, October 12-13, Mississippi State University, Starkville, Mississippi. Anna Hood, (662) 325-3200.

Florida Aquaculture Association – annual membership meeting, November 4, Tropical Aquaculture Laboratory, Ruskin, Florida, (863) 293-5710.

US Freshwater Prawn & Shrimp Growers Association – annual meeting, December 9-10, Grand Casino Convention Center, Tunica, Mississippi. Dolores Fratesi, (662) 390-3528.

Missouri Aquaculture Association – annual meeting, January 13-14, 2006, Jefferson City, Missouri. Bart Hawcroft, (866) 466-8283.

Texas Aquaculture Association – annual conference, trade show and fish festival January 25-27, 2006, Civic Center, Bay City, Texas. Donna Hansel, (979) 695-2040.

Arkansas Aquaculture 2006 – annual educational meeting, January 26-28, 2006. Jointly sponsored by the Catfish Farmers of Arkansas and the Arkansas Bait and Ornamental Fish Growers Association. Hot Springs, Arkansas. Bo Collins, (501) 673-4059.

Fish Farming Trade Show – regional trade show and conference, February 2-3, 2006, Washington County Convention Center, Greenville, Mississippi. Sponsored by Catfish Farmers of Arkansas, Catfish Farmers of Mississippi, Alabama Catfish Producers and Louisiana Catfish Farmers Association. Mike McCall, (601) 714-5327.

Arkansas Bait and Ornamental Fish Producers – educational and membership meetings, February 9, 2006, Lonoke Community Center, Lonoke, Arkansas. Hugh Thomforde, (501) 676-3124.

Aquaculture America, 2006, February 13-16, 2006, Las Vegas, Nevada. Early registration ends January 6, 2006. Sponsored by the U.S. Aquaculture Society and the National Aquaculture Association, (760) 432-4270.

Catfish Farmers of America – annual convention and research symposium, February 23-25, 2006, San Antonio, Texas. Mike McCall, (601) 714-5327.

COOPERATIVE EXTENSION SERVICE
U.S. DEPARTMENT OF AGRICULTURE
UNIVERSITY OF ARKANSAS
P.O. BOX 391
LITTLE ROCK, ARKANSAS 72203

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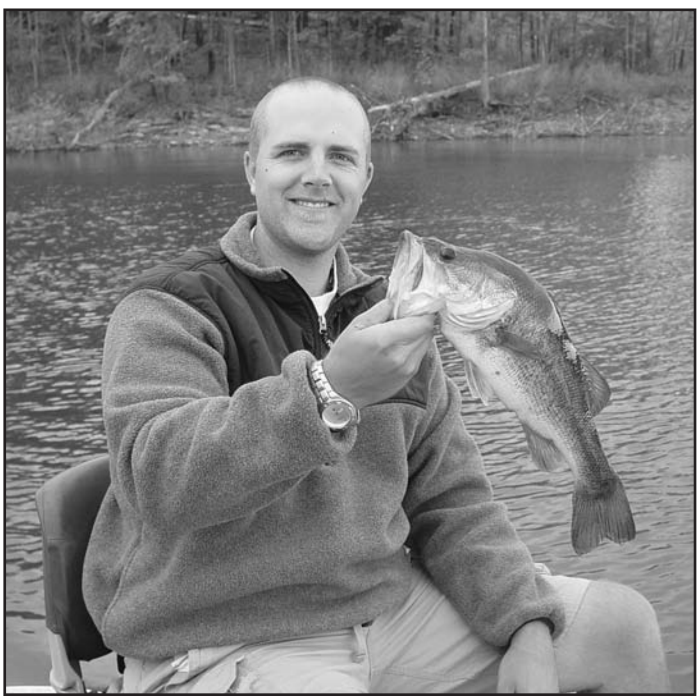

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consider improving the physical landscape of the pond. Build points, humps, saddles, islands and trenches that will attract fish during different times of the year. Remember to make these areas within casting distance from the shore or pier unless you are planning to fish primarily from a boat.

Keep a record of your habitat alterations so that you can find your underwater hot spots when it is time to fish. For the technologically inclined, a handheld GPS works well, or you can sketch a map during the reconstruction. Perhaps the easiest solution is to mark key structure with a buoy, or ensure that some of the structure remains above water as if to say, "Cast here!"

Regardless of the approach you take to convert your aquaculture pond to a recreational fishing pond, redesigning a pond can be hard work, but the results will yield loads of fun as well.

Tight lines!

Dr. Hugh Thomforde
Extension Aquaculture Specialist
Technical Editor

County Extension Agent

Debbie Archer
Communications Specialist
Copy Editor

Arkansas Aquafarming is published twice a year.
The purpose is to advance aquaculture production in Arkansas by providing reliable, practical, timely information.