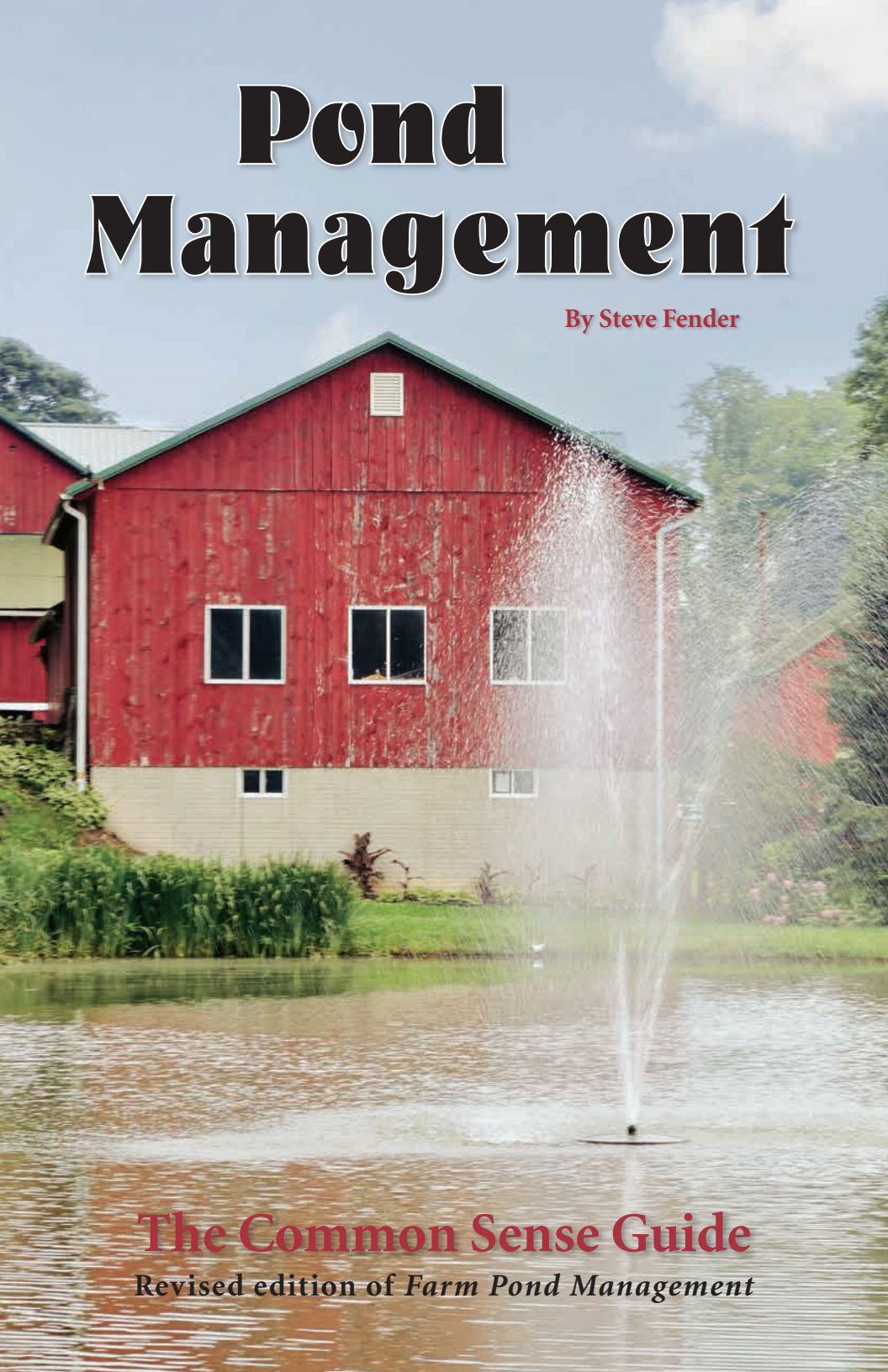
Pond Management

By Steve Fender



The Common Sense Guide

Revised edition of *Farm Pond Management*

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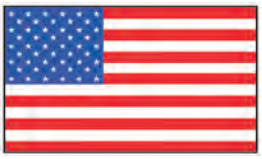

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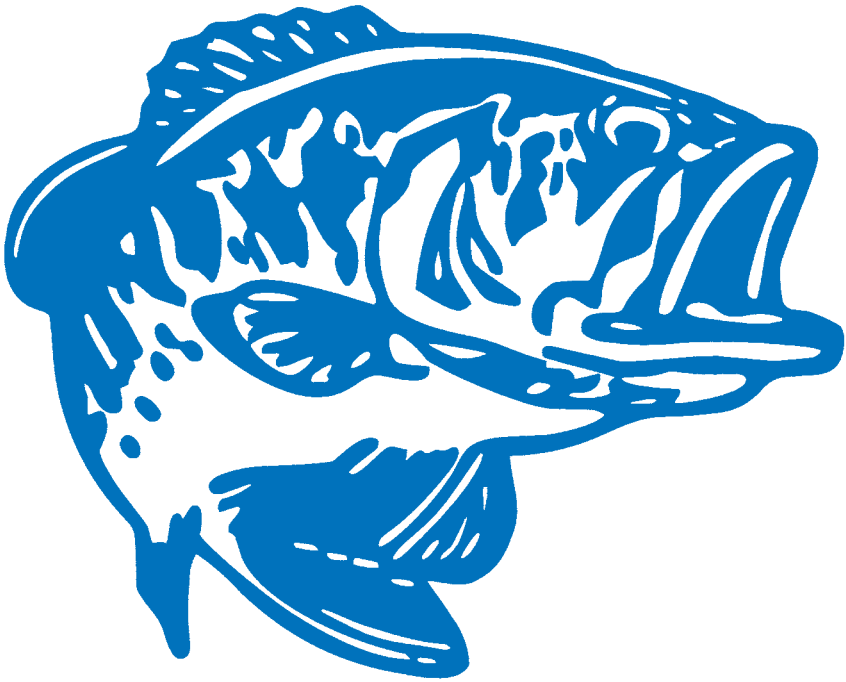

Fish Hatchery

DEDICATION

I dedicate this book to my parents, Dennis and Janet Fender. They started a fish hatchery in the 1950's and helped pioneer the industry. Without their help, there would be a lot of unstocked ponds.

PURPOSE

During these times of economic challenges we can use our farm ponds and lakes to help save money in a variety of ways. A walk out your back door or a short drive to the farm pond is much less expensive than a trip to Lake Erie. Fresh fish from your pond should give a lot of satisfaction, not to mention money saved by family and friends for fish.

I have always said that I would rather swim in a pond full of healthy fish rather than a public swimming pool.

Use your pond or lake in multiple ways to receive the benefits of your investment. That's its purpose.

Steve D Fender

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INTRODUCTION

By Todd A. Kindler

This past fall, my neighbor in the valley below us, started doing some serious excavating on his farm. From our home high on the ridge overlooking the valley and his farm I couldn't tell what he was doing. Was it for a new pole barn or for grain bins? I just couldn't tell. Several days passed and the dozer and big truck were finishing up. I realized he had just built a nice pond! As the weeks went by, he added a small dock and had a little row boat on the bank. The blue water slowly started to fill, and it wasn't too long that I saw water coming out the overflow pipe and a beautiful pond appeared. A few weeks later, I ran into the neighbor boy and asked him what plans he had for his new pond. Immediately he answered that he was going to have Fender's Fish Hatchery stock it! By the look on his face and the sound of his voice, I could tell he was really excited. I inquired about what kind of fish he was going to stock it with, and he answered, "We are going to stock it with bluegill, bass, and catfish. However, we are going to ask the folks at Fender's Fish Hatchery what kind of fish they would use and what quantities they would recommend." I thought to myself 'now that's a smart young man!'

I had the privilege this year of helping Steve Fender on this book. When we started it, I knew absolutely nothing about fish pond management and

really little about fish except they have gills and swim! After spending many mornings and afternoons following Steve around with my camera, I've learned a lot about fish pond management. I'm still no expert, but I can tell you one thing: I now have a deep appreciation for the beauty of a pond, the fish, and the total value of what it adds to your property and well being that is even more than dollars and cents! I also have a lot of admiration and respect for the Fender Fish Hatchery crew. I have known them for years, but until you hang around the Fender Fish Hatchery for some time you really don't appreciate all the hard work and dedication this family puts into their business. There were very early mornings when I would arrive to take some photos and Mr. Fender, the founder, was already on his four wheel drive Gator going from pond to pond feeding and checking on the fish and the fog had not even burned off! Then his son, Steve, and the other family members would arrive and start preparing the fish and trucks for delivery. It's a very busy place with decades of experience and a willingness to help anyone. It could be a new pond, like my neighbor's or an old pond ready to be revived. The Fender crew can help you. This book is a great place to start and a valuable resource that you can keep to help you get the full potential from your pond and stocked fish. Good luck and I know you will enjoy it as much as I have!

1 Calendar of Pond Life

January

Do you know where your fish are?

They are sleeping on the bottom of the pond or lake.

Unless you have trout in your pond, your fish are in a dormant stage. Come winter when the pond gets cold your fish will become slow to the point of almost no movement. A pond owner's biggest concern in winter should be if there is enough oxygen in the water. Some ponds will winter kill very easily, while others never do.

The difference between the two types of ponds lies in the source of oxygen. Is oxygen provided by aeration, pumped fresh water, or natural spring? Any amount of water coming in will be full of oxygen. The best way to tell if there is water coming in is by determining if water is going out of the overflow. Many times I have had customers tell me they have spring fed ponds but no water going out the overflow. If no water is leaving, unless your pond leaks, that means no water is entering the pond.

This is important because if we have a severe winter, the pond will freeze over creating an airtight seal and over time (a month or more) your fish will use up the oxygen reserve in the pond.

The least that can be done is to push off the snow. A heavy blanket of snow will cut out the light stopping all plant growth and in turn, the vegetation will begin to die and then decay. The decaying process will also use up valuable oxygen.

The best way to prevent loosing fish to a winter kill is to install some kind of aeration system, whether it be surface or bottom aeration, to provide water movement in your pond.

Aeration year round is highly recommended to keep oxygen levels at the highest possible level, and to improve water purity.

It is also very important not to ice skate or ice fish on a pond that is using any type of aeration because the ice will be uneven, making it unsafe to be on a frozen pond.

Make sure to install the low mist nozzle to prevent a big formation of ice from forming like the one in the above picture. This looks nice, but it also takes a lot of water from the pond and reduces the effectiveness of the fountain.

If ice skating or fishing is important, leave the aeration off for the first

month of weather that is suitable to freeze the pond over. Typically, it is not the first month to be concerned with. It is the second or third month of freeze-over that fish kills will usually occur providing you have no break in the weather to provide a thaw that would replenish the oxygen levels.

During this cold winter month many pond owners will take advantage of the ice and build brush piles on the ice in areas that they know the water is four to six feet deep. When the ice melts, the brush piles sink; thus providing cover for little fish that will be hatching out in a few months.

February

This month is similar to last month. The only difference is that we are closer to spring.

By now, the adult bluegill, bass, black crappie, shell cracker, and perch will be full of eggs waiting for warmer days. Ponds in central and southern Ohio begin to open toward the end of the month.

March

This month most ponds will open. We will start to see some algae and weed growth. Pond water still isn't warm enough for the Amurs to work. Chemicals won't work at this time. This is a good time to plan on adding more fish to your pond if you want to boost any one species or to add additional species.

Also in March, perch begin to breed by dropping eggs. As the ice melts and the ponds open up, begin watching for sick fish. I will provide more details about this in the next section.

April

Here at the fish hatchery, we start to receive calls from pond owners asking why they don't see their fish. Until the water gets to about 60° to 65°, the fish will not feed on pellets and won't be around the sides of your pond.

Some of our ponds, like the one in the picture above, may only get fed a couple times per week. Two or three times per week will still benefit your fish.

At this time of year, pond owners need to watch for sick fish. After a long winter, bass and mostly bluegill of six inches or more get sick from Bacterial Gill Disease.

This is noted by bluegill swimming weakly in shallow water and showing signs of fungus patches over their sides. This is both a deadly disease and very curable. One pound of copper sulfate per acre dissolved in water and broadcasted around the perimeter of the pond will generally stop the bacteria. Once a bluegill is in the fungus stage, it will probably die. I would suggest to try to net the fish that is covered with fungus and destroy it. The fish that are not infected too badly will likely heal and be all right. Some ponds will experience this problem every few years. However some may never show signs of it.

April is the time to begin feeding depending on the weather. The water may still be too cold for the fish to start feeding.

I will talk more later about the advantages of using pond conditioners. But if you are using any products like Natures Pond Conditioner from Koenders water solutions. Now is the time to put it in, as long as there is not too much water moving through the pond that it gets washed out.

May

The growing season begins. This month your pond will go from hardly any action to fully active.

By mid-May depending on the weather, there should be signs of spawning beds. Bass, bluegill, shell cracker, crappie will all be on beds ready to reproduce. The White Amurs should start to clean up on submerged weeds and algae. You should be starting to feed your fish with pellets now. There should be a lot of fish swimming around the sides, if you had a feeder set up last year, get it back in operation. Or if you prefer to feed by hand, start feeding.

The pond in this picture is covered with duckweed and watermeal. This type of condition can be deadly if no fresh water is coming in the pond or no aeration is started.

June

By now most of the breeding activity is finished. You should see small bass schooled up and bluegill will begin to leave their spawning beds. The bluegill fry (newly hatched fish) will be very tiny at this stage. They are about as big as gnats.

June is usually when the fishing gets great and lasts until the end of the month. Fishing then becomes a real challenge, because of all the newly hatched fish. They are a large food source for respectable sized fish as we enter July.

July

The water is now hot and the fish head for cooler water. Fishing is more difficult now because there is plenty of food. The catfish have

In the above picture most of the fish are shell crackers. The small fish in the right hand corner is a large mouth bass. These fish are 3 inches in average length. This would be the most common size to stock in new ponds and lakes.

now spawned. If your pond is experiencing vegetation problems, add more Amurs. If your Amurs are in their first year they may need a little more time to get big enough to be effective.

This is not a good time to try to use chemicals because
• Hot water = low oxygen
• Fast dying weeds and algae = oxygen depletion = dead fish.
I want to explain what I mean.

As water warms up, less oxygen is retained so oxygen levels will naturally be lower in hotter months. Next, not only does vegetation grow fast in warm water, but it also dies much faster making it difficult to control weed kills. After the vegetation dies, it decays. The decay process uses oxygen and can take all the oxygen out of your pond which can kill all the fish. This is a good reason to look into some kind of aeration. the sooner you get it in place the less likely you will have a fish kill. Next month things could get bad for your fish.

August

This is the month to be paying close attention to your pond.

Oxygen depletion can be a problem this time of year. Normally, this is the hottest time of the year, so oxygen levels are at their lowest. Vegetation can come and go very quickly. Plankton blooms grow and die rapidly this time of year. When this happens, the oxygen is depleted. If this is not prevented, it can cause complete fish kill. Year round aeration is very helpful to prevent fish kills from happening. Also, try to divert as much high fertility run off from your pond as possible. That would be the best way to prevent plankton bloom from beginning. NOTE: Refer to page 97 & 98 for more on August vegetation problems and control.

September

Small bluegill have been spawning all summer. This is about to end with the arrival of colder temperatures.

You will notice the fish will begin to feed less. Vegetation growth should slow down by the end of the month. If you catch any fish you will see some change. Much of this depends on weather. September can have an early frost or be very warm all month. If we have a warm month, your fish will feed and grow. Fishing will be good.

October

With the exception of Indian summer, fish growth is over for the year (unless you have trout in your pond).

Put the fish food away until next spring. Now is a good time to introduce any new species of fish or boost the population of what is already in your pond.

With water temperatures dropping, fish feeding activity will slow dramatically. Now it is safe to stock just about anything you would want without worries of the bigger fish eating the new stocking.

By now, black crappie will become firm. The flesh will not be mushy. It is a good time to catch some crappie for fillets.

November

This is a good month to stock for the same reasons as last month.
If you have a pond that can winter kill easily, now would be a good time to get your aerator or fountain running.

Also, muskrat trapping season comes in around the first week of November. This is a good time to get rid of muskrats and make a little money from their hides. At the same time you stop them from tearing up your pond.

December

An Amish saying I heard a few years ago is, "If you can put a horse on the ice of a pond before the first of the year, you won't be able to walk a dog on it after the first of the year." After I heard this, I have been watching to see if it holds true. So far it has. What the saying means is if your pond freezes over hard and thick before the first of the year, chances are the ice will open at least a little after the first of the year.

Like most rules of winter, some years this will not hold true.

It is likely your pond is frozen over by now. All you can do is make sure there is either water coming in to make oxygen or that you have an aerator of some kind.

Bits of Advice

LIVESTOCK AND PONDS

The bigger the animal the more damage will be caused. Unfenced ponds in pasture fields with cows will be tramped in around the sides. In the summertime, cows not only drink from the pond, they will also wade in to cool themselves. Not only do they ruin the banks of the pond, the cows will over fertilize the water. Like a dog that is not house broken, most cows won't be pond broken, if you get my drift.

My recommendation is to fence off the pond and put a trough below the overflow. If that is not possible, fence off a small area that the livestock can get a drink from without causing damage. Smaller livestock, like sheep, goats, and llamas will be beneficial in helping to control the vegetation on steep pond dams.

The Koenders windmill systems we sell can be equipped with an air drive water pump. These units are placed in a pond or a shallow well. When the wind blows, the air that the windmill produces will drive the pump. The idea behind this is that you can use the pump to fill a cistern or water trough.

Bits of Advice

A couple of alternative feeding methods: the first and less offensive of the two is to hang a small wattage light bulb 10 or 12 inches above the surface of the pond. At night the light will draw bugs to the surface of the water and create another food source.

Next, many pond owners will hang dead ground hogs from a rope over the water. The ground hogs will draw flies, which will produce maggots. Then the maggots drop in the water to feed your fish. I would not recommend this unless the pond is down wind from your house.

Anytime electricity is used near water, use caution so no one is electrocuted. The best prevention is to simply cut off power to the waters edge before going wading or swimming.

I remember when...

The Times-Reporter
Fri., Sept. 18, 1970 A-3

Dennis Fender, operator of a fish hatchery on RD 1, Baltic, shows one of the larger catfish placed in the lake Thursday at Sallie Buffalo Park near Cadiz. The park, located on 408 acres of reclaimed land, was opened to public use by the Hanna Coal Co. in 1965. The fish shown is one of a truck load dumped into the lake as part of a regular restocking program of the coal company. No license is required to fish here and all facilities of the park are available to the public at no charge.

2 Stocking Recommendations

1 Acre Pond

100 Bass
200 Bluegill

These two make your balance.

100 Catfish
100 Perch
100 Shell Cracker
100 Crappie
100 Hybrids
1,000 Minnows

These fish add variety to the menu.

8-10 Amurs

All these fish with the exception of the minnows are best stocked in two to four inch size range, and the White Amurs are sold in ten inch range.

Bits of Advice

Farm ponds should have fish that the pond owner would enjoy catching and/or eating. For example, if you don't like to catch or eat catfish, you shouldn't stock them.

But on the other hand, there are some fish that are needed to maintain a balance. This is what I would like to go over in this chapter.
It's a common belief that bluegill of any amount will automatically over populate. This is true, IF they have been overstocked or the pond has not been properly managed.

Any type of fish will take over a pond if put in the right conditions.
It is important to stock with a balance. For example, in a one-acre pond:

There are two types of fish needed to establish a balance. A type of predator fish and a type of forage fish. The best predator is the largemouth bass and the forage would be the good old bluegill.

BASS

Largemouth bass are best because of their high spawn numbers and survival percentage. Also bluegill are a staple diet of largemouth bass.

Bass will begin to spawn at two years of age. At which time they should be about 13 or 14 inches long and 1½ to 2 lbs in weight.

BLUEGILL

Bluegill are the best of fish for forage because of their high reproduction numbers. The best ponds are the ones that have many 1 and 2 inch bluegill.

Bluegill will spawn at 4 inches and up at less than a year old. This makes the perfect forage fish. The spawning will continue all through the warm months from the end of May through September.

These two fish could complete a pond stocking if the goal of the pond owner is only to have something in the pond.

CATFISH

Now for a variety, I will start with the catfish. I would consider this fish to be one of the best eating fish that can be stocked. Cats need to be stocked with caution. I have seen too many customers stock cats and forget they are in the pond. Catfish are one of the fastest growing and most aggressive. In two years or two summers a three inch catfish will reach fifteen to sixteen inches and weigh over two pounds. In five years they can weigh eight or nine pounds. Catfish never stop eating or growing and can heavily impact a bluegill population to the point of having nothing left for bass to eat. I like to see catfish harvested at two pounds. Because catfish fry usually get eaten, I would recommend to restock as needed.

PERCH

This picture shows counting adult perch to fill an order.

Perch are the same fish a lot of fishermen go to Lake Erie to catch. There is no reason to not have them in your backyard pond. They have good reproduction, but are poor survivors of hatches. This means smaller ponds or ponds with very little or no cover will need to restock perch every three or four years, as the survival will be poor in these types of ponds. Restocking with four inch perch will help to boost the population and adds a nice touch to your selection.

BLACK CRAPPIE

No, crappies don't eat everything in the pond, and, no, they don't take over. Why did I start with that statement? If I had a dollar for every time I heard that crappies will eat everything and take over a pond, I'd be rich. Also, I have yet to meet a pond owner that has had this problem. Think about it. A big, full-grown crappie, can't eat as big of a fish as a 12 inch bass or 14 inch catfish. Crappies won't overpopulate because they spawn only once a year. Not likely to take over? Right. Crappie are good to eat when the water is cold. Catch them through the ice. Most pond owners restock every few years to boost populations.

SHELL CRACKER (also known as RED EAR SUNFISH)

Shell crackers are not just another bluegill. Their selling points are their size. At 10-12 inch and 1-1½ lbs. they eat a lot of snails, which help to keep parasites down in the other fish. They are not a good replacement for bluegill, because they don't reproduce in numbers large enough to feed all the other fish like bluegill.

HYBRID BLUEGILL

The Hybrid bluegill in this picture is in its second summer at about 5 or 6 inches.

Hybrid bluegill are a cross of bluegill and green sunfish. The end result is a fast growing, aggressive, hard fighting pan fish. The downside is, as hybrids reproduce, the offspring will began to revert back to the parent bluegill. So if you stock hybrids, it will be purely for your enjoyment only. There is no real benefit to the pond. Hybrids will reach sizes of 10 and 11 inches and 1 to 1½ pounds.

I recommend to restock on a yearly basis, and stock the numbers you would like to harvest. If you plan on taking one hundred big hybrids out each year, you will need to stock that number.

MINNOWS

Unloading minnows off Keo Fish Farms truck onto our truck.

Fathead minnows are a feeder fish. That means their one and only purpose in life is to be eaten by big fish. We recommend them to stock in new ponds to help boost the growth of the game fish just until the bluegill begin to spawn enough to support the food chain. Some pond owners will dump thousands of them per summer trying to grow a monster bass. They are diehard fishermen. This is not necessary in a normal pond environment. An alternative to repeatedly stocking minnows is to pellet feed. You can't establish a lasting minnow population in a normal stocked pond because adult minnows only reach an adult size of 1" to 2" in size. Minnows are always near the bottom of the food chain (and you think you have it rough).

AMURS

For the better part of eight months of the season, we will average around 500 Amurs through the hatchery per week.

The best way to control vegetation in a farm pond is to do it naturally, with White Amurs. These fish are vegetarians by nature. Eight to ten Amurs per acre will usually do the job, giving them enough time to grow. It will take up to three summers until they are large enough to do a good job. Once they start to control weeds, you should be good for up to ten or twelve years. At that time, more Amurs should be added to replace the ones that will die from old age. The most common reasons Amurs won't work well is too few are added or not giving them enough time to grow to a size that will allow them to be effective. A common misconception is that when amurs get old, they quit eating vegetation. This is a myth. They eat until they die. Depending on what part of the country you are in, they will grow to sizes ranging from 40 to 100 pounds. Amurs have to eat a lot to grow that big.

Amurs can live up to twenty years.

Bits of Advice

Limit the fishing to your closest friends and family. The more fishermen you let in to fish, the more problems you'll have. Remember you paid to have the pond built, you pay the taxes, you mow the banks, you feed the fish, and you paid for the fish. If everybody else goes to public waters or builds their own pond, trust me, you'll be better off. A good fisherman can ruin a good pond in a few weeks of fishing.

If you plan on harvesting fish from your pond, set up a guideline to follow as in how small of fish can be taken.

The following list is a recommended size for maintaining a good base for pond reproduction.

Bass:	**16 inches and up or 2 lbs.**
Bluegill:	**7 inches and up**
Catfish:	**16 inches and up or 2 lbs.**
Perch:	**10 inches and up**
Hybrids:	**10 inches and up**
Black Crappie:	**12 inches and up**
Shell Cracker:	**10 inches and up**

If you choose to drop back a couple of inches on any of these fish, your pond will produce more numbers but fewer really big fish. My point is that if shell cracker, for example, are taken at 8 inches, obviously they wouldn't reach 10 inches. Your choice. More fish per acre or bigger fish feeding minnows or pellets will help to off-set this problem.

3 Fish Under Cover

An important part of a pond's production revolves around how much structure is in your pond. The reason for structure is to help increase reproduction survival. When any type of fish hatches, they will need some place to hide and feed. This will give a big boost to the survival rate of all species of fish. The fry will go into hiding until they reach two to three inches in size. Then if they become prey, this size of a meal will do more good than a freshly hatched almost microscopic fish. Also, giving little fish a chance to grow and reproduce will increase the pond's population. The best type of cover is natural cover. Good examples are tree branches, small trees, pine trees, scrub brush, and brushy trees of any kind (stay away from anything thorny). Try to

The picture above is of a pond that we drained to harvest the fish. In the background are the old tree stumps that have roots exposed providing hiding for small fish.

place cover in two feet out to six feet of water. If placed in too deep, the small fish will not go out to it. By using natural cover you will invite insects and other living matter for your fish to feed on. Once wood is submerged under water, the lack of oxygen will reduce the rotting process. Brush piles will last for decades under water.

The above picture is of a pond that has been drained, exposing a brush pile that was placed for fish cover. The more of these piles, the better for the fish.

4 Feed Your Fish

I try to encourage all our customers to feed with pellets. Bluegill are one of the main fish that will easily pellet train. By feeding bluegill, you do a couple of things. First, bluegill are the main source of forage fish in a farm pond so the more feed they eat the more eggs they lay. Secondly, if they are eating pellets that also means they aren't competing against the rest of the population for feed that the pond naturally will produce. Maybe most importantly is the extra growth put on during the growing season by feeding pellets. Another benefit to feeding is if catfish are part of the fish population, feeding becomes even more important. Because of the rapid growth of catfish, they are very much in competition with the bass. By using the feeding pellets the catfish become lazy and feed mainly on pellets therefore leaving more for the bass. If you don't have time to go to the pond everyday or so, there are a lot of automatic feeders on the market that will do the job for you.

Unless you've purchased feed-trained bass and perch, the bluegill, bluegill hybrids, and catfish will be the main species to feed. I recommend feeding of anywhere from one to three bags per acres (using a 50 lb. bags) through the summer months, which means a major amount of pressure has been taken off the food chain. Feeding pellets will change the way you need to balance the ponds and fish population. The worry of skinny bluegills is gone because as long as they have feed they continue to grow. The end result is more big gills

for the frying pan. The catfish can be your pets for as long as you want, because they are no longer a threat to the bass. If you are going to start a feeding program, it is important to have a routine. Evenings are the best time to feed, around dusk. Use a quart of feed and spot feed at several places. Over about a week's time you'll notice the fish coming to you. You will feed for maybe 10 minutes or until the fish stop eating. Choose the right feed for the job. Like dog and cat feed, there are a lot of choices on the market today. The feed I would recommend is 41% protein and 1/8" in size. Most feed manufacturers will have a high protein feed. The fish can tell if you are feeding low protein

feed. Your end result will not be the same. Also be careful not to use too big of pellets. Anything over 1/8" in size will restrict small bluegill from feeding. These are the fish you will need to target with a good feeding program. Pond size does not determine fish size. Big fish will grow in small ponds. The smaller ponds just don't grow as many big fish as big ponds do. However, remember that feeding with pellets or minnows can make your small pond an exception to this rule. The main difference between small and big ponds is the amount of feed they can produce naturally for the food chain.

Remember that taking a nice walk along the pond late in the day can be very relaxing after a long day at work. Enjoy your pond and fish!

It is a proven fact that kids who spend a lot of time fishing are spending less time getting into trouble. Buy a kid a fishing pole.

Description Of
Fish Species


BLACK BEARS

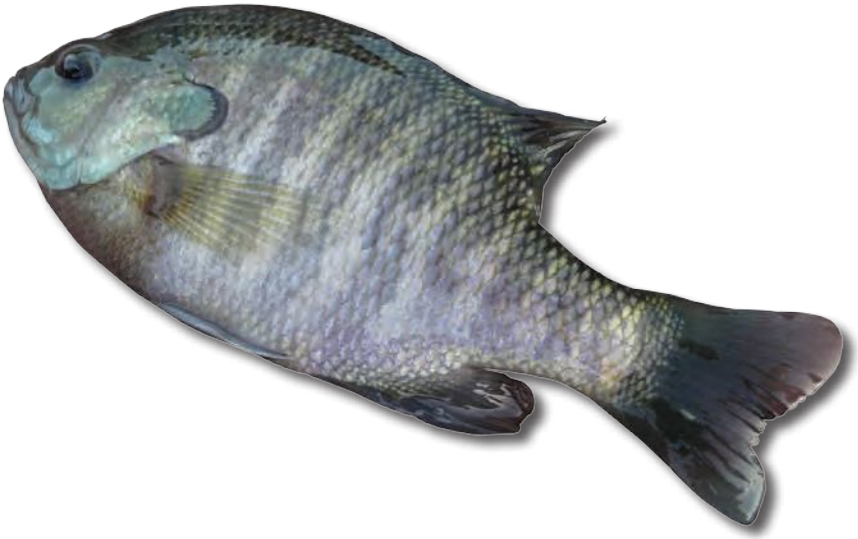
5 A Fish Biography

Largemouth Bass

This is possibly the most sought after game fish that is stocked in farm ponds today. They can reach sizes of four to five pounds and be eighteen to twenty inches in length. The most common size is two to three pounds, which in Ohio is very respectable. The bass fry hatch out in mid-May through the first or second week in June all depending on the water temperature. Good weather conditions of 60°+ warmer water. Bass males or bucks will build and guard the nest where fertilization of the eggs takes place. They will guard the eggs for the next seven to ten days. When the bass fry leave the spawning bed, they remain in a tight group. The bass buck will stay close by guarding them from other fish. As the fry grow they feed on the bottom of the food chain on

tiny microscopic living things called zooplankton. Eventually they go to bigger prey such as small fish, insects, crayfish, and about anything that will fit in their mouths. This will continue for about two weeks. At this point in time, the fry will be about ¾" in length. After they reach ¾", the bass will become independent and start breaking up the group and go their own way. At the end of summer, these bass will be about five inches in length and well on their way to the top of the food chain. Life expectation in bass can reach upwards of seven years. If you are pellet feeding your fish, remember that largemouth fish by nature do not feed train very easily. If you do want to feed your bass, fathead minnows would be the most direct way to do this. As with all warm water fish in Ohio, bass only grow in the warm months, mid-May through September. This is why southern fish grow to larger sizes than Ohio fish, because of the longer growing season of the south.

Bluegill



The bluegill in this picture is a male. Bluegill are one of the few fish that can be identified as male or female from color. Male bluegill will be very colorful.

Customers often express concern regarding bluegill over population. Any fish, if not stocked and managed properly, can take over. Bluegill are very important for maintaining a good food chain. Late winter months will find female bluegill egged up and ready to spawn once the water gets to the mid 60°'s. Like bass bucks, the male bluegills make a spawning bed in two or three feet of water, often in the same place every year. More than one female could come to the nest and lay eggs, which the male will fertilize as she lays them. It is possible for females to lay eggs more than once a year. Typically the larger adults will spawn in late May and early June. The smaller bluegill will spawn later in the summer. Bluegill that were not old enough to develop eggs over the winter, will grow and become mature and spawn later in the summer. This is why you may see bluegill fry very late in the summer right in to fall. This is why bluegill make the perfect forage fish. Adult bluegill can reach sizes of 10 or 11 inches but are often caught at the eight to nine inch range. I encourage pond owners to put size limits on the bluegills at seven to eight inches. You will have plenty of large breeders to create a good food chain, and also have some nice size bluegills to catch and eat. A fact that most people don't know is that bluegill do a very good job of maintaining or controlling the bass population as bass fry under two inches in size are on their menu.

Shellcracker

The way to identify male shell crackers is by the red ear. Both sexes will have this mark, but on males it will be much larger and deep red.

Shellcrackers are in the bluegill family. They get their name from their eating habits as they eat the small snails common to most ponds. The Shellcrackers can do this because of specialized teeth in their throats. This is very helpful as snails provide a link in the life cycle of parasites. Some of these parasites can also be found in fish and are related to swimmers' itch. Snails are only a part of a shellcracker's diet. They also feed on most of the same insects and small fish as other fish. One thing you will notice is that they rarely feed on pellets. Shellcrackers are by nature much harder to catch than bluegill. I have had customers ask about replacing bluegills with Shellcrackers and I don't recommend this. The shellcrackers don't reproduce in numbers large enough to supply a good food chain. Probably the biggest selling point is the growth rate and size. A typical shellcrackers will reach ten to twelve inches, in three to four years approaching three-fourth to one pound.

Hybrid Bluegill

Hybrid bluegills are a cross from bluegill and green sunfish. When a hatchery produces a hybrid they use male bluegill and female green sunfish being careful to have only males of bluegill and female of sunfish basically forcing a cross of the two. Normally bluegill and sunfish do not cross. They typically stay to their own family of bluegill

or sunfish. The crossing of these two fish will give the best of both worlds by giving the hybrid the length of the parent bluegill and the thickness and aggressiveness of green sunfish. Hybrid bluegill grow rapidly if the food is there for them by reaching the size of ten or eleven inches and weighing up to ¾ lb. Both bluegill and green sunfish are fairly easy to catch making hybrids the ideal fish to stock. Their fast growth means thick fillets for your table. Hybrid bluegill feed on insects and small fish like bluegill. However, they feed best on pellets. This gives the pond owner the opportunity to get three to four inch fish up to eight to ten inch fish in about two summers. One last note about hybrids, is that they are a cross of two different kinds of fish. The few that do reproduce will return to bluegill after a few generations of reproduction. So they really need to be restocked periodically.

Black Crappie

(A fish with an undeserved bad reputation.)

Crappies are very popular among ice fishermen, referred to as slabs, when a eleven or twelve inch is caught. I have heard a lot of concern of

Crappies taking over ponds, eating everything and ruining the overall balance. In the forty years of growing up in the family fish business, I have yet to see or hear of this actually happening. I suppose it is possible, but like all species, if stocked properly and managed with some common sense this should not be a problem. In ponds of two or less acres stocked at one hundred per acre along with bass and bluegill, the crappie will usually have to be restocked every three to five years because of poor reproduction survival. Growth rate on crappies will average about two to three inches in length per year on a life span of about eight years. The largest crappie I have ever measured was seventeen inches in length. Crappies will spawn in late spring about the same time as bluegill -- often in the same area preferring a stony or hard bottom to lay the eggs. They lay eggs and hatch fry numbering in the tens of thousands. Once the fry hatch the male crappie will no longer guard the nest of fry. This makes for easy feeding for two inch and bigger fish. Crappie spawn once a year in spring, so whatever survives is it until next year. The opportunity for over population of a properly stocked farm pond is just not there. Crappie feed on small fish and insects much like the bluegill and are able to eat a little larger fish. Best caught in cold months, the fillets from these fish will be mushy in warm months, but firm when temperatures go below 55° making some of the best eating fish. It is best to stock in 55° or colder as survival is not good when handled in warm months. We will not net or sell crappie in summer months because of this.

Yellow Perch

One of the best eating fish, yellow perch will reach lengths of twelve or thirteen inches and weigh almost one pound. Perch don't feed on

pellets unless feed trained in tanks as fry. They feed very well and grow rapidly. In a normal pond environment perch spawn at two years of age. Although, I have seen first year perch egg up and spawn. Perch spawn early spring around March and April depending on the water temperatures. When water reaches almost fifty-five degrees, female perch will go to a brushy area and will deposit a long ribbon of eggs in cover so when the eggs hatch the perch fry will be hidden from predators. Normally perch stay hidden from view staying in deeper water. When we have heavy rains and the pond overflows, perch are likely to head for the overflow and will go out of the pond. I recommend all overflows be restricted with some kind of screen or fence. Since perch only spawn once a year in early spring before any of the other species, the reproduction survival will be poor in smaller ponds of one acre or less. In fact, there may be no survival at all. Therefore, periodical restocking will probably be necessary.

Silver Channel Catfish

Catfish are easiest to raise because they feed on pellets at all stages of life. They are commonly started at four to six inches in size. They can grow at an average of one pound or more per year if fed on pellets. Typically after two summers of growth it's best to begin to harvest them. If left too long, catfish will become a burden on the pond's food chain. Catfish feed on fish, snails, vegetation, and even small ducks, pretty much anything that is edible. Small bluegill seem to be a favorite meal as the main diet for bass. If let go, catfish will grow to sizes of eight pounds and even up to ten or twelve pounds. Remember the older and bigger they grow the smarter and harder they are to

catch. Also, they will compete with bass. It is not uncommon to have a pond in which the catfish have depleted the bluegill population to the point of the bass becoming skinny and stunted. It is best to harvest catfish at two to three years of age at which time they should be about two to three pounds. This is the best eating size. The one exception to this rule is by feeding pellets. If you so chose, catfish will become reliant on pellets and therefore will not compete with bass. This gives the pond owner the choice of making the catfish pets for as long as they want. Reproduction in small farm ponds is common, but the survival of the catfish fry is generally zero. The male catfish will find a hole in the bank or under some kind of brush. He then will make a spawning bed. The female will come in and lay the eggs, which the male will fertilize and then fan with his tail until the fry hatch at which time they leave the nest. The catfish fry will school up for the first month making them an easy target for any predators. So the catfish will have to be restocked every few years according to how many are caught.

Fatheaded Minnows

Fathead minnows are considered both a forage fish and bait fish. Commonly sold in bait stores, fatheads are common all across the U.S.A. and Canada. They are farm raised in the south and harvested wild in Minnesota and other western states. Fathead adults typically reach about two inches, therefore, making a good feeder fish for starting a new pond. Because of their small adult size, it is nearly impossible to establish a permanent population in a pond that has bass, bluegill, catfish, and perch. These minnows can spawn up to a dozen times per summer laying their eggs on the under side of logs, sticks, rocks and anything else they can use. The normal life span of a fathead minnow is about two years.

White Amurs

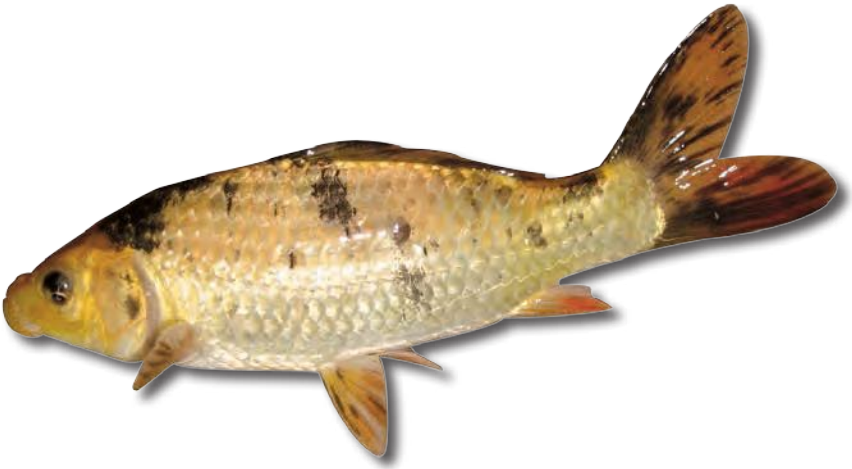
When vegetation becomes a problem, there are two choices for control. The oldest has been chemicals which is the most expensive and potentially the most deadly to your pond. The second choice and the best choice would be the White Amurs, also referred to as Grass Carp. Amurs were legalized in 1987 for use in Ohio ponds. Only sterile White Amurs are allowed in the state. White Amurs are primarily vegetarians feeding on all types of pond weed. The number of White Amurs per acre will depend on pond conditions. Bigger lakes of ten acres or more and deeper lakes tend to require less per acre than smaller shallow ponds. A good starting point is eight to ten White Amurs per surface acre. The most common and best stocking size is the ten to twelve inch fish. This size is easy to transport and are big enough that other fish will not eat them. It may take several attempts to build a good Amur population, because of natural mortality and natural predators like blue heron, fish hawks, and even Bald Eagles. The Amurs will need about two years of growth to become effective in controlling the weeds and algae in the pond. Generally, the life span of an Amur could be as much as sixteen to eighteen years, but good usefulness is about ten years. It is recommended to restock after the first Amurs have been in a pond for about eight years. If the Amurs are not effective, the most common reasons are too few fish per acre and expectations that they should be effective right away. The growth rate of these fish is incredible. A twelve inch half pound fish stocked in spring will reach twenty to twenty-four inches and weigh four to five pounds the first summer. In two years time they will grow thirty inches in length and up to ten pounds by the end of third summer. At that time, Amurs begin to control the vegetation. Depending on the types of the pond vegetation, you could need as many as twenty Amurs per acre or as few as five per acre. White Amurs will eat up to three times their body weight on a daily basis. Amurs have the potential to reach sizes of up to forty inches and forty pounds. If you are in the southern states, expect much better growth rates, as a longer growing season will result in larger fish.

Check with your game warden or department of natural resources if you are not sure if Amurs are legal in your state.

Bullfrog Tadpoles

Bullfrogs are the largest species of frogs we have in Ohio. They are popular with pond owners because of their size and loud voice. In the summertime, some pond owners complain of the noise while others like it. This is also the type of frog that hunters use sharp stickers or gigs to catch for leg and back meat. Bullfrogs are the only frog to spend one whole summer as a tadpole. Then they start to grow legs to become frogs during the second summer. If the area around the pond is too well manicured the adult frogs will not stay. Because they spend a lot of time on the bank out of the water, they prefer grassy or brushy cover. Adult frogs will come back to a pond to spawn, because they prefer still water for spawning.

Koi



Koi breeding originated in the 18th century in Japan. Koi have only been popular in the U.S.A. for about fifty years. In the last ten years we have seen a lot of interest in farm pond use. The reasons for stocking the koi may range from vegetation control to cosmetic. There are roughly eighteen varieties of koi consisting of skin type, fin colors, and one having facial features of marsupials. Koi sold at hatcheries may be sold to eat duckweed and watermill. Koi reproduction survival in a farm pond is usually very poor partly due to the bright colors of the little koi. This makes them easy to be seen by predatory fish and birds.

Koi have been known to live up to 50 years or longer.

Smallmouth Bass

Smallmouth bass for years were common to the small creeks and streams of Ohio. Some believe pollution has played a part in the decline of the smallmouth in these waters. We still sell smallmouth bass. The pond owners who do best with them stock smallmouth, but they do not stock largemouth. Ponds stocked with perch and some bluegill along with the smallmouth tend to do well. The pond owners who do the best will also supplement the food source with large amounts of fathead minnows. If you can afford it stock one hundred smallmouth per acre and use only minnows, thus eliminating competition for food. The expensive part is supplying enough fathead minnows to keep the smallmouth growing. If you are succesful you will have some of the biggest smallmouth around. If stocked with largemouth, eventually the smallmouth will be pushed back and altogether eliminated.

Walleye

Stocked in a pond of two acres or less pond, walleye will survive and do well. They thrive the best in a large body of water. Walleye were meant for lakes thirty and forty acres or larger. We have seen reproduction in small ponds. The best way to get a population of walleye in a farm pond is to repeat stocking of fish in an eight-inch size range.

Green Sunfish

The green sunfish in this picture was taken from a pond that had feed raised bass. These fish were fed heavily. This sunfish is bigger than average.

Considered trash fish, the green sunfish will only reach sizes of about five to six inches. These sunfish make very good forage for all fish. The female will reproduce when she is as small as two or three inches long. green sunfish are very important in the reproduction of hybrid bluegill. Without green sunfish, we couldn't produce hybrid bluegill. A hatchery will use a male bluegill and several female green sunfish to produce a fast growing aggressive fighting hybrid. These hybrids are considered very popular among pond owners today. In a normal pond environment, you probably will not find any green sunfish because of their small size and low dorsal fin which makes them an easy meal for the largemouth bass.

Trout

Rainbow trout are the most common type of trout sold in Ohio. As with any trout, cold water is necessary to support these fish. Trout require a high oxygen level to survive. Cold water generated through cold weather or a good strong spring is needed to grow trout. For those who do not have a good spring, I recommend stocking trout early fall or early spring and harvest before warm weather begins. Trout are a stream fish and reproduction in a farm pond is very unlikely. Trout can reach sizes of four or five lbs.

Crayfish

If this crayfish were to lose one of its legs or front claws, a new one would grow back to normal size in about one year.

Crayfish are an excellent food source for catfish and bass. Most ponds that have an established adult fish population will not have many crayfish because of the bass and catfish. Periodically adding crayfish will help add to the food chain.

Adult female crayfish will lay eggs in early spring. The female will carry the eggs under her tail for about one month until they hatch, and then she will carry the baby crabs for a couple more weeks at which time they begin to drop off her tail and go on their own way. At this time even small bluegill will eat them. As crayfish grow, they have to shed their outer shell. After they shed and before the inner shell hardens, they are considered soft shell crayfish. Bait shops will buy soft shell crayfish and refrigerate them to slow the hardening process down until they can be sold.

Northern Pike

In this picture I am holding a pike breeder that died of old age. We used to raise pike but because of high demand of other species and poor reproduction of the pike and problems of the young pike eating each other, we have discontinued raising them. But in the fall we try to locate hatcheries out in the Northwest that have pike for sale. So we do try to offer some for sale in the late fall or early winter.

Paddle Fish

This monster that I am holding is a paddle fish. We have only 4 or 5 of them in all 200 acres of water in which we farm fish. This fish is over 20 years old. We came to have these few fish when a lady in Kentucky who was trying to raise them asked us to transport some for her. As part of the payment, she gave us a few of them. Paddle fish were near to extinction at one point in history because of over fishing. They were native to much of North America. Through conservation and caring people like the lady in Kentucky, they are making a comeback.

The flesh and the eggs of a paddle fish are why they were on the way out. I have never eaten one but have been told that they are very good to eat and the eggs are similar to caviar. This one weighs over 50 lbs.

I remember when...

12 TIMES-LEADER Martins Ferry, and Bellaire, O. Thursday, November 13, 1969

STOCKING the St. Clairsville Village Reservoir again this fall, the St. Clairsville Fishing Club dumped 500 large blue gill and 100 bass into the lake this week. Helping with the stocking were Phil Egy, club president, Mr. Fender of the Fender Fish Hatchery at Baltic, Ohio, John Haught, L. K. Hess and Stanley Rumirski. The club plans to have a half ton of channel cat stocked in the reservoir in May.

6 Spawning Habits of Fish & Frogs

Frogs

The frogs in this picture are adult bullfrogs. I took the picture to show how to tell the male and female frogs apart. You will see a round disc behind the frog's eyes—this is the ear. The frog in my left hand has a larger disc or ear. This would be a male frog. Female frogs have a much smaller ear disc. Also color will not have anything to do with the sex of the frog. Bullfrogs will begin to spawn when we start having a lot of warm days and nights. The water temperature will need to be about seventy degrees and the nights will need to stay around seventy degrees also. These are the temperatures we will need to get the frogs in the mood.

The male frog will jump on the female's back and clamp fast with his front legs under her front legs. As she lays the eggs, the male will fertilize them. In seven to ten days, tadpoles will start to appear. The bullfrog tadpoles are the only frogs that will spend an entire year as a tadpole before they start to turn into frogs. Spawning season will only last for about one and a half weeks.

Crayfish

Crayfish will breed together in late fall. And then in late winter, the female will start to lay the already fertilized eggs. As she lays them, she sticks them to the underside of her tail until the incubation period is over and the eggs hatch. After the eggs have hatched out, the little crabs will hang underneath her tail for one to two weeks at which time they will begin to drop off and go on their own way.

This is a picture of a female crayfish that is loaded with eggs.

Perch

Here in central Ohio, at our farm location, our perch will begin to drop eggs as the water temperatures reach approximately fifty degrees. Yellow perch are one of the few warm water game fish that will not make a spawning bed. The adult female will find a brushy or weedy area in about two or three feet of water, and she will swim through this area and lay her eggs in a long ribbon. All the eggs are stuck together in a jelly-like mass. As she lays them, a male will swim along and fertilize the eggs. As I have stressed several times in this book, cover is very important. When the little perch fry hatch, they will be hiding in cover right away. They need this cover to have a chance to grow and move up the food chain. The female will not spawn again until the next year. Whatever survives out of this hatch will make the next generation. Typically, small ponds of an acre or less will not have a good enough survival rate and will need to be restocked with fingerling perch once every year or so to ensure future generations.

In the picture above, I am holding a batch of perch eggs.

The two pictures below are of a perch female. I have taken these pictures to show how swollen the female will be when carrying eggs.

Almost two months will pass from the time the perch spawn until the other species of fish in the pond begin to spawn.

Bits of Information

Female to male ratio is about ten females to every one male with perch.

Spawning Beds

When the water temperature reaches approximately sixty-five degrees, the bass, bluegill, shell cracker, green sunfish, black crappie, and fathead minnows will start preparing to spawn. Of all these afore mentioned species, except fatheads, the male will be in charge of building the nest, guarding, and hatching the eggs.

Spawning beds will look like potholes on a road with the depth of the holes depending on how deep the silt is in the pond. The fish will fan the mud away with their tails until they have uncovered a hard surface. The eggs, when laid, cannot sink into the silt, or the eggs will not hatch. Bass nests may be two feet in diameter, whereas the pan fish species will have a much smaller nest of only about one foot in diameter. Most of the nests will be built in a depth of about two feet of water. Fish eggs, like any type of eggs, will need some warmth in order to incubate.

After the nest has been made, the male fish will wait for the egged up females to come to the nest. She will then swim in a circular pattern, dropping her eggs while the male swims alongside her, fertilizing the eggs. In about seven to ten days, the fry will begin to hatch out.

Once pan fish fry hatch, the male will leave the nest and parenthood is finished until the next time.

Large Mouth Bass

Large mouth bass will stay with fry, as long as they stay grouped up. These little bass will swarm together for one and a half to two weeks or until they are about three quarters of an inch long. At which time they will start breaking up into groups of about ten to twenty individuals. The male bass, or buck, will guard the hatch until they split. Female large mouth bass will drop approximately 10,000 eggs per pound of body weight. Adult large mouth bass typically need to be two years old and weigh at least a pound to become breeders.

Small Mouth Bass

Small mouth bass differ from their large mouth cousins in that they guard the nest, but they do not guard the fry. And the fry will not group up. Small mouth will actively spawn in ponds.

Fathead Minnows

Fathead minnows lay their eggs unlike any other fish. The female will find an underwater structure, and she will swim upside-down, sticking the eggs to the bottom of the structure. One female will spawn several times over the course of one summer. These fish only live to be two to three years old.

Catfish

Catfish spawn in seventy degree water. So they are later to spawn than most of the other fish. The male will look for a secluded area, preferably under a bank or under a bush. Or if the pond owner wants to encourage spawning, they should put a large tile, or barrels in about three feet of water. Catfish will hide their eggs in these hideouts. Then the male will fan the eggs with his tail to keep the water moving over the eggs until they hatch. Then the catfish fry will hatch out and leave in a tight school and swim out into the pond to begin looking for food or to become food.

Bits of Information

The latest hatch of bass fry I have ever seen was on July 20th, 2009, in central Ohio. In this part of the state, generally the end of June is the end of bass spawning.

Bluegill, Green Sunfish, and Shell Cracker

These pan fish, if caught in January as adults, the females will have already developed eggs for the following spring. As soon as the water temperature reaches about sixty-five degrees, they will begin to spawn. The juvenile pan fish that were not yet mature the fall before, will now begin to feed and grow. Once they do mature, then they too will develop eggs and spawn later in the summer providing forage for the other fish in the pond all summer long. This is why you will see bluegill fry in the late fall. They are the last ones to quit spawning.

Trout

Trout are stream fish and need moving water to reproduce. If there are trout in your pond, and they have no running water, the females will egg up but will not spawn.

Crappie

Crappie will spawn about the same time as your other pan fish. I have even seen them in the same nesting area as blue gill at the same time. Only the mature fish will spawn. The juvenile crappie will grow and mature over the summer then spawn the next spring.

Perch, bass, crappie, and catfish all have one thing in common. They spawn seasonally. If any of these species are not mature in the spring or early summer, they will not spawn till the next year.

7 Aeration

If you are fortunate enough to have a good strong water source, aeration may not be necessary to your pond. However, most ponds are not supplied with a good water source and may need aeration. Fountains, aerators, and windmills are all good methods for replacing the oxygen in your pond. Fountains or aerators work by pumping water out of the pond and into the air giving the water a chance to trap oxygen as it drops back into the pond. This also helps control algae and water born pests. Windmills typically run an air pump that pushes air down to an air stone placed under the water, forcing air into the water. The hottest part of the summer and the coldest of the winter are the two most important times of the year to be using aeration of some kind. Refer to the pond calender. In the August and December, January, and February all reasons are explained in the pond calender chapter. If you do choose a windmill or any air stone type of aeration or fountain that pumps water from the bottom of the pond, be careful not to move water at depths of ten feet or more too quickly. This water may be dead water (devoid of oxygen). You can create a turnover or roll over by either pumping dead water to the top or circulating the water by the air bubble movement if you place the air stone too deep. By placing the air stone in eight to ten feet of water, as the bubbles flow to the surface, they will create a current. And over time, the dead water will mix in with the good water. Also as the bubbles flow to the top, some of the oxygen will get trapped in the water. Eventually, all the water will be good, clean, oxygenated water.

We started selling aeration systems back in the 70's and 80's. The common thought was that oxygen gain was the only benefit, but now we know that there are many advantages to aerating your water.

Over time, organic matter will build up on the bottom of your pond. Eventually this waste begins to break down into nitrates and phosphates and even some gases similar to methane. If there is no aeration present, these gases and other impurities will build up and cause high fertility levels. All this leads to yucky, stinky water that leads to more vegetation and eventually the hard to kill or control vegetations such as duck weed, water meal, and a large variety of plankton blooms. All this is leading to the grand finale of a massive fish kill caused by plant decay in the summertime. The plant decay will cause a fish kill because as the vegetation dies the process uses the oxygen up in your pond very quickly.

When you install either surface aeration or bottom aeration, you have begun to stop and reverse the aging process of your pond, keeping it younger and cleaner.

The type of aeration, either bottom or surface, is largely up to you. Some of the things to consider when choosing an aeration system are:

1. **Age of your pond.** Surface aeration is generally good enough for new ponds because they haven't been around long enough to build up muck and high fertility levels.

2. **Old ponds.** Old dirty ponds are better off with bubblers placed on the bottom for bottom aeration, (it's a maintenance thing). Dirty water plugs up surface aerators quickly. Whereas air stones are positive pressure so they won't plug up.

3. **Cosmetics—What do you prefer to look at?** Sometimes it's all about the looks. Many of our systems are sold because the fountain looks nice. But if you still don't know what to do, call us at Fender's Fish Hatchery or Koenders Water Solutions. We will help you determine what the best system is for your needs.

On the previous page is an example of fountains that are available to the general public. This is a Koenders aeration system floating fountain. The pump pushes the water up through a nozzle which defuses the water into whatever design you choose. Probably the majority of our fountains are sold for cosmetic appearance, however, they still perform a more important service to your pond by providing oxygen through areation.

If you should decide that your pond needs an aerator or fountain, remember bigger isn't necessarily better. The fountain on the left top and bottom pictures are one-half horse motors powered by 110 volt. These are large enough to do up to 1 acre of water, either six or sixteen feet deep. Keep in mind it is easy to maintain an oxygen level in the winter just by running your fountain twenty-four/seven. If you choose to run a fountain, it would be wise not to ice skate anywhere near the fountain. Any kind of aeration will possibly make the ice uneven causing the ice to be unsafe.

Aeration does not guarantee that you will not have a fish kill in the summer. As I have explained in previous chapters, when plants die, whether it is weeds, algae, or plankton bloom, they can die and decay so quickly that the oxygen can be depleted quicker than aeration can put it back. But aeration can keep a fish kill to a minimum.

Windmills are just one more option for aeration. They are common in locations where electric is not available and also some pond owners just prefer windmills over electric fountains. Either one will be effective in maintaining your oxygen levels. Possibly the greatest benefit windmills will have over electric fountains is long range use. Windmills have few moving parts and none that are under water, so the life span is much longer. The biggest difference between the two is that windmills actually pump air under the surface of the water to an airstone. Koenders has two sizes of air pumps: the single diaphragm which is for ponds up to two acres in size and the double diaphragm for larger ponds.

Koenders also offers an air pump that is an electric motor driven unit for customers who may not have enough wind for a windmill.

The airstone is a hard stone-like disc that have fine holes all through it. As the air passes through the stone, the air breaks down into a fine mist of air bubbles. As the bubbles rise to the surface, some of the oxygen on the air will be trapped in the water. Also, the windmill will keep a circle of water open even in the coldest part of winter, therefore providing a place for ducks to swim and protect themselves from predators.

Fountains can be purchased at:

Fender's Fish Hatchery

740-622-0681

or

Koenders Windmills

Phone: 888-777-4933

www.koenderswindmills.com

Manufactured/Service Center

Made in the USA

8 Oxygen

In this chapter, I will be discussing:

- Oxygen in pond
- How it gets in the water
- How you can loose your oxygen
- How to prevent oxygen depletion and fish kills

There are a number of ways oxygen is introduced and maintained in a body of water.

Wind

Wind blowing across the surface of your pond will help aerate the water.

Rain

Every time it rains, the rain water that falls to the surface of your pond will be full of oxygen, and the action of raindrops hitting the surface will aerate your pond. And finally, most ponds will have some run off ground surrounding them. As the rain water drains to the pond, this will build up more oxygen.

Sunlight

If you would have a way to monitor your oxygen level, you would find that at night the oxygen level may drop off a little, but during the day especially on sunny days, the oxygen level will go back up. This is all due to plant life or photosynthesis. As plants grow, they produce oxygen.

Ponds that have springs feeding them will be oxygen rich if the spring is strong enough to maintain a constant flow of water.

These oxygen sources are all natural and sometimes will be enough to keep your fish alive.

Oxygen levels will also change with the seasons as cold water naturally carries a higher level of oxygen versus warm weather. The result being winter, fall, and springtime oxygen levels will be higher than the hot days of summer. This is why oxygen depletion is more common in August - the hottest month of the year. The other part of the year to be concerned with is deep winter.

When we have a long, hard freeze, that freeze our pond for longer than a month, it can be dangerous. With so many variables, you can see how easily it can be to have fish kills due to oxygen depletion.

Now to simplify all this.

I will start with wintertime.

When the ponds that have no spring or water source of any kind freeze over, this creates an air tight seal. Add to this, enough snow to block out the sunlight and what happens is the little plant life there is during the winter now dies off. This does two things. First, any oxygen these plants were producing is now stopped. Second, as these plants decay, they use up oxygen. Next, your pond water will only hold so much oxygen, so when your fish use up the oxygen they then suffocate.

There are ways to prevent all of this from happening. Pushing snow off all ice will help, but is minor because there is so little plant life in the winter. The best thing is to install aeration of some kind.

There are a lot of choices of aeration. Windmills that pump air into the pond and fountains or aerators that pump or throw the water up into the air and splashes back down to mix in oxygen are a good option.

Preventing fish kills in the winter is fairly easy. But preventing fish kills in the summer can be more difficult.

This is because the levels of oxygen are already low because of the warm water temperatures and plant life dies and decays much faster in the summer.

Algae, rooted weeds, and cattails are only a problem if herbicide is used to control growth at the wrong times. In July and August, these plants rarely die on their own in a large enough quantity to cause oxygen depletion.

Using Amurs to control algae and rooted vegetation will usually be good enough.

Where the problem usually begins is with plankton bloom. This is a microscopic plant life that will make the pond water green or even dark brown.

As this bloom grows, it produces high levels of oxygen, but when this bloom dies, it will deplete oxygen levels down to nothing over 24 hours. Of course, this also depends on if the pond is being aerated and also the pond size will determine how quickly all this happens.

Plankton bloom is difficult to control. Aqua Shade will help with this but it needs to be done before the bloom begins. The best way to prevent the bloom is to take away the food source.

Ponds that are shallow and have excessive runoff from high fertility ground are at greater risk. All ponds that have a lot of sediment built up have more problems.

However, only a small number of ponds will have this problem.

Ponds and lakes that are used and maintained on a regular basis will be healthier and less likely to be prone to oxygen kills.

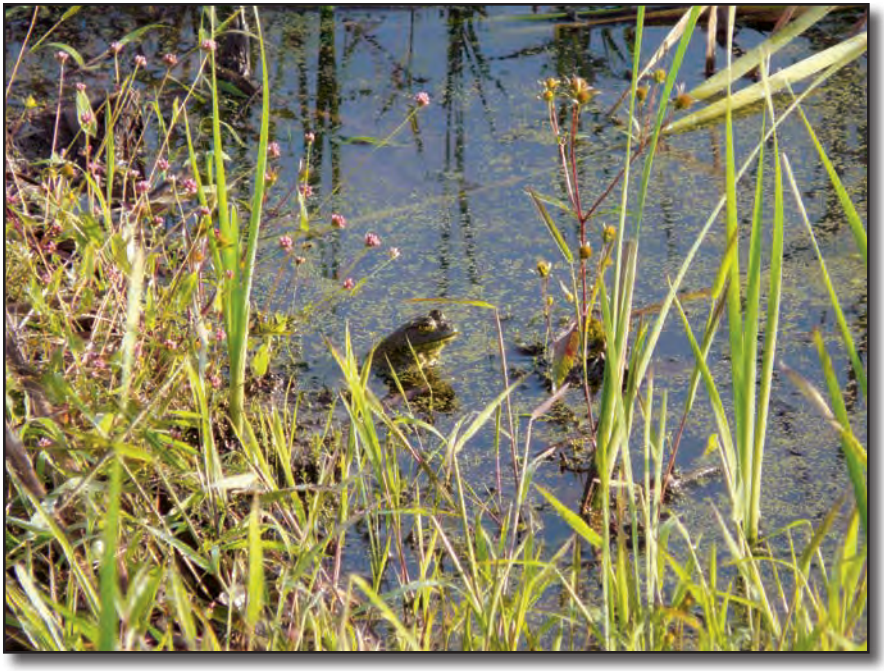
Probably the best prevention would be to pay attention to your pond and keep it aerated and use products like Nature's Pond Conditioner

that reduce the excessive black muck, this black muck makes for high fertility levels. Early signs of oxygen depletion in the summertime will be noticed by walking around the pond, and you will see a lot of small fish hanging at the surface of the water. Also, if you have been fishing, the fish will not bite.

Fish that have been pellet fed will stop feeding. The next step will be dead adult fish starting with the biggest first.

The sign of a total fish kill will be when the smallest fish are dead.

Your Pond and Wildlife



9 Your Pond & Wildlife

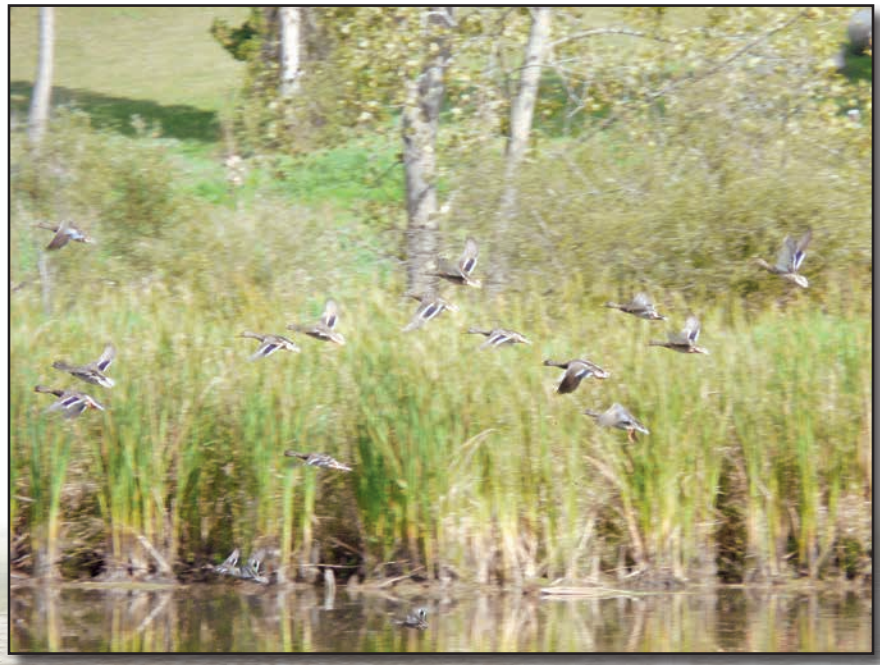
Your pond does not have to look like the pond in the bottom picture to be a good home for frogs and other wildlife, but it helps. I suggest to pond owners that they leave one end of the pond or lake grow up and look like the bottom picture. This will help attract ducks, geese, and even deer along with a lot of other animals.

This area of the pond would also be a great place for your underwater cover for the little fish.

Cattails, if left uncontrolled, can overrun a pond in just a couple of years. Weeding or pulling of the new shoots is effective enough to hold them back or spray herbicides can be used. As your Amurs become large enough, they too will help control cattails.

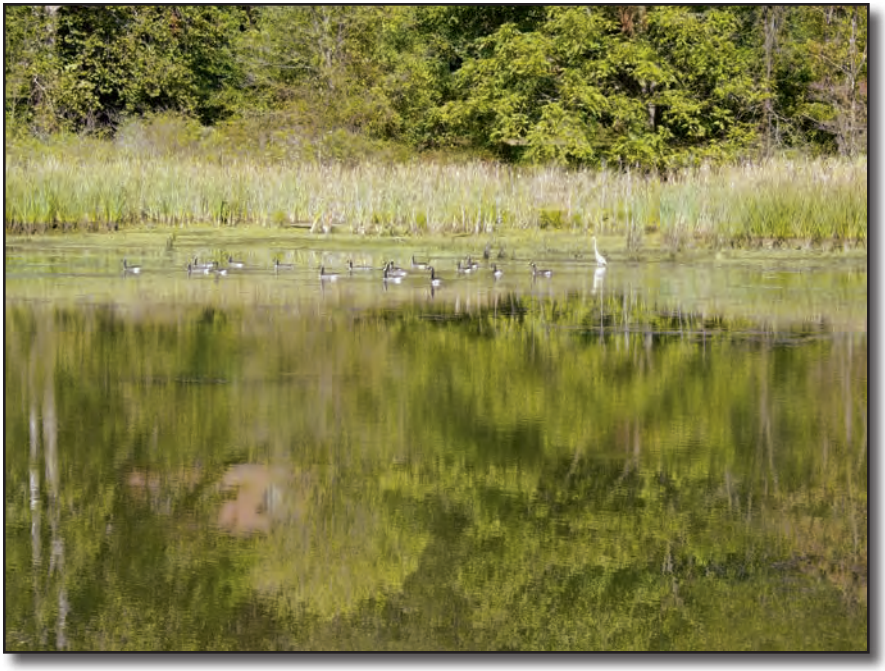
Wood duck nest boxes can be easily built or purchased. Other types of ducks will nest near your pond also if some high grass is left to grow on your pond banks.

I would suggest putting up some bat houses to help with insect control.



Most of our native ducks don't eat fish, but are known to carry fish eggs, snail eggs, parasites, and other unwanted things between ponds. However, if you have a healthy, well established pond full of well fed fish, this should not be a problem. Whether you provide a habitat that will attract waterfowl or not, ducks and geese will still stop at your pond. They just won't stay for long.

All of that I have just written applies to wild ducks and geese. Too much of a good thing is not always good. Take for instance, golf courses and geese or even private ponds. Canadian geese can and have been a problem. Given the right conditions, geese will over-run a pond or lake. They have lost fear of people and have found these ponds are a safe haven.



Some goose hunting will help put the fear back into the geese. Once the geese feel threatened, they tend to only stop by in small numbers. Too many geese in or around a pond will make a mess in the form of high nitrogen fertilizer. This makes for poor water conditions. So try to make a home for some geese. Just don't provide a goose hotel.

I remember when...

Bucket brigade lines up, takes home big catch

By Tim White
Dispatch Agribusiness Reporter

They came with buckets, garbage cans and plastic bags. They left with fish, trees, shrubs and wildflower seed.

About 75 buyers lined up for more than 3,000 bass, blue gill, channel cats and white amur at the Franklin Soil and Water Conservation District's annual spring fish sale yesterday. District officials also filled orders for about 50,000 trees and shrubs for more than 500 area homeowners.

"This is a great way to promote wildlife and conservation," said Walter Krebs, chairman of the district board. "We have expanded the program and the response has been very positive."

Rob Klamar took a vacation day to pick up 250 blue gill and 50 bass. He will use the fish to stock a small pond he owns in Fairfield County.

"It's probably more than he needs, but it's his Christmas present," said Anne Eiting, who accompanied him. "I want to make sure the fishing is good for years to come."

Most of the fish sold were bass and blue gill, according to Dennis Fender, owner of Fender Fish Farm in Baltic, Ohio. Fender has provided fish for the sale since 1977. Fender trucks fish to about half the counties in Ohio for similar sales.

"Our business has been pretty good, but we've seen some signs of the recession. People aren't paying with $100 bills like they used to. I wouldn't want to be starting up right now, but we have enough contacts to make a go of it."

Bass were sold for 55 cents each and blue gill were 25 cents to 35 cents each, depending on size. Channel catfish ranged from 45 cents to 60 cents. White amur, a sterile weed-eater, cost $10 for 8-inch to 12-inch fish. Fender sold about 100 of the Chinese natives.

"My pond is overrun with weeds," said Dan Davis of Columbus. "I've heard that these white amur will not only eat the weeds, but nose up to the grass on the shore and eat it."

In addition to the four species of fish, property owners could choose from 21 types of trees, bushes and ground cover.

"This is the cheapest way I know of to start landscaping your yard," said George Motika, who has been buying seedlings from the district for the last 10 years. "I've probably bought 160 trees over the years. Some are eight to 10 feet tall."

Supplier Dennis Fender scoops white amur at the annual fish sale

Tim White/Dispatch

APRIL 10, 1991

This picture shows the most common of all fish predators - the great blue heron.

10 Predatory Birds & Animals

Blue heron, kingfishers, fish hawks, eagles, mink, otters, snapping turtles, and water snakes are all examples of predatory birds and animals. These are all examples of predators that will at one time or another feed off your pond. Some you can control but some you will have to try to chase away as they may be protected by the government. If left alone, blue heron will make your pond a regular spot to stop. They are protected and it is illegal to kill these birds, but chasing them away is not. Heron will prey on small fish and will carry harmful diseases from pond to pond. Kingfishers fall under the same heading of being protected, but they don't kill big fish. Fish hawks are not very common, but can be very hard on twelve inch fish. However they do not transport disease from pond to pond. Eagles are a rare sight and probably wouldn't be a problem except fish are on their diet. Mink and otters, the latter just starting to make a come back, are not likely to make your pond a permanent home. They do roam large areas, but while in your pond they can be aggressive predators. There is an open season for both of these in the winter. Pick up a good game book at your local sports store to find out dates of legal harvest. Turtles and snakes don't have a big impact on the fish population, but they are predators mostly feeding on smaller fish and frogs.

The picture on the top left side is of an Anhingo or snake bird, most common to warmer southern states but can be found as far north as Ohio and Pennsylvania or even Wisconsin. These birds are fish eaters and will dive under water to catch their meals.

Bits of Advice

White Amurs, koi, and goldfish all have something in common. They eat vegetation.

White Amurs have proven to be the most effective, while koi work well on duckweed and watermeal.

Somewhere around 2004 or 2005, someone dumped a few goldfish in one of our ponds, where we raise crappie. This pond had always had a problem with algae. The goldfish reproduced and the algae was not a problem after that first year.

Since then we have been testing the idea that goldfish work to control algae. So far all the ponds we have tried goldfish in, the algae has not been a problem.

So it would appear that a combination of goldfish, koi, and White Amurs works well. Also for anyone with water troughs set out for livestock, if algae growth is a problem, goldfish work well. Just be careful if any goldfish die make sure to remove the dead fish so not to make the livestock sick.

This is one of our distributors bringing us a load of trout.

Hybrid blue gill.

Black Crappies.

Early morning fish stocking.

Our fish guard dog, Jimmy.

One happy customer.

A net full of predators walleye, musky, and small mouth bass.

Loading out a delivery on one of our tanker trucks.

Large mouth bass we use for breeders.

These are fingerling silver channel catfish just in from Arkansas.


FENDER'S FISH
&
LLAMA FARM

LEFT: in Black & White is Dennis Fender with his son, Steve Fender, holding a fish he had caught.

RIGHT: in Color is Steve Fender as an adult, with his daughter, Jenna Fender (now Schwartz) looking on, at just about the same age as Steve in the photo with his dad.

Ages unknown; these photos were posed on accident, but this year Steve's daughter, Betsy, found them in an album together.

This is my dad, Dennis, holding a black crappie some time in the early 70's.

Below is a large turtle from the summer of 1977.

This is me and my two oldest kids in the early 90's, and I am holding a white amur.

11 Weed Identification & Control

Algae

Algae will come in many different forms. Some will be light green like this picture or a dark green. It can be a fine filamentous matt or a very coarse horse hair like fiber and anything in between. Algae will have no root system and free floats on the surface. It is controllable with copper sulfate, but the easiest way to control it is with white amur.

Aeration and pond conditioners will help in control by reducing the fertility levels that these plants need to grow.

Algae Blooms

This picture is of an algae bloom. These blooms will come in a variety of colors: light green like this picture, dark green, dark like coffee, and brown, to name a few. One thing they all have in common is that these blooms need high fertility to grow and flourish. Older ponds and lakes with lots of run off from fertile land or with a lot of muck on the bottom can have this problem vegetation. Some of these blooms can be toxic to humans and livestock if they become dense enough. Here at the hatchery, we get a lot of calls in August when the summer temperatures are at their hottest from pond owners who are losing their fish from oxygen depletion. Usually the reason the oxygen is gone is because the blooms have died and the decaying process has robbed all the oxygen, killing the fish in the process.

Most all healthy ponds will have a little bloom growing. That is where we get some of our water color. The tools you can use to prevent blooms from becoming a problem are aeration and muck reducers or pond conditioners. Aeration will move the water and help knock the nitrates

and phosphates that come from decaying plant matter out of the pond. Aeration will also put more oxygen into the water making the pond conditioners work better. Starting with aeration and pond conditioners early in the life of a pond or lake can help prevent from ever having to deal with these problems.

Chara

Chara is a form of algae that grows from the bottom. It has a musky odor and feels gritty when crushed between your fingers. It will be a yellowish green color.

American Elodea

American Elodea is a submersed weed that is common throughout North America. It will have a root system and growth will be the best in the warmer months, but it will grow in cold water also just not as fast.

American Pondweed

This plant is American Pondweed. It has a long narrow leaf, and the leaves float on the surface of the water. The leaves are attached to a thin vine-like stem. Typically American Pondweed will only grow out into about 4 feet of water at the deepest, and it only grows in the warmer months starting after the frost has stopped and then goes away at the first sign of fall

Arrowhead Plant

This is an arrowhead plant, so named because the leaves are shaped like arrowheads. These plants grow around the edge of ponds partly in the water and on the bank ranging from one to three feet in height. Control can be pulling them out, mowing off, or the most permanent, chemical treatment.

Brittle Naiad

This plant will be found growing in clumps. It will have long pointy stem like leaves. The plant is brittle and will crumble easily. It also has a root system.

Coon Tail

This plant is coon tail, named for the way the plant is shaped like a raccoons tail. Coon tail is a submerged weed growing nearly everywhere in North American. A very fast growing weed, it will be fastened to the bottom of the pond with a small root system. White amur is a good method of control, but if they are not legal in your area there are plenty of chemicals that will control this weed easily.

Curly Leaf Pond Weed

The picture says it all. This is a very fast growing weed that will choke out a pond in short order. It is a rooted-in weed.

Duck Weed

Duck weed is a fast growing surface vegetation that will have two or three tiny leaves and a single root. It will be about one-eighth inch in total size. Duck weed is usually found in high fertility conditions in older ponds with a lot of muck or dead vegetation on the bottom of the pond. This plant reproduces by forming a new plant and splitting off every twenty-four to forty-eight hours .

Amurs and koi will feed on it, but the plant will produce faster than the fish can eat it. The best way to get rid of it is to use aeration and muck reducers that rid the pond of the organic matter. By trying to kill the plant with chemicals, you are only getting rid of the result of the problem. The high fertility is the problem. Get that under control and the duck weed will go away.

Smart Weed

This is smart weed. Smart weed will grow around the edge of the water and sometimes partially in the water. It is found mostly in the Midwest.

Watermeal

Watermeal is a little seed like plant that will grow to make a very dense surface cover sometimes becoming so thick that it will block the sunlight to the underlying vegetation and killing it. In turn, it will cause an oxygen depletion which causes a fish kill. Watermeal reproduces by forming a new plant from itself every twenty-four to forty-eight hours. Watermeal also needs very high fertility conditions. It is most commonly found in older ponds with a lot of muck (decaying plant matter) on the bottom of the pond.

Koi

This is a picture of koi in a little pond at a petting zoo I visited. There was a little algae and duck weed floating behind some rocks the koi couldn't get behind. I gathered some up and threw it in to the koi and they ate it very quickly. Koi can be used to help to control vegetation in smaller ponds.

Water Lilies & Cattails

This pond has both water lilies—they are the flat floating plants—and cattails. Both of these can be useful plants. The water lilies will grow a big flower and the flowers will come in an assortment of colors and also provide cover. The cat tails are helpful in attracting wildlife as they provide cover. If these plants are not controlled, they can take over. White amur and/or chemical treatment will help hold the water lilies back.

The cat tails can be controlled with chemicals. Or if they are not too bad, manual removal can be a method of control. I like to see a couple small patches of cat tails in ponds because the little fish will use them for cover, and ponds with cat tails will usually have a decent frog population.

One other use for cat tail is erosion control. If your pond has erosion problems, the cat tails will aid in holding the pond dam in place.

The weeds I have identified in this chapter are common to my part of the country here in the Midwest, but many can be found in other areas of North America.

When it comes to methods of control, you will need to check the Department of Natural Resources to see what is legal in your area. If white amurs are legal in your area, I consider that to be the safest method of control for many types of weeds. Rooted-in weeds that grow under the water and floating algae can be effectively controlled with amurs. If you can't use amurs where you are at, there are a lot of chemicals on the market that will work also. I did not list the chemicals because there are so many, and the types and uses will vary from place to place. If you have to use the chemical control methods, be careful not to use them too heavily and keep the water temperature in mind. As the water warms up, the oxygen levels drop and as the vegetation's decay, they use up oxygen. If done wrong, using chemicals can cause fish kill.

Duck weed, watermeal, and algae blooms are all high fertility vegetation and can be controlled with aeration and pond conditioners or bacteria that clean up the organic matter which give these vegetations the food they need to grow. We sell Nature's Pond Conditioner from Koenders Water Solution to our customers. Nature's Pond Conditioner is a combination of food grade dyes that block the sun light to slow the growth of the plant life and also healthy bacteria that consume the muck that help grow the vegetation.

I consider bottom aeration to be the most affective for getting rid of nitrates and phosphates that are a result of decaying plant and fish matter. The windmills from Koenders run an air pump that pushes air down to an air stone that in turn breaks the air into tiny bubbles that float to the surface. As the bubbles come up, they bring old water to the surface so the impurities in the water can escape.

Koenders also have an electric air pump that works the same way. If you prefer surface aeration (as in fountains) they are also beneficial.

Your Weedy Pond

There are several types of vegetations that any healthy pond will have. The first is floating vegetation, usually algae. Algae comes in dozens of sizes and shapes all doing the same thing, which is making your pond undesirable for fishing and swimming. Algae can be fine fibers, course fibers, (like horse hair) or one variety is called Water Net. This type looks like a net. All these varieties grow very rapidly, but Amurs will control algae. The difficult part is that there is not a root system, so to be effective the Amur has to eat all of the algae. In ponds where the algae is a major problem it can take up to twenty Amurs per acre to be effective.

The next type of vegetation is submerged weeds such as leafy pond weed, waterweed, coontail, and curly leaf pond weed. All these have root systems. Amurs have better success in control of rooted vegetation. In the process of eating these plants, the Amur will uproot it, therefore, killing a lot of the vegetation.

One weed that is particularly troublesome is the curly leaf pond weed. This noted weed will be undetected in six or eight feet of water and within two weeks can reach the top and completely cover the surface. Here again Amurs will work, but it will take larger numbers, anywhere from ten to twenty per acre.

Emergent weed is another type of vegetation. The most common type is cattails. The best way to control cattails is to remove by hand, not unlike weeding your garden. If the problem is too big to handle by hand then mechanical or chemical means may be an option.

I will promote Amurs because the cost of ten or twelve Amurs per acre is much less than a yearly herbicide bill. Chemicals used incorrectly, can kill too many weeds at one time and this will lead to oxygen depletion and possible total fish kill.

Some weeds can be beneficial to a pond. The pond will get some of its oxygen from plant life and the fish also benefit from the cover provided

by the weeds. But there is no good way to restrict the growth. We have found that if all weeds and algae are removed, cover can be replaced by creating brush piles in the pond where the fish can hide.

If you do choose to control the vegetation with chemicals, you should follow some simple rules:

- Don't try to treat the pond when the water is too hot such as in July or August. These are bad months to treat the pond because the water temperatures are very high. Hot water will carry low oxygen levels, and dying vegetation will require oxygen to decay. It is possible to wipe out the oxygen supply over a one week period. This can lead to a total fish kill.

- Don't use too much herbicide. It is much easier to add more than to take it back out. Also, treating in springtime can be harmful. Too much chemical can kill off your hatch of fry or at least kill the plankton that is the base of the pond's food chain.

Probably the most deadly of all vegetation is a combination of two: duckweed and watermeal. Duckweed looks like tiny clover and will have a single root hanging from the bottom. Watermeal looks like a tiny green seed. Both plants are less than one-sixteenth of an inch in size. These are very fast growing, free-floating vegetations. If let go, both will cover an acre or two of water in just a few days. If the pond is completely covered for two or more days, this deadly combo will block out all sunlight from underlying plant life and this will kill the plant life. Then you have a new problem. As the plant goes away by decaying, so does the oxygen causing a fish kill. Aeration can be a help. By aeration, you create water movement, which will push the duckweed and watermeal aside, letting sunlight in to underlying vegetation. Duckweed and watermeal will be most common on ponds that are in or next to the woods and have a lot of sediment in the bottom making for a very fertile environment for these problem weeds.

This is a good example of duckweed. Small 2 and 3 leaf plant with a single stem free hanging for the bottom. Given the chance, duckweed will cover your pond and block the sunlight and in turn kill the underlying vegetation.

Another type of vegetation is one that helps give the pond coloration. Plankton Bloom is a microscopic plant life form, most commonly found in high fertility ponds, or ponds that are fed with run off from pasture field, barn yards, or even too much soapy kitchen sink water. The bloom can be dark or light colors of green or be almost black in color. The green color is the most common. If the Green Bloom becomes too thick, it could be toxic to livestock. The biggest problem is that once the bloom runs its course or life cycle it will die. Being a plant form it will also require oxygen to decay. This will also cause a fish kill.

Most of these problems can be prevented with some preparation by the pond owner. Starting at the beginning, try to build a pond with an average depth of seven or eight feet. This will help keep the water cooler and give maximum oxygen reserve. Next, try to keep the run off of high fertility land to a minimum. Keeping a good Amur population will help control algae and rooted-in weeds. Aerations will also help keep the oxygen level up and could release some of the

nitrates and phosphates out into the air, also cutting down on food for the vegetation. Using Nature's Pond Conditioner in conjunction with the aeration will also help in control of the vegetation.

White Amurs are being unloaded from a truck out of Keo, Arkansas in the picture on the left top. Catfish, Amurs, and hybrid bluegill are all brought in from Arkansas. We have bought from the same hatchery out of Arkansas since 1987. That is the year White Amur became legal in Ohio.

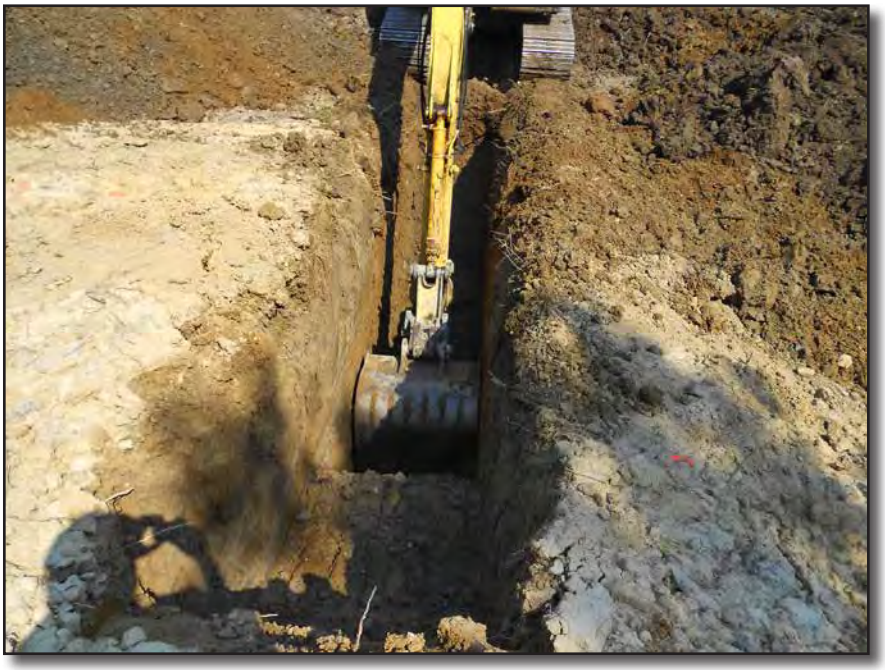
Dennis Fender is checking out a tank containing koi in this picture.

12 Pond Construction

First Steps

So you want to build a pond and think you can rent or buy the equipment and do it yourself and save a little money. Unless you are an experienced heavy equipment operator and have built ponds before, I don't recommend for you to do it.

That being said and you still want to tackle it, I'll try and give you some *do*s and *don't*s on pond construction.



Digging the core. One of the first stages of pond construction.

While location is very important, not all soil conditions are ideal for holding water. So after you have picked out the location for your pond the next thing that needs to be done is to see what you have for soil conditions. You will need a backhoe or track hoe to dig some holes to see if your dirt will hold water.

Dig several holes down as deep as you plan on making the pond. What you need to hold water is good sticky, gummy clay. If you run into lots of sand and gravel, a pond probably wouldn't work unless the water

table is high enough to fill the hole up with water. Then the pond will rise and drop according to the water table which could be controlled by a nearby river or stream. If you have sand and gravel pits in your area, watch them over the period of about a year, and you'll see I'm right. If your location is much higher than the water table and you do find sandy gravelly soil, you probably should give up the pond idea.

If you do find a suitable soil condition, then the next thing you need to do is plan out how the pond needs to be built. If the location is flat and has no run off from rain water, then you will basically dig a hole in the ground the size and shape of your pond. If the location is rolling or hilly, then you may be putting up a dam to back the water up to make a pond.

When I look for locations that are easy to build ponds on, I like gradually sloping swales with minimum run off. These locations are ideal because the ponds will have at least one water source with the rain water runoff. Just be careful that you figure in for heavy rains. You will need to put in a large enough spillway and overflow pipe to handle the water from heavy rains. For example, if the location allows for a pond of half an acre in size and you have fifty acres of run off that will drain into the pond, you probably will lose the pond and the fish you stock in it with the first heavy rain. The dam may burst and the fish will wash out. Ideally ten acres of run off for every one acre of pond surface should be safe. You can do with more run off. It just takes more planning. That is where an experienced pond builder would help.

The Next Step

You have found the perfect location, the soil looks suitable, and you figure that you are ready to start pushing dirt. What about the wet spot that is in the middle of the field that you have been mowing or farming around all this time, just a wet spot? I don't think so. Yes, that is a good sign that the soil is right for holding water but you could be looking at some serious EPA fines and legal costs. "Why would this be a problem?" you ask? In 2012, I know of two fellows who got into legal battles with the EPA because they built ponds in locations that the EPA deemed wet lands. The one man was in Pennsylvania. He built his pond and was fined over $100,000 and was ordered to take the pond out and put the land back the way it was.

In this picture, I am in the process of pushing the dam up. If you have some rain fall while you are building the pond, it will help to always keep some slope in the bottom so if it does rain, the water will drain away. If the water can't drain away, you will have a muddy mess.

The other was in Ohio. This guy decided to get in the fish farming industry so he build twenty, one acre ponds in which to raise fish. The EPA didn't like where and how he put in the ponds. The first time I talked to him about this was within the first year of the EPA's visit, and he had already been told that he could do jail time. He had already spent over a $100,000 on legal fees. Wet land areas are protected. So be careful not to disturb them to build a pond. Damming up creeks will get the same unwanted attention from the EPA. The soil and water conservation office in your county would be a good place to start. These people should know the laws. If you decide to hire an excavator, the soil and water conservation office would have a list of companies to contact. They will also have a person in the office that has the training to help you look the land over and help check the soil out and who can also help you design the pond.

Note that the bottom of the pond is smooth and uniform to provide drainage during construction.

Still want to do it yourself?

Ok, you will need a dozer, the bigger the better. Renting is probably the best way and in the long run the cheapest, you may need a track hoe too. And while you are at it, pick up a transit so you can shoot the level and height of the pond dam.

THE FIRST STEP is taking the transit and determining where the water level is going to be. You will need to do this first so you know how high to make the dam. The size of the dam will determine how much dirt you need, so you know how much top soil to push off. It's like building a house, you have to know how big the foundation needs to be before the first story can be put up.

This picture is of the beginning stages while still digging the core.

Pushing some more dirt in the beginning stages.

THE SECOND STEP is to push all the top soil out of the way; you will need it for the back of the dam so you can grow grass. If you are damming up a swale, a core or key way needs to be cut into the center of the base of your pond dam. What this does is it will form a seal that will prevent the pond dam from leaking. The core is cut in at least four foot wide and at least as deep at the bottom of your dam base the whole length of the dam somewhere near the center of the dam. Now push the core back full of the clay that you uncovered when the top soil was pushed off. Make sure that as you fill in the core, you pack it in by running the equipment back and forth across it.

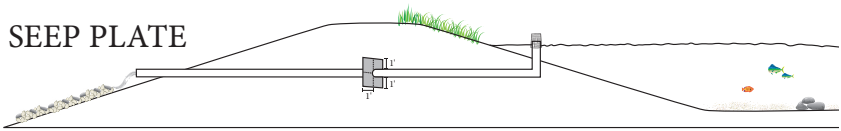
THE THIRD STEP is to start pushing clay up to build the dam. As you push the dam up you will need to decide how high you will need to make the dam. If there will be little or no run off the water level can be within six to eight inches from the top of the dam. If the pond is being built in a swale or valley then the dam may need to be one to two feet higher than the water level. Also a lot of runoff will need a large overflow and an emergency overflow. An emergency overflow is a wide low area somewhere on the dam that is lined with heavy stone; this area is going to be a couple inches higher than the pipe overflow. The idea behind the emergency overflow is when you get more water than the pipe can handle, the water level will raise up and run out the emergency overflow. You will need to have a very good idea of how much water will come down the valley that you plan to dam up so you can install the appropriate size of overflows. Also before you even start to push dirt, you should have an idea how wide the dam should be and the pitch or slope of the dam.

This picutre and the one on the opposite page show how some of the dirt gets pushed around.

I like to make the dams at least wide enough to drive a full size pickup on it, about ten feet wide and a slope of three to one. Three to one is the measurement of the slope or angle that you make the dam on both sides. For every three feet out you will have one foot of drop. If you make the slope too steep, one problem is liability. If someone falls in the water and the slope is too steep, they may not be able to climb out and could drown. The other problem is steep slopes tend to erode much quicker. For example: a dam ten feet wide on top and ten feet from top to base with a three to one slope will have a base of seventy feet.

The illustration above shows the 1 to 3 slope of the dam.

Any pipes that you install thru the dam need a seep plate put around them. A seep plate will be a plate placed somewhere near the center of the dam. The idea behind the plate is to prevent any crayfish from digging along the bottom of the pipe from one end to the other and starting a leak in your pond. The plate should be made from heavy steel, or you could build a form and pour a concrete wall to do the same thing. I will usually use steel and make it so it makes a one foot collar the whole way around the pipe. There are companies that sell overflow pipe assemblies, or you can build your own.



The illustration above shows how the seep plate should be 1' around the diameter of the pipe.

In this picture, I am dragging the drain pipe in so I can bury it, Before I cover it up, I will put a seep plate around it.

This picture and the one below show a standpipe type of overflow.

The picture on this page and the ones on the opposite page show the final stages of dirt back on the dam after the pipes have been installed.

Now, you are done pushing out the inside and are ready to push the top soil back. Before you do this, it would be a good idea to double check the height of your dam to make sure it is level. You will need to push top soil back on the dam covering up the clay. This needs to be done so you can grow grass on the dam.

The average cost of building a pond could range from $10,000 to $20,000 per surface acre if hire it out.

Do not expect to save a lot by doing it yourself. But it is a lot of fun if you like running big equipment.

I think you will find out that most good pond builders spent a lot of time playing in sand boxes with toy dozers when they were little kids. I know I did!

"The difference between a man and a boy is the size of his toys."

A vertical stand pipe or overflow like the above picture is the best and most effective. When the water level reaches the top of the pipe and runs over, the water will build up a suction or siphon effect and pull the water out. This is best on ponds that have a lot of watershed and can be quick to overflow.

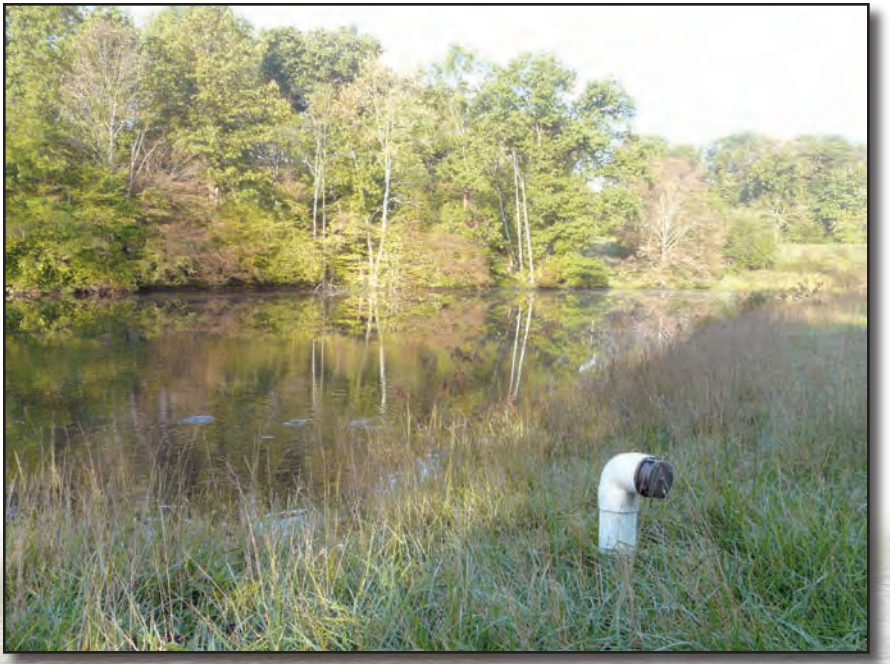
A horizontal pipe can't be used to its fullest potential until the pond level is too high. Unlike a vertical pipe, this type seldom will build a suction.

This picture shows a good example of a properly installed emergency overflow. The bottom of the overflow is about 6" above the pipe overflow, and the emergency overflow has a row of stone that will let the water through but will at least keep the big fish from escaping in a heavy downpour. It would also be a good idea to line the bottom of the overflow with smaller stones to prevent erosion or get it seeded down so there is enough heavy sod to prevent erosion. Make the emergency overflow wide, flat, and with a gradual slope so the water will flow wide, shallow, and slow.

Bits of Advice

Overflows

If you are in the process of building a pond, make sure the pipe overflow is large enough to handle the amount of run off in your pond. It's a good idea to have an emergency overflow for those gully washer rains. Emergency overflows usually consist of a low place in the pond bank, maybe a concrete trench or a ditch full of big stones. This will be in the dam at a level higher than the pipe overflow. There needs to be a screen on the pipe overflow to prevent the fish from leaving to go to the creek or bigger water or wherever they think they are going. A screen of half inch hardware cloth works best. On the opposite page are two types of overflow pipes with screens.



On the left is a picture of an overflow that is not properly buried. When the pond was built, the dirt reached out close to the vertical part. Over time muskrats, wind, and water erosion removed the dirt. Now as the water rises up to the top of the pipe, the horizontal part is filled with air. It will become buoyant and will try to float to the top. Over time the pipe will push up through the pond dam causing more problems. As much pipe as possible needs to be buried in the dirt to solve this problem.

Your lake could save your house and outbuildings or even a neighbors house. Contact your local fire department to discuss having a dry hydrant put in your pond. In case of a fire, the firefighters can hook up to your pond and have a large amount of water on hand to fight fires.

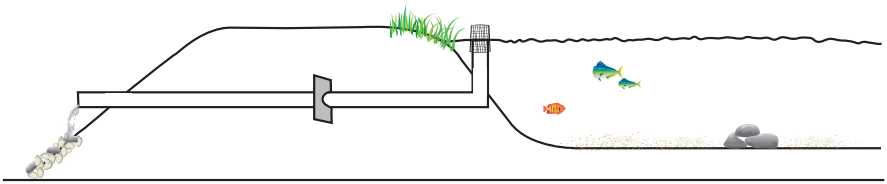
As you can see, there are a great many uses that your pond can serve. Recreation, wildlife habitat, water source to fire departments, food for the table, and even water for human use, just to name a few, are great uses of your pond. (The benefits will last for as many years.)

I have a lot of customers that come to me with ponds that have duck weed and water meal problems. I can usually describe these ponds before they tell me the about the surroundings.

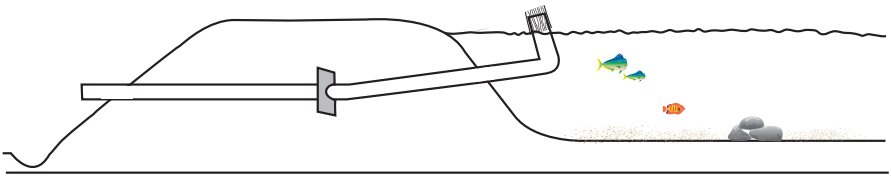
The average ponds with these problems are usually old ponds,20 years or more old, and have a large number of trees around them. The problem with having trees around the pond is all the leaves. As the leaves drop in the pond and sink to the bottom they begin to decay and over time a lot of black muck starts to built up. All this black muck produces high levels of fertility which in turn provides food for the really bad problem vegetation like duck weed, water meal and sometimes algae blooms.

If you want to leave trees around the pond, plan on using a lot of pond conditioners (bacteria) to break down this black muck, and aeration will help also.

Pond A



Pond B



Pond A has a proper set up for an overflow. The whole horizontal part of the pipe is under dirt with just the vertical riser coming out of the dam and out of the water. Also, on the other side of the dam, rocks have been piled to prevent erosion as the water runs out of the overflow. This setup will perform well for the life of the pond. Overflow size needs to be set according to the amount of acres of run off. A decision like this should be made with the help of a good excavator and local soil and water agency. Also, install an anti-seepage plate midway in the dam. This will stop crayfish from digging along the bottom of the pipe and causing dam seepage.

Pond B has a problem. When it was built, the pipe was not set back under the dam far enough. Now as the water level rises, the plastic pipe will come bouyant, and if enough pipe is sticking out of the dam, the leverage will cause the pipe to push up through the dam. Eventually the water could start to leak under the pipe. Also, at the exit end of the overflow, no stones were piled up to prevent erosion. Now there is a large hole washed out.

These three pictures will give you a little peek at how the fish get from hatchery ponds to your pond.

Top left pictures, our seining crew pulls a 150' x 12' net off the truck.

Top right picture shows them sorting fish by species and or size.

On the lower left, I am on the tank truck counting fish in the tank getting an order ready to ship to a customer.

We have roughly two hundred acres of water in which we raise fish. For the better part of nine months of the year, the three men in the top picture are out on our farms netting fish five days a week. They also help farm these ponds by restocking with breeder fish and restarting the brood ponds every spring, so we have fish to sell.

In the above picture, I am pointing to fresh muskrat droppings. Look for these kinds of signs to determine if muskrats have moved in.

13 Muskrats & Beavers

Any pond owner at sometime will have muskrats move in to the pond. Muskrats have two types of dwellings. The most common and most destructive are holes dug in the pond bank or dam. Over time these holes will cave in, and become dangerous for livestock stepping in and possibly breaking legs, lawn mowers getting stuck, or worse yet, mowers rolling over if the hole is big enough. The second type is above ground or water level houses built from cattails, sticks, or weeds. Rats are very easy to trap and there is a season for them. A seasoned trapper can remove all rats from a pond or lake in one season, but this will have to be done every year because they will return. Beavers are not a real common problem. They are usually found in wooded acres with little human activity. These are more difficult to trap and do more damage as they are much larger than muskrats. Also, it takes a very skilled trapper to catch a beaver.

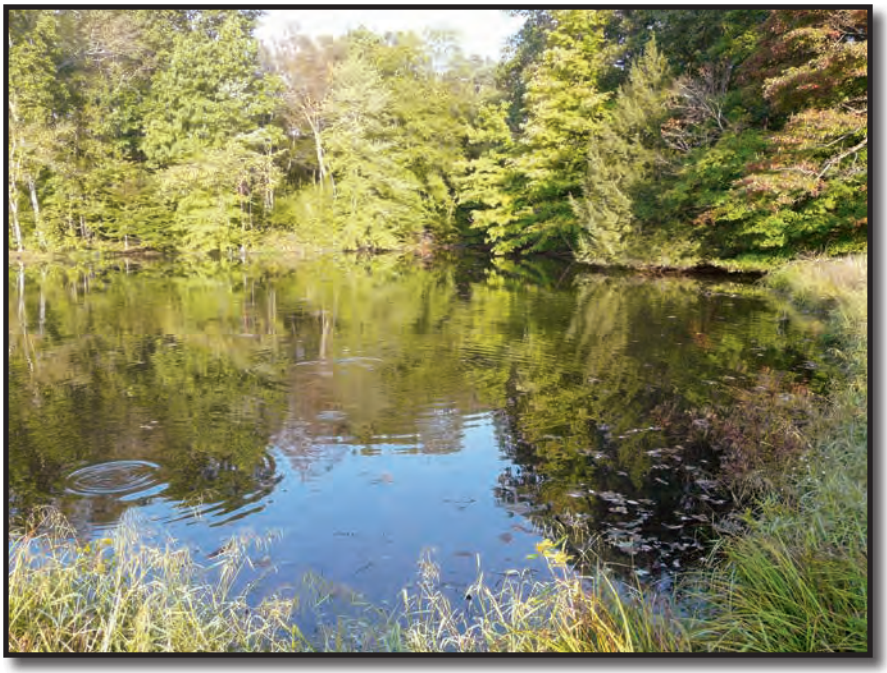
Top left and above pictures show evidence of the kind of damage rats can do if not trapped.

On the left, I have caught a muskrat in a trap and am removing it from the trap. I will reset the trap. More than one rat will live in the same den. In the course of trapping the muskrats, it is very likely that you could also catch a mink. Mink will check these muskrat holes in hopes of catching muskrats. Mink are natural enemies of muskrats.

Before setting any traps, purchase a game law book. Most sportsmen stores will carry them.

If muskrats are tearing up your pond you don't want to wait until trapping season opens, contact your local game warden. You may be able to trap with a special nuisance permit. With special permits, you usually can't keep the skins. Generally, the amount of damage rats will cause far outweighs what the hides are worth.

Your game book will give trapping dates, rules, and regulations that trappers need to follow to stay on the right side of the law.



The ponds on the left have a lot of trees on one or more sides. There are pros and cons to this. When leaves begin to fall from trees, a lot will end up in the water and will sink to the bottom. Over time, these leaves will decay and add to the sediment or muck. Dead leaves don't decay as rapidly as the vegetation that grows in the water, so oxygen depletion is not a problem right at first.

The positive side to all these leaves are the hiding places the tiny fish have. Also, the trees shade the pond, which help to keep water temperatures down in the summer. Any branches or limbs that fall in the pond also create more cover. With lots of trees come lots of insects. That means more food for your fish.

The down side to having trees around your pond is that all of the leaves will build up and make a lot of muck. Ponds like the one on page 130 are typical of the kind that grow a lot of duck weed and watermeal and become hard to clean.

I would suggest not to have too many trees around or near the pond. Do not plant them on the dam because the root system could cause leakage years down the road.

14 Fertility Control

Ponds begin to age and fill in as soon as they are built and full of water. If you were able to fast forward fifty years, plus or minus a few years, your pond, if not properly cared for, could fill in and become a swamp.

There is no reason this has to happen. If you set the pond or lake up right even before you built it by limiting the run off from ground that could erode and cause fill in from muddy water and use conditioners and aeration.

You want run off to help the pond fill if you can incorporate it into the construction of the pond. Just make sure that you have the over flow that will handle the heavy run off of a “one hundred year” flood or divert some of the water away from the pond because we have one of these every fifteen or twenty years even though they are called “one hundred year” floods. In some situations you may even want an emergency over flow. An emergency over flow is usually a wide low ditch running across your pond's dam that will handle the excess water from torrential down pours.

Pond conditioners like Koenders Natures Pond Conditioner help keep fertility levels at minimum. Fertility levels are a result of organic waste. These organic wastes come from dead vegetation, fish manure, dead fish and other living organisms that are a result of a healthy pond. As these wastes sink to the bottom of the pond they begin to decay or rot and this process will cause nitrates and phosphates to build up. Over time the levels will be high enough that problem vegetations like duck weed,

water meal, and plankton blooms that thrive in these conditions will start to appear. These are vegetations that are difficult and expensive to control. Over time if this is left go, these conditions will worsen and lead to a massive fish kill through oxygen depletion.

By using Natures Pond Conditioner in new ponds, you help to prevent these conditions from even starting. And in old ponds the aging process can actually be reversed. Natures Pond Conditioner is a combination of healthy bacteria and enzymes that will consume the organic waste or as you know it better, black, stinky muck, and turn it into clean water. This is a living organism; it needs oxygen to thrive. The more oxygen, the more active it will become. Using aeration in conjunction with Natures Pond Conditioner just makes it work better.

One other ingredient in Natures Pond Conditioner is a food grade dye. The reason the dyes are beneficial is because they partially block the sun light by tinting the water. The effect that it has on plant life is that is slows and even prevents the plant life from growing. Less plant life means less organic waste.

Questions and Answers

15 Questions & Answers

In this chapter, I plan to answer some commonly asked questions.

Some of these questions required some questions on my part to find good answers to the problems of the pond owners.

So if a question sounds like a problem you have, try and follow my line of thinking and maybe your question will be answered.

Question

My bass are small and skinny, only about 12 inches long and are easy to catch. Why don't they grow?

Answer

First thing I would ask is "Do you have catfish in your pond?" The most common reason for skinny, hungry bass is too many big catfish. What can happen is that pond owners stock catfish and forget to harvest them after two years of growth. When cats reach about two lbs. they become eating machines. One hundred or even fifty catfish at four and five pounds put too much pressure on the food chain. The reason they keep growing is because they can eat worms, grubs, snails, mussels, algae, weeds, and small ducks. Bass are not able to do this, therefore, after the cats have eaten most of the small bluegill they begin eating the next thing on their diet.

Answer

Harvest the big cats and or start a feeding program so the cats don't compete with the bass anymore.

Another reason bass can be hungry and skinny is that there are too

many big bass. If one summer the bass hatch is too good and too many bass survive they can eat themselves out of house and home.

Answer

Catch some, but don't go overboard. I suggest two or three big bass every couple of weeks until they start to look fat or become difficult to catch. You also can add some adult bluegill to boost the food chain or even add a couple thousand minnows. The bluegill are the best food to add, because they keep on giving back.

Question

My bluegill are only three or four inches and look skinny. Why?

Answer

There are probably too many bluegill, and too little food. This used to be a common problem. We don't hear much about this problem any longer. It is an easy fix. Start feeding a small (1/8 inch) pellet all summer and use a high protein feed.

Bluegills get stunted from lack of enough feed and when given the chance will begin to grow and fill back out when fed.

In the span of one summer, a three inch stunted bluegill will explode in growth by more than doubling their length and weight. Within the span of two summers of aggressive feeding, you can begin to harvest nice sizes of adult bluegill.

Adding bass and catfish will take care of this problem. Skinny, small bluegill is a result of survival of hatch. By adding bass and/or catfish (I recommend one hundred of each per acre, three to four inches or four to six inches), the reproduction survival will drastically decline back to normal.

I wrote at the start of this answer that this used to be a common problem.

People need to be more careful with stocking. The state used to recommend 1000 bluegill to 100 bass. With this recommendation the pond has started with a problem. Pond owners are more careful about who fishes and what is taken out now, which helps.

Better management is the key.

Question

Why are my adult bluegill dying? (Commonly asked during spring months)

Answer

The most common and most deadly disease to affect adult bluegill is Bacteria Gill Disease. This bacteria may be present in your pond all year. However in the spring, bluegill will be more likely to be affected because they are just coming out of a long hard winter and are weak. Signs of bacteria will be dead or weak bluegill. Normally bluegill will stay in deeper water until the water reaches 60° or 65°. The sick bluegill will have fuzzy patches on their sides and be in shallow water. The fuzzy patches are fungus. To stop this problem, treat the pond with one pound of copper sulfate per surface acre of water. One or two treatments will usually stop the bacteria.

Be sure to pick out the dead fish. That will help you to watch the pond for any more sick fish. It also helps to keep the water clean.

Question

Someone told me that Amurs stop eating after they get old. Is this true?

Answer

No. Your Amurs will eat and grow until they die, reaching thirty-five to forty inches and thirty or forty lbs. They probably won't eat as much when they get old, but they still eat. It is a good idea to start adding Amurs when the present ones reach ten years of age. But I don't recommend taking any out until they die.

Question

Why aren't the Amurs controlling my algae or weeds?

Answer

Amurs only work if applied properly and given enough time to be effective. We recommend eight to twelve Amurs to the surface acre. If a customer has four or five Amurs eaten by predators (i.e. heron, fish, hawks, and eagles) and only has two or three left, this will not be enough. I tell first time buyers to keep adding until they have success. It takes two or three summers until the Amurs are large enough to be effective. Once they start to control, you should be good for ten or twelve years at which point it will be time to start to add new ones as the old Amurs will start to die.

Question

The Amurs cleaned my pond up. Should I take them out?

Answer

Only if you want the pond to get weedy again should you take the Amurs out. The Amurs don't kill the weeds. They just control them. The exception to this would be if you have put too many in and they have the pond stirred up. If they have eaten the grass growing two or three inches above the water level. Then you may want to harvest a few. Just be careful not to take out too many.

Question

Do I need to aerate my pond?

Answer

Aeration helps to put oxygen in and purify the water. If the pond has a good spring that runs all year long and keeps the pond fresh, then no, you don't need an aerator for oxygen. But bottom aeration will still benefit the pond by bringing dead water off the bottom and also help release gases formed from decaying plant matter. Ponds that have no water source other than runoff are good examples of ponds that need aeration.

Aeration will be most important in the winter months and in the hottest part of summer.

Question

If I catch some big fish in another pond, will it hurt to put them in my pond? Will I be bringing diseases to my pond?

Answer

Sick fish don't bite. So you probably will not bring any deadly diseases to your pond. But I would be careful. If this is a body of water you have been fishing in for a long time and have been catching healthy fish, there should be no problem.

But still be careful. With all the ships traveling from other countries into our great lakes, there have been some exotic problems brought in, like Zebra Mussels for example. I don't think fish from public waters like Lake Erie or rivers should be put in your pond unless the fish look and act healthy.

Key word is: BE CAREFUL.

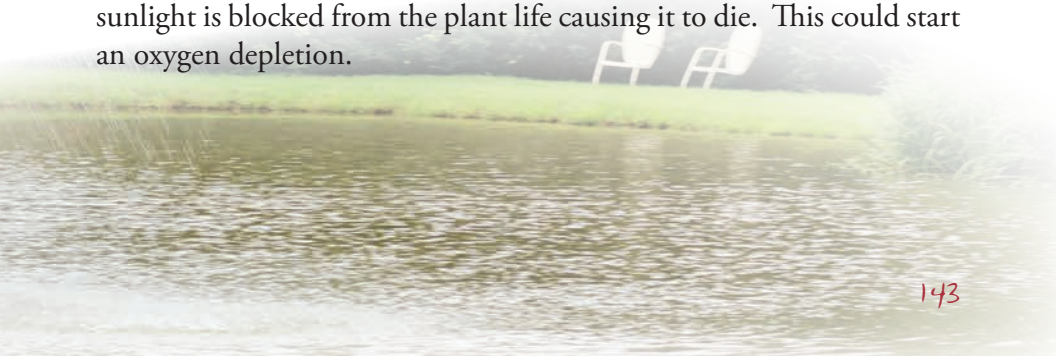
Question

Will Aqua Shade hurt my fish?

Answer

Aqua Shade and other products that color your pond water are just dyes and unless used way beyond reason, they will not directly hurt your fish.

If Aqua Shade is used after the plant life has gotten out of control, the sunlight is blocked from the plant life causing it to die. This could start an oxygen depletion.



Question
What are those black spots on my fish?

Answer
Those black spots are parasites. Parasites will either show up as black spots or some will look like little grubs just under the skin.

These are usually carried by fish eating birds like blue herons. The parasite has to have a host to live off of and part of the life cycle includes the snail. If your pond has a good shell cracker population, parasites will not be much of a problem.

Question
Will my pond winter kill?

Answer
Every pond is different. If the pond or lake has a good, strong spring feeding, chances are slim to none for winter kill.

Shallow ponds with no aeration or spring water source feeding it are likely to kill easily if we have a real hard freeze that lasts more than one month.

Question
Can my pond support trout?

Answer
All ponds will support trout over the cold months but only ponds and lakes with above average springs will keep trout alive all year.

Trout need a high level of oxygen to live. So when the water on the upper one or two feet goes above 60°, the oxygen will drop below what trout need, therefore, they will start to die.

If you want trout but don't have a good spring, put them in in during the late fall or early spring and harvest them before mid June.

Question
What is a turnover?

Answer
Ponds that are thirteen or more feet deep will have two layers of water. The upper layer will have oxygen because of natural surface aeration from wind and rain and also from plant life producing oxygen through photosynthesis. This is the layer in which your fish live.

The second layer is on the bottom and because of lack of light there will be no plant life. So there is no oxygen.

What happens with a pond "turnover"? For example, your pond water on top is 70°. On the bottom it's 60°. We have a drastic changes in the weather and suddenly the upper level of water drops to 50° making the top level heavier than the bottom causing the dead water to rise and the good water to go down causing the fish to run out of oxygen, which causes a fish kill.

If your pond is only eight or ten feet deep it is very unlikely your pond will ever have a turnover because there should not be any dead water in ten feet or less.

Question

My fish seem to be sucking for air and some fish are dead. What is happening?

Answer

Oxygen depletion. Typically this is a problem more common in late July and August. The oxygen depletion will come from a combination of hot water (80° or more) and rapid vegetation decay. The vegetation could be algae, rooted weeds, and/or plankton bloom. If fish are dying, figure on aeration for four or five days up to a week.

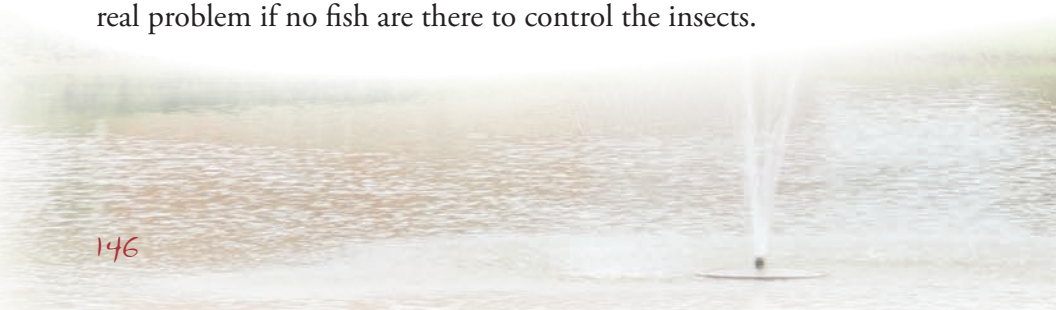
Ponds with 24/7 aeration or strong water sources usually will not have this problem.

Question

Should I leave my pond sit for a year to let the food chain get built up before I stock?

Answer

No. I recommend to stock new ponds as soon as there is enough water, typically five or six feet and at least half of the surface area. You can establish your own food chain with proper stocking, plus if in summer the mosquitoes could reproduce in the pond and become a real problem if no fish are there to control the insects.



Question

Will fish become inbred?

Answer

The smaller the pond the more likely this could happen. I haven't seen much indication of this in ponds. But restocking every couple years would be a good idea especially with species like perch, crappie, and catfish. Also a good consistent feeding program will probably be as helpful as anything.

Fishing NOTES

Fishing Notes

Date	Number & Species of Fish Stocked		Lbs. of Feed Fed per Season	Number of Fish Taken per Season	Species of Fish Taken per Season

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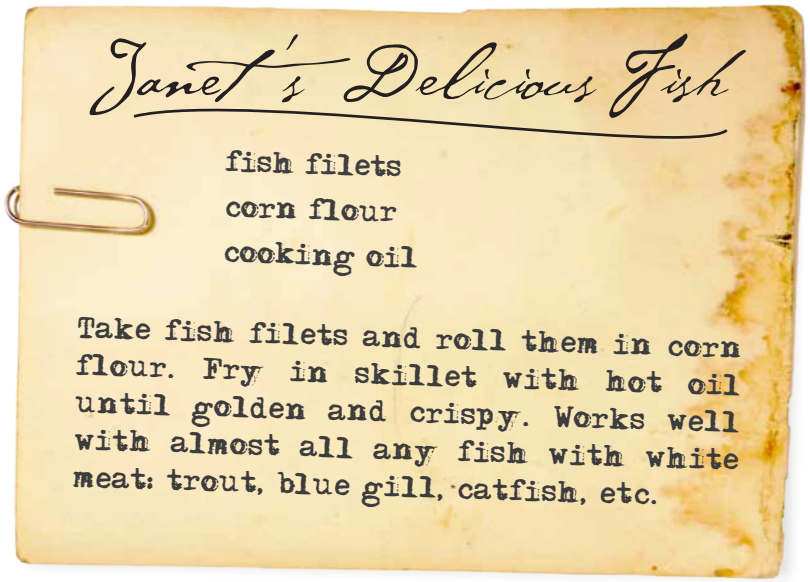
Date	Number & Species of Fish Stocked		Lbs. of Feed Fed per Season	Number of Fish Taken per Season	Species of Fish Taken per Season

Recipes

The following pages have been left blank intentionally so you can record your favorite fish recipes. To help you begin your own collection, I'm giving you a simple recipe that my mom uses to fix fish for our family.



Janet's Delicious Fish

fish filets
corn flour
cooking oil

Take fish filets and roll them in corn flour. Fry in skillet with hot oil until golden and crispy. Works well with almost all any fish with white meat: trout, blue gill, catfish, etc.

Recipes

Recipes

Recipes

Recipes

Recipes

Stocking Notes

DATE	QTY	SPECIES

Stocking Notes

DATE	QTY	SPECIES

Stocking Notes

DATE	QTY	SPECIES

A Little Bit About...

the Man Behind the Book

My name is Steve Fender. In 1956, Dennis and Janet Fender started Fender's Fish Hatchery. Nine years later I came along to round out the four children my parents raised. Today my sister, Cheryl, and I are involved in the family farm, along with Cheryl's husband, John, and my wife, Veronica.

Like most farm kids, I grew up alongside the business and from very early in life, I knew that I belonged on the farm. Like Dad, I have had on-the-job training only, having never gone to college.

By my early teens, I was already helping out with fish customers, helping get fish out of our ponds to sell, and answering questions about stocking ponds. I hope spending most of my life in aquaculture, listening to Dad and other experts in the fish farming industry, makes me enough of an authority to sit down and write a book on farm pond management.

My goal is to relay as much information as possible through this book so that anyone owning a small pond or big lake can use it as a guide to stock and properly manage ponds and lakes.

I've tried to cover as many topics of farm pond management as possible. With different geographical areas come different types of problems. Pond owners will experience problems of water hardness, pH levels, and climate. They will even vary from northern to southern Ohio. This will affect breeding and growth rate.

So with all the variations, it is difficult to cover it all.

I guess if I've missed anything, you can call the Fish Hatchery anytime. We'll try to help you out.

Thank you,
~Steve D. Fender