THE UNIVERSITY of TENNESSEE Extension

Update Newsletter

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"A Christmas of Happiness and Joy to You!"

**"May peace and plenty be the first to lift the latch on your door,
and happiness be guided to your home by the candle of Christmas."**

**"In the New Year, may your right hand always
be stretched out in friendship and never in want."**

Wildlife Management Calendar for January

by Craig Harper, Associate Professor, Wildlife Management

Habitat Management

Native warm-season grasses can be planted during the dormant season

> don't plant too deep – no more than ¼ inch!
> don't forget preemergence weed control next April/May; it is critical!

Continue strip-mowing or silage chopping dove fields to provide seed

Fertilize winter forage plots, especially those containing oats, wheat, and/or rye

> 30 pounds of N per acre
> P and K according to soil test

Soil test now for spring plots

> applications of lime require about 6 months before full effect on pH is realized

Plant trees/shrubs for wildlife

> establish hedgerows across fields with soft-mast bearing trees and shrubs
> hedgerows can be used to break up fields into sections
> also plant trees/shrubs in blocks at end of fields or in "odd" areas
> crabapple, persimmon, wild plum and others are good choices
> refer to *Improving Your Backyard Wildlife Habitat*, PB 1633, for a list of other trees and shrubs to consider

Fertilize/prune trees/shrubs for increased soft mast production

> this is for trees out in the open, not those in woods
> fertilizing oaks in woods is a waste of time and money; to increase mast potential for trees in the woods, refer to TSI activities

Continue Timber Stand Improvement activities

> stimulate growth among oaks, beech, cherry, persimmon, and other mast producers by killing surrounding competitors
> girdle unwanted trees and spray wound with a mixture of Garlon and Arsenal AC
> use 1 quart Garlon 3A and 6 ounces Arsenal AC filled to 1 gallon of water

Build brushpiles from thinned trees and pruned limbs

> put large stems on bottom, small stems on top

Erect boxes for wood ducks and bluebirds

> 1 box per 100 yards of shoreline is adequate for wood ducks
> clean out old wood duck boxes and put in fresh wood shavings (about 4 – 6 inches)
> screech owls and squirrels may use the boxes through winter
> repair/install predator shields if necessary
> bluebird boxes should be no closer than 80 yards apart
> up to 9 or more bluebirds may roost in a single box on cold nights

Keep bird feeders full

> black-oil sunflowers are a favorite of many birds
> thistle seed is preferred by goldfinches
> suet provides energy for lots of birds during the winter
> refer to *Improving Your Backyard Wildlife Habitat*, PB 1633, for information on specific feeders and seed for birds

Begin burning woods (hardwoods and pines) and fields to enhance conditions for wildlife

> make sure firebreaks are in place
> **much** more beneficial for wildlife than mowing (bushhogging)!

Wildlife Damage and Population Management

Close crawl spaces under the house and check for openings in the attic

> helps keep snakes, skunks, and squirrels from getting into places where they are not welcome
> rodents are beginning to cache food for the coming winter; take action now to keep them out of your house
> glueboards are very effective in trapping mice, snakes, and lizards looking for a warm place inside your basement or garage

Blackbirds and starlings have gathered into large winter flocks

> don't allow them to roost in your trees; if they start, they'll form a habit
> repel them with noise makers (shotguns, firecrackers, banging metal pans together)
> be persistent

Vultures can present a real problem for calving by plucking out eyes and eventually killing calves

> try scare tactics as soon as vultures appear during calving season
> contact USDA-Wildlife Services if problems continue; they can give you a referral to the US Fish and Wildlife Service for depredation permit if warranted

For more information contact: Craig Harper @ 865-974-7346 or charper@utk.edu.

# # #

Recycling Your Christmas Tree

Wayne K. Clatterbuck, Professor, Forest Management and Silviculture

What will you do with your Christmas tree after the holidays? Don't just put it out to the curb for garbage pickup. Recycle it! Most communities have a program to recycle Christmas trees. Check with your local department of public works for information.

Christmas trees are biodegradable. The trunks and branches can be used as mulch for landscaping, gardens, parks and trails. The mulch provides a hospitable environment for the roots of plants and helps to control weeds. The mulch also decomposes releasing nutrients that plants need to thrive.

Christmas trees make effective soil erosion barriers along streams and rivers. These trees also provide excellent habitat, refuge and feeding areas for fish in ponds and waterways.

Before recycling, Christmas trees can be used to make bird feeders, adding color and excitement to the winter garden. Utilize orange slices, peanut butter, suet and seed to attract birds. They will come for the food and stay for the shelter in the branches.

Christmas trees can have many more uses than just for decoration during the holiday season. Look into recycling your tree in your community instead of allowing it to take landfill space.

For more information, contact Wayne Clatterbuck at 865-974-7346 or e-mail at wclatterbuck@utk.edu.

# # #

Forests and Climate Change

Larry Tankersley, Specialist, Forest Management

Regardless of the ultimate cause, it appears that our planet's climate is increasingly variable and "changing". What's a forest landowner to think?

On April 21, 2004, the US Global Change Research Program (www.usgcrp.gov), updated their National Assessment of potential consequences for the United States. Chapter 17 discusses the Nation's forests.

Key findings include:

- Forest productivity is likely to increase due to the fertilizing effects of atmospheric carbon dioxide. These effects will however, be tempered by local environmental conditions especially moisture stress.

- Economic analyses indicate an overall increase in timber inventory, subject to external conditions such as urban sprawl. Increased timber inventories potentially reduce rates of return for landowners. These changes will vary by region and will depend also on international production.

- Changes in the severity, frequency, and extent of natural disturbances are possible due to future climate changes. Analyses suggest that the seasonal severity of fire hazard is likely to increase over much of the US with larger increases expected in the Southeast. Although the interactions between climate change and droughts, floods, hurricanes, landslides, ice storms, wind storms, insects, diseases, and introduced species are difficult to predict , but changes in these disturbances and their effects are possible.

- Analyses indicate changes in the location and area of potential habitats for many tree species and plant communities. Alpine and subalpine habitats and the variety of species dependant on them are likely to be greatly reduced while potential habitats for oak/hickory and oak/pine in the East and ponderosa pine and other arid woodland communities in the West are likely to expand. How well plant and animal species adapt to or move with changes in their habitat will depend on their dispersal abilities and the nature of the actual disturbance. Invasive and introduced species that disperse rapidly are likely to find opportunities in newly formed habitats.

- The effects of climate change on socioeconomic benefits obtained from forest will be influenced by future changes in human demands, as determined by human reactions to climate changes. Outdoor recreation is very likely to be altered by climate change. Warm water fishing would increase while cold water fishing would decrease. Summer recreation in the mountains may increase as we look for cooler environments. Skiing opportunities however may decrease.

Our forests react to environmental changes; typically in predictable fashion. Astute observations will guide our appropriate response.

Let us know if we can relieve any anxiety. Happy Holidays!

For more information contact at (865) 974-7346 or email at ltanker1@utk.edu.

# # #

Identify Roads on Your Property - Are You Ready?

Larry Tankersley, Specialist, Forest Management

This is a great time of year to identify and assess problem areas along roads where work will be needed next summer. Make notes or identify areas on maps that you can refer back to when you start to repair roads next spring or summer. You will be glad you did. Once your property dries out, it can be difficult to remember and/or find the areas that were bad during a wet season. Roads are a very important part of managing a property. You will need to be able to drive or transport large equipment throughout the property.

Walk your roads, draw your maps and make notes! We have a reasonable expectation that we will experience rain, sleet or snow this winter. If we need access to the woods during these months, we need our roads and trails to be protected and usable all year.

Forest roads should drain and dry quickly to support traffic. We have very little control over the soil texture and we expect compaction will limit infiltration of the road surface. Vegetation however limits the formation of a crust and "helps" water into the road surface. Vegetation also transpires some water drying the area. Careful selection of plants also enhances habitat for certain wildlife.

With limited surface infiltration we expect the road surface will shed water. This water will be shed in any direction depending on tilt, whether that tilt is historical, coincidental, or carefully considered. In an ideal situation we like a road that is generally high on the landscape, on the shoulder of a "ridge" with gentle grades that "naturally sheds water downhill. As reality of the site becomes apparent, no one has the perfect situation. Often building a new road is cost prohibitive. Property lines compromise engineering and crossing water when necessary requires savvy.

Forest owners in Tennessee have a variety of options that can be used to enhance drainage and drying of their roads. Deadening or removing trees provides sunlight to the road surface providing energy for drying(and growing the vegetative cover).

Always remember that flats don't drain and often drain along the road surface forming rills and gullies that are exciting to use. Tilting the road slightly down slope is helpful when the land is not too steep. Where the ground is steep, tilting the road slope inward may require occasional culverts to move "dammed" water on downhill.

When moving up or down slope (changing grade), consider draining the surface at regular intervals to limit the energy of flowing water. Engineered dips and other water control structures can limit the amount of soil moving around on exposed road surfaces. Rills and gullies are typically deeper toward the bottom of a hill because moving water along a long slope "gathers steam" in flows which can carry more soil. Dips, as opposed to bumps, slow the water and direct it downhill without significantly impeding vehicle speeds.

Road maintenance can be stressful, but is doable. Often a shovel or other equipment you have at your disposal can be very effective before considering introduction of larger equipment. The real trick is careful consideration of what you need/want from your roads, the site you're working with and the road surface. Deadening key trees and spreading some seed may be all that is necessary to reduce soil movement and allow better use our roads.

Having good roads is essential!!

For more information contact Larry Tankersley at 865-974-7346 or ltanker1@utk.edu.

# # #

The Mixed Stand (Pine-Hardwood) Management Alternative

Wayne K. Clatterbuck, Professor, Forest Management and Silviculture

Mixtures of pines and hardwoods often occur on forested areas in Tennessee that are not intensively managed. These stands are generally found on the marginal sites of (1) partial harvests or cutover areas with a blend of residual trees and regeneration sources (seeds, sprouts and established seedlings and saplings or (2) where site preparation (mechanical, chemical or fire), or the lack thereof, after a regeneration harvest did not completely favor either pure hardwood or pine stands. Mixed stands also develop naturally as a transition between early successional (pioneer) pine stands and later successional hardwood species.

The benefits of pine-hardwood mixtures are attractive to many landowners. Accepting mixed stands is often less costly than establishing pure stands, i.e., lower intensity to control competing vegetation. Mixed stands offer a greater range of microenvironments that support a wider variety of wildlife species. Diversity among tree species reduces the risk of disease and insect problems in the forest. Pure stands are more conducive to insect and disease epidemics. A few examples include the southern pine beetle (pure pine), gypsy moth (oak-hickory), and oak decline (oak). Pine-hardwood stands also will produce a greater variety of forest products. Future demand for a particular type of wood is difficult to predict. A mixture of species and forest products allows a more diversified investment portfolio. In mixed stands, a two-stage harvest approach is conducive with the shorter-lived and faster-growing pines being harvested first, leaving the slower growing hardwoods for future harvests.

A problem with mixed stands is that the composition and structure will change over time in response to environmental and management changes. Mixed stands are transitional during the succession of pine to hardwoods. The long-term maintenance of pine-hardwood forests is problematic at best. Pines are short-lived trees that require full sunlight for survival. Thus, pines will not develop in the shade of overstory hardwoods. Large overstory gaps are needed for pines to regenerate, develop and survive.

Pine-hardwood mixtures can be easily established. Before planting, a prescribed summer burn is used to prepare the site. Then plant pine at wide spacing (100-150/acre) during the winter. The fire temporarily delays the growth of the hardwood sprouts and allows the pine to make rapid early growth. As the hardwood sprouts regain their vigor, the site quickly becomes a pine-hardwood stand.

With more than 70 percent of the forested land in Tennessee being on mediocre to low productivity (marginal) sites, pine-hardwood mixtures are a significant opportunity to increase productivity (volume growth), income, diversity and other amenities of the forest in both the short and long term. Pine-hardwood mixtures are not for everyone. Remember that these mixtures are not permanent and relatively short-lived. However, landowners often overlook the potential of such stands. Lower cost, increased productivity and more diversity make mixed pine-hardwood stands worthy of consideration.

For more information, contact Wayne Clatterbuck at 865-974-7346 or e-mail at wclatterbuck@utk.edu.

# # #

Brown Needles on Eastern White Pine

Wayne K. Clatterbuck, Professor, Forest Management and Silviculture

During the late fall and early winter, we receive numerous inquiries about brown needles on eastern white pine trees. The browning of needles is a common and natural occurrence. If you look closely, the brown needles occur just inside the branch tips on the previous year's growth, not the current year's growth. Needles are retained on white pines for two years before they are shed. The needles turning brown are the two-year needles that are in process of being shed. Notice the accumulation of needles on the ground. Needles will continue to be shed throughout the winter before the new growth begins in the spring.

Pines will also have a lighter, dull-green to yellowish color during the winter months. The metabolic processes in pines, such as photosynthesis are not as active as during the summer. Generally the lower temperatures in winter retard and sometimes cease photosynthesis, although some does occur when temperature and moisture conditions are favorable. The green color of the needles is maintained somewhat during the winter, but the dark green color typical of active growing conditions in summer does not carry over to the winter

For more information, contact Wayne Clatterbuck at 865-974-7346 or e-mail at wclatterbuck@utk.edu.

# # #

Emerald Ash Borer

Adam Taylor, Assistant Professor, Wood Products Specialist

The emerald ash borer (EAB) (*Agrilus planipennis)* is an exotic beetle that was discovered in Michigan in 2002. The adult beetles eat foliage and cause little damage; however, the larvae feed on the inner bark (phloem) of ash trees, disrupting the transport of nutrients and this eventually kills the tree. EAB has only been observed on ash trees in North America but all ash species appear to be susceptible.

So far, EAB has killed more than 20 million trees. Ash is not a dominant species in Tennessee, ranking 11th in abundance, and EAB has not yet been detected in Tennessee. However, the EAB infestation has spread quickly from its origin in southeastern Michigan. Despite significant control efforts, EAB has been found throughout Michigan and into Ontario, Ohio, Indiana, Illinois and Pennsylvania.

Ash trees can be treated with insecticides to help deter or eliminate EAB infestation. This is an expensive process and is only practical for individual trees. Control measures in the infestation zone have focused on cutting and burning affected trees. The movement of firewood and other fresh wood products is also restricted in those areas.

It is not known how EAB was transported to the United States from its native Asia but it probably arrived in solid wood packing material (e.g. pallets). The establishment and spread of exotic insects such as EAB is a growing national concern and has led to increased efforts to prevent the movement of pests on fresh-sawn wood. Tennessee is a major manufacturer of wood pallets and any pallets that are destined for export must now be heat treated to kill any insects or larvae.

More information on the emerald ash borer can be found at http://www.emeraldashborer.info/ or by contacting Adam Taylor: 865-946-1125, AdamTaylor@utk.edu

# # #

Responsible, Sustainable, "Award-Winning" Timber Sales

David Mercker, Extension Specialist, Forest Management

Several years ago I was handling a timber sale for a landowner, and a sawmill manager showed up to place a respectable bid on the trees. He was an honorable, second generation mill manager and he quipped, "When dad ran the mill, log procurement was a whole lot easier. If the mill was low on logs, dad would spend a day meeting with landowners. By day's end he'd have enough timber purchased to run the mill for months." Apparently at that time, timber was plentiful, cheap, and "in the way!"

Times have changed. Our forests have changed. Sawmills are changing. Forest landowners are transforming the way they do business too. Nowadays, landowners don't just sell their timber. They *market* it. Landowners must engage in a series of succinct, deliberate steps, that at a minimum takes several months to complete. Here's a generalized look at some of those steps.

First, See a Forester - and perhaps several. A good source of initial contact is your local Division of Forestry Area Forester. Though their services are limited, they can offer an unbiased opinion of the condition of your timber and determine if a commercial harvest is possible and warranted. They can also discuss cost-share forestry incentive programs for follow-up management after the harvest. They will likely stress the importance of your forest management plan too.

Inventory Your Timber - Other farm products are not sold on guesswork, neither should timber. Your local University of Tennessee Extension Office normally maintains a list of private foresters whom are capable of determining the board foot and/or tons of wood to be included in your sale.

Don't Hi-grade Your Forest -When selecting trees for sale, be sure to include more than just those with highest present value. Certain species have traditionally been undesirable, lower-value trees. Every harvest is an opportunity to improve your stand by removing the undesirable and suppressed trees. It is advisable to designate trees chosen for sale by marking them with long-lasting, high visibility paint (both at chest height and again at ground level).

Have an Estimate of Value Before Selling - Your forester is capable of establishing a fair market value for your trees. You can visit the Division of Forestry's web site
http://state.tn.us/agriculture/forestrytfbp.html
for recent price averages for delivered sawlogs and pulpwood in Tennessee.

Advertise to a Broad Market - Here's where the marketing pays off. Expose your timber to all reasonable markets, including: Master Loggers, timber buyers/brokers, industry foresters, sawmills and pulp and veneer mills if your sale includes these products. The Tennessee Forestry Association website has a list of Master Loggers by county at: http://www.tnforestry.com/loggers.htm#mldatabase

Seek Sealed Bids - In most cases, it's recommended to accept lump sum sealed bids for your timber rather than pay-as-cut or cut-on-shares. Exceptions include low-quality sales, including pulpwood.

Get Paid up Front - Payment in full, before tree felling begins, is normally advisable. Your personal tax implications may suggest otherwise. For timber tax info, refer to (Tankersley):
http://www.utextension.utk.edu/publications/pbfiles/PB1691.pdf

Prepare a Contract - This protects your interests, highlights conditions of the sale, addresses liability and insurance issues, BMP requirements and more, all while being reasonable with the purchaser. The University of Tennessee Department of Forestry, Wildlife and Fisheries (Clatterbuck and Tankersley) has a sample contract for your guide located at:
http://www.utextension.utk.edu/publications/pbfiles/pb1607.pdf

Monitor the Logging - This allows for communication with the logger and addresses potential problems while the logger is still on-site. Be sure that Tennessee BMPs are being followed. To learn more, visit: http://www.tnforestry.com/loggers.htm

Remember too, your timber sale project has an impact on those other "bundle of rights" enjoyed by society. The air, water and wildlife passing through your forest are co-owned by you and them. If we are to be successful in comforting society and protecting the right to practice forestry, we must engage in responsible, sustainable, "award-winning" timber sales.

For more information contact David Mercker at

# # #

Winter is the Time to Lime Ponds *(reprint)*

Tom Hill, Professor Emeritus, Fisheries Management

For both freshwater fish and freshwater prawn production, water pH of 6.5 - 9.0 is the desirable range. To avoid extreme fluctuations either above or below these levels, it is very important that the alkalinity of the pond water be above 20 ppm.

Phytoplankton are microscopic aquatic plants which are responsible for most of the oxygen (through photosynthesis) and primary productivity in ponds. Ponds with alkalinity levels below 20 ppm do not usually support good phytoplankton blooms and do not commonly experience dramatic pH changes.

Total alkalinity in ponds can be raised by adding agricultural limestone. A quick way to determine if a pond needs to be limed or not is with a simple water testing kit that measures total alkalinity. Ponds with water less than 20 ppm total alkalinity usually need lime and the farther below 20 ppm the water is, the more lime will be needed. However, even though the alkalinity test indicates lime is needed, it doesn't tell how much. To determine the need and how much to add, send a pond bottom sample to the University of Tennessee Soil Test Lab in Nashville and the results with a recommendation will be returned.

Lime should be added to ponds in the winter, because it will cause phosphate in the water to precipitate and be unavailable for growing phytoplankton when applied in the summer. Liming your ponds in the winter will help you **avoid water quality problems** next summer.

# # #

Nutritional Needs of Catfish *(reprint)*

Tom Hill, Professor Emeritus, Fisheries Management

While it is true that channel catfish do not eat as much food in winter, paying attention to their diets will mean more potential profits from brood fish, fingerlings and harvestable sized fish that must be carried over.

While brood catfish spawn once a year in the summer and the females begin right away to form eggs for the next year. It is especially important they receive proper nutrition during the cooler months to produce a good crop of eggs. Research has shown that many more viable eggs are produced when fish is included in their diets. An effective way to do this is to stock fathead minnows in with the brood fish. Along with the fish flesh, a supplemental diet of pelleted catfish food, fed at the rate of 1 percent of their body weight on alternate days, will keep the brood fish in good condition and enable them to spawn successfully.

Catfish fingerlings are much more active in cooler water than adults and may take some food even when ice is around the edges of ponds. Their performance in production ponds the following summer will depend to a large extent on the way their nutritional requirements are met during the cooler winter months. **Unless they are fed adequately in the winter, they will become emaciated and more susceptible to parasite and disease problems. Skeletal deformities from vitamin C deficiency may be particularly prevalent.**

Food-size catfish held over during these months in production ponds without feeding lose about 9 percent of their weight. When fed 1 percent of their body weight either on alternate days or on days when surface water temperatures are 54 degrees F or above in mid-afternoon, you should see a gain of about 18 percent body weight during winter months. They will be in good condition and ready to go to market at the proper time. Fish food is expensive and certainly does not need to be wasted, but by using good feeding practices catfish farmers can expect much better performance by all their fish. The ends results will be worth it.

A publication, **PB1287 Channel Catfish Production in Tennessee**, has more detailed information and is available from UT Extension.

# # #

Pond Evaluations

by Kedric Nutt, co-owner and operator of Southeastern Pond Management

Pond owners regularly request help managing their pond. Usually, this means they have already perceived some "problem" with their pond or fish population. Often the pond owners simply states their pond needs help or need "something" but they aren't sure what it needs.

It is at this point that the subject of a pond evaluation typically arises. Like a doctor giving a patient a physical, we cannot prescribe a regimen to heal the "patient: until we have performed a full and complete examination. This examination is referred to as a standard fish pond evaluation. The prescription or regimen of corrective actions is presented in a "Management Plan".

To properly evaluate a pond and develop an accurate and appropriate management plan, the entire pond physical structure, the pond environment, the surrounding environment and the fish population should be throughly examined. The pond is a complete ecosystem and all of it's components must be considered when determining how to manage that ecosystem to maximize or optimize the fish population to the owner's specification.

One of the first question is how big is the pond. Knowledge of the true size of the pond is critical to successful management of a fish pond. Management actions such as fish stocking, fertilization and fish harvest are based on per acre rates. How can you know how much of whatever is needed without the true size of the pond?

Current technology allows us to accurately measure a pond's total surface area quite easily. First, we use hand held GPS units on site. Simply walking or driving around the pond at the water line provides an extremely accurate area measurement. Second, if the pond is older, it may be on the latest U.S. Geological Survey Topographic maps. If so, the area can be measured from the map using a simple computer program.

In some cases, an issue of the pond staying full or "holding water" arises. One of the possible causes of this is inadequate watershed. The pond surface area: watershed area ratio, to a large extent, determines if a pond will fill up and stay full, or nearly full, throughout the year. Again,
measuring the pond surface area and mapping out the total watershed may be necessary to answer that question. We may us GPS mapping and/or U.S.G.S. topo maps for this subject. If there is suspicion or evidence of leakage or seepage, referral to a civil engineer for a formal pond or dam leakage assessment may be required.

Make a visual inspection of the pond structure, primarily the dam and associates structures. A properly built pond dam is a true man mad structure - just like a concrete and steel building – and, therefore is a product of proper engineering design and construction. Look at the general condition of the dam to identify any serious issues or problems which might result in dam failure (breech, breakage) and drainage of the pond and loss of the fish population.

Also examine the dam drainage system. A properly designed and built pond must have an adequately designed and sized drainpipe system and an emergency overflow conduit of some sort. The standard design for ponds is a drainpipe through the bottom of the dam which is joined to a "riser" or "stand" pipe to drain off excess water or overflow during normal times and for average, typical rainfall events. Coupled with this is a lowered wection on the dam structure itself called the "emergency spillway". This section is designed to handle overflow during excessively heavy rainfall or flood type events.

These components of a pond are critical to the long term success of managing the pond. Therefore, examine this structure and note any problems or potential problems and describe them in the management plan for corrective action, if necessary.

It is during this examination that we look for any signs of potential animal/wildlife control issues. Typically, beavers and/or otters show some sign at or near the dam. With beavers, they may attempt to dam up the emergency spillway or the standpipe. It is also common for beavers to excavate a lodge into the dam. Otters commonly enter ponds from below, thus creating a clear path straight up and down the backside of the dam.

Next, examine what is referred to as pond productivity or fertility level. This is the ability of the pond to grow and support so many pounds of fish per acre. The majority of the fertility level is determined by the nature and character of the soil on which the pond was constructed.

Management of the pond fertility levels mainly involves a program of regular fertilization. However, fertilization will not be effective or successful if the pond soil and water is not of the proper chemistry. Collect a water sample from the pond to measure the pond's alkalinity. This is a chemical parameter which indicates the need for lime. Liming ponds is an essential component to effective pond management. If the alkalinity is below 20 milligram/liter (mg/l), it indicates a lime application is needed. If it is 20 mg/l or above, fertilization can proceed according to the standard fertilization program.

Related to the pond productivity level is the presence and extent of any aquatic weeds or algae. This affects the magnitude of fish production because aquatic weeds and algae remove nutrients from the food chain which would otherwise be channeled into fish production. In the sport fish pond, none of the fish species in the food chain eat weeds or algae . Therefore, aquatic weeds and algae do not contribute to the ultimate production of bass and bluegill.

During the evaluation, look for weeds and/or algae. If found, identify the species and extent of growth so we can make proper management recommendations for control and/or eradication. This typically includes the stocking of grass carp and may include a prescription for herbicide application.

Finally, we get to the fish population. This is the major part and usually the most interesting component of the evaluation to the pond owner. For an evaluation and management plan, we collect a representative sample of the fish population using an electro-fishing boat. This is standard equipment in the world of fisheries science for collecting an accurate sample of a fish population. A gasoline generator produces electricity and a pulsator (control box) converts the raw electrical current into a usable form to safely stun the fish so they can be collected.

Because water is actually a rather poor conductor of electricity, the electro-fishing boat electrifies a fairly small area immediately around the boat. In general, the electrical field is strong enough to fully stun fish for collection approximately 15 feet around the boat and 10 to 15 feet deep. Since the area electrified is relatively small, we must move around the entire pond, basically hunting and "fishing" to collect a suitable sample.

After the sample is collected, we move back to the pond bank where the fish are "worked up" as we call it. Fish are measured at least for length and counted by species. In particular, we measure and weight the adult bass. This is critical for assessing the "state of balance" between the predator and the prey species in the pond. If the bass are skinny or below "average weight" it indicates the pond is bass crowded. If the bass are plump and mostly at average weight, it indicates the pond is in balance.

The state of balance or imbalance determines to a large degree the management actions we prescribe for a given pond. Of course, consultation with the pond owner and a determination of his/her specific goal for the pond is absolutely necessary. We can't prescribe the correct management actions without knowing the desired end product.

So, the on-site evaluation collects the data as described above. This data can be returned to a fisheries biologist to be analyzed and developed into a pond evaluation report and management plan. The report includes figures and graphs depicting the pond's unique fish population characteristics, such as the bass length-frequency distribution and condition factors or relative weights of the bass. These figures and visual aids help the pond owner understand the current condition and character of their pond's fish population. All other aspects of the pond's condition are described and discussed in detail.

At the conclusion of the report is the step by step management plan - a list of pond management activities designed to achieve the goal of the pond owner. It is essential to follow-up with the pond owner to discuss the specific management recommendations and make decisions for implementation of the plan. At that time, some management activities may be scheduled while others are noted for future scheduling.

In this process, the final goal and hopefully the end result is reaching the expressed goal of the pond owner and producing the type of recreational sport fishing that is desired.

# # #

"We all want progress, but if you're on the wrong road, progress means doing an about-turn and walking back to the right road; in that case, the man who turns back soonest is the most progressive."
~ C. S. Lewis

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