



Forestry, Wildlife & Fisheries Update Newsletter

Department of Forestry, Wildlife and Fisheries
George Hopper, Department Head

November 2004
Website: <http://fwf.ag.utk.edu>

Calendar of Events

- Nov. 29** Forestry Assn. Organizational Dinner
Van Buren County
- Nov. 30** Forestry Assn. Key People Meeting
Putnam County
- Dec. 2** Forestry Assn. Forest*A*Syst Program
Henderson County

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Notes From the Web

Samuel Jackson, Web Coordinator

This month, as we are approaching the holiday season, I want to highlight a nice website that the Tennessee Department of Agriculture has produced, <http://picktnproducts.org>. The site is designed to promote ag and forestry products produced in our state. How does that relate to the holidays, you ask? Well, once you go to the site, the third choice on the left-hand side of the page is "Christmas Trees." Clicking on that link takes you to a set of resources that proves valuable as we go about selecting the right tree for our holiday celebrations.

The main item available at this site is a directory of tree growers in our state. It is arranged by region of the state and county. By clicking on the name of a tree farm, it gives you contact information, species sold, and hours of operation. The site will also generate a map of where the tree farm is located, making it easy to find the perfect tree.

Aside from the directory, the picktnproducts.org website provides guidelines for selecting balled and burlap trees, key guidelines for ensuring their survival after you plant them. It also provides you with guidelines for selecting a cut tree to be sure you get one that won't shed its needles for Santa comes to visit. Finally, the website also provides links to both the National and Tennessee Christmas Tree Growers Associations, where you can find information and learn even more about Christmas trees.

Visit <http://picktnproducts.org> to check out the Christmas tree directory!

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Adam Taylor Joins UT Extension: Welcome

George Hopper, Professor and Department Head

We are pleased to have Dr. Adam Taylor join our faculty as our wood product specialist on November 1, 2004. Dr. Taylor will develop a state wide Extension educational program in the area of forest products. Adam completed his PhD in Wood Science from Oregon State University and also has family and work experiences from Toronto, Canada. Adam will be headquartered in the Tennessee Forest Products Center on the Knoxville campus. He can be reached by phone at 865.946.1125 or mataylor@utk.edu.

###

Wildlife Management Calendar for November

Craig A. Harper, Associate Professor, Wildlife Management

Disc firebreaks around fields and woods before the ground freezes

- winter wheat can still be sown, if desired, or leave fallow

Flood waterfowl impoundments

- a depth of 8 – 10 inches is ideal for dabbling ducks

Continue Timber Stand Improvement activities

- select good mast producers and release their crowns by girdling and spraying competitors

Begin planting trees/shrubs for wildlife

- use as a hedgerow to break up fields into sections
- plant in blocks at field corners and “odd” areas
- use soft- and hard-mast producers (see PB 1633 for list of species)

Build brushpiles

- put large stems on bottom, small stems on top

Spray tall fescue

- use 2 quarts of a glyphosate herbicide (e.g., Roundup[®]) per acre

Put out bird feeders and keep them full

- black-oil sunflowers are a favorite of many birds
- see PB 1633 for list of seeds preferred by various birds

Continue strip-mowing dove fields

- migrating doves appreciate your efforts and the late dove seasons can offer great shooting

Begin dormant planting of native warm-season grasses

- don't plant too deep – no more than ¼ inch!

Go hunting!

###

Fisheries Management for Winter Months

Take pond bottom soil samples, send to Soil Test Lab
- test need for lime - apply now through February

Continue feeding catfish for winter - feed at reduced rate

Where possible, draw-down water in ponds to expose aquatic weeds
- this will help control weeds

Repair and renovate ponds where needed

- investigate and spot problem areas
- sealing by compaction is the simplest and least expensive method
- Benonite has been used successfully to seal ponds, especially where leaks cannot be detected
- if large quantities of calcium are present in soil, use an application of sodium carbonate (soda ash)
- if you have problems with fluctuating water levels. . . don't give up

Stock trout in your pond

- trout can be grown successfully in the winter months, November - April
- eliminate wild fish from ponds before stocking trout
- stock with 6" or larger trout - growing season is only about 5 months
- start fishing as soon as fish are 8 - 9 inches long
- all trout should be out of the pond by April when water temperature gets over 70 degrees Fahrenheit

Forestry Management for Winter Months

Inventory stand, choosing crop trees based on the following

- Timber harvesting, crops trees should have high economic value, a dominant or co-dominant health crown, few or no epicormic branches, no open wounds, no v-shaped or forked splits

Tree planting, tree planting and more tree planting

- Plant trees and other woody plants in the dormant season from December to March 15

Remove dead, dying, broken or loose branches, clear trees of sprout or sucker growth

Establish needs for herbicides, now is a good time to plan and buy

Check property lines, give hunters clear site of boundaries

Roads ready for winter? Use Best Management Practices

- Check bridges and stream crossings
- Use gravel on mud to level road edges for truck safety
- Observe for drainage problems, make notes to fix road in the summer
- Consider "daylighting wet spots". Mud holes may be in shade. Remove trees causing shade to allow sunshine to dry wet areas

Photograph the landscape. This is a good thing!

- Do during the winter to see the drainage patterns and plan future needs for BMPs, especially old logging and farm roads.

Consider re-vegetation on exposed areas

Get ready for taxes, timber sale receipts, expenses, casualty losses, etc

- check out new forms, www.IRS.gov

###

Soil Test Now for Spring Wildlife Plantings

Craig A. Harper, Associate Professor, Wildlife Management

It's not too early to think about spring planting. Getting soil samples tested now and applying amendments as necessary will pay dividends come spring.

Most sites need liming to adjust soil pH. However, it is not until 5 – 6 months after liming before the full effect is realized. Therefore, if you plan to plant food plots or native warm-season grasses (nwsg) next spring, you should apply lime as recommended by your soil test soon. Most food plot plantings do best when the pH is 6.0 – 7.0. At this range, nutrients are most available to plants and bacterial activity is high. This allows rapid decomposition of organic matter for nutrient cycling and increased nitrogen fixation for legumes. Nwsg grow relatively well even when the pH is 5.0 – 6.0, especially when managed for wildlife habitat. However, when nwsg are grown for livestock, pH should be adjusted to 6.0 – 6.5 to promote additional growth and nutrient availability.

Lime applications are most effective when incorporated into the soil by plowing and/or discing, especially when liming relatively acid soil that has not received lime in many years. This ensures adjustment through a greater portion of the root zone. Surface applications may not improve soil pH several inches down into the soil column. If the site requires a heavy lime application (3 tons or more per acre), it is best accomplished with a split application, up to 2 tons initially and the remainder 6 months to 1 year later.

Existing cool-season forage plots containing oats, wheat, and rye will benefit from a winter application of nitrogen (30 – 60 pounds per acre). Nitrogen is very short-lived and the effects of fall fertilization are gone by mid-winter. Phosphorus and potassium are longer lived in the soil and their application should follow the recommendations from a soil test.

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Justifying Forest Herbicides

David Mercker, Extension Assistant II and Dr. Allan Houston, Associate Professor

Recently there has been some highlighting of forest herbicide use in Tennessee, specifically the use of aerial spraying associated with the management of pine plantations. Though understandable that society might initially have some unease with the use of herbicides (consider the days of DDT), a closer look brings reassurance that today's herbicides are safe.

Herbicides are one of several types of “pesticides.” Pesticides are chemicals used to control injurious organisms. Pesticides include: **herbicides** (to control weeds and vegetation), **insecticides** (to control insects), **rodenticides** (to control rodents) and **fungicides** (to control fungus). Each of these is used regularly around many of our homes and gardens to rid unwanted pests. If used according to the instructions, they perform necessary functions and are safe. The same is true of forest herbicides.

The following offers some balancing thoughts that are often overlooked in discussions on forest herbicides. Consider:

1. **If we plant, we must also manage.** Herbicides allow young tree seedlings the opportunity to overcome competition from unwanted vegetation and thereby capture the site. Once planted, we have an obligation to assure the survival of new seedlings.
2. **Herbicides are chemicals, but so too is salt.** And salt, just as caffeine, baking soda, and aspirin, is highly toxic if used incorrectly. The point is that herbicides are applied at very small rates, often *ounces* per acre. These rates are safe, having no lasting affect to the site.
3. **From lab to label.** Today, in order for an herbicide to be labeled for commercial use, it must undergo rigorous testing and regular monitoring. Government restrictions on herbicides (through the FIFRA act of 1947) are much more stringent than in days past. At best, less than one in 20,000 chemicals make it from the chemist’s laboratory to the farmer’s field. A new product is subjected to hundreds of separate tests to ensure that, when used properly, it will not present any health or environmental concerns. Pesticide development, testing, and EPA approval takes eight to 10 years (this is less time than it takes pharmaceutical companies to develop a new drug) and costs manufacturers at least \$50 million for each product.
4. **Chemical companies are cautious.** Such companies are very aware of past reputations and, if nothing else, recognize that trespass on public safety or biological standards would be sure suicide.
5. **Applicators must be licensed.** To apply herbicides commercially, requires testing, licensing, and continuing education (and when applied aerially, applicators must have a pilot’s license).
6. **Labels are specific and penalties expressed.** Not following the express written instructions for herbicides is a federal offense, subject to fines and loss of license.
7. **If not herbicides, then what . . .** bulldozers, prescribed fire, hoes? Each of these has some application, but none are practical or economic on large scale operations.
8. **Herbicides enhance ecology.** Herbicide applications can be tailored to enhance the environment by controlling *unwanted* exotic invasive plants, thereby benefitting the indigenous ones. Consider the rapid spread of invasive plants such as kudzu, privet, Tree-of-Heaven, and bittersweet and their detrimental affect to forest regeneration.
9. **Spray drift is noticeable.** Concern for off-target spray drift is common. However, if spray drift were occurring on any measurable scale, the evidence would be irrefutable. Trees and weeds far from target areas would be dead or severely damaged. To avoid spray drift, applicators include adjuvant (drift control thickening agents) in their solution, and they spray during periods of low wind.
10. **Frequency of application.** Very few forests will ever receive herbicide applications (less than 10%) and those that do, receive it on average once every 30 years. Compare that to the frequency of row crops.

- 11. Applied with helicopters.** Most forest herbicides are applied with helicopters. Helicopters are extremely accurate in spraying only the intended target. They fly low and slow, and require more advanced pilot training than fixed-wing aircraft.
- 12. Only a “caution” label.** FIFRA assigns hazard rating to pesticides according to potential harm to humans and the environment. Three ratings exist: caution, warning, and danger. The lowest levels of toxicity are those pesticides labeled as “caution.” Virtually all forest herbicides applied in Tennessee are labeled as caution. Compare this to some of the chemicals found under our sinks and in our garages.
- 13. The real issue.** Perhaps the real intent in challenging the use of forest herbicides is preventing the conversion of hardwood stands to pine. This is a different argument altogether.

Herbicides prepare the forest site for planting, control weeds upon planting, and eliminate invaders after planting. American wood production requires the use of forest herbicides. Herbicides help produce safe, abundant and affordable supplies of fiber. Wood production would drop dramatically if herbicides were not available to tree farmers. Herbicides are relatively nontoxic to humans and animals, and only then at extremely high rates - rates that far exceed manufacturers’ recommendations.

Ref: <http://www.croplifeamerica.org/public/retest>
http://www.pharmafocus.com/cda/focusH/1,2109,22-0-0-JAN_2004-focus_feature_detail-0-142237,00.html

Cantrell, Rick L. and George M. Hopper. 1989. “Forest Herbicides are Safe to Use – Here’s Why”. The University of Tennessee Extension Service. SP368.

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New Wood-Protection Treatments

Adam Taylor, Assistant Professor, Wood Products Management

Wood products that are used outside are exposed to a variety of hazards that can greatly reduce their service life. This is especially true in Tennessee, where wood-eating termites are prevalent and the mild climate is favorable to the wood-rotting fungi.

Preservative chemicals are often added to wood products to deter wood-destroying organisms and thus increase the usefulness of wood products. To achieve the highest levels of protection, the chemicals are forced deep into the wood using a pressure treatment cycle. Southern pine poles and structural lumber are very well suited to this purpose, because they have large amounts of easy-to-penetrate sapwood. Creosote and pentachlorophenol are two effective preservatives that are used to protect utility poles and railroad crossties. Unfortunately, these chemicals are carried in an oil solvent that makes the treated wood unsuitable for applications such as residential decking and fence boards, where people frequently come into contact with the wood.

Chromated copper arsenate (CCA) is a clean, waterborne wood protection system that has a long history of excellent performance. The copper, chromium and arsenic components of this system bind to the wood chemically, ensuring that the treatment stays in the wood. The result is treated-wood

products that remain protected after many years in service and are safe for human contact.

Many people are familiar with CCA-treated wood. It is the relatively inexpensive, green-colored wood that has been a popular choice for building decks and fences over the past twenty years. Recently however, amid general concern over the presence of arsenic in the environment, the manufacturers of wood preservatives voluntarily withdrew CCA from use for residential treated-wood products (i.e. decking and fencing). A variety of other waterborne chemicals have been introduced to take the place of CCA. These products are also green in color and contain copper, but they do not contain arsenic. The new formulations do not yet have the proven history of CCA, but they should provide years of safe and effective performance.

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Variable Tree Retention

Wayne K. Clatterbuck, Associate Professor, Forest Management and Silviculture

Variable retention harvest system, as defined by the Society of American Foresters, is an approach to harvesting based on the retention of structural elements or biological legacies (trees, snags, logs, etc.) from the harvested stand for integration into the new stand to achieve various ecological objectives.

Major variables in the variable retention harvest system are types, densities, and spatial arrangement of retained structures. Aggregate retention is the retention of structures or biological legacies as (typically) small, intact forest patches within the harvest unit. Dispersed retention is the retention of structures or biological legacies in a dispersed or uniform pattern.

Variable retention has been championed in the Pacific Northwest (primarily British Columbia and Oregon) and in Finland as a method to ameliorate the visual appearance of clearcuts. Large trees are used to provide some structural diversity and eventually coarse woody debris that would not be present if a complete clearcut is used. However, the science behind tree retention is at best limited. Should trees be left singly or in groups? What benefits are being addressed biologically as well as economically with tree retention?

Patrick Moore, from Vancouver, British Columbia writes that variable retention is based on the idea that the most important value in the forest is biodiversity, the many species of plants, animals, birds, insects and invertebrates living there. In order to make sure that all the species can survive in a managed forest, it is necessary to understand their habitat requirements for breeding, feeding, hibernating, etc. So long as sufficient habitat is retained on the landscape it should be possible to maintain viable populations of each species. Coincidentally, many species are perfectly happy in landscapes where the trees have been recently cleared. Birds that nest in shrubs will usually find more available shrubs where the forest cover is removed. Other species, such as cavity nesting birds, need standing dead trees in the landscape, and still others need fairly large blocks of older forest. Variable retention is about planning timber harvesting over time so that all the necessary features for species survival are always present somewhere in the landscape.

Variable tree retention is practiced in the western United States as a way to maintain a wider range of biodiversity in large area harvests (hundreds of acres) in stands of one or few number of species. The concept, because of its positive overtones has been transferred to the eastern United

States. However, is variable tree retention needed to maintain biodiversity in eastern forests? Considering that most harvests in the eastern US are less than 100 acres, that eastern forests are composed of many species on a varied landscape, and the faster recovery time after forest disturbance, variable tree retention is probably not necessary to maintain biodiversity in eastern forests. The scale of disturbance and recovery is not as great as in western forests. Some animal, insect and invertebrate species may be displaced by harvests for a short time, but adjacent forests usually can continue these habitat conditions such that biodiversity is sustained.

To some degree, variable tree retention is already practiced in the eastern United States. Standard practices such as streamside management zones (SMZs), visual buffers and islands of vegetation left in the harvest area to maintain undisturbed or unique areas have attributes of variable tree retention. The smaller ownership size of forests also contributes to the wider range of landscape diversity.

In Tennessee, variable tree retention is not a new concept. Forest research at Sewanee, TN in the late 1970's left ten or so mature trees per acre in an attempt to ameliorate the visual aspects of a harvested area. The research was to determine the effects of these remaining trees on the development of regeneration and whether the trees would increase in value. The results were that the public was more appreciative of the visual effects of leaving a few trees in the harvest area, the remaining trees actually declined in value, some single trees died due to increased exposure and the trees did negatively influence the development and composition of regeneration in the proximity of the tree crowns.

Forest managers should consider the purpose of variable tree retention within the scale of their management operations. Trees to maintain visual quality, to implement a two-age form or to uphold vertical forest structure on the harvested area are positive attributes of variable tree retention. However, tradeoffs are also prevalent such as damage to residual trees during harvest, potential decrease in value of remaining trees and the impacts of those trees on the development of regeneration. Many aspects of variable tree retention are already in place with SMZs, visual buffer areas and in protecting unique topographic and vegetational areas.

Variable tree retention is not a panacea in eastern forests. It may sound better than its actual contribution to landscape biodiversity, especially in the smaller harvests and diverse landscapes in eastern forests. As with all forest management activities, forest managers and landowners should evaluate the positive attributes as well as the tradeoffs with variable tree retention and make decisions based on management objectives. Variable tree retention is another one of the subjects that may not have universal application, but is a tool that can enhance forests and management under specific circumstances.

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Mistletoe Mythology

Larry Tankersley, Extension Specialist, Forest Management

The name “mistletoe” derived from ancient observations that the parasite would often appear on a branch or twig where birds had left droppings. “Mistel” is an Anglo-Saxon word meaning dung and tan is a word for twig. Thus dung on a twig.

Since early times, mistletoe has been one of the magical, mystical and sacred plants in nature. It was held in great reverence by the Celtic Druids, who searched for the plant in the tops of the “sacred oak” on the sixth night of the moon. Dressed in white robes the druids would cut the oak mistle toe with a golden sickle amidst prayers and rituals. They believed the mistletoe protected its’ possessors from all evil and that the oaks, on which it was seen growing were to be respected because of the wonderful cure which the priests were able to effect with the mistletoe. The ancient Druids used mistletoe as an aphrodisiac, protection against poison and believed that it had the power to bestow life and fertility.

In the middle ages and later, mistletoe was hung from the ceilings to ward off evil spirits. In Europe, mistletoe was placed over houses and stable doors to prevent the entrance of witches.

Kissing under the mistletoe is first found associated with the Greek festival of Saturnalia and later with primitive marriage rites. In Scandinavia, mistletoe was considered a plant of peace, under which enemies could declare a truce or warring spouses could kiss and make-up.

Christian folklore believes mistletoe was once a tree, of whose wood the cross on which Christ died was made. The tree then shriveled up with shame, changing into a plant that pours down good fortune on all who pass under it.

Shakespeare referred to it as the “baleful Mistletoe,” from the Scandinavian legend that Balder, the god of peace, was slain with an arrow made of mistletoe. He was restored to life at the request of the other gods and goddesses, and mistletoe was afterwards given into the keeping of the goddess of Love. It was ordained that everyone who passed under it should receive a kiss to show that the branch had become an emblem of love, and not of hate.

Later in 18th century England, mistletoe credited with a certain magical appeal was fashioned into a “kissing ball”. At Christmas a young lady standing under a ball of mistletoe, brightly trimmed with evergreens, ribbons, and ornaments, cannot refuse to be kissed. Such a kiss could mean deep romance or lasting friendship and goodwill. If the girl remained unknissed, she could not expect to marry the following year.

Ancient magical uses.

The leaves and berries were once used for protection against lightening, disease, and misfortune. Mistletoe was often place in cradles to protect children from being stolen by fairies and replaced with changelings.

A ring carved of mistletoe was thought to ward off sicknesses when worn, and it was believed the plant would cure wounds quickly when carried (not applied to the wound).

Mistletoe was used in spells aimed at attaining immortality and when worn around the neck, it was supposed to make one invisible to enemies.

Placed at the bedroom door, mistle toe was believed to grant restful sleep and beautiful dreams. It was also sometimes placed under the pillow and hung from the headboard.

Medicinal history.

Mistletoe has been used for centuries for its medicinal properties. Although not scientifically validated, it may have been used as early as the 16th century to improve circulation and relax muscles. Other unverified uses include treatment of internal bleeding, convulsions infertility, arthritis. Rheumatism, gout, hysteria, whooping cough, asthma, hypertension, headache, dizziness, menstrual cycle and menopausal symptoms, diarrhea, chorea (rapid, jerky movements), and rapid heartbeat. Because of its calming effect, mistletoe is used as a tranquilizer for various nervous conditions and for the treatment of mental and physical exhaustion. It is also used as long-term therapy to prevent hardening of the arteries. Reports that mistletoe can induce lower blood pressure in animals and humans appeared as early as 1906.

Mistletoe has held interest as a possible anti-cancer agent since the 1920's. Extracts derived from it have been shown to kill cancer cells and to stimulate the immune system. In light of these properties, mistletoe is considered a “biological response modifier”. These constitute a complex group of substances that have been used individually or in combination with other agents to treat cancer or to lessen the adverse effects of anti-cancer drugs.

Mistletoe is used mainly in Europe and Asia, where commercially available products are marketed under a variety of brand names. Mistletoe extracts are prepared as aqueous solutions and they can be fermented or unfermented. Mistletoe extracts have been administered by injections (sometimes in the vicinity of the tumor), or intravenous infusion.

Reference: *Mistletoe, Mythology and Medicine*, Katrina Thompson. Go to www.cancersalves.com.

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Southern Regional Aquaculture Center - Solving Aquaculture Problems

Thomas K. Hill, Professor Emeritus, Fisheries Management

The Southern Regional Aquaculture Center (SRAC) is one of five regional centers established by Congress about 15 years ago. The centers are administered through the USDA Cooperative State Research, Education, and Extension Service. Mississippi State University serves as the host institution for SRAC and the administrative center is located at the Thad Cochran National Warmwater Aquaculture Center at Stoneville, MS.

Aquaculture is one of the most rapidly expanding agricultural industries both here and in other parts of the world. Domestic aquaculture production is centered in the southeast region where more than 100 species of fish, shellfish, and aquatic reptiles and plants are cultured for food, bait or ornamentals. The total economic value of southeastern aquaculture is over \$5 billion. Understandably, the need for information to sustain growth and development has increased dramatically over the past 20 years.

The need for SRAC is obvious. In simplest terms, SRAC provides an efficient means for identifying and solving aquaculture problems. Here's how it works. Priority research and education needs for the southern region are identified by the Industry Advisory Council, aquaculture

representatives from throughout the region. Then there is the Technical Committee which is composed of research and extension scientists who work at universities in the southern region. These two groups recommend project areas to the SRAC Board of Directors. The Board selects priority categories from the recommendations for project development and funding. The best scientific talent in the region is then brought together to address the identified problems.

The impact of these research efforts has been the development of many technologies that have been adopted by the aquaculture industry. Hundreds of high quality peer-reviewed scientific articles, graduate theses, technical papers and extension fact sheets have been published. This information is used by aquaculture producers, lending agencies, and consumers. High schools and colleges use SRAC publications in their classrooms throughout the United States and in other countries of the world.

For further information on SRAC and detailed reports of various projects, visit the SRAC web site at <http://www.msstate.edu/dept/srac>. You will find the following available:

FACT SHEETS – Information is available on more than 10 species of fish and shellfish.

RESEARCH PUBLICATIONS – Participating scientists have published numerous articles in scientific journals on work resulting from SRAC projects.

SRAC CD – Contains over 150 fact sheets.

SRAC VIDEOS – There are currently 20 videos available on subjects including catfish, bass, crawfish, water quality, shrimp, baitfish and more.

AQUAPLANT – This web site was designed to help pond owners and their advisors in the identification and management of aquatic vegetation.

Also, each Extension leader was sent a CD last year (March 2003) that has all of the SRAC extension publications (more than 150) that can be printed off in the Extension offices. Additionally, as many of you know because you utilize them, a large number of these Extension publications are available in printed form from the mailroom at the University of Tennessee. I know you will find these publications useful as you work with your clients to provide them the best available research based information.

###

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.

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