

Why a nutrient management plan?

By TOM BASDEN

Nutrient Management Specialist, WVU Extension Service

Congress passed the Clean Water Act nearly 30 years ago to eliminate the discharge of pollutants into U.S. waters and achieve water quality levels that are fishable and swimmable. Initially, the U.S. Environmental Protection Agency (EPA) concentrated on industrial point source and sewage treatment sources of pollutants.

The Clean Water Action Plan, announced in 1998, refocused the cleanup of surface waters to include nonpoint sources of pollution. This type of pollution typically is described as coming from lawn care, agriculture, forestry, and construction activities. These nonpoint sources include livestock operations described by EPA as animal feeding operations (AFO) or concentrated animal feeding operations (CAFO). An AFO is a feeding operation that does not have to be regulated; a CAFO is a regulated feeding operation that has been inspected and found to be a significant contributor of water pollution or that has more than 1,000 animal units in its operation.

Livestock owners and operators are becoming familiar with the National Pollutant Discharge Elimination System (NPDES). This system is being revised to address nonpoint source discharges. If approved, the system would identify

individual livestock operations as an AFO or a CAFO, and then issue a permit to the operator if discharges of pollutants are found to be coming from the operation. These permits will require the implementation of a comprehensive nutrient management plan (CNMP) to address the nutrient, sediment, or pathogen discharges.

A nutrient management plan has six components. Four are necessary and two depend on the individual operation.

1. Proper storage of manure and maintenance of the storage structure.
2. Proper land application of the manure.
3. Appropriate site management that looks at the risks on a particular field, such as sinkholes, streams running through the field, shallow groundwater, or erosion that needs to be controlled.
4. Record keeping that documents land practices, so that if anyone has questions, there is proof of what is being done and why.

The two optional components under the plan are:

5. Feed management to improve feed efficiency so that nutrient content of manure is reduced.
6. Alternative uses for the manure. This component is needed by producers whose

operations generate more manure than can be applied on their own land.

An NPDES permit will include a schedule for completing a nutrient management plan and the requirement that it be maintained and updated. The livestock operation's owner is responsible for the development, implementation, and maintenance of the plan.

The Natural Resources Conservation Service's role is to provide technical guidance in writing nutrient management plans. Independent certified planners or certified staff from the Soil Conservation Agency and WVU Extension Service also are available to area livestock producers interested in developing a plan.

Nutrient management planners in the Northeast are preparing to respond to the 80 percent of landowners who own livestock who are expected to have a nutrient management plan within the next three to five years. The West Virginia Department of Agriculture (WVDA) has established a nutrient management certification program. Individuals are fulfilling the certification requirements in anticipation of the future workload.

West Virginia livestock producers should not see nutrient management planning as a regulatory hoop to jump through. It is a management tool that can improve farm profitability. Over the last 10 years, many farmers developed nutrient management plans before this regulatory pressure arose so they could safely apply nutrients to their farmland and get the most nutrient value from their animal manure.

A nutrient management plan is a method of demonstrating that the farm operator is minimizing the environmental impacts of raising livestock while improving the efficiency of the operation. Regulators will be looking at groups of farmers in watersheds to adopt nutrient management strategies as a whole. If groups of farmers voluntarily implement nutrient management plans, it eventually will allow them to defend themselves in situations where agriculture is accused of creating environmental problems.

If you are a livestock producer, how well do you recycle the animal manure generated on your farm? How well do you manage the winter feeding area on the farm? Are you currently using a nutrient management plan that is updated annually by a certified planner? If a Division of Environmental Protection officer visited your operation, could you document how you are minimizing erosion, utilizing manure, and applying fertilizer at the right time and rate?

Why do you need a nutrient management plan? Because a nutrient management plan makes sense from the environmental, risk management, and economic points of view. At this time, the West Virginia Department of Agriculture has 42 certified nutrient management planners throughout the state. Contact the WVDA at (304) 558-2201 for assistance in locating one of these certified planners. The planner will help you become prepared for the changing regulatory environment and improve your ability to defend the actions you take on your farm. ●

Extending grazing season reduces costs

By ED RAYBURN

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Feed—especially winter feed—represents over half of the cost of producing livestock. The winter feed cost for a beef cow often ranges between \$1 and \$1.50 per head per day. Since pasture costs one-half to one-third as much to produce as harvested feeds, extending the grazing season is one of the most effective ways to reduce costs. One can minimize feed costs by striving to achieve as close to a 12-month grazing season as practical.

Managing a forage crop by accumulating forage produced during a period of active growth for grazing when forage growth has ended is called "stockpiling" or "deferred grazing." Deferred fall and winter grazing can reduce the need for hay feeding and the cost of maintaining cattle. The amount and quality of forage available for grazing in late fall and winter are determined by the starting date of accumulation, nitrogen

fertilization rate, forage species present, and date of forage use.

Average snow-free wintering season

Experience has shown that most livestock accustomed to winter grazing will actively graze through new snow that is 8 inches deep. Cattle grazing is limited by compacted or crusted snow, but horses and sheep are adept at pawing through heavy snow or crust to reach the grass underneath. When you allow animals to graze in deep snow, it is important to keep an eye on body condition to ensure that they are obtaining enough feed. The length of the snow-free wintering season varies with elevation.

Forage species for deferred grazing

Forage species adapted to deferred grazing include perennials such as tall fescue, orchardgrass, and companion perennial legumes; winter annual grasses such as rye and wheat; and annual forbs such as the brassicas. Among the perennials, the legumes are the most damaged by hard frosts and need to be grazed before frost damage and weathering cause excessive dry matter and quality loss. If planning to graze alfalfa after frost, keep in mind that bloat is likely to be a problem on recently frosted alfalfa.

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Perennial grasses differ in their tolerance to freezing and weather damage. Reed canarygrass and bromegrass are the most sensitive to frost damage; orchardgrass and Kentucky bluegrass are intermediate in sensitivity; and tall fescue is the most tolerant.

Tall fescue is the best grass species to use for late fall and winter grazing. In the late fall,

on date of deferral, soil fertility, legume content, rate and timing of nitrogen fertilizer, and weather conditions after growth ends.

The quality of stockpiled tall fescue is more than adequate for dry mature livestock that need only to maintain body weight. If fertilized with 50 pounds to 100 pounds nitrogen per acre in July or August, tall fescue harvested in December will yield 2,000 pounds to 4,000 pounds dry matter per acre, containing 8% to 16% crude protein and 60% to 65% digestible energy.

Crude protein content increases as nitrogen application date is delayed from June to September. It increases with nitrogen fertilization rate, but decreases as deferral date and environmental conditions improve growth potential. Digestibility and palatability of tall fescue increase in the fall as cool weather causes the

nonstructural carbohydrates (sugars) to increase. Forage deferred from August and September with nitrogen fertilization will have the high digestibility and intake (61% TDN, 2.5% DMI) but intermediate to low yields.

After killing frosts, forage quality will decline as rain leaches nutrients from the forages. This results in a gradual loss of crude protein and digestibility as winter progresses. As new growth begins in the spring, quality will increase.

A study at the Jackson Branch of the Ohio Agricultural Research and Development Center evaluated the body weight and condition score gain by gestating beef cows grazing stockpiled tall fescue (Table 1). During the four-year study, body weight gains averaged 1.71 pounds per head per day, ranging from 1.64 pounds to 1.85 pounds. Increase in body condition score over the fall grazing season averaged 0.71 unit, with a significant reduction in the number of cows in body condition 4 or lower,

which is considered critical for cow productivity and profitability (Table 2).

When to start stockpiling

Highest yields of stockpiled tall fescue are obtained by early deferral. Due to low light intensity and cool temperatures, little forage growth occurs after early to mid-November. For high yield and quality,

stockpiling of tall fescue should start between mid-July and mid-August. The earlier stockpiling starts, the greater the late fall yield will be. If fescue is stockpiled before July, quality will be lower, but yield will be about the same.

Response to nitrogen fertilization

Adequate nitrogen will increase yield and quality of stockpiled fall pasture. Nitrogen can be provided by growing clovers or by applying nitrogen from commercial fertilizer, manure, or chicken litter. Grasses need adequate nitrogen to grow actively, produce proteins, and accumulate sugars during the cool fall

Table 3. The average yield above a 2-inch stubble of stockpiled tall fescue in Virginia in mid-November based on date of deferral and rate of nitrogen fertilizer (11 site years reported by Green, Rayburn, and White).

weather. The accumulation of proteins and sugars makes fescue more tolerant to freezing and provides a greener, higher quality forage for grazing.

The response to nitrogen is reduced when legumes make up a large part of the stand, when there is a high residual soil nitrogen from previous applications of manure, or if other factors such as drought limit plant growth.

Typical fall yield response per unit of nitrogen applied averages about 20 pounds dry matter per pound of nitrogen (DM/lb. N) applied.

This occurs when nitrogen is applied at rates under 100 pounds per acre (lb./a). On the other hand, when there is a high legume content in the stand or when other minerals or drought limit growth, only 5 to 10 pounds DM/lb. N may be achieved.

The cost of additional forage produced with nitrogen fertilization can be estimated using the forage yield response per pound of nitrogen and the price of nitrogen. If a yield response of 20 pounds of forage DM/lb. N can be expected and nitrogen costs \$0.36 per pound, then each additional pound of forage grown costs:

$\$0.36 / 20 \text{ pounds of forage} = \$0.018/\text{lb}$ or $\$36/\text{ton DM}$

For a 1,200-pound cow eating 2% of her body weight (24 lb. DM), this would cost:

$\$0.018 \times 24 = \$0.432 / \text{cow/ day}$

When using nitrogen, apply it at 50 to 100 pounds per acre, depending on the amount of forage desired. Fertilizer nitrogen should be applied soon after stockpiling starts. If using urea, apply it just before a rain to reduce the loss of nitrogen by volatilization. Ammonia formulations of nitrogen do not run the same risk of loss as urea.

Productivity, grazing management, and acreage requirement

Stockpiled tall fescue yield is determined by the number of days the stand is deferred and the rate of nitrogen fertilizer applied. The dry matter yield will vary due to differences in fall weather, soil conditions, and management before stockpiling and at harvest. Table 3 shows the average dry matter yield obtained in Virginia based on days regrowth before November 15 and nitrogen rate. The average yield over seven years in Ohio was 3,576 lb./a, with 74 lb. N/a in August. Depending on frost and weathering damage, losses from November into December will range from 0-1,000 pounds with an additional 600-1,200 pounds DM/a from December to February.

If animals are allowed free access to stockpiled forage, they will eat only a part of the forage and walk much of it into the ground. By providing only what the herd will consume in one to seven days, more forage will be eaten and less wasted.

The highest utilization will be achieved by using daily strip grazing. One acre of a dense 8- to 10-inch high tall fescue pasture will feed 50 1,000-pound dry cows for two to three days. In cold weather, forage intake may be higher. In rainy weather, treading damage may decrease utilization. Grazing to a 2-inch stubble increases forage use, decreases the competitive nature of endophyte-infected tall fescue, and helps maintain more legumes in the stand. When grazing endophyte-free tall fescue, leave a 2- to 4-inch stubble at the end of grazing. This encourages a vigorous spring growth that will improve long-term stand persistence. When grazing tall fescue during

Table 1. Fall grazing gain of gestating beef cows on stockpiled tall fescue in Ohio at the Jackson Branch, OADC (adapted from Boyles et al. 1998).

stockpiled tall fescue can be leafy, palatable, and high in protein, sugars, and digestible energy. Livestock producers have mixed feelings about tall fescue due to poor animal performance on this forage during the summer. With the exception of lactating dairy animals and pregnant mares, there is seldom a problem when tall fescue is used as part of a system containing other forages.

Other perennial forage species have growth response and forage quality similar to tall fescue until they are killed by frost and undergo weather damage caused by rain and snow.

Quality of deferred pasture

When pasture is managed for deferred grazing, a compromise has to be made between yield and quality. Management that provides the highest yield often produces lower quality forage. Forage quality and yield depend

Table 2. Change in body condition score of gestating beef cows grazing stockpiled tall fescue in Ohio at the Jackson Branch, OADC (adapted from Boyles et al. 1998).

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Oxygen depletion results in 'summerkill'

BY KEN SEMMENS

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As you walk around your pond one summer day, you see a dead fish, then another, and then many more. Dead fish ring the pond or have accumulated in a raft of debris on the downwind side. You wonder what happened and what you should do. Your pond has suffered summerkill.

Summerkill is a type of oxygen depletion. In short, lack of oxygen causes the fish to suffocate. Instead of an oxygen concentration between 4 and 10 parts per million (ppm), the amount of oxygen dissolved in the water is less than 2 ppm and perhaps less than 1 ppm. The oxygen depletion need only occur for a short time to kill the fish. It may occur at night. Chances are that the oxygen concentration will have already increased to normal levels by the time you discover the problem.

If you discover the oxygen depletion as it happens, you would see fish swimming head up at the water surface, opening and closing their mouths. Called "piping," this is a way for fish to obtain oxygen as it dissolves from the atmosphere into the water surface film. Fish also will seek out oxygen in water sources like streams or, possibly, springs. The more severe the oxygen depletion, the more desperate the fish's response. Muscles used for swimming require oxygen to work, so many of the piping fish eventually will swim to the edge of the pond and rest on the bottom. They continue to breathe heavily in an effort to obtain as much oxygen as possible.

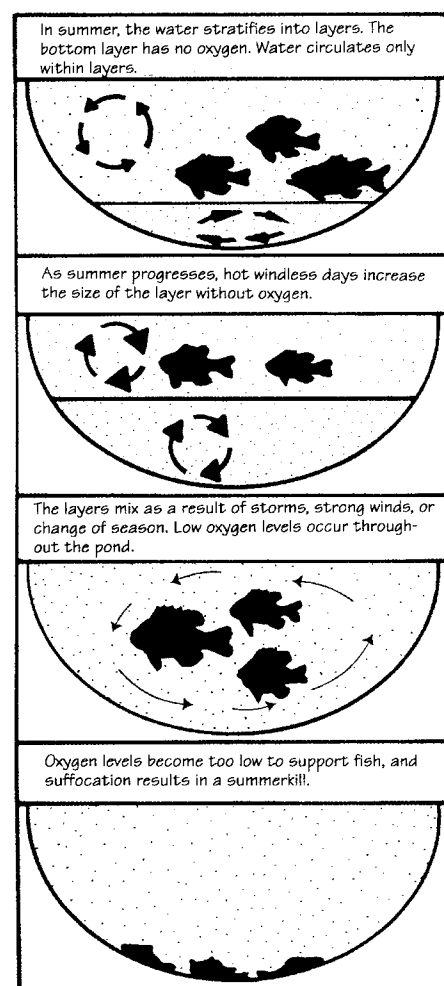
If oxygen does not immediately become available, the fish will die. Large fish tend to die before small fish. Small fish, which require less oxygen, frequently find some relief in shallow areas where large fish cannot go. Many dead fish will sink and float to the surface several hours later. The day after a fish kill, the amount of fish lost appears greatest as the dead fish bloat and float. This is a good time to determine the number, the kind, and the size of fish lost. Eventually, the dead fish will "melt" away and disappear.

The potential for summerkill depends on the presence of a layer of water on the bottom of the pond that has no oxygen (see the figure). This bottom layer is cooler and may have a dark color or an unpleasant smell. If the water on the bottom is "bad," fish will avoid this layer even if they prefer the cooler temperatures (trout, for example). Bacterial decomposition of plant or animal matter causes this "bad" water. This condition occurs more frequently in deep ponds where excess water is discharged from the surface layer. The bottom layer slowly accumulates while any overflow comes from the top layer.

A weather event usually triggers summerkill. The event, which may be a strong wind, a hard rain, or a quick flush of water,

causes the top and bottom layers of the pond to mix. Mixing occurs more easily in the spring or fall when the temperatures of the top and bottom layers are similar. After the mixing, the pond color may change from green to brown. The oxygen depletion may happen a day or two following the weather event.

If you discover an oxygen depletion as it is happening, the obvious course of action is to add oxygen to the water. Increasing the flow of oxygenated water to the pond is one strategy. Another is to aerate the water in the pond.



Aeration may consist of stirring, spraying, or using another way of exposing water to the atmosphere. Fish farmers have discovered that more oxygen is transferred when large volumes of water are exposed to the air rather than bubbling air into the water. Once the oxygen levels increase, the behavior of the fish will return to normal.

If the sun is shining on plants in the water, photosynthesis may save the day. You may recall that oxygen is a by-product of photosynthesis. These plants may be microscopic algae (phytoplankton) that make the water appear green. Rooted plants or filamentous algae growing below the water surface will add oxygen also. Plants floating on the surface (for example, water lilies) and other plants whose leaves are exposed to the atmosphere will not contribute significantly to the oxygen supply below the water surface.

It is possible for the oxygen depletion to return each night for several nights until the pond becomes stable again. For this reason, it may be prudent to for several nights, especially if plants in the pond are not producing much oxygen.

In the long run, the best strategy is to minimize the accumulation of "bad" water on the bottom of the pond. This can be done by drawing the overflow from the bottom rather than from the surface. For ponds with an overflow pipe in the deep part of the pond, this is a simple matter. Placing an oversize pipe over the overflow pipe so one end is slightly above the water surface and the other end is near the bottom will force overflow from the bottom of the pond.

It usually is unnecessary to restock the pond following oxygen depletion. Although many of the larger fish may have been killed, their seed remain in the pond and will grow to replace them. Restocking grass carp or hybrid striped bass would make sense since they do not spawn effectively in ponds and would not be replaced by recruitment.

Summerkill is one type of oxygen depletion. Other types include a "bloom crash" and winterkill. These topics and many others are discussed in the *Ohio Pond Management Handbook* published by the Ohio Department of Natural Resources (ODNR Public Information Center, 1952 Belcher Drive, Columbus, OH 43224). The figure accompanying this article appears on page 37 of that handbook. ●

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cold weather, livestock do not refuse the forage near manure piles as they do during summer grazing.

When legumes are used to provide nitrogen, the fall growth should be lightly grazed to use the legume before it is lost to freezing weather. Weaned calves can make good use of this high-quality legume forage. The grass can be saved for later use by dry cows. If the legume forage is not used before or shortly after frost, the usable forage yields from legume-tall fescue stands will be reduced.

Tall fescue stands containing clover or lespedeza should be grazed close during the winter or spring to encourage the establishment of legume seedlings. Dragging the pasture in early spring will spread the manure and seeds, ensuring a better distribution of seedlings and plant nutrients. By grazing the area after dragging, the cattle will walk the seed into the soil surface, improving seedling establishment. ●

Start saving now for college education

BY LINDA BULL

Lewis County Extension agent

and

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A college education can make a great difference in a child's life. Getting a college degree provides a person with enriched knowledge—useful both on and off the job, expanded job opportunities, and the potential to earn more money each year and over a lifetime. Whether you are the responsible parent or grandparent of an infant or a teenager, it is not too early—or too late—to make plans for the child's college education. Paying for that education is easier if you start early and develop long-range plans.

Costs

The cost of education beyond high school varies depending on the career field and the type of school. Community, technical, and junior colleges offer a variety of programs that can be completed in two years or less; their graduates receive an associate degree. These institutions often serve commuters from their geographic area at a lower cost.

Four-year colleges and universities offer a wider range of academic fields leading to a bachelor's degree and provide opportunities for graduate work. Costs include tuition, fees, room, board, books, transportation, and miscellaneous expenses. Public institutions generally have lower tuition rates for in-state students than private schools. In 1998, costs were about \$14,000 per semester for private institutions and about \$1,000 for public colleges.

As soon as the child is old enough to consider the type of education he or she would like to pursue, parents should seek specific information about schools that would meet the child's educational goals. There are many great financial aid programs. Financially speaking, all kids can go to college.

If you start saving when a child is born, you will have 18 years to save. A deposit of \$32 per month in an account earning 4 percent interest would yield \$10,000 over the 18-year period. However, if you wait until the child is 16 to begin, you will need to set aside \$401 per month to reach the \$10,000 goal. To save \$10,000 at 4 percent every five years, you need to save \$151.06 per month.

The most important thing is the disciplined commitment to regularly set aside a reasonable amount that you can afford each

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month. As soon as children can read and observe, teach them to become partners in their "college funds," making small donations from part-time jobs, allowances, and cash gifts. The attitudes and values learned in this experience will last a lifetime.

How to invest

The guidelines for educational fund investing are similar to those for retirement investing. When children are very young, parents and others can and should invest in higher growth instruments. As they approach the college years, it is best to transfer funds into lower risk investments. For example, for children up to age 12, you may want to consider a mix of U.S. and international stock-owning mutual funds. Over 10 years or so, the funds should far outpace other products. These funds have averaged 10 percent to 12 percent growth annually on money invested for at least a decade.

For children 12 to 14, investing in bonds, long-term certificates of deposit, and zero-coupon Treasury securities may be best. When children reach this age, start methodically moving some of the educational money from stocks to more secure investments and complete this process well before the freshman year.

Savings and investment instruments include savings accounts, certificates of deposit, bank money market accounts, money market mutual funds, U.S. savings bonds,

corporate bonds or stocks, and U.S. Treasury securities. Investment instruments vary in return and risk. Savings accounts, certificates of deposit, and bank money market accounts are low-risk investments because they are insured by the federal government up to \$100,000.

Of the low-risk options, savings accounts usually generate the lowest rates of interest, but they may be a good choice for short-term investment. Certificates of deposit often produce a higher rate of return if invested until the maturity date determined at the time of purchase. Series EE U.S. Savings Bonds purchased to pay for a child's education are tax-exempt when cashed if they are held in a parent's name, and if the parent files a single income tax return on an income of \$42,300 or less or a joint return on an income of \$63,450 or less.

U.S. Treasury securities (bills, notes, or bonds) are essentially risk-free because the federal government backs them, but rates of return vary with the length of issue. In terms of U.S. Savings Bonds, parents should check out the I bonds now paying 7.1 percent interest. These are exempt from state and local income taxes. Federal income tax on I bonds' earnings can be deferred until the bonds are cashed or when they stop earning interest after 30 years. Investors cashing I bonds before five years are subject to a three-month earnings penalty. For more information, check the Web site (www.publicdebt.treas.gov/com/comei500.htm) or call the Savings Bond Customer Service at 304-480-6112.

The Education IRA allows parents (or other interested parties, related or unrelated) to save up to \$500 a year for each child under

age 18 in the family. The initial contribution is not tax-deductible, but the money grows tax-free and distributions aren't taxed when used to pay for qualifying educational expenses. Although the Education IRA is a good savings tool, it is unlikely that savings of \$500 a year will cover all the costs of a college education. With mutual funds, money market mutual funds, and stocks and bonds, the risk is greater but so is the potential for return.

A new savings option for West Virginians, the West Virginia Prepaid College Plan, was initiated in 1998 through the State Treasurer's Office. The plan enables parents or others to contract for future tuition only at a West Virginia public college or university at the current tuition rate. The plan will have many changes when open enrollment occurs this fall. Now, enrollment is open only for students in the 10th grade or younger.

Like other financial products, the plan has advantages such as tax benefits and disadvantages such as the parent not being able to manage those dollars. As a consumer, you need to ask lots of questions. For example, what happens to the interest this prepaid investment earns if the child does not go to college? Are these dollars treated as a "resource" that decreases a family's statement of financial need on a dollar-for-dollar basis for federal financial aid program purposes? Are there other penalties?

Some information on this plan is available from the State Treasurer's Office at 1-800-307-4701 or on the Web (www.wvtreasury.com). Another Web site (www.collegesavings.org) provides additional details. Yet another (www.savingforcollege.com) provides some different points of view about this product.

Whose name is on the account?

UGMA/UTMA (Uniform Gifts to Minors Act, Uniform Transfers to Minors Act) accounts have been used for many years. If you choose to set up a child's savings account in this way, it is his or her money and you are the custodian. You can make withdrawals only for the child's benefit. Earnings are taxed at the child's lower rate.

These accounts have two disadvantages: (1) the child may decide to use the money for a different purpose when he/she reaches majority; and (2) when financial aid is calculated, as much as 35 percent of these funds is expected to be used for education each year.

If you keep the child's college savings in your name, the earnings will be taxed at your higher rate. An advantage is that when financial aid is calculated, only 6 percent of a parent's assets is expected to be used for education each year.

Remember, you do not have to have the total amount accumulated before your student begins college. Financial aid is available through colleges and universities in the form of grants, scholarships, loans, and work-study programs. Merit-based financial aid is based on academic performance, artistic ability, or athletic skill. Needs-based financial aid is based on projected costs and the student's ability to pay these costs. Begin early in your student's junior year of high school to investigate financial aid options. We wish you good luck with this family adventure. ●

So you want bobwhite quail?

By WILLIAM N. GRAFTON

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Bobwhite quail were fairly common in West Virginia until the 1970s. By that time, grassland farming had replaced cultivated crops, many fencerows had disappeared, and the forests were becoming mature. The "straw that broke the camel's back" was the extremely cold winters of the late 1970s. Quail froze or starved during these winters, with only a few holding on in the Ohio Valley, the Eastern Panhandle, and the Greenbrier and Monroe county areas.

Quail need a mixture of woodlands, brush, grass, and cultivated lands to maintain healthy populations. West Virginia and Ohio wildlife managers use a 40-acre area as general rule of thumb for providing quail habitat. The "40" should include at least 10 acres of corn, wheat, soybeans, lespedeza, or other quail foods. It also should have three to five acres of woody cover, or three separate quarter-acre woody thickets connected to the feeding area by travel lanes of brushy

fencerows, and a few acres of good nesting cover—grasses and forbs intermixed with scattered low shrubs and small trees.

Bobwhite quail can be managed easily. Simply provide the bird's three basic requirements—food, loafing and escape cover, and nesting cover—within its daily home range of $\frac{1}{8}$ to $\frac{1}{4}$ mile.

To provide food for quail:

- Leave weeds in the outside row or two of cultivated crops by not treating with herbicides. Such weeds as ragweed, beggar-ticks, smartweeds, dock, crabgrass, and foxtail grasses provide excellent seeds for quail food. Also leave a row or two of the grain unharvested.
- Plant Korean lespedeza in small areas too rough to farm.
- Selectively manage fencerows, odd areas,

and woods borders to favor food-producing shrubs and small trees.

Provide nesting cover for quail in the following ways:

- Delay mowing of fencerows and roadsides until after August 1.
- Maintain at least one shrubby-grassy fencerow along each crop field.

Once food and cover are adequate, it still may be necessary to release pen-raised birds to get bobwhite quail established. West Virginia's landscape has changed so much over the past 30 years that quail will be difficult to reestablish even in the heavily farmed counties. ●

WVU UPDATE

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The West Virginia University Extension Service and the WVU College of Agriculture, Forestry, and Consumer Sciences are pleased to offer this educational insert to the Farm Bureau NEWS as a service to West Virginians. We welcome your questions or comments.

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