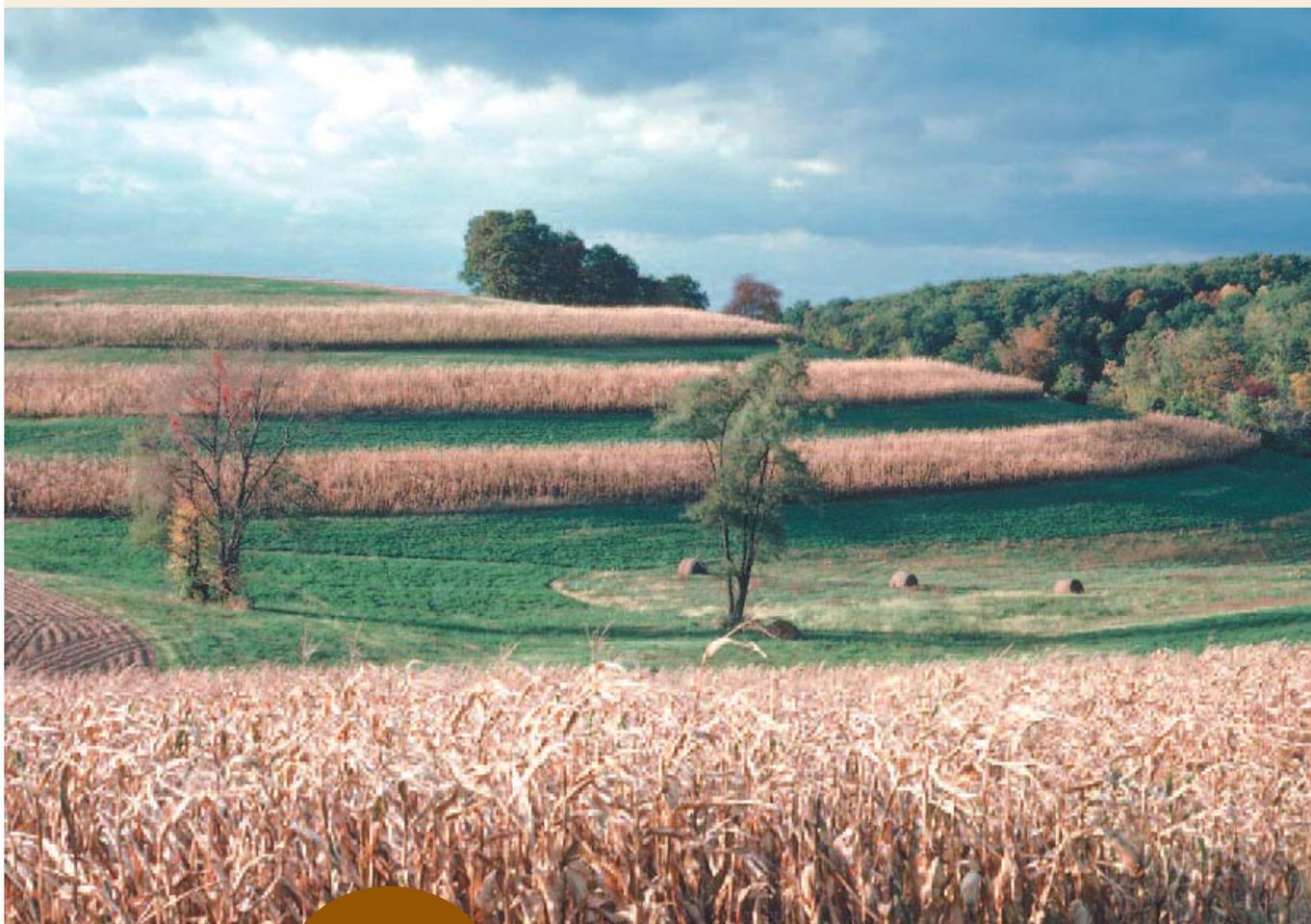




# Cover Crops

RESTORING THE SOIL AND PROTECTING THE BOTTOM LINE



CHESAPEAKE BAY FOUNDATION  
*Saving a National Treasure*



## HOW COVER CROPS CAN HELP YOU

**Farmers are the traditional stewards of the land.** Yet they face tough challenges as they try to balance profitability and the health of the soil and water. One tool to protect healthy land, water, and finances? Cover crops.

Farmers initially used cover crops to anchor soil, particularly in the winter. Recognizing the need for nitrogen to fertilize summer corn or sorghum crops, farmers started planting legume cover crops, such as clover or vetch.

Today, there is evolving recognition that cereal grain cover crops, such as

rye or wheat, can control erosion while also trapping much of the nitrogen left by the preceding corn or soybean crop, so it does not leach into groundwater. Research has shown that legumes, even in mixes with cereal grains, do not reduce nitrogen leaching nearly as much as cereal grains. That's why extension bureaus, conservation districts, and conservation services all promote—and sometimes cost-share—cereal grain cover crops to protect the soil and groundwater.

Farmers inspect the harvest at a farm in Lancaster County, Pennsylvania.

## WHY COVER CROPS?

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**Cover crops demand attention at the two most critical times of the year for row crops.**

They need to be planted while the row crops are being harvested and removed when it is time to plant the next row crop. So why should you shift energy from harvesting to plant a cover crop?

Cover crops, and especially cereal grain cover crops, are good for soil, drinking water, and streams and rivers. Government incentives encourage some, but many farmers prefer not to use government programs.

Cover crops can provide many benefits, not just for healthy soil and water, but for next year's crop and profits—and all the future crops to come.

Some suggest that cover crops cost more in time, energy, money, and yield of next year's crop than they pay. The truth, based on significant research, is that, as with almost everything else farmers do, the costs and benefits of cereal grain cover crops depend on where and how they are used.

## MANAGING COVER CROPS FOR PROFIT

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**Cereal grain cover crops offer numerous benefits.** The most common short-term benefits to the crop following the cover crop are:

- Weed control
- More plant-available water
- Nutrient recycling
- Reduced compaction and surface soil bulk density

Properly managed, each of these can provide economic benefits as well.

### • WEED CONTROL

**Carefully managed cover crops can generate herbicide savings of five to more than 25 dollars per acre.**

Numerous studies show that a vigorous cereal grain cover crop requires reduced rates of post burn-down herbicides. It can also eliminate the need for broadleaf control. This is due to two factors: the mulching effect of the cover crop, and the broadleaf suppression effect of chemicals in certain cover crops, such as rye.

Farmers can usually maximize these effects by letting the cover crop grow as long as possible before killing it. There are, however, nutrient recycling and water conservation reasons for wanting to kill the cover early in the spring. **Killing the cereal grain crop at or just before the “soft-dough” stage is probably optimum, but you can decide on the relative importance of each benefit.** If reduced herbicide use and/or increased weed control are important to you, you may want to let the cover crop grow longer to maximize that benefit, while recognizing it will reduce other benefits.

### • INCREASED WATER RETENTION

**Depending on the price of corn, better water retention can increase revenue by 20 to 150 dollars per acre.**

Research suggests cover crops may actually leave more water, not less, for the summer crop. The cover crop may speed drying of the soil in the early spring, but that is usually during a



period of excess moisture so it is, in fact, frequently desirable.

Cover crops increase infiltration of water over winter compared to fallow fields, so more water can be stored throughout the soil. Unlike fallow no-till or conservation tillage, the increased infiltration is not likely to increase nitrogen leaching since the cover crop has “trapped” much of the excess nitrogen in its topgrowth and roots during the fall. The increased infiltration means the cover-cropped soil starts the season with more available water.

After the cover is killed, the soil retains more water (by having lower evaporation rates) due to the vegetative mulch covering left by the cover crop. This, along with improved erosion control, is also why it is usually best to kill-down, crimp, or roll the cover crop rather than disking or plowing it. The combination of increased infiltration and reduced early summer evaporation can provide enough additional water to increase yields in drought years. Corn yield increases of 5-30 bushels/acre have been attributed to improved water availability due to use of cereal grain cover crops.

- **RECYCLING NUTRIENTS**

**At 2008 nitrogen prices, managing and crediting cover crops for nitrogen release could save farmers 10 to 25 dollars per acre—more if a pre-sidedress soil nitrogen test (PSNT) shows higher levels of available nitrogen.**

What appears to be the most obvious benefit of a cereal grain cover crop may also be the most challenging to manage for, and the most difficult to quantify. As “trap crops,” cover crops recycle nitrogen and other nutrients by capturing them in their biomass. How much of the trapped nitrogen is actually available to the next crop?

This is a particularly important question when corn is planted into a cover crop cereal grain. If the cover crop is allowed to grow later in the spring (past “soft-dough” stage), a more serious question is: Will the cover crop “immobilize” some of the applied nitrogen during its decomposition and require higher nitrogen rates to achieve optimal yields?

Data shows fairly consistent trends. All point to careful spring management as the key to making your cereal grain cover crop a nitrogen source rather than a nitrogen sink. For best release of stored nitrogen, March kill-downs are preferred, in the “pre- or early-boot stage.” If you want to optimize weed control and water retention while still getting nitrogen benefits, however, wait until the “soft-dough” growth stage to kill the cover crop. If immobilization of nitrogen occurs, it is more likely in “strawy” stems than in lush leaves. It also occurs early in the growing season, when soil nitrogen levels may be low and microbial decomposition of the cover crop is at its peak. Thus, particularly if you wait until “soft-dough” stage to kill the cover crop, application





Farmers can ensure healthy land and water through cereal grain cover crops.

of starter nitrogen to corn at planting is critical following a cover crop. It may be wise to increase the percent of total nitrogen applied as starter to about one-third of the total nitrogen application, with the rest applied at sidedress.

Although good calibration data for nitrogen application rates have not been developed, it may also be useful to do a PSNT to determine how much plant-available nitrogen is present. With proper cover crop management and use of enough starter nitrogen, “trapped” nitrogen can be made available for the following corn crop. Although recommended rates vary, some scientists suggest crediting 25-50 pounds of nitrogen per acre following an early killed cereal grain cover crop

which received starter nitrogen at planting.

If cover cropping becomes standard practice in your rotation, nitrogen accumulated in soil organic matter from cover cropping will be available for crop use within five to ten years. In this situation, long-term use of cover crops can be credited with 25-50 pounds per acre per year of nitrogen to corn crops. There could be considerably more available nitrogen, so it is probably a good idea to run a PSNT, as you do on a manured field, to determine how much nitrogen is available before sidedressing.

In addition to nitrogen, cover crops trap all plant nutrients in their tissue and may move nutrients from deeper in the soil to the surface through their root system. “Trapping” and “mining”

is probably most important for more leachable nutrients like sulfur and potassium, but it could also be important for calcium, magnesium, and perhaps even phosphorus. If you are applying sulfur, the cover crop may reduce that need (and cost), especially if you have deep sandy surface soils. Applied potassium leaches below roots of growing plants, but the cover crop traps it so that it is available for your crop. While sulfur and potassium are not serious water contaminants, it is more cost-effective to keep them in your soil.

- **REDUCE COMPACTION AND LOWER SURFACE SOIL BULK DENSITY**  
Improving aggregation and reducing bulk density make for a better seedbed and a denser and deeper root system which increases yields.

Research indicates that the use of cover crops, particularly when regularly incorporated into rotations, can reduce or prevent compaction and make the surface soil more porous. These effects enhance root growth and rooting depth and allow easier flow of air and water through the soil. The most conclusive research in reducing compaction has used “tap-rooted” nontraditional cover crops such as winter radish. However, cereal grains can have extensive root systems that help break up moderate compaction and provide soluble organic compounds. Cover crops also leave a lot of organic carbon in the surface soil that

improves porosity and reduces bulk density. Anyone who has ever had compaction problems knows that preventing or correcting it can have a major impact on row crop yield, particularly with corn.

## **CEREAL GRAIN COVER CROPS MAXIMIZE YOUR FINANCIAL RETURN**

**There are a number of compromises and trade-offs to ensure optimum benefits for weed control, water retention, nutrient recycling and soil quality from cereal grain cover crops.**

You should manage your cover crop to maximize those benefits you value the most. The following system, however, should enhance your gains overall.

First, plant cover crops as early as possible to allow good fall growth. If you can manage it carefully, rye germinates easily, gives the fastest fall growth, and keeps growing longer into winter than the other small grains. It also grows vigorously in the spring and can provide good mulch, even with an early kill-down. Spring growth is the challenging part. Once temperatures warm, rye grows quickly, so the critical spring management is to kill it at/before the “soft-dough” stage. For all cereal grain cover crops, but particularly for rye, killing them between the early boot and “soft-dough” stage is likely to provide the greatest returns to the next crop.





Stripcropping yields benefits on this Pennsylvania farm.

## **COVER CROPS FOR THE LONG-TERM: IMPROVING SOIL QUALITY AND THE BOTTOM LINE**

**Long-term, continual use of cover crops is widely recognized as being good for soil quality.** Most farmers know that it is good to improve soil quality but have a hard time assigning a specific dollar value. Cover crops prove themselves to farmers who grow crops (such as vegetables, silage, and tobacco) that are said to be “hard” on the soil, frequently requiring extensive tillage and/or leaving very little healthy organic residue. Farmers growing these crops routinely plant cover crops as soon as the summer crop is harvested. And although dairy producers may utilize their rye cover crop, the vegetable growers and the remaining tobacco growers have found fewer uses.

Still, all three groups have recognized that over time, cover crops

counter the loss of soil organic carbon, destruction of soil structure, and frequent compaction caused by tillage-intensive crops with little residue. Growing cover crops may be essential to maintaining soil quality where crops that are “hard” on the soil are grown. They can maintain and even improve soil quality, and thus yield profitability in the row crop rotations common to the mid-Atlantic.

## **FINAL WORDS**

**Farmers who manage cover crops carefully and make timely decisions will be happy with the results. Cover crops do not cost, they pay. And the region’s soil and water resources benefit as well.**

*For more information, visit [cbf.org/covercrops](http://cbf.org/covercrops).*



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*Saving a National Treasure*

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### **ABOUT THE COVER:**

Stripcropping prevents erosion on farms in Carroll County, Maryland.

Photos by Tim McCabe, Natural Resource Conservation Service (NRCS).

### **PHOTO CREDITS:**

page 1: Bob Nichols, NRCS

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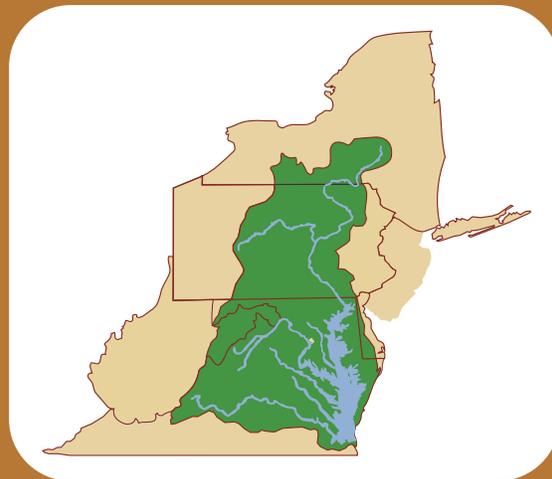


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## CHESAPEAKE BAY WATERSHED



The Chesapeake Bay's 64,000-square-mile watershed covers parts of six states and is home to more than 17 million people.



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