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Farm FORWARD

How Chesapeake Bay Farms Can Improve Water Quality, Mitigate Climate Change, Create a More Resilient Future, and Support Jobs and Local Economies

John Pavoncello/The York Dispatch

CHESAPEAKE BAY FOUNDATION

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WHITE PAPER

FARM FORWARD

How Chesapeake Bay Farms Can Improve Water Quality, Mitigate Climate Change, Create a More Resilient Future, and Support Jobs and Local Economies

Executive Summary

Approximately 40 percent of land in the United States, and one-third of the Chesapeake Bay's 64,000-square-mile watershed, is dedicated to farming.[1] It's no wonder then that the way we farm has profound consequences for the health of our communities, our environment, and our local economies. The status quo food system isn't working for us or the environment.

Agriculture is the largest source of pollution to the Chesapeake Bay and its watershed and impairs many other waterways of national importance, such as the Great Lakes and the Gulf of Mexico.[2] It also remains a significant source of climate-warming greenhouse gases, accounting for roughly 10 percent of U.S. emissions annually.[3] In addition, many farms are vulnerable to the effects of climate change, which are already being felt across the Chesapeake Bay watershed. Extreme storms can lead to floods that wash away soil and fertilizers, damaging crops and farmland and carrying pollution into waterways, and droughts are among the costliest environmental disasters in the United States.[4]

Agricultural conservation practices are one of the most cost-effective solutions to address these urgent problems, providing multiple environmental and societal benefits. Practices that focus on building healthy soils and maintaining permanent vegetation such as forest buffers can reduce pollution, actively remove carbon from the atmosphere, and improve the land's ability to withstand floods, drought, and other extremes linked to climate change.

For example, CBF's multi-year study of farms in in the Bay watershed that converted conventional farmland to rotationally grazed pasture found an average reduction of 42 percent for net greenhouse gas emissions and average reductions of 63 percent, 67 percent, and 47 percent for nitrogen, phosphorus, and sediment pollution, respectively.[5]

Additionally, many of these practices help farmers cut costs and make their farms more resilient to environmental and economic shocks by increasing yields, reducing the need for costly inputs like fertilizers and pesticides, and buffering the impacts of extreme weather. For example, case studies of farms that adopted soil health conservation practices including reduced tilling and no-till, cover crops, and nutrient management, found that row crop farmers improved their bottom line by an average of $37 per acre, per year.[6]

There is acute need in the Chesapeake Bay watershed to adopt these farming practices on a much larger scale. Collectively, the six Bay states, and especially Pennsylvania, are far behind schedule in meeting the pollution reductions required by the Chesapeake Clean Water Blueprint (formally the Chesapeake Bay Total Maximum Daily Load, or TMDL). These reductions in nitrogen, phosphorus,

and sediment pollution are needed to remove the Bay from the federal "dirty waters" list.[7] **More than 80 percent of the remaining pollution reductions must come from agriculture.**[8]

With less than four years until the Blueprint's 2025 deadline, providing more financial and technical support to help farmers implement conservation practices, especially forest buffers, is essential to meet the requirements on time.

Forest buffers are not only the most cost-effective way to reduce polluted runoff from farm fields, they also reduce greenhouse gases. If the Bay states meet their commitment of implementing 190,500 acres of forest buffers by 2025,[9] it would remove more than 173,000 metric tons of carbon dioxide annually[10]—equivalent to the annual emissions of more than 37,600 passenger vehicles.[11]

Investing in conservation practices can also benefit local economies. For example, the trees used to create forest buffers, as well as the supplies necessary to fence cattle out of streams, are purchased from local business and frequently installed by local contractors. As an example of the size of the effort, the Keystone Ten Million Trees Partnership, led by the Chesapeake Bay Foundation, has a goal to plant 10 million new trees in Pennsylvania before the end of 2025. The partnership is spending about $2.7 million for nearly 700,000 trees, shelters, and stakes to supply plantings through 2022. Local businesses will be providing the trees and other supplies, which will be used primarily to create forest buffers.

Without delay, federal lawmakers should increase funding for agricultural conservation programs and technical assistance. The U.S. Department of Agriculture (USDA) should establish the Chesapeake Resilient Farms Initiative, which would direct additional federal dollars to the watershed, particularly to Pennsylvania.

USDA must also reinvigorate the federal Conservation Reserve Enhancement Program (CREP) and accelerate forest buffer plantings by allowing states to take advantage of new improvements included in the 2018 Farm Bill, updating cost-share rates to ensure farmers are adequately compensated, and administering the program efficiently and effectively.

Implementing conservation practices will not only benefit farmers and achieve a restored Bay—worth an estimated $130 billion annually in economic, public health, and environmental benefits[12]—but will also make significant gains toward the nation's climate goals[13] and improve the wellbeing of the more than 18 million people who call the watershed home.

The Need for Agricultural Conservation Practices in the Chesapeake Bay Watershed

The Chesapeake Bay, despite progress to reduce pollution, remains dangerously out of balance, with persistent areas of low oxygen and greatly diminished habitats that are critical for supporting robust populations of fish and wildlife.[14] The Bay is subject to a Total Maximum Daily Load (TMDL) established in 2010 by the U.S. Environmental Protection Agency (EPA) that sets limits on the amount of nitrogen, phosphorus, and sediment pollution that can flow into its waters.[7] All six states and the District of Columbia that share the Bay watershed agreed to create and implement plans by 2025 to meet the TMDL requirements and restore the Bay to health. Together, the TMDL and the state plans form the Chesapeake Clean Water Blueprint. This federal/state partnership is the largest and most complex of its kind in the nation.

But the Bay states—and especially the state of Pennsylvania—are far behind in meeting their pollution-reduction commitments. State plans to achieve the Blueprint goals identify that 80 percent of the remaining pollution reductions must come from agriculture.[8] While many farmers are beginning to adopt conservation practices that reduce pollution, the effort must urgently accelerate and scale up in areas of the watershed where these practices will have the greatest effect in order to meet the 2025 deadline on time.

Of particular importance is turning around severely lagging efforts to plant forest buffers along streams[9], which are one of the most cost-effective ways to reduce water pollution from agricultural lands and can be an important tool to mitigate climate change. If the Bay states meet their commitment of implementing 190,500 acres of forest buffers by 2025, it would remove more than 173,000 metric tons of carbon dioxide annually[10]—equivalent to the annual emissions of more than 37,600 passenger vehicles.[11]

The most recent data (2019) from the Chesapeake Assessment Scenario Tool show Pennsylvania has only implemented 10 percent of its 2025 goal for forest buffers.[8] Virginia has only implemented 4 percent of its goal. And while Maryland has achieved 86 percent of its commitment, its goal was low, at only one-third of Virginia's and one-fifth of Pennsylvania's.

Up-front costs and a shortage of technical experts to assist with implementation create barriers for many farmers who want to adopt conservation practices, including forest buffers. While some Bay states and the federal government offer cost-share programs and assistance, historical funding levels are not nearly enough to meet the need, and bureaucratic obstacles have left key programs languishing. Significant increases in USDA conservation funding to support buffer implementation will be critical to meet the 2025 requirements.

In Pennsylvania alone, the agricultural funding need between now and 2025 is roughly $3 billion, and data indicate the state isn't getting its fair share of federal conservation dollars. A 2017 report by the U.S. Governmental Accountability Office suggested that Pennsylvania is shortchanged roughly $20 million each year by the Environmental Quality Incentives Program—a cost-sharing program for conservation practices—because the money is allocated based more on historical funding amounts than conservation needs.[15] In addition, unlike Virginia and Maryland, Pennsylvania does not currently have a state agricultural cost-share program to provide resources to its farmers.

Benefits for Water, Climate, and Economies

Investing in agricultural conservation practices benefits more than water quality. Many of the same practices that reduce pollution flowing into waterways are also an important tool for reducing greenhouse gas emissions and building resilience to climate change, as well as providing economic benefits to farmers and their communities.

Water Quality Benefits

The biggest sources of water pollution from agriculture are sediment and fertilizers that wash off the land during rainstorms and flow into agricultural drainage ditches or directly into nearby rivers and streams.

Sediment can smother aquatic life and block sunlight that submerged aquatic plants need to grow, destroying habitat for many species. Fertilizers and manure add excess nutrients, primarily nitrogen

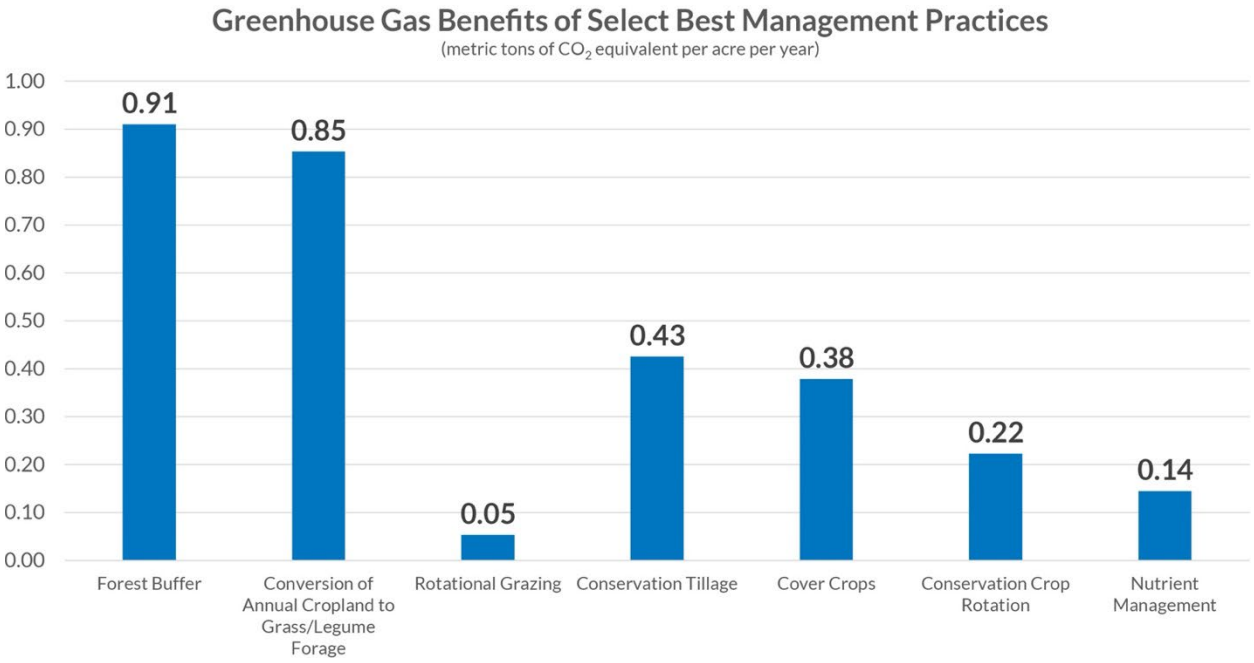
and phosphorus, that feed large algal blooms. When these massive blooms die, the decomposition process depletes the surrounding water of oxygen, creating dead zones where many species cannot survive. Some blooms also produce toxins that are harmful to animals and humans.

Forest buffers along streams and conservation practices that build healthy soils in farm fields reduce the amount of these pollutants reaching nearby waterways by acting like a sponge that soaks up water and nutrients.

Climate Benefits

Many of the same conservation practices that reduce water pollution also reduce agricultural emissions of some of the most common greenhouse gases and remove carbon from the atmosphere. They also help build the land's resilience to climate extremes. These benefits are of particular note for efforts to address global climate change.

Conservation practices that reduce the use of farm equipment, such as rotational grazing and reduced tilling, can directly limit the amount of carbon dioxide (CO_2) released into the atmosphere from agricultural activity.



In addition to CO_2, farms can reduce emissions of nitrous oxide (N_2O), which is predominately produced in the soil by microbial processes and is heavily influenced by how much nitrogen fertilizer and manure farmers apply to the land. By using best practices to manage the amount and timing of fertilizer and manure applications, or converting fields from grain crops to pasture, farmers can directly reduce the amount of nitrogen applied to fields as well as increase the amount of nitrogen used by plants. And while methane (CH_4) is emitted by cattle during the fermentation process they use to extract nutrition from the food they eat, the amount of these "enteric" emissions can be managed through the type of food and supplements farmers feed their livestock.

Farms have the potential to not only limit their own emissions, but also become a carbon sink by taking more CO_2 out of the atmosphere than they emit. The primary way they do so is by building healthy soils and maintaining areas of permanent vegetation—namely, forest buffers and pasture. By increasing the amount of organic matter in the soil, which refers to materials like decomposing leaves and insects, conservation practices increase the amount of carbon stored in ground. Living trees and plants also remove CO_2 from the air during photosynthesis and store the carbon in their branches, stems, and leaves.

Practices that build healthy soils also build resilience to climate change. Healthy soils are slower to dry out during periods of drought and have a greater capacity to soak water into the ground during heavy rainstorms, reducing flooding. Farms with healthy soils can often reduce their vulnerability to pests, diseases, and other climate-related risks. In addition, forested streamside buffers on farms not only filter pollutants and remove carbon from the atmosphere, but also have a cooling effect on nearby land and streams—an increasingly important role as temperatures rise[16] and threaten aquatic species, like trout, that need cool water to survive.

Economic Benefits

Farmers who adopt conservation practices are often motivated by ecological and societal benefits, but economic benefits are also a major factor.

For example, grazing livestock can significantly reduce the amount of money farmers spend feeding their animals. Nationwide, feed costs accounted for an estimated 75 percent of the operating costs for dairy farms in 2020,[17] according to the U.S. Department of Agriculture (USDA). Instead of purchasing feed elsewhere or growing crops on-farm that must be harvested for feed, farmers who graze their animals rely largely on the grass and forage growing in their pastures.

Cost savings from reduced use of synthetic fertilizers, herbicides, insecticides, and antibiotics can also have a positive impact on farm profitability. And increasing the resilience of farms to climate extremes like droughts and floods, which are intensified by climate change, could help curtail major economic losses in the agricultural sector. Case studies conducted by the American Farmland Trust measured the economic benefits to farmers that adopted soil health conservation practices in New York, Illinois, and California. The studies found that row crop farmers improved their bottom line by an average of $37 per acre per year and, on average, farmers received nearly three dollars back for every dollar they invested in conservation practices.[6]

Establishing conservation practices on farms often requires supplies such as fencing, water systems, and trees and shrubs. Investing in conservation practices therefore provides an economic boost to local businesses and can create jobs for workers who are involved in supplying the necessary materials and providing technical assistance and maintenance.

Best Practices and How They Work

Conservation practices, frequently called best management practices, or BMPs, are tools that farmers can use to reduce soil and fertilizer runoff, properly manage animal waste, and protect water and air quality on their farms. Widespread use of the following practices could significantly reduce pollution in the Chesapeake Bay watershed, reduce climate emissions and the associated

damage from climate change, and help improve farmers' bottom line by building healthy soils and reducing operational costs.

Streamside Forest Buffers

Forested buffers are areas bordering stream banks that are taken out of crop production or pasture use and planted with native trees, shrubs, or grasses. Buffers are at least 35 feet wide on either side of a stream. They act as natural filters that slow water flowing off the surrounding fields and allow nutrients from fertilizer and manure to soak into the ground. They benefit both the farm and the streams by reducing erosion of soil, and farmers can select trees that provide additional benefits—such as shade for livestock or fruit and nuts that can be harvested as additional crops. In addition, they are an incredibly effective tool for mitigating climate change and its effects. Trees remove carbon dioxide directly from the air through photosynthesis. They move carbon into the soil, as well as store it in their leaves and branches, keeping it out of the atmosphere where it contributes to climate change. Each acre of forest buffer removes nearly 1 metric ton of carbon dioxide per year.[10] They also cool the surrounding land and waters, a valuable function as temperatures rise and extreme heat events become more common, and provide refuge for wildlife and pollinators.

Converting Cropland to Pasture and Rotational Grazing

Livestock operations often grow corn and other crops to feed their animals. By converting this land to pasture, farmers can build their soil health and create a permanent cover of vegetation that traps soil, water, nutrients, and carbon. In addition, rotational grazing involves frequently moving livestock between small grass pastures, sometimes as often as once a day, rather than keeping livestock on the same area of land for long periods of time. This allows plants time to regenerate, preventing bare ground and keeping pastures more vibrant with healthier soil. By moving animals frequently, rotational grazing also spreads manure naturally over the land rather than concentrating it in one place.

CBF's multi-year study of farms in in the Bay watershed that converted conventional farmland to rotationally-grazed pasture found an average reduction of 42 percent for net greenhouse gas emissions and average reductions of 63 percent, 67 percent, and 47 percent for nitrogen, phosphorus, and sediment pollution, respectively.[5]

Streamside Fencing

Installing fences along streams in pasture areas is a simple but essential way to reduce pollution on farms. When livestock enter streams on farms, their hooves can cause erosion and damage the streambanks, and they can defecate and urinate directly in the water, which adds excess nutrients. Fences keep livestock and their waste out of waterways, reducing pollution and erosion and helping prevent the spread of waterborne disease. Though many farmers allow livestock access to streams as a water source, water pumps and lines, and even solar-powered mobile watering stations, can provide viable alternatives. In addition, the purchase of the supplies necessary to fence the cattle out of streams benefits local businesses.

Nutrient Management Plans (NMPs)

Nutrient Management Plans (NMPs) are documents that outline how much and when fertilizers should be used on a farm's crops. This helps ensure that crops are able to use the fertilizer when it is applied, and that fertilizers aren't overapplied. By developing and using the nutrient management plan, farmers can minimize fertilizer costs and reduce nutrient runoff into local waterways.

Continuous No-Till

Continuous no-till, also known as conservation tillage, reduces erosion and runoff by minimizing soil disturbances. Traditional plowing and tilling disturbs the soil by creating deep furrows in the ground and turning soil over, leaving it unprotected and vulnerable to erosion by wind and water. By minimizing tillage, farmers can build their soil's health and encourage beneficial microbial life. Healthier soils have a greater capacity to infiltrate water and retain moisture, reducing runoff and keeping nutrients in the ground. Healthy, undisturbed soil can also store large amounts of carbon, keeping it out of the atmosphere and benefiting the climate.

Cover Crops

Cover crops are not sold, but provide other benefits to the farm, such as soil improvement, water retention, weed suppression, and erosion prevention. They are typically grown at strategic times before or after cash crops, such as corn or soybeans, to ensure farm fields are continuously covered in vegetation. This both protects bare soil from erosion and makes sure any excess fertilizer in the field is held in plants, rather than washing off into waterways. Cover crops can also enhance the health of the soil. For example, certain crops add back nutrients that were depleted during the main harvest, while others help break up the soil with their roots—providing natural tillage without disturbing the soil overall.

Conclusion and Recommendations

Farming plays a critical role in the health of our rivers and streams, in the social fabric and economies of our communities, and in the future of our climate. We cannot restore the Chesapeake Bay without addressing pollution from agriculture. Adopting agricultural conservation practices will not only improve water quality in the Bay, but also reduce greenhouse gas emissions and build natural infrastructure and climate resiliency across the region.

We must act immediately, given how little time Bay jurisdictions have left to meet the requirements of the 2025 Chesapeake Clean Water Blueprint and how little time we have as a nation to reduce greenhouse gas emissions and prevent the worst of climate change from occurring. The following policy recommendations should therefore be implemented without delay.

Provide Support and Resources to Targeted Agricultural Conservation Programs

Federal lawmakers can encourage farmers to adopt conservation practices by addressing the shortage of cost-share and technical assistance funding. Congress is considering increasing funds for federal conservation programs, a welcome move that also supports the Biden administration's desire to increase the adoption of climate-smart agriculture practices. CBF is advocating for USDA to establish the Chesapeake Resilient Farms Initiative and direct more federal funding across the

watershed, particularly Pennsylvania, which is far behind schedule in reducing pollution from agriculture.

Other proposals that could benefit water quality and reduce the damage from climate change include the Billion for the Bay Initiative and legislation such as Virginia Representative Abigail Spanberger's Climate Stewardship Act.

The Climate Stewardship Act would provide tens of billions of dollars in investment in the U.S. Department of Agriculture's working lands conservation programs with funding directed toward climate stewardship practices.

Congress should adopt these initiatives and target a significant portion of the funding to additional technical and financial resources in basins within the Chesapeake Bay watershed where conservation farming practices are most effective at improving water quality—what the Environmental Protection Agency's Chesapeake Bay Program refers to as "most effective basins."[18] Many of these basins are located in Pennsylvania.

Reinvigorate CREP and Forest Buffer Plantings

Due to their outsize ability to both reduce water pollution and trap and store carbon, planting more forest buffers along streams on farms is essential. For years, the federal Conservation Reserve Enhancement Program (CREP) has been the most important federal program for implementing buffers. The program is a state-federal partnership administered by the USDA's Farm Service Agency (FSA), which provides contracts and funding, and the Natural Resources Conservation Service, which delivers technical assistance to farmers. Unfortunately, CREP is languishing.

The 2018 federal Farm Bill contained language by Pennsylvania Sen. Bob Casey to provide substantial improvements to CREP.[19] The new measures ensure farmers have adequate financial support to maintain buffers and protect their investments. They also ensure that farmers are fairly compensated for expenses associated with buffers, such as installing fencing along streams and providing alternative water sources for livestock. But instead of increasing access to this essential program, FSA under the previous administration created bureaucratic impediments to putting these programs on the ground, requiring a renegotiation of each state's FSA.

USDA leadership, in partnership with the states, is critical to re-invigorate CREP and accelerate forest buffer plantings. The FSA must allow states to take advantage of the new CREP provisions in an expedited manner, update cost-share rates to ensure farmers are adequately compensated and administer the program efficiently and effectively. The NRCS should devote more resources providing outreach and technical assistance to deliver the program.

Regenerative Farms at Work: Case Studies from the Chesapeake Bay

CBF conducted a multi-year study of changes in soil health resulting from converting conventional farms to rotational grazing and quantified some of the environmental (water quality, greenhouse gas, and soil health) and economic benefits. The project was funded through a Natural Resources Conservation Service (NRCS) Conservation Innovation Grant (CIG). Before and after soil samples were collected to assess the changes in soil health and models were used to quantify the benefits.

The average reduction of greenhouse gas emissions across all farms was 42 percent, due to a combination of increased carbon storage in the soil and lower emissions of nitrous oxide from reductions in fertilizer/manure use. Modeling results also indicated substantial reductions in annual amounts of nitrogen, phosphorus, and sediment pollution from the farms. Average reductions were 63 percent, 67 percent, and 47 percent for nitrogen, phosphorus, and sediment, respectively.[5]

The following case studies detail the results on farms in Maryland, Pennsylvania, and Virginia. They include interviews with the farmers about the changes they made to their land and operations and why they chose to do so.

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GRAZING AT WORK

Blue Mountain View Farm

FARM: Blue Mountain View Farm, a 198-acre organic dairy farm with 95 milking cows plus 60 heifers and calves.

OWNER: Matt Bomgardner

LOCATION: Lebanon County, Pennsylvania

BASELINE PRACTICES: 50 acres of cropland with a mixture of corn, alfalfa, and rye with manure and fertilizer applied

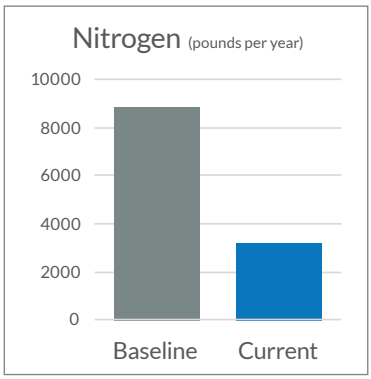
ON-FARM CHANGES: Between 2008 and 2016, Bomgardner converted this cropland to rotationally grazed pasture so he could increase the percentage of time his dairy herd spent foraging on grass and comply with organic dairy standards. He also eliminated the use of synthetic fertilizer.

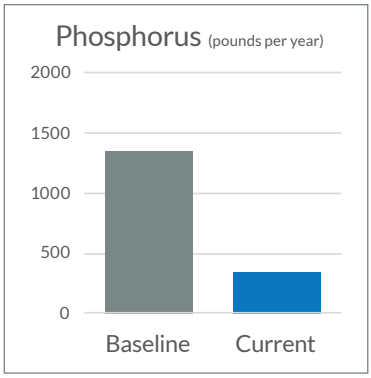
Environmental benefits of switching to rotational grazing:

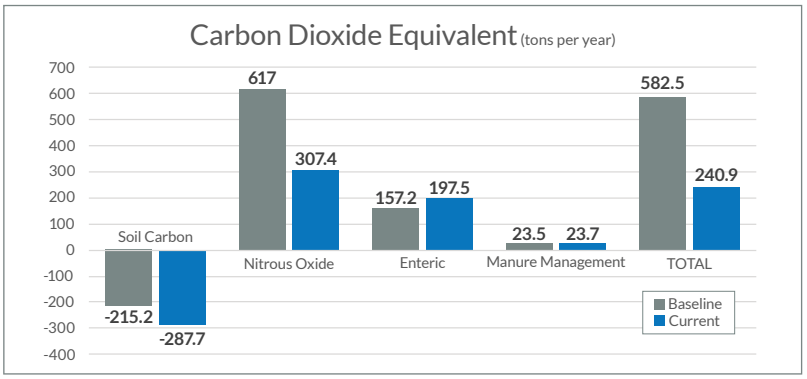
WATER QUALITY: A farm-scale modeling tool was used to estimate water-quality benefits. Nitrogen, phosphorus, and sediment pollution decreased by 64 percent, 74 percent, and 75 percent, respectively.

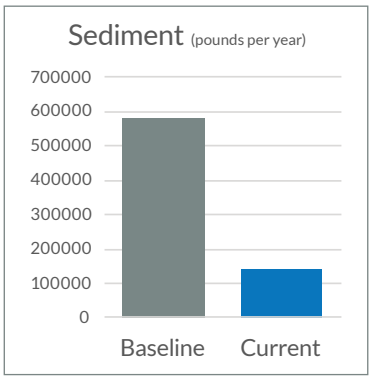
SOIL HEALTH: Soil health is measured by several physical, biological, and chemical indicators, including the amount of organic matter in the soil, health of microbial communities, and how well it can resist erosion. These indicators result in a rating from 0 to 100, where higher scores are better. Blue Mountain View Farm's soil health rating increased from 86 to 92 between 2016 and 2018, including significant improvement in key indicators like organic matter.

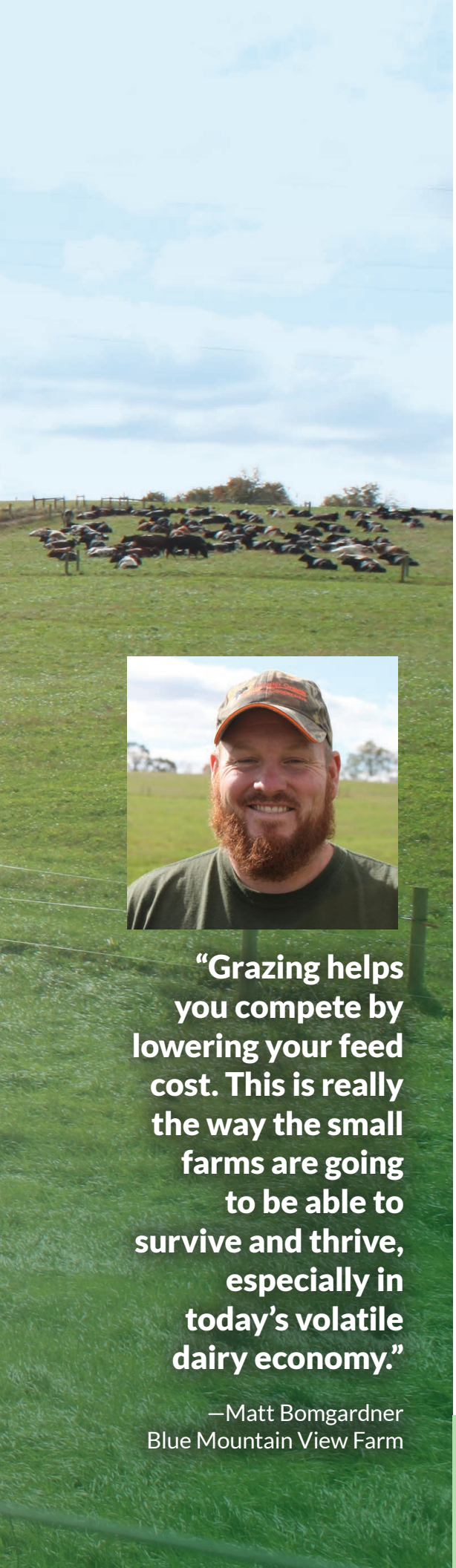
GREENHOUSE GAS (GHG) EMISSIONS: A farm-scale tool was used to estimate changes in GHG emissions. Overall, GHG emissions from the farm decreased by roughly 59 percent, mostly due to increases in soil carbon sequestration and decreases in fertilizer use that resulted in less nitrous oxide (a very potent GHG) emissions. The overall change is equivalent to the amount of carbon that would be stored annually by three acres of mature forest.











“Grazing helps you compete by lowering your feed cost. This is really the way the small farms are going to be able to survive and thrive, especially in today’s volatile dairy economy.”

—Matt Bomgardner
Blue Mountain View Farm

FARMER’S VIEW

Matt Bomgardner

Matt Bomgardner grew up on Blue Mountain View Farm, where he now lives with his own family. He sees grazing as one way to help ensure Lebanon County’s small farms continue into the next generation with lower costs for feed, infrastructure, and replacement animals due to improved herd health.

Why did you choose to rotational graze?

Grazing helps you compete by lowering your feed cost. This is really the way the small farms are going to be able to survive and thrive, especially in today’s volatile dairy economy. I can maintain milk production while getting at least 40 percent of the herd’s diet from pasture, so that’s a big cost-saver. Additional benefits are that the cows spread their manure, don’t need bedding, and almost always have better health when they go outside, leading to longer productive lives. While management requirements often increase in a grazing system, many see less labor since field work and cow husbandry are reduced.

Infrastructure can be far less expensive, varying from a million-dollar barn to a $50,000 really good pasture system with mixed forages, fences, lanes, and waterways. Our farm had outdated facilities, so instead of building a whole new barn, we can just send the cows out to improved pastures. That saved us hundreds of thousands of dollars.

What changes have you seen on your farm?

With managed grazing, the cows are excited to move to a new paddock with fresh forage, so eat better and maintain yield. They don’t congregate in one area, so they spread out the nutrients from their waste. With grass growing and recovering more quickly, the rain isn’t hitting soil causing erosion. I can’t tell you the last time I saw a gully that washed out, and we’ve even been doing a little plowing. So just having the higher organic matter and going back into a perennial [grass] as soon as we could after an annual [crop] is beneficial.

What do you think are the biggest barriers or challenges to grazing?

Right now, especially with dairy, it’s the finances. Low and fluctuating milk prices, even in the organic sector, make any investments a challenge. It’s difficult to hire help or an apprentice.

What would you tell other farmers interested in grazing?

Grazing is both an art and science, and isn’t as simple as putting cows on grass and walking away. Having mentors and attending grazing pasture walks and conferences helps you learn a lot. By visiting a local grazer, you’ll see their grasses and legumes, height when cows start, when they pull the cows out, and stocking rate. You can ask about their production, ideal type of cow, and how they breed for that cow. You’ll see the paddock layout, lane system, and watering system. You’ll also be able to get sound advice on making the conversion to grazing.

Plenty of resources are available to help. NRCS has been really involved here with funding and technical assistance, and the County Conservation Districts and Penn State Extension also can help with advice.

LEARN MORE about grazing in the Chesapeake Bay watershed and resources available for farmers through the Mountains-to-Bay Grazing Alliance by visiting **m2balliance.org**.

GRAZING AT WORK

Fair Hill Farms

FARM: Fair Hill Farms, a 600-acre organic dairy farm milking roughly 600 cows.

OWNERS: Ed and Marian Fry, Matt and Megan Fry

LOCATION: Kent County, Maryland

BASELINE PRACTICES: The 200 acres of cropland converted to pasture were originally used to grow a mixture of corn, triticale, and alfalfa. Manure was applied to the cropland and existing pastures.

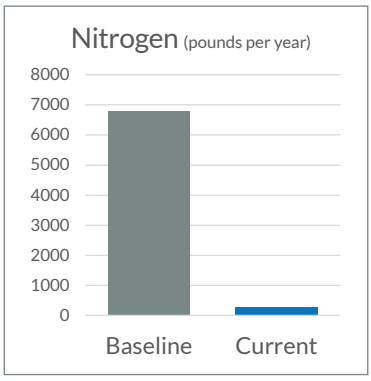
ON-FARM CHANGES: In 2016, roughly 200 acres of cropland were converted to rotationally grazed pasture so the percentage of time the dairy herd spent foraging on grass would comply with organic dairy standards.

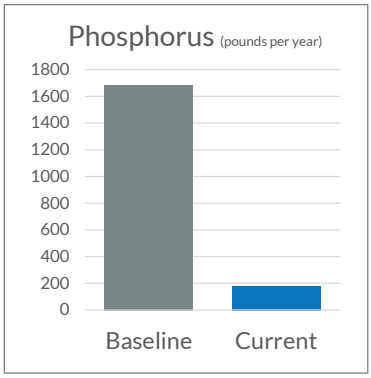
Environmental benefits of switching to rotational grazing:

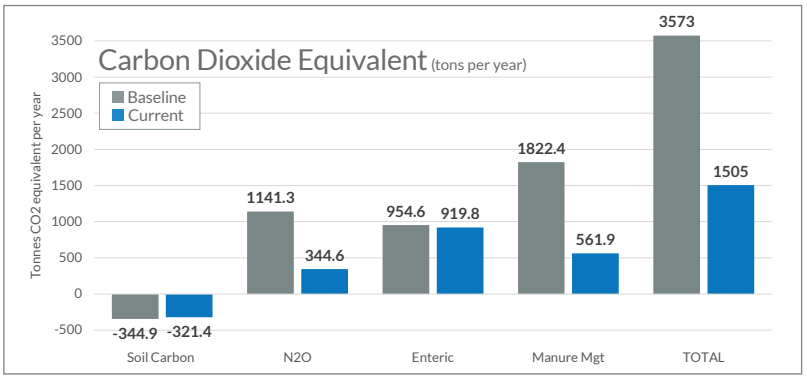
WATER QUALITY: A farm-scale modeling tool was used to estimate-water quality benefits. Nitrogen, phosphorus, and sediment pollution decreased by 96 percent, 89 percent, and 99 percent, respectively.

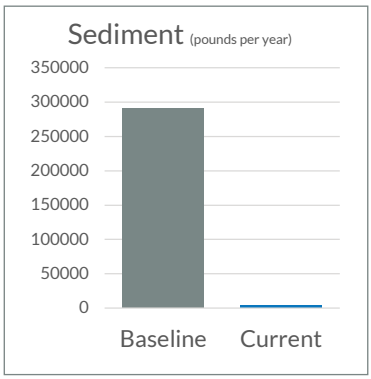
SOIL HEALTH: Soil health is determined by measuring several physical, biological and chemical indicators, including the amount of organic matter in the soil and how well it can resist erosion. These indicators result in a rating from 0 to 100, where higher scores are better. The farm's soil health rating increased from 52 to 65 between 2016 and 2018 and experienced significant improvements in organic matter and aggregate stability.

GREENHOUSE GAS (GHG) EMISSIONS: A farm-scale tool was used to estimate changes in GHG emissions. Overall, GHG emissions from the farm decreased by roughly 60 percent, mostly due to increases in soil carbon sequestration and decreases in nitrous oxide (a very potent GHG) emissions, reflecting changes in available soil nitrogen. The overall change is equivalent to the amount of carbon that would be stored annually by 16 acres of mature forest.









“Much like any type of farming, doing things with a purpose and intention will yield the results you’re looking for.”

—Matt Fry (on far right with his family)
Fair Hill Farms

FARMER’S VIEW

Matt Fry

The Fry family has been operating Fair Hill Farms on its current site since 1960 as a dairy and grain operation and first began transitioning the land to organic in the late 1990s. The farm now supplies milk to the Horizon Organic Milk brand.

Why did you choose to convert to a pasture system?

We had a conventional dairy but were running an organic cash grain business as well. In 2015, we were approached to transition the dairy to organic because there was a shortage of organic milk in the marketplace. When we sat back and ran the numbers on it, it was the right move for our business. We’d been comfortable operating on the row crop side, and we’d done intensive grazing on yearling and bred heifers for 15 to 20 years as a cost control method. For us, a lot of it was about streamlining our operations and our comfort within the organic world.

What changes have you seen on your farm?

During grazing season, it brings an added level of management to the dairy. We’re rotating the cows so every time they leave the milking center, they are getting a new break of pasture. That takes labor to make that happen—moving fences, moving water—and we’re consistently checking those cows. Another thing that’s been very noticeable is we have a pond on the farm that drains a relatively large area that was historically row crops. Now that much of that ground is in pasture, there’s a big change in water quality. There’s much less sediment, and that pasture ground takes up water quicker. There’s also been a significant increase in bird activity, specifically song birds.

What do you think are the biggest barriers or challenges to grazing and switching to an organic system?

One big challenge right now is access to milk markets. You want to make sure you have that market secured before you transition from conventional to organic. That 12-month transition in your dairy is an extremely challenging time, when you have to manage the cows organically and are still selling milk at a conventional price. We do see a decrease in milk production when we start grazing, due to the energy output of those cows when they’re walking out to pastures. However, we see income over feed cost increase. We’re more efficient with our feed dollars—that’s what puts value on.

What would you tell other farmers interested in grazing?

If you are switching from conventional to organic, I really cannot stress enough the significance of having your budget for that transition period done properly. For grazing in general, you have to be critical of your cow herd. When we went through that transition, we did see attrition of our older, larger cows. Doing that type of walking was tough for them, so we changed the focus of our breeding and genetics to focus on smaller frames and more health and fitness traits. Much like any type of farming, doing things with a purpose and intention will yield the results you’re looking for.

LEARN MORE about grazing in the Chesapeake Bay watershed and resources available for farmers through the Mountains-to-Bay Grazing Alliance by visiting **m2balliance.org**.

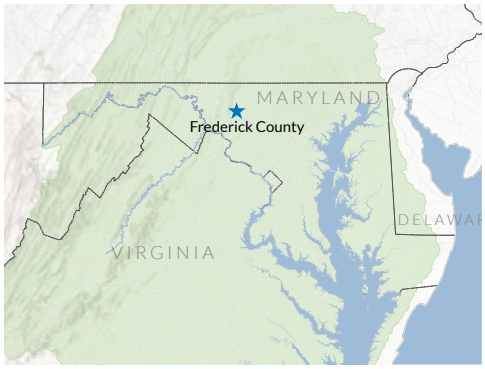
GRAZING AT WORK

Open Book Farm

FARM: Open Book Farm, a 133-acre diversified farm that grows organic vegetables and raises 100 percent grass-fed beef, pastured poultry and swine.

OWNER: Andrew and Mary Kathryn Barnet

LOCATION: Frederick County, Maryland



BASELINE PRACTICES: Open Book Farm was originally a conventional dairy operation with confined animals and roughly 133 acres grown in soybeans, corn, and winter wheat.

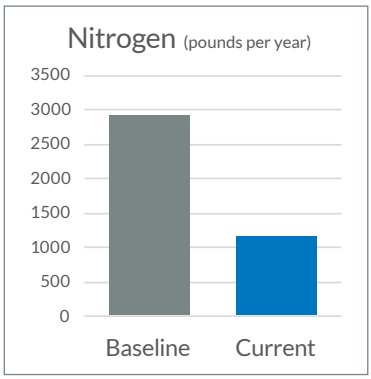
ON-FARM CHANGES: The Barnets purchased the farm in 2015 and have progressively taken over its management from the previous owner. They converted about half of their land into rotationally grazed pasture and raise approximately 10 beef steers, 6,000 broiler chickens, 150 laying hens, 100 turkeys, and 20 swine each year.

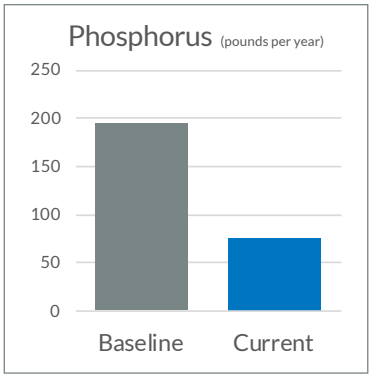
Environmental benefits of switching to rotational grazing:

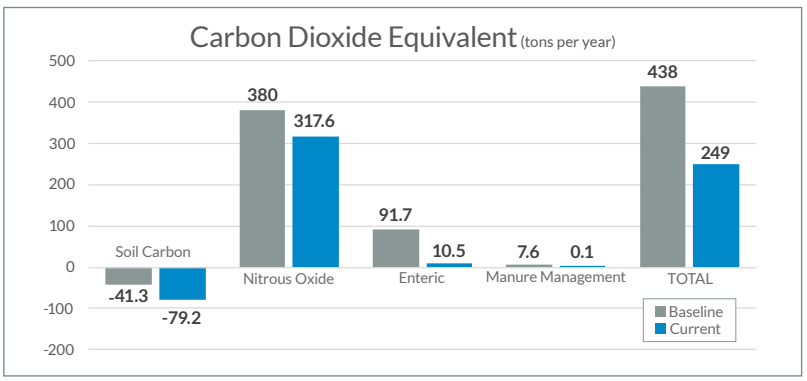
WATER QUALITY: A farm-scale modeling tool was used to estimate-water quality benefits. Nitrogen, phosphorus, and sediment pollution decreased by 60 percent, 61 percent, and 19 percent, respectively.

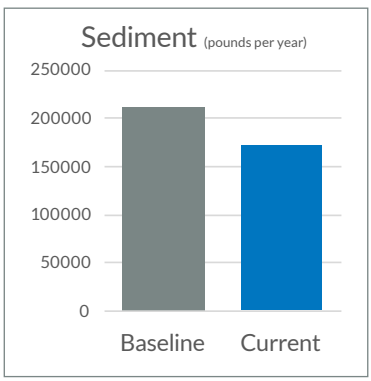
SOIL HEALTH: Soil health is determined by measuring several physical, biological, and chemical indicators, including the amount of organic matter in the soil and how well it can resist erosion. These indicators result in a rating from zero to 100, where higher scores are better. Open Book Farm's soil health rating increased from 72 to 84 following the implementation of rotational grazing, including significant improvement in key indicators like organic matter and aggregate stability.

GREENHOUSE GAS (GHG) EMISSIONS: A farm-scale tool was used to estimate changes in GHG emissions. Overall, GHG from the farm decreased by roughly 43 percent, equivalent to the amount of carbon that would be stored annually by almost two acres of mature forest.









“If you’re thinking about turning row crop ground into pasture, I think the programs that are out there will cover the vast majority.”

—Mary Kathryn Barnet
Open Book Farm

FARMER’S VIEW

Mary Kathryn Barnet

Andrew and Mary Kathryn Barnet met while working on an organic farm in Georgia. At their own farm, they’ve continued combining their love for physical work with a desire to grow food in an environmentally meaningful way.

How did you transition from row crops to grazing?

The first thing we did was seed the pastures and put in some cover crops where we wanted to plant vegetables. We did the riparian [streamside] buffer planting the second year. Then we put in fencing so we could bring cattle to the farm and we put in water lines so we could get water to the animals.

We’ve been really fortunate because Frederick County’s NRCS agency is absolutely fantastic. In addition, CBF also helped us make the transition from row crops to rotationally grazed pasture.

What changes have you seen on your farm?

If we’re sitting on our porch, we have this big riparian forest buffer planting, we have lots of pastures that have tall grass, lots of habitat, so we see and hear a lot of birdlife, which is really neat.

It’s hard to compare a piece of ground in your mind to how it was four years ago, but what we can do is walk up to the border of the part of our farm that is still being row cropped. On one side you’ve got this lush pasture that is so diverse and so alive, and you literally hit a line and just see bare, dead ground.

What do you think are the biggest barriers or challenges to grazing?

Some of it is not realizing what’s available, and part of it is not being in the community of people who are already doing these things. The Maryland Grazers Network was key in providing an experienced grazing farmer mentor to work with us. If you feel like you’re inventing the wheel, you’re probably not going to.

What would you tell other farmers interested in grazing?

If you’re thinking about turning row crop ground into pasture, I think the programs that are out there will cover the vast majority, but there can be timing issues and you may need to wait a year or more if government cost-share programs are out of funding. So it is important to do research on other funding options outside of government cost share.

You do have to plan ahead because of the funding cycles—you can’t go in and expect to be approved the next day. For example, since we’re taking over this farm progressively, we’ve already talked to NRCS and lined up what we want to do in the next two to three years.

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GRAZING AT WORK

Funkhouser Farm

FARM: Funkhouser Farm is a 91-acre cow-calf operation in Virginia's Shenandoah Valley.

OWNERS: Karla Funkhouser

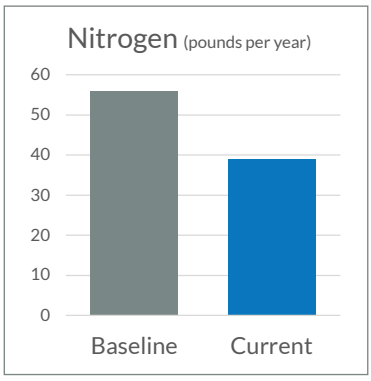
LOCATION: Shenandoah County, Virginia

BASELINE PRACTICES: About half of the property was dedicated to continuous grazing for the 27 cow/calf pairs and the other half was grown in hay and then grazed.

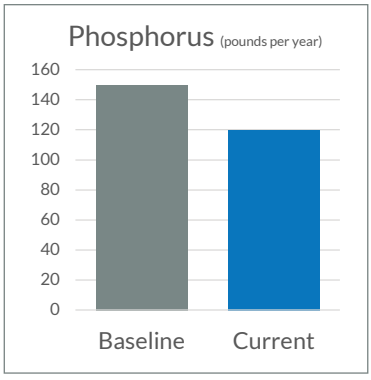
ON-FARM CHANGES: With assistance from CBF's Carbon Reduction Fund, Karla was able to install a water hydrant system that allowed her to implement a rotational grazing plan that included the current pasture and hayfield. She also plans to increase her herd slightly to 30 cow-calf pairs.

Environmental benefits of switching to rotational grazing:

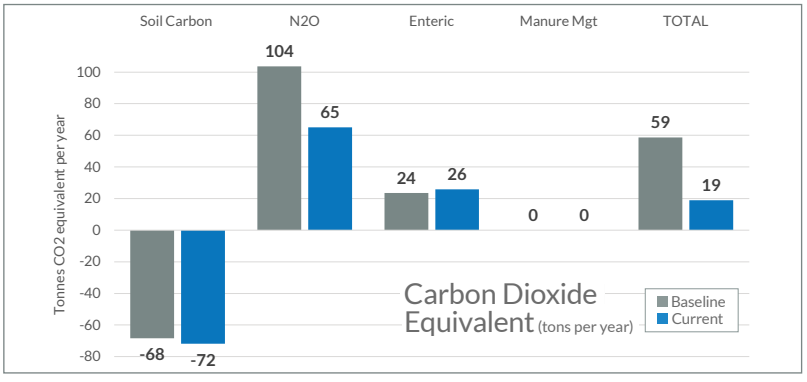
WATER QUALITY: A farm-scale modeling tool was used to estimate water quality benefits. Nitrogen and phosphorus pollution decreased by 30 percent and 20 percent, respectively. Estimated sediment loads, however, increased slightly, by 6 percent, potentially due to the increase in animals.

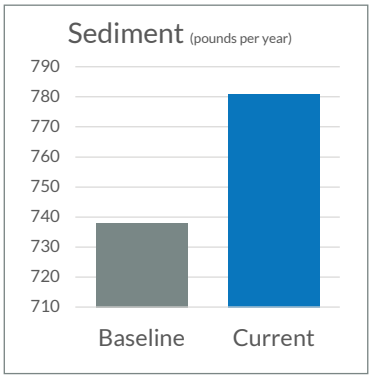


SOIL HEALTH: Soil health is determined by measuring several physical, biological, and chemical indicators, including the amount of organic matter in the soil and how well it can resist erosion (as measured by "aggregate stability"). Most of the soil parameters measured in both 2016 and 2018 were in the 'optimal' range, with the exception being much lower aggregate stability and organic matter values in two out of the four sampling fields in 2018. This decrease was not expected and we believe it was due to high rainfall and poor drainage in those fields.



GREENHOUSE GAS (GHG) EMISSIONS: A farm-scale tool was used to estimate changes in emissions. Overall, emissions from the farm decreased by roughly 68 percent, equivalent to the amount of carbon that would be stored annually by one-third of an acre of mature forest.





“The quality of the grass is so much better, and the cattle love to get new grass.”

—Karla Funkhouser
Funkhouser Farm

FARMER’S VIEW

Karla Funkhouser

Karla Funkhouser’s farm has been in the family for at least four to five generations. She took over the cow-calf operation from her father. She says rotational grazing has improved her pastures and is simple enough she can do it on her own.

Why did you choose to rotational graze?

Our extension agent was the first one who said something to me. It sounded good, it was something I could do, and I was always working toward this being a one-lady operation. It’s such a wonderful idea, rotating the cattle, and I found out it’s been around for years and years.

What changes have you seen on your farm?

When my dad would have cattle on the whole pasture, no part got a rest, and the cattle were always walking over it. Now this rest period really helps the ground and the vegetation.

The quality of the grass is so much better, and the cattle love to get new grass. When I drive out to the field in the truck, they will come and wait. I can open up just a single strand of poly rope and they will walk right through to the next paddock. They are anxious to get in there.

What do you think are the biggest barriers or challenges to grazing?

To make it work where my family farm is, the problem was getting a water source because the only source was right near the farmhouse. This is such a big improvement from what it was. Before, I was loading water into a 300-gallon tank and taking it out to different paddocks twice a day.

One thing, and I think it would scare most farmers, is if I had to come up with the money for the watering system. I could have managed the fence. But I think the program really helped.

What would you tell other farmers interested in grazing?

I would tell other farmers what a great idea it is. You get your manure spread around so you don’t have to spread fertilizer as often, and it does help control the weeds. If you set up temporary paddocks first, you get an idea of what will work for you.

My advice to somebody who wants to try it is to listen to people who have done it. I would highly recommend [CBF’s Virginia watershed restoration scientist] Matt Kowalski. I found him easy to work with. I didn’t mind being told what to do, and he knew how to set up the fencing. Even though I went to a class on fencing, they go too fast, and I needed to work with someone one-on-one.

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CHESAPEAKE BAY FOUNDATION

Saving a National Treasure

For more than half a century, the **Chesapeake Bay Foundation** has led a landmark effort to save the Chesapeake Bay—a national treasure on which the health and wellbeing of nearly 20 million people and 3,000 species of plants and animals depend. Grounded in science and focused on local waterways, we educate tens of thousands of people each year, advocate for better public policy, hold governments and polluters accountable, and perform essential hands-on restoration.

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MOUNTAINS-TO-BAY GRAZING ALLIANCE

The **Mountains-to-Bay Grazing Alliance** brings together private and public partners within the agricultural community to promote wider adoption of rotational grazing and related conservation practices that benefit water quality, improve soil health, and boost farm economies in the Chesapeake Bay watershed. It connects current and new grazing farmers through outreach, technical assistance, farmer-to-farmer mentoring, on-farm demonstrations, and other resources.

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