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Special Report

# The Challenge of the Chesapeake

## A Drop in the Bay

Story by Sandy Bauers, Photographs by Sharon Gekoski-Kimmel

LITITZ, Pa. - More than a decade ago, tiny Lititz Run in Lancaster County was a ribbon of fetid water that was too hot, too slow, and too poisoned by agricultural runoff to support trout for more than a few weeks.

Then the community embraced its revival. Neighbors re-created wetlands. Farmers changed time-honored ways. Today Lititz Run is a rarity among waterways: a year-round trout stream that has won national accolades and been cited as a model.

But as a tributary in the Susquehanna River watershed, Lititz Run still isn't clean enough, and it adds to the pollution that the Susquehanna sends downstream to the nutrient-choked Chesapeake Bay.

Pennsylvania bears a huge responsibility for the despoiling of the bay. The Susquehanna, which drains half the state, pumps in 40 percent of the bay's nitrogen, largely from agriculture, and a gusher of its two other major pollutants - natural sediment and phosphorus from fertilizers and detergents - abetting the decline of the Chesapeake's celebrated fishing industry.

"As goes Pennsylvania," says J. Charles Fox, the Environmental Protection Agency's senior Chesapeake adviser, "so goes the bay."

Lititz Run, all 6.5 miles of it, is a microcosm of the problem. Though much has been done, the pollution runs deep and will be hard to totally reverse. Even as it first burbles forth in the quaint town of Lititz, about 75 miles west of Philadelphia, the stream is laced with harmful nitrogen, likely from decades of fertilizing nearby.

The stream's renewal represents a hopeful but cautionary tale for how difficult a real cleanup will be.

Experts say the efforts in Lititz need to be enhanced and then duplicated across 100,000 streams in the bay's watershed.

It won't be enough, they say, just to curb runoff, alter farm practices, and upgrade sewer plants.

Saving the bay will require a broader range of fixes across a wider swath of the watershed, the tenacity of governments, an influx of money, smarter development, and the long-term cooperation of virtually everyone living here, at a time when the population is increasing dramatically.

"We are 17 million people living in this watershed," says Don McNutt, administrator of the Lancaster County Conservation District, "and we're going to impact it. The farmers are feeding the people, and the people are flushing their toilets. That's the long and short of it."

President Obama has promised to help. In the spring, he signed an executive order requiring a more aggressive federal role in cleaning up the Chesapeake Bay.

Instead of goals a decade out, the states have set two-year "milestones." So the people who set them will still be in office and accountable when it's time for a reckoning.

The goals are also humbler, critics note, falling short of past promises. Officials call them more realistic.

This fall, for the first time, they will begin setting strict numeric pollution limits - called a "total maximum daily load" - for the bay. Those will be passed down to the states, then to smaller jurisdictions. The limits will be largely mandatory, not optional.

The first draft reports detailing the government's plans are to be published Wednesday on the Web.

The aim is to restore what Obama called a national treasure. The Chesapeake is the country's largest estuary, so called because it mixes salt and fresh water.

Today, even though people swim in the bay, eat its fish, and ply its waters with all manner of boats, "it is a shadow of its former self," says Harry Campbell, a scientist with the nonprofit Chesapeake Bay Foundation.

Water quality remains poor, and the habitats are dramatically degraded. Signature species like the blue crab and the Chesapeake oyster are at a fraction of historic levels, in large part because of the pollution coursing down from the north.

The first of many failed attempts to clean up the bay began in 1983. Two more followed, with the latest one expiring next year. The most recent efforts have left the bay "no better, or arguably even worse, than it had been," says John Hanger, secretary of the Pennsylvania Department of Environmental Protection.

## **All about trout**

Lititz Run begins in a rock-lined pond under a plaque that reads, in German, "God's fount is never failing."

From there, the stream flows past businesses and houses, bisects cow pastures and cornfields, slips through parks, and dips under highways, then meets the Conestoga River by a historic covered bridge and finally flows into the Susquehanna on its way to the bay.

Greg Wilson, 50, who lives a half-mile from the stream, just wanted a place to fish. He started its restoration with a few rocks.

He had decided to join the conservation group Trout Unlimited, which was so shy of workers that the group immediately put him on the chapter's board.

In 1990, he got some boulders donated, Trout Unlimited gave him a few hundred dollars, and he set about trying to stabilize the banks of the stream along one farm owned by Ed Hess.

Then he moved to another farm.

It seemed quixotic. One farmer remembers that often it would just be Wilson and another man, Harold Alleman, rolling rocks with a pry bar, one by one, into place along the stream bank.

Many farmers refused Wilson access. One, fists clenched and shouting in anger, demanded that Wilson remove some rocks he had inadvertently put on the farmer's property.

Gradually, though, people began to notice.

A few years in, Wilson showed up at a Warwick Township meeting to talk about Lititz Run.

"We had a number of parks adjacent to the stream that we weren't doing a lot with," Township Manager Dan Zimmerman says. "The board said, 'You know what? You're right. Let's partner.' "

Once Lititz Run's supporters formed a nonprofit watershed alliance in 1997, their credibility grew. A local environmental firm, LandStudies, joined in. They began to get bigger grants.

Awards rolled in, too. TV showed up. A Japanese delegation visited.

Cleaning up Lititz Run became like a club that everyone wanted to join. Scouts and school groups came out.

Farmers First Bank took on an erosion project near its office. The utility PPL Corp. kicked in money for projects, as did the local mouthwash plant. In the last two decades, \$1.5 million in grants, private and public money, and donated equipment has helped improve the stream.

"No matter how hardheaded a person is, I've never met anyone who says, 'I want dirty water,' " Zimmerman says. "It's just trying to figure it out."

## **Nitrogen management 101**

Wayne and Brenda Baum are strolling along Lititz Run, where their son Matt, 10, is wading in a pool, hunting crawfish. It's a scene that would have been unthinkable two decades ago.

Lititz Run bisects the Baums' 27-acre dairy farm, one of about 100 farms in the Lititz Run watershed and one of 5,500 in Lancaster County, the heart of Pennsylvania farming.

Lancaster has more corn, cows, hogs, and chickens than any other county in the state.

The milking barn of one of the largest farms - Kreider, just outside Lititz - is so big that four buses

drive through it.

Lancaster also has more manure. In 2007, Lancaster pumped more nitrogen from manure - eight million pounds - than any other county into the Susquehanna.

In the early '90s, when Wayne Baum's father owned the farm and conservationists asked whether they could work on the stream, he refused. "He didn't want anyone telling him what to do," Baum says.

Baum, 48, later took over the farm. The next time the question arose, in 1998, he said yes.

Now Baum's barn has gutters and downspouts leading rainwater to the stream, to keep it from rinsing the barnyard of manure and sediment before getting there.

A shed protects mounds of manure from rainfall until it's time for Baum's neighbors to spread it on their fields.

Down at the stream, trees shade its deep pools and shrubs trap runoff. Cows are fenced out, except for a concrete crossing.

As the years went by, more Lititz farmers joined: Hess, Wenrich, King, Smucker, and Weidler.

Some fixes are simple. Many crop farmers incorporated "no-till" planting and the use of cover crops, minimizing soil erosion.

Some require new technology. Kreider, for instance, is building a multimillion-dollar treatment system to turn the waste of 2,000 cows into renewable energy.

The conservation district's McNutt contends that although agriculture is the biggest player, it's also doing the most work.

From 1985 to 2007, nitrogen pollution from Pennsylvania farms in the Susquehanna watershed dropped 28 percent.

No other sector declined as dramatically. Most increased.

But farmers must do more.

Those with a lot of animals are required to have manure plans, but some don't. Even among those who do, 57 percent are out of compliance, a recent study found.

A lot of the persuading falls to the county soil conservation service. When Jeff Hill, one of its technicians, first visits a farm to encourage conservation, he says, "I'm from the government. Don't shoot."

It's a joke. With a kernel of truth. Many Amish and Mennonite farmers have stuck to old methods and don't want government interference.

But now their participation is considered so critical that the Chesapeake Bay Program has awarded a \$500,000 grant to the Chesapeake Bay Foundation to "engage" them.

## **Effluent you can drink?**

Todd Kauffman has to raise his voice above the rush of water. And the cacophony of construction equipment.

The Lititz sewage plant, which he manages, treats about three million gallons of wastewater a day and discharges it into Lititz Run.

Not counting forests, which are natural systems, sewage plants in the Susquehanna watershed are second only to agriculture in the amount of nitrogen they contribute.

In 2006, the state Department of Environmental Protection announced a new permitting plan to further restrict the nutrients in effluent. Two years later, officials at 84 plants sued, challenging the DEP's authority.

They felt it was unfair that although agriculture's reductions were voluntary, theirs were mandatory. Compounding their ire was the cost: The latest estimate tops \$1 billion.

When Lititz officials saw how low their new limits were, even Mayor Russell L. Pettyjohn, a 20-year appointee to the Chesapeake Bay Commission, balked. He griped to the DEP, "What do you want us to do, drink it?"

He had a point. With the new limit, the effluent from the sewer plant would have less nitrogen than Lititz's public drinking water.

But Pettyjohn and his colleagues in Lititz and Warwick Township, which co-own the plant, more than relented.

Rates were low and construction costs favorable, and they didn't want to face another upgrade in 20 years. Instead of spending \$5 million for the required improvements, they're spending \$15 million to exceed them.

But here's how deep the problem runs: Even the springhead is full of nitrogen, likely from decades of fertilizer and manure.

In the spring, Michael Helfrich, the Lower Susquehanna riverkeeper, tested it and was stunned by the results.

"So how is a streamside buffer going to help stop this?" he asked. "The cause of the impairment begins before Lititz Run even exists."

## **More people, more lawns**

One of the signature scenes in the Lititz Run watershed is a cornfield giving way to houses, their roofs jutting high above golden tassels.

Unlike agriculture, the Chesapeake's urban and suburban pollution sources haven't lessened at all. They've gotten worse.

"For every yard of progress we have gained, we have lost a yard to increasing population,"

foundation president William C. Baker says.

About 170,000 people move into the bay watershed every year. With them have come roofs, shopping centers, schools, parking lots, and roads - impervious surfaces that contribute to runoff.

During the 1990s, the bay watershed population rose 8 percent; impervious surfaces increased 40 percent.

Then there are all those heavily fertilized, lush lawns, leaching nitrogen. Indeed, some say the biggest crop in the bay watershed isn't corn; it's grass.

Warwick, which encompasses much of Lititz Run, exemplifies the problem. It was Lancaster County's fastest-growing township in the 1990s, booming 33 percent from 1990 to 2000.

County principal planner Michael Domin says the municipality has handled the growth well, guiding it to areas with water and sewer hookups, encouraging denser, more walkable communities.

One housing developer established a streamside buffer of trees and shrubs and then installed trails through it. He built better storm-water systems.

The township building is considered a model. Runoff from the parking lot flows to a state-of-the-art "biofilter" system. Porous sidewalks - the concrete has bigger stones in it, leaving voids - let rain soak through.

Domin recently stood there in a downpour, just to see whether it worked. "It was amazing."

Domin figures growth is a given throughout the bay watershed. "But how we grow is going to define whether or not the bay health increases over the years."

## **Change is messy**

Even as Lititz Run was improving, the state was faltering in its cleanup efforts.

In 2004 - four years after another national Chesapeake cleanup agreement was reached, and one year after new goals were decided on - Pennsylvania officials announced their own strategy of 50 "best-management practices."

Howls erupted.

The wastewater plants headed for legal action. "The farmers weren't happy. The builders weren't happy. We all had issues," says John Brosious, deputy director of the Pennsylvania Municipal Authorities Association.

Then there was the cost: \$8 billion. Which only made him think: "You guys are crazy. If you think . . . everyone is doing all of this over all of central Pennsylvania . . . that's just not happening."

The association eventually persuaded the legislature to impose a nine-month moratorium on the plan in 2006.

After dozens of meetings with hundreds of participants, Pennsylvania got a new plan at the end of

2006.

Its new two-year milestones, announced in the spring, identify 30 specific actions.

Much is identical to what the state had already been doing - planting trees, trucking away manure. Except this time there's more of it and new stuff besides.

One thing that could make a difference is technology. Among the newest, Pennsylvania State University researchers have figured out how to apply dry manure under the soil surface, instead of on top, and reduce nutrient runoff by 90 percent.

Another new offering is nutrient trading. A farmer, for instance, can make extra improvements and "sell" the benefit to a local sewer plant facing an expensive upgrade.

One of the first pilot projects, a wetlands restoration, was along Lititz Run.

Finally, there's the money. In the last fiscal year, Pennsylvania budgeted \$67.5 million for bay-related programs.

Given the state's budget woes, sufficient funding in the future is far from assured.

As for federal money, it comes from so many pots that state officials - and even the feds - have difficulty tracking it.

One new source this year is \$93 million in Recovery Act funding for state wastewater projects. And a big chunk will obviously flow to plants in the Susquehanna watershed.

Also, \$5.4 million will come from the federal Farm Bill solely for projects in the bay watershed.

That amount will be doubled next year, tripled the year after.

Craig Derickson, the state conservationist, says so many farmers had signed up for assistance that he expects all of this year's money to be spoken for by the end of September.

The problem now, he says, is staffing. "Do we have enough people in the field? The answer to that is no."

## **Partial fix for phosphorus**

At 6 a.m., with the horizon just lightening, State Sen. Michael Brubaker strides down his driveway in sneakers and a sweatshirt, setting out on his morning walk.

As chair of Pennsylvania's delegation to the Chesapeake Bay Commission, the Lancaster Republican is one of the state's most influential voices when it comes to the bay.

He also has an intimate view of Lititz Run. For 20 years, he's lived just uphill. His children grew up making paths along its banks. Now he walks it almost daily.

Brubaker's father and grandfather were in the fertilizer business, yet now he tells farmers they must do with less.

A conservative who convened a county task force that committed to pollution reductions, he nevertheless went before a U.S. Senate subcommittee last month to ask for more federal intervention on bay matters.

"The time has come to revamp the law," he said at the hearing, adding more federal oversight, accountability, and money.

His first bill was to ban phosphorus from dishwasher detergent sold in the state, after its removal from laundry detergent years ago. It goes into effect in 2010 and will help Pennsylvania meet its milestones.

He wants to ensure that each new step doesn't halt economic development by making costs too high or land development impossible.

"So then we need to ask how to get meaningful reductions," he says. "It comes back to technologies. Science has to solve the problems for us."

Like other officials, he worries about what will happen if Pennsylvania fails to meet its goals this time.

Of the 30 actions proposed in the milestones, some will probably not happen, he says. "So the question will be, 'OK, EPA, how do you mark Pennsylvania?'. . . I've asked the question, and they could not answer it."

Ultimately, he feels everyone in the Chesapeake Bay watershed will have to change by driving less, or using less electricity, or fertilizing their lawns less.

Finger-pointing is "not a trap I want to get caught in," he says. "I say to agriculture, 'You need to do your share.' I say to homeowners, 'You need to do your share.' And I say to commuters, 'You need to do your share.' . . . Only when we all start doing our share does the bay even have a chance."

## **All that sediment**

One of the Susquehanna River's last acts before entering the bay is to generate electricity as it flows through the Conowingo Dam.

Anglers line up to cast into the churning outflow. Andrew Young, who drives down daily from Intercourse, pulls in yet another white perch. By evening, they'll be breaded, fried, and eaten.

The dam serves another function: Behind it, the water slows and about two million tons of sediment - one of the bay's three big pollutants - settles out each year.

But the dam will reach its sediment capacity in 15 to 20 years, a U.S. Geological Survey study concluded this year.

At that point, two million more tons of sediment a year will course downriver.

To Helfrich, the riverkeeper, the dam is one of many elephants in the bay that officials aren't paying enough attention to.



Storms could buy more time for the reservoirs by rinsing out the sediment, but that's a problem, too.

In 1972, during a four-day downpour brought by Hurricane Agnes, the raging Susquehanna scoured the dam impoundments and carried years' worth of additional sediment downriver.

When it got to the bay, Helfrich says, "it smothered everything." It killed crabs. It killed bay grasses. "It was the most damaging event in the written history of the bay."

It could happen again. In mock tribute, one of his colleagues has nicknamed Conowingo "Katrina-wingo."

Meanwhile, researchers at Franklin and Marshall College in Lancaster have found that the region's ancient floodplains, which normally sponge runoff and filter pollutants, have been covered by anywhere from a few feet to 20 feet of sediment.

This "legacy sediment" - or, more colorfully, "millpond mud" - settled out behind thousands of old mill dams, transforming the landscape. It is highly erodible and tends to carry pollutants.

Officials say that unless legacy-sediment controls are added to the bay's computer modeling - which would lead to programs and funding to get rid of it - Pennsylvania will never meet its goals.

"So am I optimistic about Obama saying some words?" Helfrich asks. "I am optimistic that we have an intelligent and curious leader. I hope they will have the strength to actually address some problems that are financially very difficult to address."

## **A sea of grass**

Just beyond the historic lighthouse in Havre de Grace, Md., the Susquehanna flows at 18 million gallons a minute, making the final leg of its 444-mile journey from Cooperstown, N.Y.

Inside the nearby maritime museum, Ian Jones, 16, is growing sea grasses.

It's his Eagle Scout project. Every week he replenishes the water in two shallow tubs and tests the pH.

Grasses are critical for the bay, providing shelter for blue crabs and young striped bass, plus food for waterfowl. And because they're sensitive to changes in water quality, they're an excellent barometer of bay health.

Out on the Susquehanna Flats - the river delta - the grasses cover 23 square miles, dense enough to be visible in satellite photos.

Scientists don't know all the reasons for the comeback of the grasses, but they feel certain that one is less nitrogen from the Susquehanna. Monitors upstream show a 25 percent drop in the last two decades.

Healthy grass beds improve water even further by filtering out sediment and nutrients.

"The first thing that strikes me is how clear the water is," says Lee Karrh, a biologist with the

Maryland Department of Natural Resources. "Then, the abundance of life."

But the grasses are a small beacon in a gloomy picture.

The bay's deeper channels in particular are where its problems remain most troublesome. They are low-oxygen dead zones where little can survive. And the crab and oyster industries remain much reduced.

"The river is running cleaner, but not nearly clean enough," says Rich Batiuk, associate director of science for the Chesapeake Bay Program.

A cleaned-up bay would have more dissolved oxygen to support aquatic life, the water would be clear and free of chemical contaminants, underwater bay grasses would flourish, tidal wetlands would be abundant and productive. Above all, the bay's oysters, blue crabs, and fish would rebound and thrive.

## **Gone fishin'**

"Watch this," Logan Myers says, grinning in anticipation.

Back up along Lititz Run, amid the greenery of land his wife's father bought - now the 100-acre Millport Conservancy - Myers reaches into a plastic bucket and tosses a few pellets of fish food into Lititz Run.

Within moments, a huge trout splashes to the surface.

Lititz Run, like many other streams in Pennsylvania, is stocked with trout.

In most streams, the trout die by summer's end because the water warms too much and there's not enough food.

In Lititz Run, they not only survive. They also breed.

In the last 10 years, pollution has declined: sediment by 9 percent, phosphorus by 10 percent, and nitrogen by 47 percent.

"It's a very good illustration of what it's going to take across the entire Chesapeake watershed," says the bay program's Batiuk.

Officials and advocates know it's not good enough.

"It took probably 50 to 100 years to cut all the trees down, to do the farming. Now we're putting houses on," says Matt Kofroth, a watershed specialist with the conservation district.

"We can't expect to just plant trees and walk away."

So they're keeping at it.

They take fifth graders on an annual tour of the watershed, priming the next generation for all the things it will have to do to take care of the local stream.

That's because, in the end, they've learned that they're not improving Lititz Run for a bay miles away.

Their reward comes in driving along and seeing anglers like Greg Wilson fishing in it. Or knowing that 10-year-olds like Matt Baum now wade in it. Or having a state senator take his morning walk along it.

"It's good for the bay, but we did it for ourselves," Wilson says. "We live here, and we want to fish here. It's our neighborhood."

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A color slide show featuring Lititz Run and the efforts to clean up the bay is at <http://go.philly.com/chesapeake>

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## INSIDE

A look at the Susquehanna watershed and the impact of Pennsylvania's pollution on the Chesapeake. **Graphic, A13.**


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