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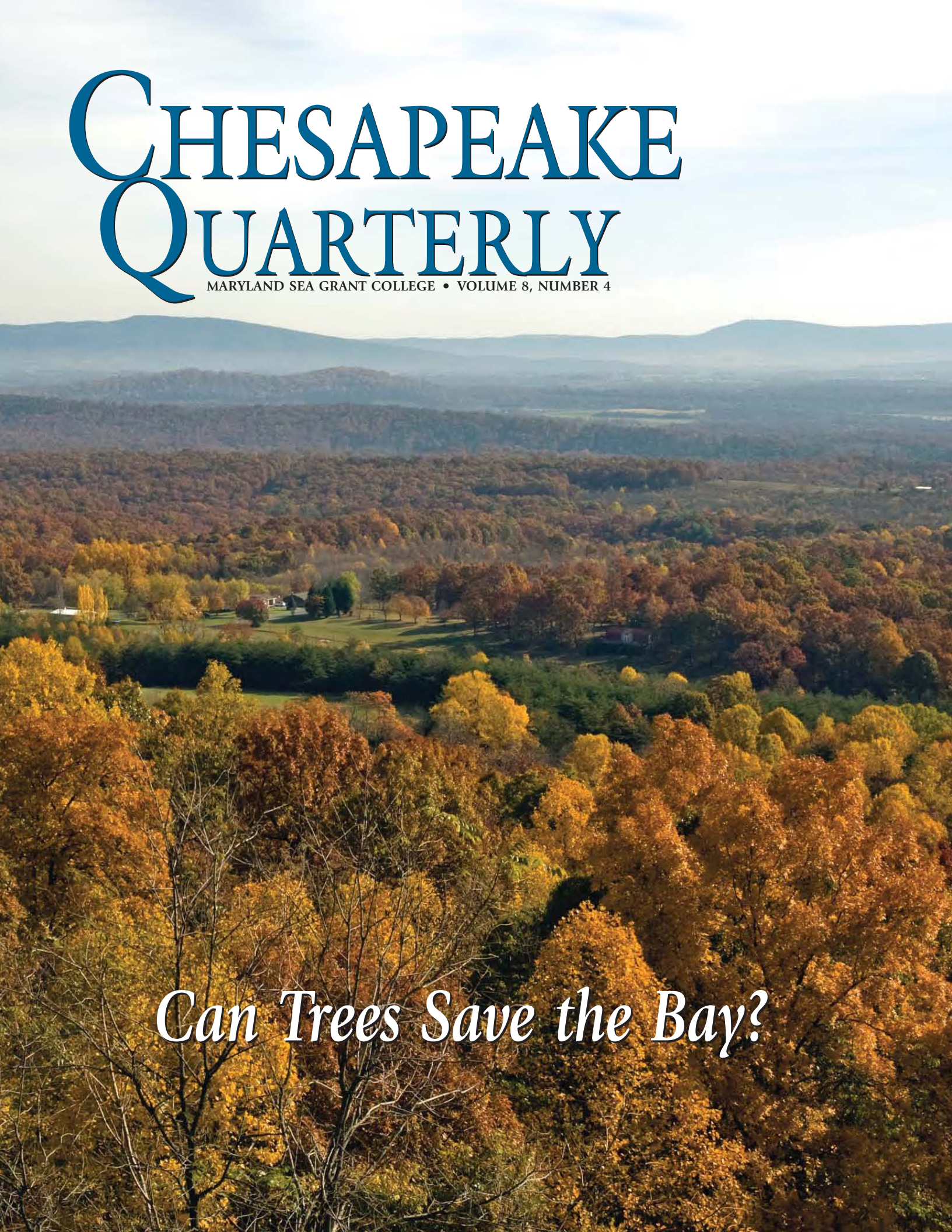

Can Trees Save the Bay?

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Chesapeake Quarterly explores scientific, environmental, and cultural issues relevant to the Chesapeake Bay and its watershed.

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Cover photo: *Trees stretch toward western Maryland on a bright October morning. It's in the Bay watershed's western reaches that most big stands of forest remain.* ***Opposite page:*** *Small brooks feed Poplar Lick, a mountain stream in the Savage River watershed west of Frostburg, Maryland.* PHOTOGRAPHS BY JACK GREER.

Downstream

It's quiet here. No motor sounds. No highway nearby. No airplane overhead. Today a south wind blows through fall's final leaves, the season's last warmth before winter. This is the forest, home of a special kind of silence.

Forests are more than trees. Bear live here. And deer and bobcat and wild turkey. From canopy to roots, forests silently work with the planet's elements — carbon dioxide, nitrogen, phosphorus — to shape their own environment, and ours.

Beyond this, forests are places of solitude. Forests give us space to think.

Longtime New England forester Ross Morgan says he does his best thinking in the woods. Morgan is someone I met through a friend who spends summers in Vermont. For Morgan, a walk in the woods makes things clearer. In the woods, he says, "things make sense."

For 40 years Morgan has consulted with landowners from his home in Craftsbury, far north of Chesapeake country. He's spent a lot of time in the trees, and over the years his thinking has migrated from technical analysis to more philosophical consideration — a deeper appreciation for what forests do, what they mean. He worries that his fellow Americans don't seem to think about forests very much.

He tells this parable. When Americans began to fully settle this land, three boxes were sent from Europe with valuable information about forestry. The first box was marked "science." By the end of the 19th century, Morgan says, our knowledge was impressive. Though early forest researchers lacked today's tools, they gathered extensive empirical evidence,

from Deep Woods

Trees on trees, a stalwart legion,
Swiftly past us are retreating …
— Goethe's *Faust*

mapping, observing, collecting, experimenting. They learned a lot about how forests function, and that work continues today.

The other two boxes of information about forestry were marked "philosophy" and "art." Those two boxes, he says, never arrived.

Fairly late in his career, Morgan studied the foundations of forestry in places like Germany, Austria, and Switzerland, and he was amazed to find frequent references to Friedrich Schiller and Johann Wolfgang Goethe. Schiller and Goethe wrote extensively about forests (Goethe included science among his many talents), but they were not foresters. Mostly they were poets. Thinkers.

In the beginning Americans feared the forest. Clearing trees became synonymous with conquering the wilderness and taming the land. In this country, says Morgan, few understood the full value of forests. Even in the 19th and early 20th century, our philosophy of forestry, still largely unformed, focused on maximizing short-term profits. This led to clear-cutting and to bare fields and eroding hillsides. To the destruction of forests.

To be fair, as the country grew it spawned some of its own natural philosophers. George Perkins Marsh, for example, often considered the first American environmentalist, and Gifford Pinchot, the first chief of the U.S. Forest Service. And later, conservationist and thinker Aldo Leopold, advocate for a new land ethic. At the base of this fledgling environmental perspective lay the Transcendentalists, Ralph Waldo Emerson and Henry David Thoreau, who went to the woods to learn to live.

But today, in Thoreau's New England, many of the landowners that Morgan advises — mostly owners of small woodlots — don't put much stock in forests. They manage their trees, with Morgan's help, but in the end most cut them down for short-term gain.

He's not against cutting trees — we need timber, he says, for paper and other products. For building our homes. But while his clients appreciate the value of trees, most of them don't understand the value of forests. They lack the ethic of sustaining forests as ecosystems.

For those of us who live in the Chesapeake watershed the question is whether economic need — or greed — will determine the future of forests on private land. Those forests are often in the hands of those who may not think of themselves as foresters or forest owners, or forest philosophers. And the economic pressure is not just for timber. It's for the land itself.

Morgan worries that our current efforts at managing forests may fail because we don't have a solid philosophy to guide us.

Perhaps. In this issue of *Chesapeake Quarterly* we take a walk in the woods with some who have done their thinking in the forest, who keep a close connection with rural lands and timberlands. Learning a little about their efforts may help us think more deeply about trees and forests. And about our chance for a new land ethic that values forests as ecosystems and as special places. How we treat these quiet refuges will also tell us a good deal about the future of the Chesapeake watershed.

— *Jack Greer*

Saving Trees for the Forest

Jack Greer

"Watch out for rattlesnakes. Don't put your feet anywhere you can't see."

Nancy Ailes has been "buzzed" twice already this year by rattlers. She loves to watch them. She says they're pretty lethargic. Usually. When an Allegany Trail power line crew recently found a nest of female rattlers and killed them, it upset her mightily. Rattlesnakes bear their young alive, she says, and the "mommies" gather in nests to protect them.

She marches through tall grass. It's hard to keep up and still watch your feet.

Ailes is making the rounds today, checking out forests and fields she's been trying to save for nearly a decade. The threat she fears is not rattlesnakes, but development.

Back home in West Virginia, *Nancy Ailes devotes time and talent to saving rural lands in the watershed of the Cacapon and Lost rivers. She's racing against a wave of population and development that spreads west from urban centers like Washington and Baltimore.* PHOTOGRAPH BY JACK GREER.

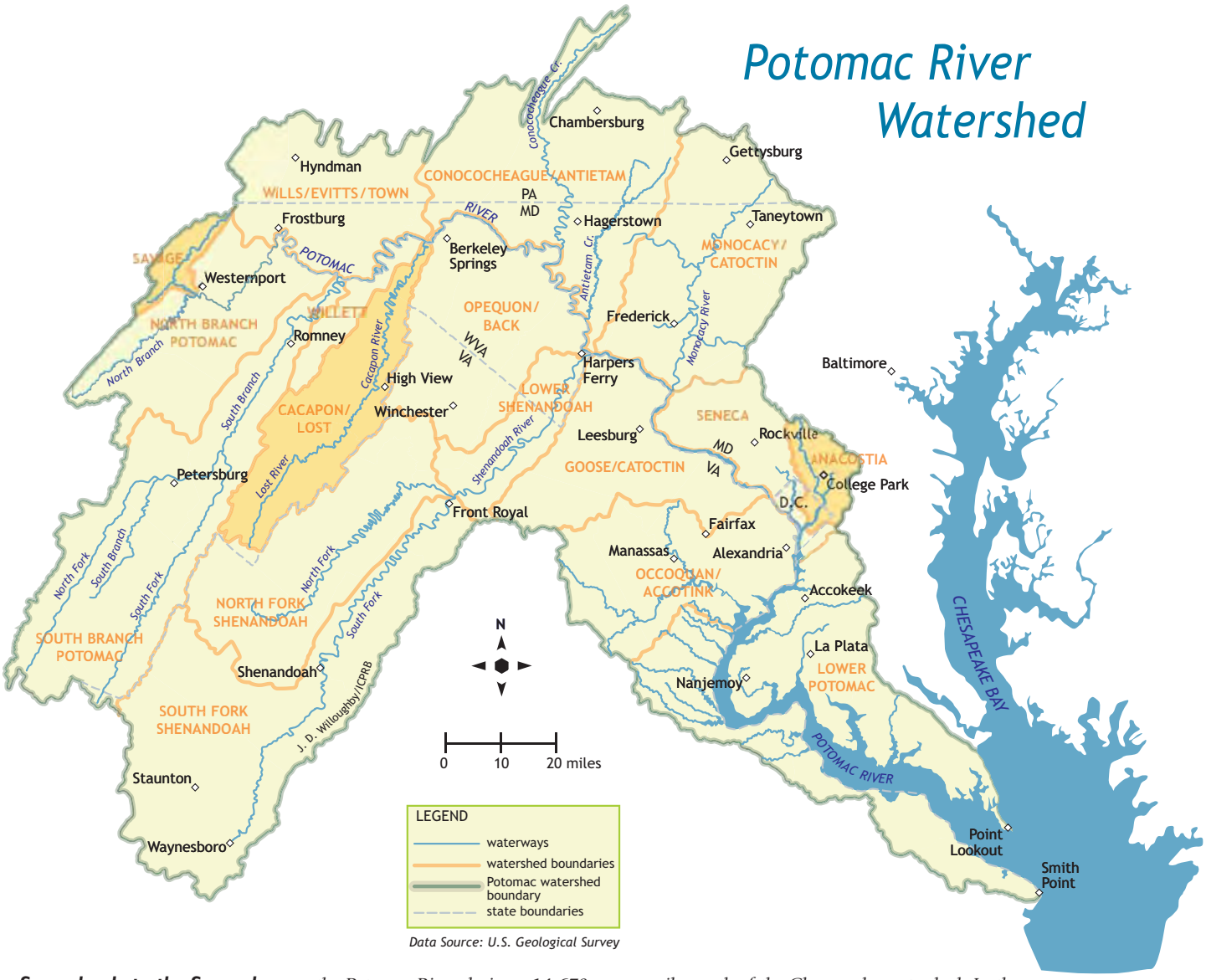
This part of West Virginia, as wild and wonderful as the slogans would have it, is within striking distance of the highly populated Eastern seaboard and the sprawling cities of Washington and Baltimore. Many of the homes built here recently, she says, are second homes for people who live and work in those nearby cities. As the head of the Cacapon and Lost Rivers Land Trust, she works on convincing the locals — farmers and other landowners who still live here — to give up their development rights to ensure the future of this rural landscape.

Nancy Ailes loves this land, rattlesnakes and all. She grew up in nearby Romney, West Virginia "on the back of a horse." When she was about seven or eight, her father taught her to fly-fish in local streams. Now her worst nightmare is that the farms of her youth will begin to sprout houses, and the forests around those farms will fall to make way for residential subdivisions and recreational developments. She fears that what's natural and homegrown about this place will disappear.

It's a realistic fear. Land preservation is a tough task in this neck of the woods. Much of this landscape belongs to farmers who grew up here. But many are already struggling with rising production costs and the falling prices bequeathed by global competition. For many, their land is their savings account and their stock portfolio rolled into one.

The air smells clean here. From the middle of the field Ailes points out a fenced area, part of a habitat restoration project — one of the watershed's successes. And she can see, on the other side of the fence, land that's yet to be saved. All through these valleys and along these hillsides there are fields and forests with pretty views ripe for development.

With premature white hair and bright eyes, Ailes is still this side of 60. As she walks through this broad field surrounded by ridges, she appears to draw on a deep well of energy. A natural-born hiker, she trekked Yellowstone National Park from top to bottom with her husband, ecologist George Constantz. And then they hiked it from side to side. Over the past seven years, they also took on Jasper, Banff, and other parks. All told, they



Second only to the Susquehanna, *the Potomac River drains a 14,670 square-mile swath of the Chesapeake watershed. In the center of the western ridge-and-valley terrain, the catchment for the Cacapon and Lost rivers rises like a teardrop. The heavily forested Savage River basin fringes the very edge of the watershed in far western Maryland. From the upland reaches to the Washington suburbs, saving forests offers the best hope for improving water quality in "the nation's river" — and in the Chesapeake Bay.* MAP CREATED BY JENNIFER D. WILLOUGHBY, INTERSTATE COMMISSION ON THE POTOMAC RIVER BASIN.

hiked some 1,200 miles with packs on their backs.

But her usual stomping ground is here along the eastern edge of West Virginia, near the Virginia line and just south of the panhandle, a shank of the state that juts east between Pennsylvania, Virginia, and Maryland. It's beautiful here, both farm country and mountain country. Much of this is grazing land, rolling grassland surrounded by trees. It's the trees that make the ridges green, miles and miles of forest.

Her work in these uplands is part of a battle to save the landscape. It is also work that will help save the Chesapeake Bay.

When rain and melting snow run off this part of West Virginia they sooner or later spill into the Cacapon River. At Paw Paw, West Virginia, the Cacapon joins the Potomac. When the Potomac hits Great Falls, it roars over the cataracts and lands in tidal waters, delivering its load of nitrogen, phosphorus, and sediment to the Chesapeake. That deadly trifecta of dirt and nutrients has altered the ecology of the estuary, darkening its waters, robbing its seagrasses of sunlight, creating dead zones every year along the bottom.

The forests Ailes wants to save serve as important buffers — taking up nutrients, binding carbon, evening out the flow of surface waters, and protecting streams against flashiness, eutrophication, and overheating. Forests perform so many "ecosystem services" throughout the six-state Bay watershed, that scientists in a 2006 report on the state of the Bay's forests estimated their ecological value at some $24 billion a year.

Saving forestland has emerged as one of the best ways to restore water quality in the Bay's tributaries. And one of the best ways to save forests is to stem the

tide of sprawl development. Conservationists and others — after watching a degraded Chesapeake fail to improve after more than a quarter century of commitments and restoration efforts — are counting on Nancy Ailes and others like her to preserve the region's open lands and especially its forestland.

The challenge she faces each day is convincing farmers and other landowners to give up their development rights to preserve this watershed's farm and forestland. Whether her efforts ultimately succeed will depend on her continued passion, her skills as a negotiator, and on the willingness of those who own the land to forgo potential profits for the greater good — for the good of the land.

Saving forests here is like holding the line in an ecological battle. After all, it's here in the western reaches that most of the Bay watershed's large tracts of forest remain. And according to the Chesapeake Bay Program, the Bay watershed is losing more than 100 acres of forest a day.

How are forests doing out here? How healthy are they?

High overhead a hawk pierces the afternoon with its sharp cry. Ailes shades her eyes to look up. Probably a redtail, she says. The hawk wheels toward a high ridge, toward where autumn-tinted trees stretch way off to the west.

A Life in the Trees

It's the first day of bear season, but Keith Eshleman doesn't think about that. Not until a ranger in a pickup rumbles down the rocky access road and pulls up with his arm out the window. Yep, first day of bear season. Probably should be wearing an orange hat. Or vest.

The access road — meant for rangers and off-road vehicles — runs along Poplar Lick, a bright mountain stream that lies about ten miles west of Frostburg, Maryland. Poplar Lick flows into the Savage River, which means that like the Cacapon River, it's a tributary of the Potomac. On this October morning it gurgles with rainwater filtered clean by leaf duff, roots, and all that's buried

Taking the pulse of mountain streams, *Keith Eshleman tracks the health of the forest by looking for telltale signals in the quality of the water. Opposite page: Monroe Run passes through forested hillsides once bared by heavy logging. Now gray patches reveal another threat, oak branches stripped by gypsy moths.* PHOTOGRAPHS BY JACK GREER.

beneath the forest floor. Along this stream the trees look hardy. Hemlocks grow dark green. Ash leaves flash burnt yellow.

Eshleman, who's on foot, has come to observe several streams and to check one of his many monitoring stations. A hydrologist, he's spent nearly 15 years in Frostburg at the Appalachian Laboratory, part of the University of Maryland Center for Environmental Science. In this mountainous countryside he studies connections between woodland streams like Poplar Lick and the health of the forests that surround them. It's a great laboratory for testing how forests affect watersheds.

As he walks along the stream, he picks out ash and beech and shagbark hickory. He taps black cherry trees with trunks as big around as oaks. For a hydrologist, he seems unusually fond of trees.

His team operates 7 stream monitoring stations in Western Maryland forests and 3 more on mine land. He also tracks a number of monitoring stations in the Shenandoah National Park, including 40 on Paine Run alone. Most of the readings he gets from his forested sample sites have remained fairly stable over many years. That stability allows him to pick up small changes. He says that after a good rain he can spot sediment signals even from small farm fields or eroding backyards.

The Savage River watershed, of which Poplar Lick forms a part, is now more than 80 percent forested, but it wasn't always so heavily treed. Early in the 20th century, after heavy logging, these hills stood bald. The trees have come back, and Eshleman now describes these forests as well established, full of bear and other wildlife, and well above the 70 percent coverage needed for good stream health.

But some of his monitoring data have picked up worrisome changes in the trees, not just here but in other watersheds as well. After a steep drive uphill from Poplar Lick to the Monroe Run overlook, he points to the problem. On the right-hand ridge, bare limbs show up as patches of gray. These leafless oaks are not just dormant, they're dead. Victims of the gypsy moth.

This troublesome insect arrived in New England in the late 1860s, courtesy of a scientist named E. T. Trouvelot. Trouvelot hoped to breed gypsy moths

with other moths to create a new strain of silkworms. Instead he spun a nightmare. With few natural enemies, the gypsy moth moved west and south — recently aboard trailers, campers, trucks, and cars…wherever the wandering moth might lay its eggs.

Eshleman says that gypsy moths hit these forests with a double whammy. Forests cover large stretches here, but the woods are literally moth-eaten. Because they defoliate and kill so many trees, the moths thwart the forest's knack for taking up nutrients and sequestering carbon. Then, adding insult to injury, the feasting caterpillars excrete large amounts of "frass" — waste that's rich in organic nitrogen and carbon. So just as the forest loses much of its capacity to handle nutrients, the caterpillars drop a heavy load.

The loss of trees in forested bowls between ridges would be especially bad for water quality.

This is what his monitoring stations have told him. When moths defoliate the trees, in-stream monitors pick up rising levels of nitrogen.

The trend is alarming. These forests face a number of exotic enemies, he says — not only the gypsy moth but the emerald ash borer and a woolly adelgid that attacks hemlocks. In places not protected from harvest, trees also face the chainsaw. In some areas of the Bay watershed, forests now resemble a patchwork quilt.

These forest disturbances damage more than the trees. They hamper the ability of forests to take up nitrogen and phosphorus, their ability to protect the Chesapeake Bay. This is particularly damaging given that the Bay already suffers from too many nutrients, too much sediment.

He says that the loss of trees in forested bowls between ridges would be especially bad for water quality. Up here these hollows can send large amounts of rainwater toward streams and rivers. If disturbed by insects or chainsaws, forests will also send down big slugs of nutrients.

Eshleman says he appreciates the efforts of those working to restore forest buffers, but he doesn't think that saving riparian buffers is enough. Buffers can often be thin strips of trees, he says. "That may be important down near the Bay," but we're

Continued on p. 10

Can We Protect the

From hillsides to shorelines, trees filled the Chesapeake Bay watershed to the brim when the first Europeans planted their roots in the 17th century. Forests covered nearly 95 percent of the land. But by the turn of the 20th century, logging and agriculture had felled 60 to 70 percent of the watershed's lush forest cover.

Today, forests make up an estimated 58 percent of the watershed, according to the regionwide Chesapeake Bay Program. A marked improvement from 100 years ago, but still far from what experts say is needed for a healthy Bay.

With daunting deadlines for restoring the Chesapeake looming, officials and managers are looking to the trees for answers. Scientists widely recognize forests as the most beneficial land cover for preserving water quality. Trees help shield the Bay from pollution, acting as sponges that soak up excess nutrients and filters that trap water-clouding sediments.

Don VanHassent of the Maryland Forest Service puts it simply. "We spend a heck of a lot of money trying to clean the junk out of the water. Well, how about trying to keep the junk out in the first place?"

Forests help do that, he says. He thinks that they are the defensive line the Bay needs. But it's a defense under pressure. Since the mid-1980s the watershed has lost about 100 acres per day to development.

Keeping up — or at least catching up — with these losses means preserving forests before they become part of that depressing statistic. To that end, VanHassent and his counterparts throughout the Bay states are intent on "keeping forests in forests."

They've even been ordered to do so.

In 2006, the Chesapeake Executive Council issued a directive calling for retaining and expanding forests in the Chesapeake Bay watershed. The Council noted that although its efforts to preserve land had been widely successful, they did not specifically target forests — the very land hailed as most important for the Bay. A comprehensive report, *The State of Chesapeake Forests*, which detailed the threat of development to the region's private forests, further spurred the call to action.

In 2007, in response to the directive, the Executive Council released a plan calling for permanent protection of 695,000 acres of forest (about the size of sixteen Washington, D.C.s) by 2020. The goal targets forests in areas of "highest water quality value" — such as those near headwaters, steep slopes, and riparian areas, and large interior blocks of forest that may connect to other preserved land.

As part of this "Forest Conservation Initiative," states must protect 266,400 acres (about six Washington, D.C.s) by 2012. But while the land conservation goal of the Chesapeake 2000 Agreement was met with great success — surpassed two years ahead of schedule — this new focus on forests has proven more difficult.

Sally Claggett from the Chesapeake Bay Program and the U.S. Department of Agriculture Forest Service reports that in the first year the watershed preserved about 85 percent of the annual target of 50,000 forest acres. Although this is a significant amount of forest cover, Claggett says that they were "not necessarily high-value acres."

She says that in 2009 they've been concentrating more heavily on working with the states to target high-value areas, which — while following the goal's true intent — may mean coming up even shorter.

Preserving forests is more challenging than preserving places like agricultural lands, she says, because there simply aren't as many preservation programs aimed at

Both farmland and developed land *send more nutrients and sediment downstream than forests. To rescue Bay water quality, the regionwide Chesapeake Bay Program has launched a "Forest Conservation Initiative," targeted to protect 695,000 forest acres by 2020.* PHOTOGRAPHS: ABOVE, BY JACK GREER; BELOW, BY ANDY LAZUR; OPPOSITE PAGE, BY SANDY RODGERS.

Chesapeake's Forests?

Jessica Smits

Protected Forestland in the Chesapeake Watershed 2008

Dark green patches *show lands that are both protected and forested. Other forestlands, even when enrolled in conservation programs or easements, may not be permanently protected.* SOURCE: CHESAPEAKE BAY PROGRAM.

The Heart of the Matter
Can we control population growth?

Forests fall and suburbs spread for many reasons. Bigger homes. Bigger lots. More cars and more highways. But underlying all this sprawl lies a driving force: an increasing human population and an economy based on growth. It's not a topic many want to take on. It's politically complicated. It runs afoul of our cultural assumptions. But Bay author Tom Horton confronts the issue in a provocative white paper entitled *Growing, Growing, Gone*.

Read about Horton's report in a web-only feature of *Chesapeake Quarterly* online, and learn what the Bay writer might say differently, if he were writing that report now. Visit www.mdsg.umd.edu/CQ.

forests. Claggett says working with local governments is key. "Decisions on what to protect and where to protect often come from the local government."

Don VanHassent agrees. "It all starts at the local level with land planning and zoning."

VanHassent also teams up with local land trusts, conservation organizations, and forestry boards all across Maryland to reach out to private forest owners who may be interested in setting aside their land in a conservation easement or applying for funds through national efforts such as the Forest Legacy Program.

He is pleased that efforts to conserve forest in Maryland recently got a boost with passage of the Sustainable Forestry Act of 2009, which went into effect on October 1. Among other things, the act calls for enhancing outreach efforts and financial incentives to encourage landowners to protect their forests from development.

But what exactly does protection mean?

In most cases it means permanently protected from development, but there are always exceptions. In the case of easements on private land, VanHassent says each easement has its own terms. The degree to which they protect forests varies. Some may allow building a house or two, while others may not even allow maintenance tree harvesting.

Sally Claggett says that sometimes forests on "protected land" can be cleared for other uses. She witnessed this during a trip to Gettysburg National Military Park where she saw trees cleared to make way for a new visitor center and museum. Not all preserved land is managed with conserving the environment as its primary goal, she explains.

Military bases, which may boast extensive tracts of forest, also illustrate the complexity of forest preservation. While the land is often considered protected, if the military needs to build an airstrip or barracks, the trees will come down.

All of this makes focusing attention on protecting forests more important — especially forests with a strong influence on water quality. In recent years, riparian buffers, bands of vegetation along streams and rivers, have received special emphasis. Additional watershed-wide goals call for restoring and planting buffers, but even new plantings do not necessarily enjoy official protection.

In the end, Claggett says, it will come down to developing long-term partnerships with those who own or control forestlands to get the amount of tree cover needed for a "healthy, functioning watershed."

Partnerships, along with patience and perseverance, because it may take a while to get there. But at a rate of 100 acres of forest lost each day, will we run out of time?

Saving Trees, from p. 7

not just holding the line on nitrogen, he argues. We're trying to reverse current degradation. Forests are "anti-degradation," he says

Forests can take hits from exotic pests, chainsaws, and changing climate, if we give them space to respond. They can experience shifts in shape and species makeup, but with sufficient size and diversity they can be remarkably resilient.

Even when forests are disturbed, he says they're still the most "retentive" landscape we have — the best sponge for nitrogen and other nutrients. "We haven't gone far enough," according to Eshleman. "If we're serious about protecting water quality, we have to save what forests we have left."

Of Farms and Forests

Back in her dining room, Nancy Ailes sits down with Mike Rudolph. His family's farmed this part of West Virginia for three generations. The room is cozy, with a mountain view through wide windows. Rudolph seems mostly at ease, but he clearly has a lot on his mind. The local supply store sent him the wrong fence posts this week and he's had to reorder them. The guys he's working with on the fencing project are waiting for him, and there are decisions to make. During a long conversation, Ailes's phone rings. It's Rudolph's coworkers, calling about the fence.

It's in the harsh context of economics that Nancy Ailes speaks to farmers about putting some of their land in easement.

Rudolph won't say so, but he has one of the biggest cattle operations in this part of West Virginia. His cattle graze different parcels of land in both Hardy and Hampshire counties. He's quick to explain the economic squeeze that he and other farmers feel every day.

"Imagine," he says, "that you were still making whatever it was you were earning back in the 1970s and trying to live on that in 2009. That's what farmers are trying to do." Beneath the visor of his Farm Credit field cap his blue eyes are piercing. "Farming's the only business I know," he goes on, "where you buy everything retail and then turn around and sell your product wholesale — and still try to stay in business."

According to Rudolph, the squeeze between what a farmer can get for his product and what he has to pay — especially for anything that's energy related — gets tighter all the time.

It's in this harsh context of farming and economics that Ailes speaks to Rudolph and other farmers about putting some of their land in easement. She asks them to sign legally binding commitments that will keep that land from being developed — forever.

A tough sell. But she argues that without this kind of intervention, farmland will disappear. The legacy of land that these farmers inherited will no longer pass to another generation. The watersheds of the Cacapon, the Potomac, and so many rivers that flow into the Chesapeake will lose their rural landscapes.

It's clear that Rudolph cares about the land. He speaks of local tracts with affection, telling their histories. There's a piece down by the river that might go up for

Generations of farming *run through the blood of Mike Rudolph (above). He and his brother have invested considerable time and money in best management practices, including a confined feeding station for cattle (left). Trees form the backdrop for his grazing lands — about 40 percent of forested lands in the Bay watershed are associated with farmland.* PHOTOGRAPHS BY JACK GREER.

sale. A big chunk up on the ridge that's already been sold. He's especially worried about a family that owns a lot of acres in the watershed — it looks like they might sell that property in pieces.

Sitting forward on her dining room chair, Ailes says that selling off property is a strong temptation, when land prices are high and times are tight. But she's shown that conservation easements can help farmers surmount the difficult financial hurdles of holding on to their land. She works with lawyers who identify tax breaks — savings in federal inheritance taxes, for example. The Land Trust is able to purchase a few of the easements, but most are donated. Her job would be easier if West Virginia offered state tax advantages for conservation easements, but so far that hasn't happened.

Are the slim incentives now in place enough to make the difference for a working farmer? Will someone like Mike Rudolph actually give up his development rights to protect the land in the face of financial uncertainty?

The Future for Forests

There is no doubt that the future of the Bay's forestland lies largely in the hands of private landowners. According to the National Forest Service, some 64 percent of forested land in the Bay watershed is family owned. Businesses, by contrast, own only 14 percent. As the number of private landowners goes up — currently some 15,000 families and individuals — the size of the forest parcels they own goes down. For nearly 70 percent of all those private forest owners, their piece of the forest measures less than 10 acres.

In short, more people now own smaller plots. That may be highly democratic, but it creates a special challenge for those trying to manage forestland, and for those trying to protect the Bay's water quality.

It's easier to deliver to a few big landowners a convincing message about managing forests than to reach out to scores of new tree owners. That's why Nancy Ailes right away aimed for a few big spreads in the Cacapon watershed. By striking deals with a relative few, she was able to protect thousands of acres from development.

Now it's getting more difficult — for

By the Numbers

58. Percentage of the Bay watershed that is forested. While a significant improvement from the turn of the 20th century when logging and agriculture left forests a ghost of their pre-colonial past, this is still a long way from the 70 percent forest cover that some scientists think is needed for a healthy Bay.

100. Estimated number of forest acres lost per day in the watershed since the mid-1980s. Some experts believe the actual number may be even higher. And natural resource managers are concerned that despite the slumped economy, developers stand poised to ramp up once the real estate market bounces back.

7.32 million. Acres of land preserved in the Chesapeake Bay watershed as of 2008. This surpassed the Chesapeake 2000 Agreement's goal of 6.8 million acres or 20 percent of the watershed by 2010. This is not all forestland.

70-80. Approximate percentage of preserved land that is forested. A concrete number is hard to come by given that data on preserved land are not easily broken down by land cover. Additionally, some forests on military land are considered "protected" although they could be converted to other uses.

695,000. Additional acres of forestland the Bay states have committed to preserving in the watershed by 2020 as part of the Forest Conservation Initiative. The goal targets so-called "high-value forests" — those with the greatest influence on water quality.

42,551. Acres of forest preserved in 2008 toward the Forest Conservation Initiative goal — though the Chesapeake Bay Program notes that most of this is not high-value forest.

10,000. New goal for miles of forest buffers planted by 2010. The original goal was 2010 miles by 2010, reached far ahead of schedule. Experts predict the states will fall short of this new goal by approximately 2,000 miles. And buffers planted does not necessarily equal buffers protected. Riparian forest managers worry they could be losing buffers as fast as they are planting them.

6,172. Miles of forest buffers planted along streams since 1996. A buffer must be at least 35 feet wide to count toward this goal, though buffers between 100 to 300 feet prove most effective for improving water quality.

— Jessica Smits

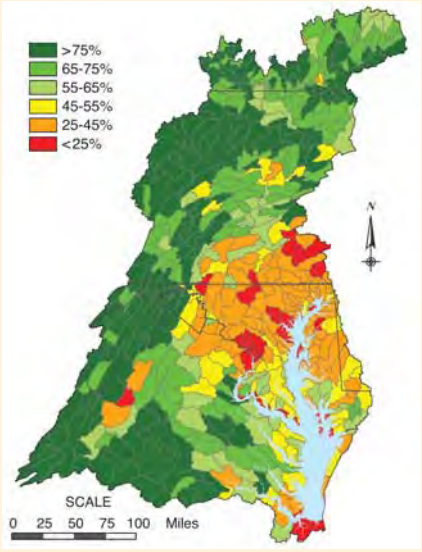
The View from Above

When it comes to forests, Stephen Prince takes the long view. And the high view — usually about 400 miles up or more. That's the altitude range for polar orbiting satellites like Landsat. The big picture comes in handy when trying to get a handle on the whole Chesapeake Bay watershed — a 41-million-acre chunk of real estate that stretches from the soggy marshlands of the Eastern Shore to the flinty highlands of West Virginia and Pennsylvania.

Today Prince sits in front of two large computer screens, looking at the satellite image of a small patch of woods. Students wait outside his office door. For more than 20 years he's studied the region's landscape and taught geography at the University of Maryland, College Park.

Prince and his colleagues produce maps that show where the forests are, and where they aren't. One map breaks this down by sub-watershed, using color codes (see map at right). Dark green shows watersheds at least 75 percent forested — where most experts agree that streams have a good shot at ecosystem health. Much of that dark green is confined to the western reaches of Virginia, West Virginia, and Pennsylvania.

As the map moves toward the metropolitan areas of Philadelphia, Baltimore, Washington, Richmond, and Norfolk, forest cover drops to less than 45 percent and then even less than 25 percent. Along the suburban fringe, where development and forests collide, battles over trees can be fierce.



A patchwork of watersheds *knits together to create the Chesapeake drainage basin. Dark green denotes watersheds still heavily forested in 2000. Stephen Prince and his colleagues use satellite imagery to track changes in land cover, including forest cover and impervious surfaces.* SOURCE: MID-ATLANTIC REGIONAL EARTH SCIENCE APPLICATION CENTER.

One of those battles has come to College Park, not far from where Prince now sits. The image on his screen is of a threatened forest right across campus.

Lying alongside busy University Boulevard, this small forest patch looks a little beaten up. A deadly tornado ripped through in 2001, twisting tree trunks and breaking branches. According to campus experts, these woods offer a chance to document how a small forest can come back from such insults.

Prince refers to this 22-acre patch of forest as "the wooded hillock." It's become a bone of contention, sparking articles not only in the student paper but in the *Washington Post* and the *Baltimore Sun*. Campus planners want to bulldoze almost half the woods so they can move maintenance facilities and a parking lot away from Route 1, an area designated for more upscale development.

Students are upset about losing the woods. And so are faculty.

Prince, whose accent reveals his roots in the United Kingdom, speaks with some heat. He says that the woods serve as an outdoor classroom for some 1,300 students a year who study biology and the environment. He feels that taking down the woods doesn't fit well with a recent campus-wide emphasis on sustainability or with pledges to preserve natural environments. It doesn't help to green the University's image.

And he thinks the trees play an important ecological role. He points to the image on the computer screen. There a green triangle reaches from one patch of woods to another.

Prince says it's the last remaining connection between the riparian forests along the Northwest Branch and those of the Northeast Branch — tributaries of the Anacostia and therefore of the Potomac River. Ecologists call these woodland connections "corridors." And if the trees of the wooded hillock come down, that natural corridor will close.

This battle has special significance for Prince. His academic training is in plant ecophysiology — he studies and teaches the relationship between plants, landscapes, and ecosystems. He uses models with names like "Sparrow" to estimate the impact of impervious surfaces. He estimates the amount of runoff that comes from developed landscapes, and the amount of nitrogen and phosphorus that flows down streams and rivers into the Chesapeake Bay.

Though nothing like the vast reaches of forest in the Bay's western watershed, the wooded hillock plays its part in slowing runoff, absorbing nutrients, and providing a wildlife corridor — the last living connection between the two arms of the Anacostia. As development spreads through the suburbs, it's not the only wooded corridor that's closing.

— J. G.

her and for many like her. To get a sense of the task facing the Potomac watershed, multiply the challenge Ailes faces in the Cacapon many times over. And even more for the whole Bay watershed.

Easements will be an important tactic in the fight to protect open lands from development, but they will not be the only tactic. Ailes's husband, George Constantz, founded the Cacapon Institute to focus attention on the health of the river and its watershed. Education. Advocacy. Technical assistance. These are some of the tools people like Ailes use to protect the land one acre at a time.

Her tools, it seems, are working.

Mike Rudolph has put conservation easements on substantial portions of his land. And his brother, Jackie, has as well. He says they may do more. He says he doesn't want to see the land "broken up."

Because of farmers like the Rudolphs and others, the Cacapon and Lost Rivers Land Trust has now put into permanent easement some 10,000 acres — 10,000 acres protected from development in perpetuity.

With obvious emotion, Ailes tells the story of one farmer who was able, with their legal advice, to hang on to family land he'd inherited while saving it from development. The day he signed the conservation agreement he cried tears of joy.

For Ailes, saving the land from development is the essential first step. Yes, she says, there are other issues to take on. Fencing streams. Protecting woodlands. Redesigning feedlots. But if the land falls to development, pushing for better farming and forestry practices will be moot, because this will no longer be farm or forestland.

She estimates that about three quarters of easements here are forested. But how secure are the forests on these farmlands, especially along the ridges and in the hollows?

They are not completely protected, says Ailes, though the easements spell out strict requirements for a formal forest management plan before any harvesting can take place. That plan must have a goal for maintaining wildlife habitat and for

In a disappearing act, *the Lost River for much of the year drops beneath a mess of boulders. When it reappears above ground it becomes the Cacapon. Nancy Ailes wants to ensure that the watershed's farms and forests don't perform a disappearing act of their own.* PHOTOGRAPH BY JACK GREER.

promoting the "long-term sustainability of contiguous forest."

Rudolph knows he can harvest his timber if he wants. For him, the trees on his property represent a "savings account," an account he can cash in if he has to. He says that he'd prefer never to do that, because "once you cash in your savings, they're gone." Besides, he likes the trees. The farmland around here has been about half working landscape and half forest for a long, long time. It's not likely to change.

Even so, unless he signs away his timber rights, the trees are his. There are no laws to protect them. Local limits on land use are not strict — in fact in this particular county, there is no zoning.

This is one of the key pieces to the forestry puzzle. Farms are currently one of the most polluting forms of land use, largely because they cover so much acreage in the Bay watershed. But farms are also home to many of the Bay's large patches of forestland. If farms break up and fall to development — to roads, subdivisions, schools, churches, shopping centers — that will mean more forest fragmentation. And worsening water quality for rivers like the Cacapon and other tributaries to the Potomac River and the Chesapeake Bay.

Nancy Ailes walks Rudolph out to his truck. There is hardly a sound to interrupt the silence between them. They both grew up in this ridge-and-valley terrain. They both formed a bond with this land long ago. Rudolph climbs into his pickup and cranks the engine. As he pulls off down the road, Ailes waves briefly before heading back inside. A light breeze rattles leaves around the house, a breath come down from that forest on the ridge.

— *greer@mdsg.umd.edu*

For More Information

State of Chesapeake Forests (2006)
http://na.fs.fed.us/watershed/socf.shtm

Forestry for the Bay
www.forestryforthebay.org

Forest buffers
www.chesapeakebay.net/forestbuffers.aspx?menuitem=14780

Forest stewardship education (UM Extension)
www.naturalresources.umd.edu/EducationalWBY.html

Cacapon and Lost Rivers Land Trust
http://cacapon.org

Information and handbook on conservation easements:
The Trust for Public Land, www.tpl.org

Information on the Potomac River and great maps:
www.potomacriver.org

Mid-Atlantic Regional Earth Science Application Center
www.geog.umd.edu/resac/

Save the Wooded Hillock
www.savethehillock.com

The Tree That Was
Saving the American Chestnut

Jack Greer

It would not be right to call Joe Dickey a sentimentalist. With a doctorate in physics, a full career in Navy research labs, and years more of teaching at Johns Hopkins University and elsewhere, Dickey has a clear-eyed view of the world. When he and his wife bought this land in southern Anne Arundel County in 2002, they had no plans to become chestnut farmers.

But when they decided to buy the adjacent 22 acres of farm fields to add to their original 5 acres, they found themselves on the tax books as farmers. Either that, or they owed the government a lot more money.

Tall, outdoorsy, and rugged-looking, Dickey liked the idea of becoming a certain kind of farmer. What kind of farmer wasn't clear, but he ran across an article in *Science News* that intrigued him. It described a grand experiment with a grand old tree: the American chestnut.

Most of us, including Dickey, who just turned 70, are too young to remember the age of the American chestnut. We do — many of us — know the story of its demise.

A Colossal Loss

The American chestnut once graced forests all along the Eastern seaboard, from Maine to Georgia. For thousands of years it supplied large brown nuts, wrapped in an uninviting spiky green bur. The tree fed all kinds of wildlife and then all kinds of humans. For hundreds of years it supplied good wood as well, for log cabins, for furniture, and in the end for railroad ties, mine shafts, and telegraph and utility poles.

Then in the early 1900s chestnut trees began to die. The chief forester at the New York Zoological Park (now known as the Bronx Zoo) first puzzled over dying chestnuts in 1904. In 1906 scientists identified this new fungus, and at first they thought they could control it. They tried selective cutting and aggressive trimming. Infected chestnut trees resembled amputees, until they finally succumbed and were cut down. By 1908 the *New York Times* declared, "Chestnut trees face destruction."

In the years following, the blight spread. As early as 1911, the fungus had found its way to nearly a dozen states. Some experts continued to argue that a Herculean effort to stay ahead of the disease could still save many of the American chestnuts that remained, especially the large stands in Virginia and the southern Appalachians.

In the end, even these diehard tree warriors threw in the towel. It was a rout. By the 1920s and 30s, the chestnut blight had conquered just about every forest in the U.S. Only a few stands seem to cope with the blight, in lower Michigan, for example.

Here, in Chesapeake Country, a few sizable trees remain. Mostly we have only old photographs, old tools, old carvings. One relic is a totem shaped from chestnut wood given to early settlers by Bay-area Indians. It's kept in the American Portrait Gallery, where its dark iconographic wood still gleams, handled by many hands.

Old photographs, old stories, a few survivors. But also green shoots — reedy saplings that the stumps of otherwise dead chestnut trees send up year after year. These green scions should be rays of hope, but after they reach about the height of a human, the ever-present blight finds them. And kills them. Researchers tell us that sprouts from these old chestnut ghosts can't keep coming back forever.

Race Against Time

This is where Joe Dickey comes in. When Dickey decided to become a part-time farmer, chestnut trees became his crop. It's a crop he'll never harvest.

His trees actually belong to the American Chestnut Foundation. Along with many others, he's working with the Foundation to see if he can get chestnut trees to grow — and survive.

In 2005 they brought nuts to plant, and when the time comes they will come and

In a field of dreams, chestnut trees *selected from different genetic pools (above left) soak in the southern Maryland sun. Physicist Joe Dickey (opposite page) never thought he'd be a chestnut farmer. An accidental expert, he points out the heart-shaped stipule on a mostly Chinese chestnut tree (above right). Nutritious brown nuts (below) once sustained both wildlife and mountain folk.* PHOTOGRAPHS BY JACK GREER.

take the best of what's left to propagate the next generation. This leaves Dickey with a 10-year commitment and a lot of work to do. To begin, he marked out 10-foot centers over large stretches of his newfound fields and sweated with four or five volunteers from the Chestnut Foundation to plant 200 nuts. Each nut represented the best offspring from the previous generation.

With green shoots sprouting in the ground, he could have stood back and watched his crop of chestnuts grow, except for the deer. And the raccoons. The only thing that stopped deer from grazing on his tender seedlings was a fence made of mesh some eight feet high — high enough that they wouldn't leap over it.

The raccoons were more determined, and smarter. Dickey put plastic tubes around the seedlings, and thought he'd solved the problem. But the raccoons simply dug beneath the plastic tube until the sprouting nut dropped into their humanlike hands. To stop the digging, he laid large mats of chicken wire over the plantings. That seemed to work.

As the growing season progressed, he had to keep down all the other things that grow in a field. He had to mow. And mow. He does this himself, a physicist-farmer on the back of a tractor.

The next year, he planted another 200 trees, and the following year he planted 200 more. He now has a chestnut orchard of some 600 trees.

These are not ordinary chestnuts. Only two or three percent count as pure American chestnut, and these are almost certain to die. Most of his trees hold a genetic mix of different breeds, carefully coded and recorded. This field of dreams is more like a big roulette wheel. The winning number will be the right genetic combination, the proper mix of disease-resistant genes and good growth.

The lucky numbers for this game come from two main sources. First, the American chestnut, with its penchant for towering trunks and spreading branches — a king of the forest. Second, the Chinese chestnut, which is hardy and disease resistant, but lower and bushier than its kingly cousin.

The object of the game is to have enough of the first genes to get a tree that resembles the American chestnut of yore, and enough of the second to keep that tree from dying.

So far, Dickey says, only the trees that are mostly Chinese seem able to survive. Good for a garden or backyard, perhaps, but no forest dweller, no towering giant, no source of abundant lumber. No storied chestnut tree.

Next spring, in 2010, experts from the American Chestnut Foundation will come and inoculate each of his five-year-old trees with a particular strain of blight (fungus). Then they'll wait a year or two to assess the trees' health. To continue this breeding experiment, this race against time, they'll select the ones that are doing the best. Say 2 or 3 out of 100. They will destroy the rest. Cut them down and burn them.

"It's a little sad, isn't it?" Dickey says, his eyes looking off beneath heavy eyebrows. Perhaps he can be sentimental after all.

The experiment will go on. There are about three or four such orchards in Maryland, he thinks. One in the coastal plain (his), one in the Piedmont, and at least one in the mountains. Each orchard is a roll of the genetic dice. Each temporary chestnut farmer hopes to take breeders one step closer to a winner.

For now Dickey's trees look great, row after row. He can pick out the young trees that are all Chinese. The leaves are wider, thicker. Many are bearing nuts, carried in those bristly green porcupine cases. Dickey says it's not likely that any of these trees have seen the more virulent fungus strains, strains that almost certainly hover nearby. The blight keeps hanging around, year after year, decade after decade.

After a century of hope and struggle, modern breeders like Dickey are betting their money, sweat, and labor on a winner — a survivor that could bring towering chestnuts back to the forests of the Bay watershed and beyond.

For more about chestnut trees, see Susan Freinkel, *American Chestnut: The Life, Death, and Rebirth of a Perfect Tree*, University of California Press, 2007.

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Harbor Dredging Study

Sediments dredged from Baltimore Harbor shipping channels may be suitable for a number of innovative uses, according to a new report. These uses range from construction materials to nonagricultural soil amendments.

The 110-page report, *Sediment in Baltimore Harbor: Quality and Suitability for Innovative Reuse*, results from a year-long effort by an independent technical review team. Its purpose is to provide the Port of Baltimore, citizen stakeholders, and other interested parties with an objective approach for handling and using sediments from the harbor.

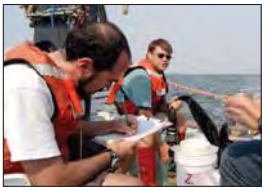
The review team found that sediment dredged from some locations is of sufficient quality for a variety of innovative reuse options, such as fill for mines and for sand and gravel pits, and components in cement filler and lightweight aggregate materials. A limited number of locations meet Maryland criteria for residential reuse, which includes such uses as manufactured topsoil (not meant for cropland). Soil from a few sites is unsuitable for any reuse.

In its report, the team lays out a step-by-step protocol to help determine reuse options available for given dredging projects. This guidance recommends that before decisions are made regarding dredging and innovative reuse, any specific location be subject to case-by-case, site-by-site testing, risk assessment, and monitoring.

For additional information, including a downloadable copy of the entire report, as well as a four-page layperson's summary, visit the web at www.mdsg.umd.edu/dredging.

Maryland Sea Grant Opportunities

Request for Proposals



Maryland Sea Grant is seeking research proposals for a special one-year funding cycle. Projects will run from February 1, 2011-January 31, 2012. Preproposals are due in February 2010, and final proposals will be due in June 2010. To learn more about the focus of this year's RFP, visit the web at www.mdsg.umd.edu/programs/research.

Fellowship Opportunities

Coastal Management Fellowships, NOAA Coastal Services Center. These two-year fellowships, currently available for 2010-2012, provide on-the-job education and training opportunities in coastal resource management and policy for post-graduate students and project assistance to state coastal zone management programs. The fellowships are sponsored by the National Oceanic and Atmospheric Administration (NOAA) Coastal Services Center.

The deadline for submitting applications to the Maryland Sea Grant office is January 29, 2010. For more information, visit Maryland Sea Grant at www.mdsg.umd.edu/programs/education/fellowships/, or NOAA at www.csc.noaa.gov/cms/fellows.html.

Dean John A. Knauss Marine Policy Fellowships, National Sea Grant College Program. Applications are sought for these one-year (February 2011-January 2012) graduate fellowships, funded by the National Sea Grant office and administered through individual state Sea Grant programs.

Knauss Fellows spend a year in marine policy-related positions in the legislative and executive branches of the federal government.

Applications are due at the Maryland Sea Grant office February 20, 2010. For application details, visit the Maryland Sea Grant web site at www.mdsg.umd.edu/policy/knauss. For information about the fellowship program nationally, visit the National Sea Grant Office at www.seagrant.noaa.gov/knauss.

Research Experiences for Undergraduates (REU). Maryland Sea Grant is currently seeking students for the summer 2010 REU program. Funded by the National Science Foundation, the program pairs students with marine scientists at the Horn Point Laboratory (HPL) in Cambridge or the Chesapeake Biological Laboratory (CBL) in Solomons to conduct academic research projects for twelve weeks (May 23-August 15). The labs are part of the University of Maryland Center for Environmental Science (UMCES).

To be eligible, students should be undergraduates who have completed at least two years of study towards a bachelor's degree and still be undergraduates in the fall of 2010. Preference is given to students who are rising seniors. Those from underrepresented groups and institutions with limited research opportunities are especially encouraged to apply.

Applications are due February 17, 2010. To apply, visit the web at www.mdsg.umd.edu/reu.

Read our BayBlog, see the Photo Gallery, and send your comments to us at www.mdsg.umd.edu/CQ
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