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The HIGHLANDS Current

2018 Golf Guide
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May 4, 2018 161 Main St., Cold Spring, N.Y. | highlandscurrent.com

What's Up with Breakneck?

Planned closure delayed until at least the fall

By Ian Halim

Although plans had called for closing access to Breakneck Ridge from Route 9D on Jan. 1 to allow construction on the Hudson Highlands Fjord Trail to proceed, it will remain open through the summer and into the fall, according to trail officials.

Scenic Hudson, which is spearheading the Breakneck Connector project that will be part of the Fjord Trail linking Cold Spring and Beacon, says the delay is due to a lack of bids on the project. It received only one, which exceeded the budget, said Senior Planner Amy Kacala. A new bidding process will begin in the fall. In the meantime, she said, the nonprofit plans to hire a landscape firm to propose modifications to the design.

Breakneck has become an increasingly popular destination for hikers, drawing more than 1,000 visitors on most summer weekends and an estimated 100,000 in 2017. Trails.com ranks it as the most pop-

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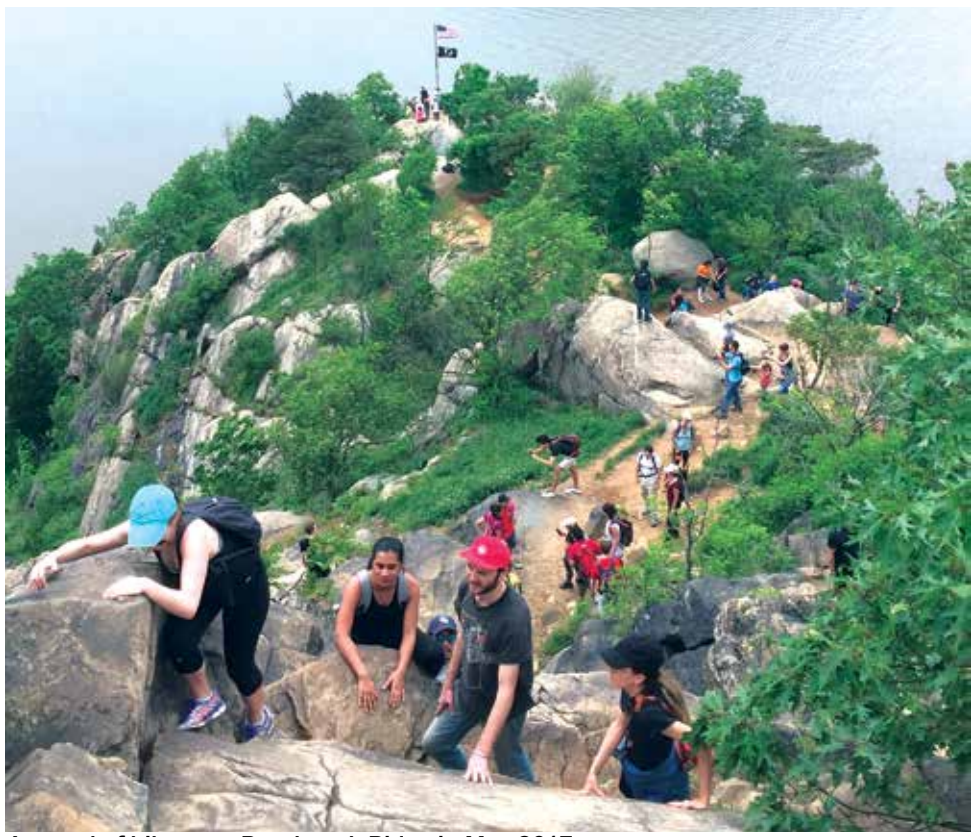

A crowd of hikers on Breakneck Ridge in May 2017 *Photo by Luis Maldonado/NYNJTC*

By Chip Rowe

The climate has always been changing. If you are in the Highlands, you are sitting at this moment on a spot once covered with several thousand feet of ice. But that was 21,000 years ago.

Now imagine the Highlands just 30 years from now, when our climate will be closer to what you find today in Raleigh, North Carolina.

That may sound appealing, but along with the temperate mercury we will see far less snow and far more heavy downpours, "100-year storms" that will occur every 5 or 10 years and cause billions of dollars in damage, and summer droughts that will change what farmers are able to grow. We will suffer extended heat waves, with between 10 (Albany) and 28 (New York City) "danger days" on which the heat index hits 105 degrees or higher. At the same time, the Highlands will look like a resort to the residents of Raleigh (70 danger days) and Phoenix (147).

If unchecked, sea-level rise will push the Hudson River to the Metro-North tracks on Cold Spring's waterfront by 2100, putting the Hudson line north and south under water. The Beacon train station will be overrun and Dia:Beacon will become an island. Average temperatures, at their worst, could be 10 degrees higher by the turn of the century and the growing season a month longer, allowing for more pollen and more ticks. Poison ivy and algae blooms will thrive.

"The rate of change is scary," says Radley Horton, a climate scientist at Columbia University who lives in Cold Spring. "The red flags are here."

While the climate has always been changing, it has never changed as fast as it has since 1830, the year the first coal-powered steam engine,

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Beacon Police Release Body-Cam Policy

Allows officers to view footage before reports

By Jeff Simms

The Beacon Police Department's policy on how officers use body cameras receives mixed grades when compared to guidelines suggested by civil-rights groups but largely conforms with those of police executives.

The agency released its policy following a Freedom of Information Law (FOIL) request by *The Current*. Patrol officers in Beacon began wearing the cameras about six weeks ago, and Chief Kevin Junjulas says he hasn't heard any feedback, positive or negative, from the community. "The department continues to find the body cameras useful," he wrote on May 3 in an email.

The Beacon police used a nearly $10,000 federal grant to purchase the cameras, a technology also employed by officers in neighboring Newburgh and Wappingers Falls. In Putnam County, Sheriff Robert Langley Jr. says he plans to have his deputies use them, as well.

Watchdog organizations such as the American Civil Liberties Union and The Leadership Conference/Upturn have been critical of the technology, saying the cameras have not

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TECH TITANS — Bryce Lake and Eamon Wall work on projects on April 30 in the newly opened Innovation & Learning Center at the Desmond-Fish Library in Garrison. For more photos, see highlandscurrent.com. *Photo by Ross Corsair*

(Continued from Page 1) the Tom Thumb, was constructed in Baltimore. Powered by fossil fuels, a trip that took two weeks in 1830 took only two days by 1857, and takes two hours today by plane. As America grew, it became smaller.

Nearly two centuries of burning the fuels required to run our trains and cars and planes, and heat our interiors and power our gadgets, have come with a heavy price. The carbon dioxide (CO_2) released by generations of innovation has saturated the atmosphere, dramatically increasing the amount of solar heat it traps, a process first conceptualized in 1856 by scientist Eunice Foote in a paper presented in Albany (see story at right).

This relationship later became known as "the greenhouse effect," because the atmosphere traps heat in the same way a greenhouse does. And we need that heat; for starters, it keeps the oceans from freezing solid. But the more carbon we release into the atmosphere, the more heat the atmosphere traps, and the hotter the earth becomes.

The change isn't dramatic in the moment. But when scientists pull up ice cores in the Antarctic to measure carbon in trapped air from as long ago as 11,000 years and study tree rings for growth rates, a troubling pattern becomes apparent: a slow and steady rise until the industrial revolution, when the lines on the charts that track everything bad look less like the gentle westerly slope up Anthony's Nose and more like its sheer face.

No one alive today will be around to see a happy ending, if there is one. If global warming is to be stopped, it will take generations. Based on documented changes, climatologists years ago concluded the situation is a runaway train — more precisely, a runaway oil train. We can only slow it down, buy some time. It's a legacy issue, which is always a hard sell. Many of us never write a will, let alone plan for a century or more down the road.

"In 2040 we will know the future of the earth, whether it's going to warm 4 degrees or 9 or 10," says Eban Goodstein, director of the Bard Center for Environmental Policy. "What will it take to hold the rise at 4 degrees? There were 32 billion tons of CO_2 emitted globally last year, and we would have to cut emissions by 70 percent by 2050 — starting now."

Unfortunately, Goodstein said that in 2012. Last year, 37 billion tons of CO_2 were released.

The problem is particularly challenging because the world's climate is maddeningly complex. If you turn one dial, it's hard to predict which other dials will move. That imprecision is what skeptics, including many in the fossil fuel industries and the current head of the Environmental Protection Agency, seize on when they insist that the threat is oversold. Yet the ice at the poles is clearly melting, the seas are clearly rising and the storms are clearly more frequent and intense.

Climate Change Projections for the Highlands

	Baseline	2020s	2050s	2080s
Increase air temp	50°	2.3° – 3.2°	4.5° – 6.2°	5.6° – 9.7°
% ↑ precipitation	51"	2 – 7%	4 – 12%	5 – 15%
Heat waves	1	3 – 4	5 – 7	6 – 9
Days over 90°	10	26 – 31	39 – 52	44 – 76
Sea-level rise	Current	1 – 9"	5 – 27"	10 – 54"
100-year flood	0% probability	↑ 20 – 50%	↑ 70 – 90%	↑140 – 610%

Source: *Responding to Climate Change in New York State ClimAID Report* (2011, 2014) for Region 5, which includes Dutchess and Putnam counties

Graphic by Lynn Carano

Although global warming affects every person on earth — at last count, there are more than 7.8 billion of us — we wanted to focus on the Highlands, as best we could. Fortunately, there are many people who live here — scientists, journalists, farmers, naturalists, legislators, activists — who are able to help us better understand what is happening, and will happen.

Over the next few weeks, we will examine the impact of climate change close to home — including on our river, weather, farming and food, the wildlife we see, the wetlands and trees, the poison ivy, the ticks, the dirt roads. We will speak to the innovators who are addressing how we must adapt, and the activists who are hoping to change the conversation here, in Washington and across the country.

But first, to get a broader perspective, I visited with three Highlands residents who think about climate change every day: **Alison Spodek**, an assistant professor of chemistry and environmental studies at Vassar College, whose battle with leukemia changed, and informed, her view; **David Gelber**, who left a two-decade career at *60 Minutes* to pursue what he sees as the story of our time, and whose reporting spurred him to action; and **Andy Revkin**, who has reported on climate change for 30 years for *The New York Times*, *ProPublica* and, most recently, *National Geographic*. *(continued on next page)*

Alison Spodek at home in Beacon with her children, Noa and Abraham *Photo by Meredith Heuer*

The Discovery of the Greenhouse Gas Effect

Although credit for identifying the greenhouse gas effect typically goes to John Tyndall, who published a series of papers in 1859, the first scientific research that identified it was presented three years earlier, in Albany, at the annual meeting of the American Association for the Advancement of Science.

The author was a relative unknown, a 37-year-old woman named Eunice Foote who had come to the conference with her husband. Little is known about her background, but her two-page report, "Circumstances affecting the Heat of the Sun's Rays," explained experiments she had done to measure the variation in the absorption of radiant energy by gases in the atmosphere. It also included her speculation that increasing the amount of carbon dioxide in the atmosphere would lead to global warming.

Scientific American praised Foote for her experiments, which involved an air pump, thermometers and glass cylinders, and noted it was "happy to say" they had been "done by a lady."

David Gelber at his Garrison home

Photo by Meredith Heuer

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Alison Spodek

Six years ago, at the age of 37, with two young children at home, Spodek was in a hospital bed at Sloan Kettering, dying of acute myeloid leukemia.

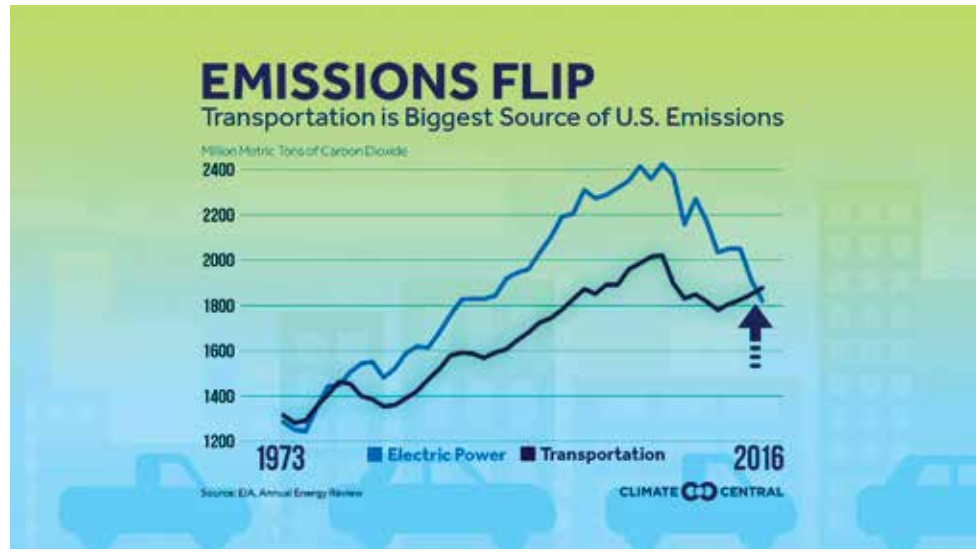
She was told her odds of surviving five years were 1 in 5.

A stem cell transplant saved her. In March, *Slate* published an essay the Beacon resident wrote about her near-death experience and how it influenced her view of the earth and its future (bit.ly/alison-spodek).

When she began teaching her students at Vassar about climate change, Spodek focused on what needed to be done to avert catastrophe. By the time she returned to work in 2014, she wrote in her essay, "I no longer could see a track that turned away from the edge. We are already locked into catastrophic changes, terrible human and animal suffering."

"We are in the middle of a mass extinction," Spodek says when I meet her at Ella's Bellas on Main Street in Beacon, where she retreats to grade papers. "We are losing tremendous amounts of biodiversity, animals, plants, fungi, everything. There have been five mass extinctions, according to the fossil record. In this one, our quality of life will be significantly diminished. And it's not any one species, such as the white rhino — it's entire systems that are complicated and overlapping."

Despite what she described in her essay as her "new willingness to see and acknowledge the hardest parts of this reality," she tells me she meant for the piece to be hopeful: We may not be able to stop climate change but we can do everything we can to push it back, just as anyone would



when battling cancer.

"It would be absurd to say to a 37-year-old cancer patient, 'Cheer up, you were going to die eventually!' " she explains. " 'If you would have lived to 80, that's only a 43-year difference!' "

She believes "paradigm shifts are possible." After meeting with members of the Beacon chapter of the Citizens' Climate Lobby earlier in the day we spoke, she says she left feeling intrigued by the prospects of a plan to make it expensive for energy companies to release carbon into the atmosphere, a practice known as carbon pricing. "If we can harness the power of the market, things could change very fast," she says.

The problem with climate change, she says, is that "everybody imagines this perfect nature that existed in the past, and since we can't go back to that, maybe we should give up. When I start to feel despair, I tell myself and I tell my students, postponing the inevitable is all we ever do! We can postpone destruction and keep things nice for a little longer.

"The difficulty," she adds, "is that we want to teach young people lessons with a positive spin. Elementary, middle and high school students are being taught that if you ride your bike a little more and recycle your cans, everything will be O.K, and that's not a realistic expectation we're setting for them. We're letting ourselves off the hook that way, which we will pay for.

"But as I'm talking to my daughter, who is 10, I don't want to paint a totally bleak picture," she says. "You can be a good environmentalist but it has to be bigger than that." She quotes a Jewish text, the *Pirkei Avot*: "You are not obligated to complete the work, but neither are you free to desist from it."

Spodek grew up in Washington, D.C., and as a child wanted to be a poet. She remembers the first time she heard about climate change. She was 10 or 12 years old, and she learned from a newscast that the planet was warming. "I was totally terrified," she recalls. "I thought, this seems

like a bad situation. We should have been dealing with this 35 years ago when I first heard about it."

Inspired by her high school chemistry teacher, she took some chemistry courses at Wesleyan "and kept taking them and all of a sudden I was three-quarters of the way through the major." She earned a master's degree in chemistry at Yale and was pursuing a doctorate at Columbia in physical chemistry before changing course. "I realized I was looking at four years in the basement with a laser," she says.

Before enrolling in grad school, Spodek and her husband, Brent (now the rabbi at the Beacon Hebrew Alliance), traveled four months by bicycle through California and from Florida to North Carolina, all while living in a tent. "That shifted my relationship with the outdoors," she said. She left the physical chemistry program and got involved in research to study arsenic levels in ground water. She would eventually earn her Ph.D. in earth and environmental science and was hired by Vassar in 2009.

She knows it's difficult for people to fathom the changes that are coming. But like Radley Horton, who was a classmate at Columbia, she sees the signs, from the lack of fireflies for her children to catch to the pervasive poison ivy. "Part of why climate change is personally upsetting to me is that I can't see anything without seeing climate change," she says.

David Gelber

Gelber, 77, grew up in Elizabeth, New Jersey, where he says a defining memory of his childhood was "the fumes coming from the refineries in Rahway and Linden. I'm glad every morning to wake up in Garrison," where he lives in a home overlooking the Hudson with his wife and two daughters.

He was the editor of his college newspaper at Swarthmore, did some work as a cub reporter for the *Elizabeth Daily Journal* and, after graduation, became editor of an alternative weekly in Boston called *The Real Paper*. After a fortuitous introduction, he was hired as a reporter at WNBC in New York City.

He didn't last. "I was the role model for Albert Brooks' character in *Broadcast News*, with the flop sweat," he says, "so they made me a producer." From there he progressed to the *CBS Evening News* and *60 Minutes*, where he worked with Ed Bradley until Bradley's death in 2006.

In 2009, Gelber and his associate producer, Joel Bach, reported a story with correspondent Scott Pelley on Jim Rogers, the CEO of Duke Energy. Rogers did not sound like a typical coal-industry executive.

> Pelley: Controlling carbon emissions in the near future is inevitable in your view. This is going to happen.
>
> Rogers: It's inevitable in my judgment.

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Pelley: You're one of the biggest polluters in the world when it comes to carbon emissions.

Rogers: We're one of the largest emitters. And it tells you how daunting the challenge is that we have in front of us.

Pelley: You know, there are a lot of people, many of them in your industry, many whom you probably know, who say that global warming is not a big problem.

Rogers: It's my judgment that it is a problem. We need to go to work on it now. And it's critical that we start to act in this country.

"Rogers was a smart guy," Gelber says. "He understood that climate was a big deal. He made friends with environmentalists and then basically screwed them on the Waxman-Markey Bill," which would have established a system where the government would limit the amount of greenhouse gases that could be emitted and companies would buy or trade permits, with the maximum amount of CO_2 that could be released in total each year slowly reduced.

"Rogers got liberal Democrats to vote against Waxman-Markey," which was passed 219-212 in the House but never brought up in the Senate, Gelber says. "He was torn between what he knew to be true and his fiduciary responsibility to his shareholders."

The Rogers story prompted Gelber and Bach to dig deeper into climate change. The more they learned, the more they considered focusing on the topic.

"*60 Minutes* is a magnificent job and you get to be a dilettante, but at the time I had just had kids at a relatively advanced age and I thought they are going to have to live with this," Gelber recalls. "I wanted to spend the rest of my journalistic career trying to get people to focus on what is the single biggest story out there."

In 2011, Gelber and Bach left CBS and began to look for financial backers for a documentary film or series. Bach had a college friend who was a niece of the longtime Hollywood producer and agent Jerry Weintraub, who agreed to meet with them. "He said to us, 'You left *60 Minutes* to report about the weather?' But [George] Clooney and Brad Pitt and others were concerned, and Jerry was so helpful." (Weintraub died in 2015.)

The director Jim Cameron (*The Terminator*, *Titanic*) heard about the project and agreed to meet, too. He became an executive producer. They pitched Arnold Schwarzenegger and Harrison Ford. They signed on, as well.

Four years later, the series, *Years of Living Dangerously*, premiered on Showtime. The opening episode followed Ford to Brazil, where he confronted forestry officials who were allowing trees to be burned in protected land to clear space for palm-oil trees, which produce an ingredient widely used in packaged foods and beauty products. The series won an Emmy.

Season 2 aired on the National Geographic Channel; Ivy Meeropol, a documentary filmmaker who lives in Cold Spring, produced two episodes. *Years* has been picked up for a third season on National Geo. Past episodes were viewed more than 120 million times online during the last three months of 2017, Gelber says.

He acknowledges that the project has moved beyond reporting. "We're walking some kind of weird line between journalism and advocacy," he says. "But we are absolutely determined never to lie to people. Everything is carefully vetted."

What frustrates him, he says, is that the television networks rarely report on the issue. To combat that, the *Years* team plans to expand its website and launch an international newsroom. "If you want to have any impact, you have to do more than a series every two years," Gelber says. "You have to keep the issue alive every single day as long as ABC, NBC, CBS and Fox are ignoring it. People assume if they don't hear about it, it couldn't be that important."

What needs to be a priority? Like many others, Gelber advocates carbon pricing. "Make the polluters pay," he says. "They are getting away with dumping toxic garbage in the atmosphere. The restaurants on Main Street in Cold Spring have to pay $100 a week to get rid of their garbage, but the oil companies don't pay."

Whatever the mechanics, he says, "this is a political question more than anything. We have been subjected to a kind of tribalism, where you have the only major party in the Western world denying climate change behind a leader who thinks it's a hoax cooked up by the Chinese. There are many things about Democrats I'm not crazy about, but they are the right side of science and the right side of history. We had a president before Trump who believed in carbon pricing, and in 2008 John McCain was better on climate change than Obama was."

Gelber says he's been reading books lately about World War I, and what strikes him is that "every single decision they made was insane. It got us Hitler, it got us Stalin. This climate change thing is almost part of that continuum of man's impulse for self-destruction. But I can't believe it's a lost cause."

Andy Revkin

Revkin planned to be a scientist. He graduated from Brown with a degree in biology, and then received a fellowship to conduct research in the South Pacific. "Halfway through that, a sailboat needed a crew, and so I sailed 17,000 miles in 18 months, and that's what made me want to be a journalist."

We talked while he walked his dogs, Mickey and Maddie, in Cold Spring at Dockside Park, which will likely be under water by the turn of the century.

Although he switched careers, Revkin says he finds science and journalism to be similar in many ways. "They both try to probe the real nature of things," says the Nelsonville resident. "Both are potentially laden with values. Both are not always pretty. The only difference is that in journalism the peer review is after you publish."

After earning a master's in journalism from Columbia, Revkin began his career as an assistant copy editor at *Science Digest*. In 1985, he wrote a cover story for the magazine about "nuclear winter," a hypothesis that a global war could cause severe climate cooling if the soot from massive fires blocked out the sun.

Three years later, after moving to *Discover*, Revkin wrote another cover story, about global warming. It was prompted by the Senate committee testimony of a NASA climatologist named Jim Hansen that captured the attention of the media and Capitol Hill. Hansen had been asked to speak because Yellowstone National Park and the Amazon rain forest were ablaze that summer and the eastern United States was suffering a record heat wave.

"The greenhouse effect has been detected, and it is changing our climate," Hansen told the senators, noting that NASA was 99 percent certain global warming was caused by man-made carbon dioxide. One observer noted Hansen's testimony pivoted climate change from a scientific discussion into a policy debate.

Revkin, who is on the advisory board of

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In 2014, *Vanity Fair* published a photo of the producers behind *Years of Living Dangerously*: Jim Cameron, Jerry Weintraub, David Gelber, Joel Bach and Arnold Schwarzenegger. Gelber, whose face ended up in the magazine's gutter, says his daughter, Clara, asked him, "Daddy, why didn't you move over?" *Photo by Michael Turton*

Andy Revkin at Dockside Park in Cold Spring

Photo by Meredith Heuer

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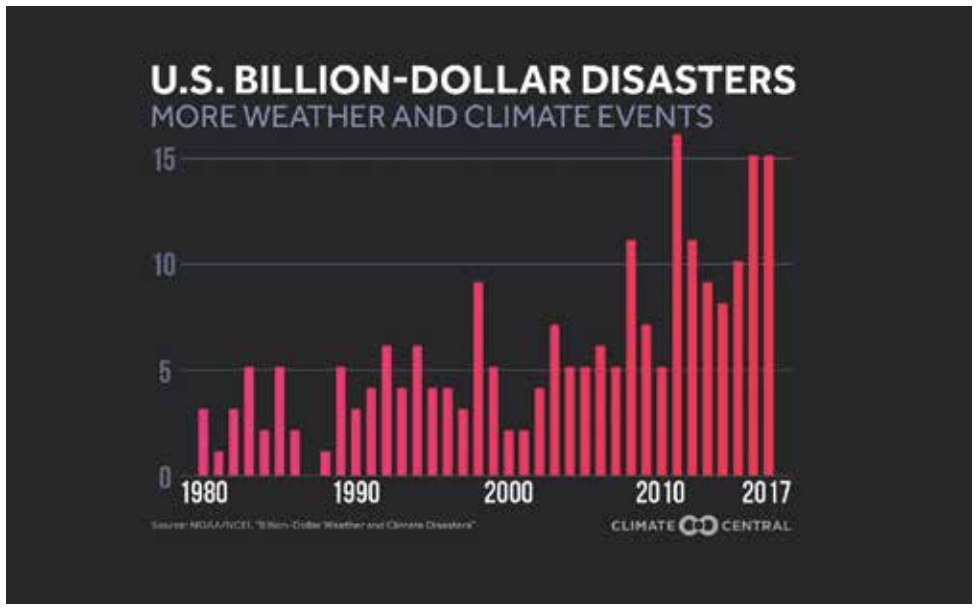
Highlands Current Inc., the publisher of this newspaper, spent 21 years as a science writer at *The New York Times*, writing a blog about climate change for the last six of them. After a stint at *ProPublica*, he was hired in March by the National Geographic Society as its strategic adviser for environmental and science journalism.

He has written about climate change for 30 years. Is he sick of it?

"I get tired of the dynamics around it," he says. "Everyone's yelling and claiming to be on the high ground — campaigners and resisters."

Although there is an industry of people, including President Trump, who argue that climate change is not happening, or at least that humans are not to blame, Revkin says he avoids calling anyone a denier.

"Everyone has a certain level of denial about this issue, so you have to be more specific," he says. "New York Mayor Michael Bloomberg, in his last speech in office in 2013, said we needed to invest $20 billion to make the city resilient by 2050, but the core line was about the rising sea level: 'We will not retreat.' That's a complete denial of science. He's a believer in cutting greenhouse gases but he's also in denial that, even if you aggressively cut them, it won't stop the sea from rising for 50 years. People need to get over that."



This chart and the one on Page 13 were created by Climate Central (climatecentral.org), a nonpartisan group of scientists and journalists who research the changing climate and its impacts. Its board is chaired by Stephen Pacala, a professor of ecology and evolutionary biology at Princeton University.

Revkin says he will address this in an essay he wrote for the July issue of *National Geographic*. "The bad news about the problem is that it's so big," he says. "The good news is it's so big it's actually not a problem. We need to take away the faux sense that we can solve the climate problem." Instead, he proposes we "replace it with working in a sustained way and handing off to the next generation what it needs to build a new relationship with the climate system. Because it's big and complex, everyone can take a piece of it."

In 2016, in an essay he wrote for *Issues in Science and Technology* titled "My Climate Change," Revkin wrote: "I find global warming doesn't worry me — at least not in a gut-twisting, obsessive way. Rather, a stripped-down agnostic version of the Serenity Prayer has come to mind lately as I've grappled with humanity's 'only one planet' predicament: change what can be changed, accept what can't and know the difference. Science can help clarify which is which."

Looking back at his three decades of coverage, Revkin notes that "we all got fooled, including me. When I was a kid there was smog and rivers were polluted, but those were environmental problems and you could fix them. In 1987, with the Montreal Protocol, they found a way to have a global agreement to get rid of the chemicals depleting the ozone, and it's working slowly. So in 1988, when global warming became the story, it was only natural to think, we can use the same tools: a treaty or a law. But part of my learning curve and part of everyone's learning curve was that we need more than a bill."

He's not as confident as Gelber and others that carbon pricing is ever going to happen at a level that will make a difference. But, still, is he optimistic about our chances? He's been asked this before. "I'm *engaged*," he says immediately, with a smile. "I'm an optimist when I wake up but usually need a beer or two by the time I go to bed. What has to be taught is a mix of urgency and patience."

What's Ahead

Part 2: Rising Waters

The Hudson River is rising, and increasingly violent storms are expected to cause widespread flooding. Will planners, including at Metro-North, be ready?

Part 3: Farming and Food

Shorter, warmer winters and longer, hotter summers will change the nature of farming in the Hudson Valley. Can farmers do anything to prepare?

Part 4: Wildlife and Nature

Rising temperatures and waters will have a dramatic effect on the wetlands, wildlife and trees along the Hudson — and human health, as pollen and tick levels climb and poison ivy and algae blooms expand. What changes can we expect?

Part 5: What Now?

A state initiative called Climate Smart Communities has pushed towns and cities to make changes; Kingston, a river community of 25,000, was an early adapter. But what are the political challenges, and who, in the end, will pay?

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Painting with Plants
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SWEET TEETH — The annual K104.7 Cupcake Festival took place on Main Street in Beacon on May 5. There were an estimated 20,000 cupcakes to choose from, but these girls were happy with ice cream. For more photos, see highlandscurrent.com.

Photo by Skip Pearlman

Rise in 'Vaping' Causes Alarm

Scentless e-cigarettes seen as health threat

By Liz Schevtchuk Armstrong

From the hallways at Haldane to Philipstown Town Hall and the Putnam County Legislature, electronic cigarettes, or "vaping" devices, have raised alarms — and calls for action.

E-cigarettes turn liquid containing nicotine, fruity flavors or marijuana into an inhalable vapor. Heated by batteries, e-cigs take various shapes and can resemble pens, computer flash drives, lipstick and phones. They're so popular that *to juul* — the brand name of a popular e-cig — has become slang.

The devices are sold online and at smoke or "vape" shops. A shop opened and shut in Cold Spring this past winter, and two op-

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How Hot? How Soon?

Climate change in the Highlands

Part 2: Rising Waters

"The sea is a cruel master, and she hath taught me prudence."
~ from Blackbeard, Buccaneer (1922)

Everyone loves being near the water, as long as it's not over your head. The coasts are also the most densely developed areas of the U.S., and the most vulnerable to rapid climate change due to global warming.

That warming is caused by the increasing amount of carbon dioxide (CO_2) in the atmosphere, which traps heat and has been melting ice at the poles faster than scientists anticipated, adding to the volume of the oceans. The heat is also increasing the temperature of the water, causing it to expand.

Together these factors have pushed sea levels up about 8 inches since 1900. That doesn't sound like much, but it's 8 inches closer to overrunning the banks, and ocean water doesn't recede like storm surge. More important, in the past 20 years, the sea has risen roughly twice as fast as it did in the previous 100.

"We're pretty much locked in at 2 to 3 feet of sea-level rise in this century," says Radley Horton, a climate scientist at Columbia University who lives in Cold Spring. "That's the best-case scenario. The further we push the system, the bigger potential for surprises, such as 6 to 8 feet."

The rise will have profound effects on New York City. The Highlands, which are also located on the ocean (the lower part of the Hudson is an arm of the Atlantic, with tides and seawater) will likely also see dramatic changes, including more frequent flooding from storm surge and the eventual submersion of the Beacon, Cold Spring and Garrison waterfronts and Metro-North tracks.

In this, the second part of our series on climate change in the Highlands, we will look at how the Metropolitan Transportation Authority plans to protect our access to New York City, whether the dirt roads of Philipstown will survive, how a Cold Spring architect is designing homes to withstand climate change, the extreme storms that may soon pass for normal, and how we will deliver the runoff from frequent and heavy downpours to the river without also sending our sewage.

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Villanova Seeks Scuccimarra's Legislature Seat; Denbaum Joins Race Against Odell

Challengers could force Republican primaries

By Liz Schevtchuk Armstrong

Criticizing Putnam County's current Republican leadership, GOP dissidents recently launched campaigns to oust County Executive MaryEllen Odell, their party's flagbearer, and District 1 Legislator Barbara Scuccimarra, who represents Philipstown.

On Monday (May 7), Patty Villanova, a professional paralegal, Putnam Valley resident, and Cold Spring shopkeeper, announced her candidacy for Scuccimarra's seat.

Three weeks ago, Paul Denbaum, a lawyer and member of the Kent Town Board, declared his candidacy for county executive. He became the second Kent official in the race. Kent Supervisor Maureen Fleming, a Democrat, announced her campaign on March 9.

The primary election, if necessary, would take place Sept. 13.

Scuccimarra on Tuesday (May 8) gave mixed signals about her plans. She said mid-day that while close to a decision, "I'm not yet" sure whether to run again. "Let me think about this and I'll get back to you." But before the day ended, her Facebook page displayed a notice of a campaign-launch fundraising cocktail party on June 2. She did not respond to email and phone requests for clarification.

District 1 covers Philipstown and part of Putnam Valley. Like Scuccimarra and Odell, the other eight legislators are Republicans (along

(Continued on Page 3

The 100 (Make that 30) Year Storm

Will today's worst case become tomorrow's norm?

By Brian PJ Cronin

The lower part of Main Street in Cold Spring was flooded in 2012 during Superstorm Sandy. *Photo by L.S. Armstrong*

Five thousand miles separate the Highlands from the Sahara Desert, but the Saharan winds will play a significant role in how many hurricanes we see in the near future.

Welcome to the world of climate science, where the observation by John Muir, the 19th-naturalist who spent time in Garrison, rings true about how anything you pick up is hitched to everything else in the universe.

To understand how storms in the Highlands will be affected by climate change, I spoke to Tim Hall, a senior research scientist at the NASA Goddard Institute for Space Studies who studies tropical cyclones and climate variability (and lives in Garrison); Radley Horton, a research professor at Columbia University's Lamont-Doherty Earth Observatory who specializes in the impacts of climate change (and who lives in Cold Spring); and Mike Favetta, a former meteorologist for News 12 Westchester who founded WeatherPrep, a firm devoted to climate-change adaptation.

All three noted the challenges of seeing verifiable trends within the noise of constant climate readings and separating various predictions into, as Hall says, "the hierarchy of what we know for sure, and what we're mostly certain about."

What's for sure is that it's going to get very wet.

Horton says that when considering storms over the Highlands, you have to look down. "You have to start with the conversation about sea-level rise," he says. "Even if we get lucky and only have a 2-feet increase, that still causes a three-fold increase in the frequency of flooding."

A 2-foot increase may seem small when considering the 9-foot surges that Sandy produced, but Horton points out that any increase will stay with us, even at low tide and fair weather. And it will make high tide storms more dangerous. With 3 feet of sea level rise, storms that now bring 3 feet of surge will bring a 6-foot surge, and so on. "You're getting floods with the effects of Sandy three, five, 10 times as often," he says. "That's a huge risk. What was a 100-year-storm now happens every 30 years."

It's also getting hotter. One projection is that by 2050 the earth will be, on average, 8.5 degrees warmer. That may not seem like much in May, when the temperature in the Highlands can swing 30 to 40 degrees in 12 hours, but just like a relatively small amount of sea level rise, it can have a big impact.

"The temperature in the human body is 98.6 degrees," Favetta says. "If you go up 2.5 degrees, you have a 101-degree fever. The earth works the same way. When there's more heat in the atmosphere, there's the opportunity for more water vapor to be absorbed into the air. When there's more heat in the air, you have more severe storms because the atmosphere can grow a little higher, and create storms that are taller and stronger."

More severe rain causes more flooding, Horton notes. "In the Northeast, we're already seeing that the heaviest rain events are happening about 70 percent more often than they were 50 or 60 years ago. There's a lot of reason to think that all of that increased moisture in the atmosphere is going to fall out in more and more local events that are going to be devastating, as opposed to the sorts of gentle summer drizzles that we all wish we could get more of."

Ironically, higher thunderstorms could spell trouble for solar panels. "In the Hudson Valley, when late-afternoon thunderstorms form at the end of a hot, humid day, those storms will rapidly grow tall enough and large enough to create record-breaking hailstones," says Favetta. "And those large hailstones have no mercy when they smash into solar panels."

Winter won't offer much relief. Although warmer temperatures will result in fewer days below freezing, on the days when the temperature does dip below 32 degrees the water vapor in the air should lead to more severe snow, even if the storms occur less frequently.

That trend — fewer but stronger storms — applies to hurricanes in the Atlantic as well, but for different reasons. As climate change fuels the continued desertification of North Africa, the Sahara Desert is expected to grow (it's already the size of the U.S.), which will cause more dry, dusty desert air to be blown out to the Atlantic from westward winds.

"The dust tends to reflect incoming radiation, so it acts as a cooling agent to the sea surface below," explains Hall. "You can get these episodes where this dry, dusty air destroys cyclones or makes them less likely to form. But once they do form, the fact that you have a warmer sea surface and more moisture in the air allows the storm the possibility of reaching greater intensity."

So does that mean that, with fewer Atlantic hurricanes, the possibility of the Highlands being hit with another Irene will go down? Yes, Hall says, but the problem is that when the Highlands gets hit, there's a greater chance the storm will be an absolute monster. And as with sea-level rise and temperature, it only takes a small increase in power to have a massive effect.

Hall, who as part of his research develops models for the insurance industry to estimate the likelihood of buildings being blown apart by storms, notes that the

(continued on next page)

Extreme Scenes

Last year, the National Oceanic and Atmospheric Administration (NOAA) released a report that predicted what high tide would look like at the turn of the century if nothing is done to combat global warming.

It isn't pretty. If the level of carbon dioxide, which traps heat in the atmosphere, continues to rise unabated, and parts of the Antarctic ice sheet collapse sooner than expected, the agency predicted sea level could jump 10 to 12 feet on the East Coast by 2100. That would put the charging bull on Wall Street under water.

Using the NOAA numbers, the nonprofit Climate Central created a "layer" for Google Earth to visualize what such an extreme rise would look like, a scenario it notes is "considered unlikely but increasingly plausible." We used the layer to create a flyover of the Highlands, which can be viewed at highlandscurrent.com.

A vision of Cold Spring in 2100 under "extreme" sea level rise. For images of Beacon and Garrison, see highlandscurrent.com. *Climate Central/Google Earth*

Manitou Station Road in Garrison has been raised 4.5 feet to prevent damage from flooding. *Photo by Michael Turton*

Radley Horton at the Cold Spring waterfront *Photo by Meredith Heuer*

Stormwater Blues

Climate change will bring heavy rain, but where will it go?

By Michael Turton

Much of the conversation surrounding the effect of climate change on water focuses on flooding caused by sea-level rise and extreme storms. But another, less talked about, aspect of the problem is how to get all that water back to the river.

Stormwater, or rain that is not absorbed, flows into streams that lead to the Hudson. If the number and severity of storms increase as climate change models suggest, stormwater runoff is bound to increase as well, adding to the risk of flooding and a phenomenon known as "combined sewer overflow" in which the heavy rains overwhelm treatment plants. To avoid having sewage back up into homes when that happens, it's released into the river.

Bryan Quinn, a Beacon-based environmental designer, says we should be thinking more about stormwater, including using less impermeable concrete and asphalt. We also should be thinking small, he says.

"The DEC [Department of Environmental Conservation] has really upped their game in the past couple of decades regarding stormwater management for new developments," he says. "But for smaller projects they haven't gone far enough."

Quinn advocates rain gardens and planting depressions or bio-swales which slowly release water over time. The vegetation they contain not only helps to reduce flooding, it filters pollutants. Retention ponds and rain barrels have similar effects.

He's not a fan of manicured lawns. "If we can replace lawns with meadow, it can do a lot to increase infiltration and reduce water flows." In more rural areas lawns can be replaced by forest.

Jennifer Zwarich, who heads Cold Spring's Tree Advisory Board, also sees forests as part of the solution. "The trees in our community forest are on the front line of our region's struggle with stormwater management," she says. "Tree canopies and root systems significantly slow down runoff by capturing water and absorbing or releasing it back into the atmosphere."

Safe Harbors Green in Newburgh was designed by Quinn and incorporates his conservation concepts. Plant materials and swales help the small park absorb all the rainfall it receives. "Not a single drop leaves this park," Quinn says. His design also accounts for climate change by including an extra, deeper swale that will slowly release water in the event of an extended downpour.

Quinn says there must be more collaboration between municipalities so that they together can manage an entire watershed, rather than only the parts within their borders. "Political boundaries don't make any sense from a water perspective," he says. Philipstown's Clove Creek for example, flows south along Route 301 in Putnam County before heading north along Route 9 into Dutchess County and the Town of Fishkill, then west through Beacon before emptying into Fishkill Creek.

Getting to the City

Metro-North has a plan, but will it be enough?

By Chip Rowe

Climate change presents a particular challenge to Metro-North, and especially to the Hudson line that connects the Highlands and New York City: before the century turns, much of its 73.5 miles of track could be under water.

Metro-North, which is run by the Metropolitan Transportation Authority, has a plan to combat the effects of global warming on its system, which serves two-thirds of the state's residents. But as with most ambitious, epoch-defining projects, it lacks the tens of billions of dollars necessary to shore up the Hudson line and other low-lying tracks, including New York's subway.

The MTA has been a relatively early adapter. A decade ago, the agency established a commission on sustainability. The 22-member panel was led by Jonathan Rose, an urban planner who is cofounder of the Garrison Institute, and included the presidents of Scenic Hudson and Riverkeeper. Radley Horton, a climatologist at Columbia University who lives in Cold Spring, also contributed.

"We asked the decision-makers at the MTA for the scenarios that kept them up at night," Horton recalls.

The commission released its report in 2009, suggesting many upgrades. What it couldn't account for was the $75 billion to $100 billion it anticipated the agency would need over the following decade, outside of suggesting Congress pass a moon-shot $1 trillion spending bill and that mass transit receive 25 percent of the revenue from a carbon-pricing market that doesn't exist.

Three years later, Superstorm Sandy devastated the region. If the disaster had a silver lining, it was that it "focused everyone on climate change," says Projjal Dutta, who joined the MTA in 2007 as its first director of sustainability. Sandy also acted like a demolition crew, taking out the MTA's most vulnerable infrastructure and creating an opportunity to rebuild and fortify before the next 100-year storm that everyone agreed would arrive far sooner than 100 years.

The agency is spending half of its $10.5 billion in Sandy recovery funds not on repairs but resiliency projects. That includes $350 million to raise the signaling and communication lines on the Hudson line and add flood protection to critical substations. The line is breached when the tide rises about 6.5 feet above sea level, which is the same predicament facing FDR Drive in Manhattan, the Long Beach branch of the Long Island Railroad, LaGuardia airport and the A and C lines of the New York City subway. Sandy, whose surge reached 9 feet in places, closed service to the Highlands for four days.

In many spots along the Hudson line, it would not take much to flood the tracks.

Photo by Michael Turton

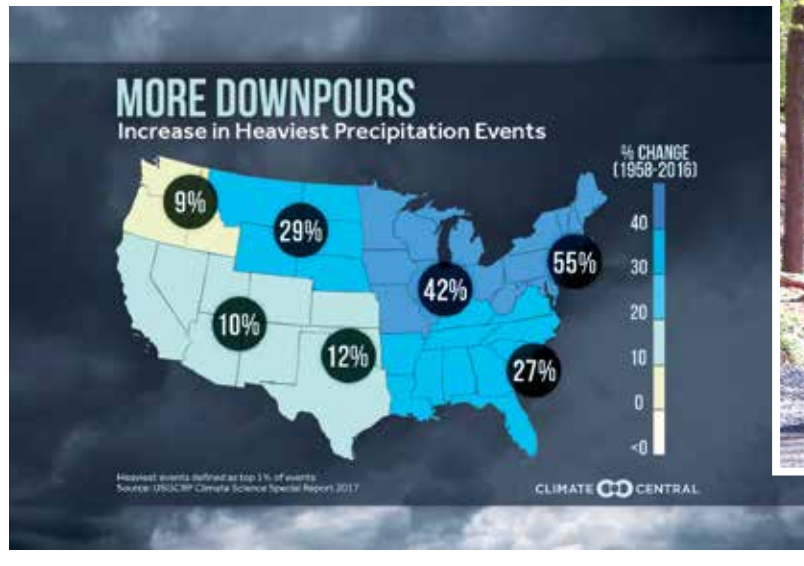
The Hudson line tracks are another issue. In the long term, they will likely need to be raised or moved. Neither option seems feasible.

"Much of the line is bordered by a steep topography," notes Horton. "You can't go part way up a cliff. At the top of the cliff, you face legal challenges trying to secure a right of way along 74 miles of what is mostly private land."

Dutta says while the MTA has looked to 2100 in its planning it isn't focused on the tracks because that far out scientists can't say with precision how far the water will rise. "The priority is the next 30 to 40 years," he says.

As part of the 2009 report, Horton and five colleagues concluded the MTA was "largely unprepared" for global warming, particularly flooding and the effects of intense summer heat on its air-conditioning systems, switch gears and steel rails.

Asked in 2018 if he felt the agency was still "largely unprepared," Dutta pauses, then reframes the question. "Are we *better* prepared? Yes, definitely," he says. "Are we fully prepared? No."



Will Climate Change Kill Dirt Roads?

With more frequent storms, Philipstown may not have a choice

By Michael Turton

The future of Philipstown's dirt roads, which account for half of its 60-mile network, has been an ongoing debate. Should they be preserved or paved?

Global warming, which is expected to increase the frequency of storms and heavy downpours, may only intensify the discussion.

Dirt roads have unmistakable beauty but also an inherent flaw: they wash out, making driving hazardous and requiring regular repairs. The eroded material also pollutes streams that flow near the roads.

Carl Frisenda, who has worked on roads across Putnam County for nearly 40 years and in 2015 was elected as Philipstown highway superintendent, says he is already seeing the effect of rapid climate change on the roads.

> *"Old Albany Post Road has seen it all, and it's still here."*

"Years ago, you wouldn't have had all these major washouts," he said. During the sequence of Nor'easters that hit the region in March, "we were always going back out to make repairs," often at the same locations, he says. "That's a lot of material, labor, fuel and wear and tear on machines."

An erosion-prone portion of South Mountain Pass was paved just before Frisenda took over, and he thinks it was necessary. "Before it was paved they were always there grading the hill," he said. "Now we do nothing."

He estimates dirt-road maintenance to be at least twice as costly as asphalt. His department, which has a $3.7 million budget, spent about $620,000 in 2017 on general road repairs.

The cost of maintaining rural roads is expected to rise everywhere because of more frequent storms, most urgently in the Great Plains, where the Environmental Protection Agency says the cost of repairs could rise by $1.1 billion by 2050. Globally, it's a daunting issue for nations such as Africa and India, where only about half the roads are paved and many of the dirt ones are already in bad shape.

Frisenda is not overly optimistic about winning the battle in Philipstown. "I don't think it's going to get any better," he says. He was hoping to buy time by added a binding agent called bentonite to the standard gravel, known as Item 4, but was disappointed with the results. He's had more success with recycled Item 4 that includes millings from crushed asphalt.

Not surprisingly, Terry Zaleski, president of the Old Road Society of Philipstown, has a different outlook. Asked if climate change could spell the end for local dirt roads, he responded with a quick "No," citing their stamina over centuries of bad weather. "Old Albany Post Road has seen it all, and it's still here," he says.

A Philipstown Highway Department grader smoothes out Old Albany Post Road.

Photo by M. Turton

Built to Spill

'Passive' houses and parks that flood

By Brian PJ Cronin

Joe Kiernan and Nava Tabak at Long Dock Park in Beacon

Photo by B. Cronin

The economic downturn of 2008 killed Scenic Hudson's plans for an eco-friendly convention center at Long Dock Park in Beacon. It might have been a blessing in disguise.

The massive storm surges that accompanied Hurricane Irene in 2011 and Superstorm Sandy in 2012 left the park under a foot of water, and while the convention center would have been designed to withstand severe floods, maybe it's better that the plans were scrapped.

"Even our building over there, which is flood resistant, with no electrics low to the ground, still took in a foot of water," says Nava Tabak, who oversees climate and science issues for the nonprofit, pointing to the historic red barn. Fortunately, the building has been designed for quick recovery. The walls on its first floor can be easily removed to dry the interior.

Climate change has made it nearly impossible to build anything on the banks of the Hudson without a plan for midcentury, when rising sea levels are expected to transform what we currently think of as catastrophic flooding into what high tide looks like twice a day.

For Scenic Hudson, it presents an opportunity to demonstrate what a 21st-century waterfront park might look like.

Long Dock Park is built on fill — it was added to the shoreline to make it easier for ferries and merchant ships to access the city's factories, serving, in effect, as a "long dock." As the boom years faded, the land became a wasteland of auto salvage and refuse that many older residents recall as an unauthorized playground. Tabak says years of soil remediation were required before Scenic Hudson could even think about a park.

Its first section opened in 2011, with construction on its final section expected to be completed within months, depending on how fast the grass grows. "We want the lawns and everything to be well-established before we expose them to foot traffic," says Joe Kiernan, the park's project manager.

The park is designed to withstand flooding caused by storm surge (sea-level rise is a different challenge; models of extreme sea-level rise show the park mostly submerged by 2100). Instead of a concession stand, the park has space for food trucks, which can drive away before the water rolls in. The kayak shed withstood both Irene and Sandy because the surge flowed through its grate-like walls. "The floods came in with debris and mess, but the shed was fine," says Kiernan.

Long Dock's landscaping has also been designed to mitigate flooding. High berms direct water to wetlands and swales that dot the property.

"Once the water's here, you don't want it just flowing through and scouring and eroding everything," explains Tabak. "You want to keep it, let it percolate, and let it flow out as slowly as possible."

The land was seeded with vegetation that can withstand flooding, such as switchgrass, goldenrod and wild rye. When the tall grasses die back in the winter, they decompose and help nourish the soil, which in turn makes it more absorbent.

Kiernan and Tabak note that one of the surest signs that the park has developed into a healthy ecosystem is the abundance of wildlife that can be found hiding in the tall grass, sometimes steps from passing joggers: deer, fox, herons and egrets flock to the vernal pools and temporary marshes that appear after heavy rains.

As river communities consider how to protect their shorelines from the effects of rising temperatures, Kiernan argues that accepting, directing and absorbing floodwaters is a better choice than seawalls and other barriers. "When you do that, the wave energy is just going to travel and impact somewhere else," he said.

Home of the future

Downriver, in Cold Spring, Laura Bergman has come to the same conclusion.

"I'm tending the shoreline because no one else will," she says as she prunes vegetation near her waterfront home. "Some people from Albany" — presumably from the state Department of Environmental Conservation — "told me they wanted to do something that involved removing the trees. I told them my property was off limits."

Bergman bought her house at the entrance to Dockside Park in 2012 and planned an extensive renovation. Then Sandy came, flooding the park and house and destroying a quonset hut on the property. Soon after, she met James Hartford, who with his wife, Juhee Lee-Hartford, has an architecture firm in Cold Spring.

He told her she should consider a "passive" house. "When I explained passive housing to her, she said 'Why would I want to do it any other way,' " says Hartford.

Passive housing refers to designing a house to have as small a carbon footprint as possible by minimizing mechanical inputs for heating and cooling.

Hartford says the design is vital to combating climate change. "Buildings consume almost 50 percent of our total energy in this country," he says. "People are focused on the fuel efficiency of cars, but whether you're driving a Prius or a Hummer, once you get home and turn them off, they're the same vehicle. You don't leave your vehicle running overnight, but we leave our houses running all the time."

By living in a home that stays cool and ventilated in the summer and warm in the winter thanks to airtight design and superior insulation, he says, residents will be able to shelter for days during emergencies in which the power is out and HVAC devices are offline.

To prepare for flooding, Hartford installed a foot of rigid insulation over the existing concrete slab, then added another 4 inches of concrete, raising the lower floor by 16 inches. "If Sandy comes back, she'll be lapping at the doorsill but won't get in," he says.

As in the Red Barn at Long Dock, all of Bergman's outlets and electrical equipment are positioned high. Vapor barriers block moisture and, unlike Sheetrock, the cement board siding is resistant to mold. There's also no furnace for the water to destroy: the home is powered by an 8-kilowatt photovoltaic array of solar panels. Bergman's monthly power bill is a $25 service charge.

Even after all that, should the water rise too high, Bergman has a Plan B.

"I have my kayak," she says, pointing under the porch. "I can just float away."

Laura Bergman and James Hartford outside her home overlooking Dockside Park in Cold Spring

Photo by B. Cronin

What's Ahead

Part 1: Runaway Train (May 4; see highlandscurrent.com)

Part 3: Farming and Food

Shorter, warmer winters and longer, hotter summers will change the nature of farming in the Hudson Valley. Can farmers do anything to prepare?

Part 4: Wildlife and Nature

Rising temperatures and waters will have a dramatic effect on the wetlands, wildlife and trees along the Hudson — and human health, as pollen and tick levels climb and poison ivy and algae blooms expand. What changes can we expect?

Part 5: What Now?

A state initiative called Climate Smart Communities has pushed towns and cities to make changes; Kingston, a river community of 25,000, was an early adapter. But what are the political challenges, and who, in the end, will pay?

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Remembering Warren

Haldane grad, 22, was one of 16 Philipstown residents who died in World War II

By Michael Turton

The memorial installed at the corner of Main and Chestnut streets on the lawn of St. Mary's Episcopal Church in Cold Spring bears the names of 16 Philipstown residents who died while serving in World War II. Warren Eitner, 22, a Haldane grad, is one of them.

Warren Eitner's grave in France. The Haldane grad was killed in 1943 during a bombing run over Germany.

Technical Sgt. Warren Eitner

Photos courtesy of Mark Pfarrer

He was a radio man. When his B-17 bomber took off from an airfield in England in October 1943 for a run, he had already taken part in at least 12 missions and knew the risks. The log from a six-hour mission he had flown two months earlier 500 miles into enemy territory recorded the bombers being "battered by [enemy] fighters, coming in sometimes 20 at a time" and how the crew watched 17 of the U.S. planes shot down.

As World War II survivors and their family members die — most are now in their late 80s and 90s or older — their memories of the war and those who fought it pass with them. For Memorial Day, we thought we'd remember one of the 16, with the help of his youngest sister.

(Continued on Page 5)

In Beacon, Airbnb Rentals Illegal, Edgewater Development Cut Back

Council votes on two contentious issues

By Jeff Simms

Stuck in a grey area between city zoning regulations and state building codes, the Beacon City Council voted 4-3 on Monday (May 21) to reject a proposed law that would have regulated Airbnb and other short-term rentals, effectively making them illegal.

It also voted 5-2 on a change in zoning that will lower by almost 25 percent the number of units that can be included in the Edgewater apartment development at the waterfront.

Short-term rentals

The council voted 4-3 against a proposed law that would have amended zoning laws to legalize short-term rentals made through sites such as Airbnb. If adopted, the law would have also required homeowners to comply with state building codes, which, for home-sharing, require adequate fire exits and other safety measures.

Council members Terry Nelson, George Mansfield, John Rembert and Amber Grant voted against the proposal. Jodi McCredo, Lee

(Continued on Page 8)

Part 3: Farm = Food

By Chip Rowe

David Wolfe feels for the farmers. A professor of plant and soil ecology at Cornell University, Wolfe has studied the effect of climate change on crops grown in the Hudson Valley and New York state for 30 years.

Farmers are accustomed to dealing with the vagaries of weather, but, still, Wolfe says he has been stunned by how quickly conditions are degrading. The average temperature in New York has risen about 11 degrees in the past 15,000 years; without dramatic intervention to lower the level of heat-trapping carbon dioxide (CO_2) in the atmosphere, it may jump 6 to 8 degrees within the next 100.

"No farmers in the history of modern agriculture have seen the pace of change projected for this century," Wolfe says.

The rising temperature will lead to more intense and lengthy summer droughts that shrivel crops and the udders of the state's 620,000 dairy cows, which prefer the thermostat at a cool 72 degrees or lower.

But it also brings challenges year-round.

In New York, global warming is creating more intense spring downpours, which saturate fields and delay planting and, subsequently, harvest. These heavy rainfalls have increased more in the Northeast than in any other part of the country. Heavy rains also increase the likelihood of potato and tomato blight and fungal problems in root vegetables such as carrots.

Farmers will benefit from a longer growing season, because the warm temperatures cause perennials to bloom earlier. But that doesn't decrease the risk of frost and freeze damage. When plants bloom too soon, they are vulnerable if the temperature drops again. That's what happened to the fruit crop in New York in 2016. Also in 2012. And 2007.

Insects such as the corn earworm, flea beetle and stinkbug prefer a nice summer day and, as temperatures rise, are pushing their way north. While all plants thrive when exposed to carbon dioxide, invasive weeds with deep roots such as poison ivy and kudzu do especially well. Studies have found invaders become more resistant to herbicides such as Roundup when grown in a high CO_2 environment.

What can farmers do? They must adapt, if they can afford to. Cornell University and other institutions are trying to help by assessing which direction things are moving, and which crops might work best 10, 20 and 30 years from now. But it's difficult in the meantime to enjoy longer growing seasons if your fields are saturated in the spring and dust during the summer.

In this, the third part of our series, Pamela Doan spoke with Wolfe and Laura Lengnick, who advises Hudson Valley farmers on "cultivating resistance." She also visited farmers, including Jocelyn Apicello of Longhaul Farm in Garrison, Dave Llewellyn of Glynwood Farm in Philipstown and Mark Doyle of Fishkill Farms, to hear firsthand about the challenges facing the growth industry.

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It's 2050. Can Farmers Still Feed Us?

Battling drought, flooding, heat — and uncertainty

By Pamela Doan

We'll still have wine.

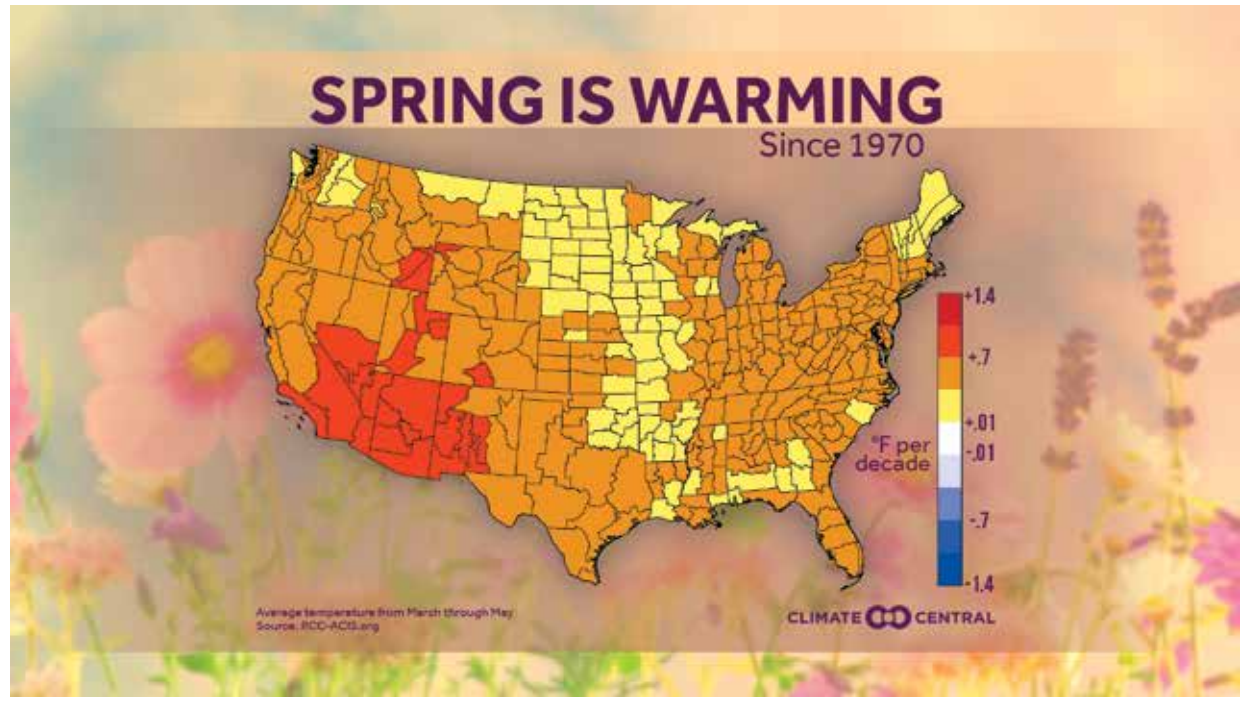
Even if crops are flooded out, frozen in a late frost, fried in a heat wave, eaten by the spotted lanternfly, crushed by hail, blown away in a hurricane or succumb to a blight or other disease as a result of climate change, New York's wine industry (third in size only to California's and Washington's) should be able to produce European grapes for cabernet sauvignon, merlot, zinfandel — all the varieties that have trouble now because they need longer growing seasons and milder winter temperatures.

Global warming will be bringing both to the state.

Projections show that average temperatures in the Northeast will be much warmer by midcentury, and precipitation will increase in both amount and intensity. Those conditions will make the length of the growing season even more critical and test the resourcefulness and adaptability of farmers.

David Wolfe at Cornell University and his colleague Allison Chatrchyan, director of the university's Institute for Climate Smart Solutions, are deeply involved in the questions about what we need to protect our capacity to grow food.

Attitudes among farmers are changing. "Five years ago, farmers didn't want to talk about climate change," says Chatrchyan. Surveys done by various researchers earlier in this decade back that up, finding most farmers to be skeptical that the climate is changing, and attributing unpredictable weather to … well, unpredictable weather. But Chatrchyan says she is encouraged by a surge in traffic in the past year to the institute's online tools that provide long-term projections.



Using Climate Smart Farming, a farmer can see the local drought outlook, use a soil water-deficit calculator and find predictions for plant development.

"If you look up the date it became warm enough to plant for Cold Spring in 2016, you see that it was well above the 15-year average and the typical date over the past 30 years," Chatrchyan says. "It shows a farmer that climate change is happening."

Wolfe, who has been teaching at Cornell since 1984, began looking more closely at global warming and its effects on agriculture in 1990. Scientists were reporting that CO_2 was increasing rapidly in the atmosphere, and as a plant physiologist, he knew that would affect plants.

At the time, he recalls, he hoped his research would help some future generation of farmers.

"I could see it would affect the climate but I didn't expect to see changes like this in my lifetime," he says. "The movement of insects and diseases, earlier bloom dates, the melting Arctic."

Ideally every farmer is assessing what they need now, says Chatrchyan. The challenge is figuring out what to do, given the uncertainty and complexity of climate change. Do you change crops now? Do you purchase expensive equipment based on what *could* happen?

It's never good for crops when the weather is breaking records, and especially not when it happens every year. The last two seasons provide a case study.

In the winter of 2015-16, lower-than-usual snowfall was followed by low precipitation and stream flows during the growing season of 2016, both important sources for groundwater and irrigation systems. It was the worst drought most farmers had ever experienced, and the hottest temperatures. Farmers who rely on rainfall to water their crops reported losing as much as 90 percent of their yields. Even farmers who irrigated lost 30 percent.

In 2017, heavy rainfall flooded the fields. This not only damaged crops but shortened the growing season because the ground was too wet to plant on schedule. This was a problem for more than 95 percent of farmers surveyed across the state and 80 percent said they lost money.

This may soon not be unusual. According to the U.S. National Climate Assessment, since the 1950s the Northeast has had a 71 percent increase in "extreme

(Continued on next page)

Dave Llewellyn at Glynwood Farm *Photo by Meredith Heuer*

(from previous page) precipitation events," defined as more than 2 inches of rain falling in a 24-hour period. Heavy rains wash away soil and damage crops that are left standing in pools of water. Roots rot.

The stakes are enormous. New York is among the top five producers in the nation of apples, grapes, tart cherries, pears, cabbage, sweet corn, snap beans, pumpkins and onions. It's also a critical provider of dairy products, which account for half the annual agricultural sales in the state.

Even if New York farmers take every measure to optimize water use, it might not be enough. During the 2016 drought, wells and streams went dry. There was water in the lakes of western New York but no way to get it to fields in the Hudson Valley. "We don't have the infrastructure to deliver water to farmers like they do in the western U.S.," says Wolfe. "It will take major tax dollars. It's beyond an individual's investment."

Wolfe says that unless decisions are made now about land conservation in New York, he foresees the potential for larger agriculture firms to relocate to the state and buy up parcels as other parts of the country become too difficult to farm.

In discussions about climate change, the word *resiliency* comes up. Laura Lengnick, a soil scientist and farmer based in North Carolina who is working in the Hudson Valley with Scenic Hudson, developed a model for how it applies to farming.

In her book *Resilient Agriculture: Cultivating Food Systems for a Changing Climate,* Lengnick explains the approach that farmers must take when addressing climate change is to "bounce forward." Other models of farming are based on stable climate conditions. Resilient agriculture assumes conditions are dynamic.

For example, when faced with more frequent droughts, farmers can do what they have always done and install irrigation and improve soil quality. Lengnick considers these short-term solutions. A resilient action questions what crops grow best in drought conditions and makes the switch to drought-resistant perennials.

In the Hudson Valley, she says, a resilient food system is based on "small and diversified farms, direct-to-consumer markets, sustainable and organic practices and regional supply chains."

While the rapid changes due to global warming are unprecedented, she says, "we don't have to start at zero. We can use the framework of sustainable agriculture."

Glynwood Farm

Dave Llewellyn oversees management of the 225-acre, nonprofit Glynwood Farm on Route 301 in Philipstown, plus another 300 acres in New Paltz. Its land includes vegetable and fruit fields, livestock pastures, forest and grassland.

"I grew up in a family of environmentalists and climate change has been on my radar since I was a kid," says Llewellyn. "It has always been a part of my decision-making as a farmer."

Llewellyn says his plan for Glynwood is to move beyond organic and sustainable practices, which are about maintaining what we have now, to "regenerative agriculture" that improves the land during production and makes it more likely to withstand extremes.

Water is a crucial part of the process. Llewellyn has adapted a practice developed in Australia called "keyline design" that moves water across the landscape to drier points by opening channels that don't break up the soil. The process captures more rainfall and there's less soil lost to erosion.

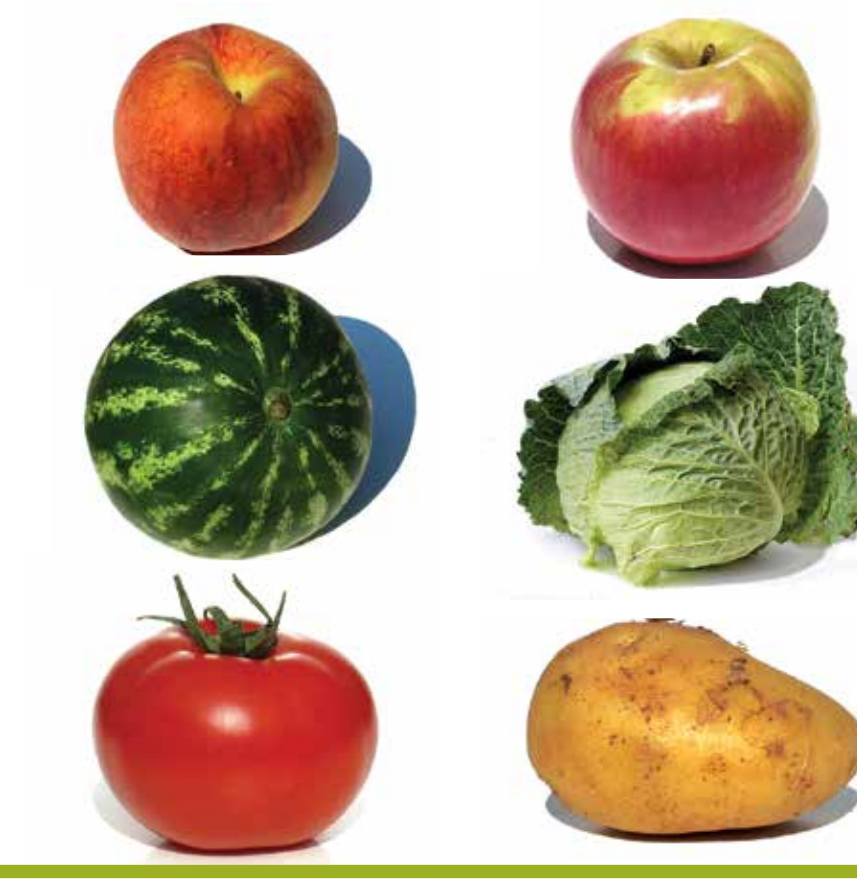
The other aspects of Llewellyn's water strategy are building soil that can hold more rainwater and planting trees and shrubs whose roots slow runoff. This is important as more rain arrives in heavy downpours.

Llewellyn says many farmers are using more non-food crops in fields after the harvest thanks to the U.S. Department of Agriculture's educational efforts o n s oil health and climate change. Called "cover crops," winter wheat, rye, and red clover take nitrogen from the air and hold it in their roots where other plants can use it. Long a practice of organic farming, it's now being used more widely by farmers who relied on chemical fertilizers. "Chemical inputs can harm the microbiology of soil and you have to use increasing amounts to get the same result," Llewellyn said.

To reach its goal of year-round growing for its community-supported agriculture program (CSA), Glynwood uses row covers and hoop houses that act as greenhouses. Each *(Continued on next page)*

Climate Change Trade-offs

Warmer temperatures, a longer growing season and more CO_2 in the atmosphere may make it easier to grow some crops in New York even as it threatens the ones that now make the most money for farmers. David Wolfe cautions, however, that while a crop might do well in a new climate, so might an insect or weed that wipes it out.



Laura Lengnick, who consults with farmers in the Hudson Valley, inspects a high-tunnel cucumber crop in North Carolina.

Climate Listening Project

(from previous page) layer of protection for the plants is the equivalent of adding half a growing season, Llewellyn says. "I don't have to worry about a frost coming if I can protect the plants or about heavy rains bringing in fungal disease spores."

While longer growing seasons benefit farmers, the unpredictable temperatures complicate matters. "If it warms up earlier in the spring but goes back to a hard frost, it doesn't benefit a grower," says Llewellyn, who trains farmers to plan for climate change. "It just confuses plants."

Organic food is typically more expensive than conventional produce because it doesn't use shortcuts that have a long-term impact on the soil and contribute to global warming. "Climate change is going to force farmers into better practices and it may slowly be reflected in prices," he says.

Longhaul Farm

Jocelyn Apicello, and her husband, Jason Angell, farm organically and raise chickens, turkeys and pigs on 4 acres at Longhaul Farm in Garrison.

Apicello, who grew up in Kingston, has a doctorate in public health and describes climate change as a natural outgrowth of the field. "I've always been on the lookout for issues about the greater good," she says. "It was clear that this was one of the biggest issues facing humanity and one of the biggest problems to work on."

After Apicello and Angell were married, they moved to Argentina to live on a farm in rural Patagonia. It was a turning point. "I saw the far-reaching impact that farming can have not only on human health but on environmental health," she says. "You can feed an individual, feed a community and address climate change" at the same time.

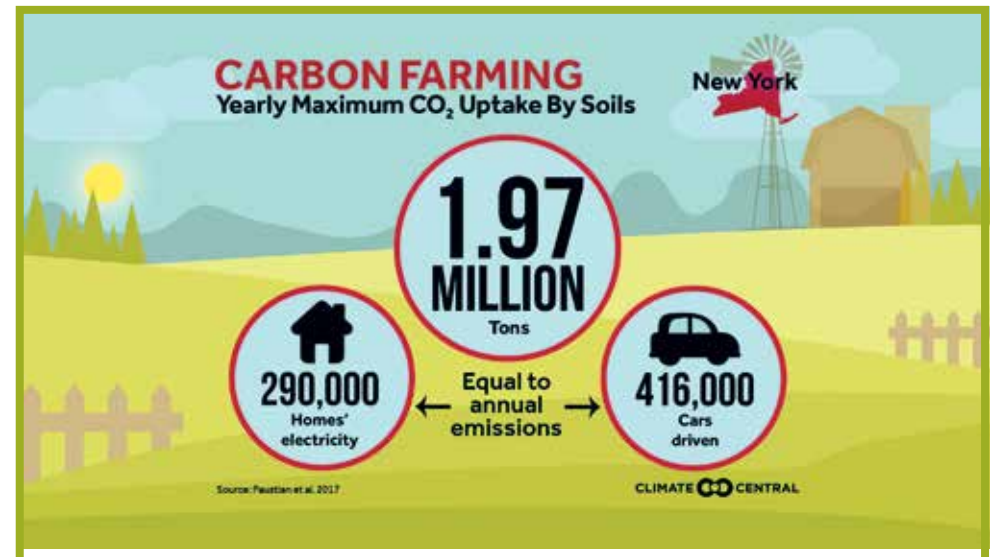
When they returned to the Hudson Valley a year later, the couple were ready to live more simply, she says.

Like many small farmers, they both have other jobs. Apicello is a professor of public health at William Paterson University in Wayne, New Jersey, and an urban farming adviser and teacher for the Bard Prison Initiative. Angell teaches at Bronx Community College.

Apicello says the scale of their farm has shielded them so far from the challenges facing farmers with hundreds of acres. They can water by hand, for instance, and don't have to invest in irrigation systems. Since they don't use tractors or harvesters, they are more agile in working the field and can drain it more easily after a heavy rainfall. She says she hasn't noticed a change in yields but attributes that to their size.

Because the farm is small, they also are more likely to quickly spot pests, and they can experiment with crops with far less financial risk.

Since winters have been milder and the summer and fall seasons longer, Apicello has experimented with row covers in her family's garden to take advantage of warmer temperatures. But she's noticed that invaders such as chickweed thrive in that environment, too.



THE DIRT ON CARBON FARMING — The soil stores carbon, although because of practices such as tilling, it's estimated cultivated soils have lost up to 70 percent of their original stock, which becomes CO_2 when exposed to air. Studies have found that practices such as planting "cover crops" to reduce soil erosion, less tilling and applying compost can move carbon from the atmosphere into the soil. This graphic, created by Climate Central, estimates the amount of CO_2 that could be stored in New York if these practices were widespread.

"I document when I see different weeds," she says. "The Japanese knotweed, garlic mustard and black swallow-wort — they're all coming earlier and blooming earlier."

Apicello shared a 15-minute documentary, *Life in Syntropy*, about a farmer and researcher in Brazil who studied the cycles of the rainforest and developed a way to grow food there without ripping out the vegetation. It's called *agroecology*.

The video inspired her, she says. "Humans can be a part of the natural world — not try to overtake it or just let it be wild and separate from it," she says. "As climate change is pressing down on us — even though we're late in trying to turn it around — we can at least adapt and lessen the blow."

Fishkill Farms

Before he could talk about climate change, Mark Doyle, who manages Fishkill Farms, has to redirect an insurance adjuster who has arrived to survey damage from the May 14 storm that tore through the Highlands. The "macroburst" destroyed 10 years of work in a few minutes, ripping 3,000 apple and cherry trees out of the ground and bringing hail large enough to damage the berry and vegetable crops. (See Page 7.)

Doyle, the farm's manager, is a South African with a degree in agriculture business management. He's been farming since his teens and working on farms in the Hudson Valley since 1989. He and Josh Morgenthau, who is the third generation of his family to run the farm, began working together in 2008. Doyle describes their strategy as diversification and connecting with customers.

The diversification is apparent in the 270-acre farm's operations. It sells produce at farmers' markets; offers CSAs for 41 weeks of the year locally and in Brooklyn; raises chickens and sells eggs; lets customers pick their own fruit, vegetables and flowers; and operates a year-round farm store. In 2016, it launched Treasury Cider, a line of hard cider made from its apples.

The storm damage last week wasn't Doyle's first experience with losses. In 2016, the fruit trees bloomed four weeks early and were then hit with a hard frost, wiping out the peaches, apricots, nectarines and plums, as well as 40 percent of the apples. They saved as much as they did by using helicopters to hover over the orchards, an *(Continued on next page)*

Jocelyn Apicello at Longhaul Farm *Photo by Meredith Heuer*

Sticky Situation

Sap buckets near Hubbard Lodge in Philipstown *File photo by Michael Turton*

By the end of the century, maple syrup could be worth its weight in gold.

A study published in January in *Ecology* predicts that global warming will have a devastating effect on maple trees. Scientists tracked the growth of 1,000 sugar maples at four sites in Michigan between 1994 and 2013 and found that warm, dry summers stunted their growth. The biggest trees didn't grow as fast, and saplings were less likely to survive. Because older trees that grow more slowly produce less sap, and because young maples need to be at least 10 inches in diameter to be tapped, warmer and drier summers will be a problem.

At Longhaul Farm in Garrison, Jocelyn Apicello has noticed a change in the maples near her property. "The maples are weakening," she says. "They're so sensitive to temperatures and they're taking a hit."

For sap to flow, the temperature needs to drop below freezing at night and rise above freezing during the day. Warmer temperatures have already pushed the first tap of the season eight days earlier than it was 50 years ago. (The first tap in New York in 2017 was on Jan. 1.) More sap may be required to make syrup as its quality suffers. It takes 40 gallons of sap to produce a gallon of syrup, but higher temperatures cause the sap to be less sweet.

More Stink Bugs Coming

Temperature, more than any other factor, drives the spread of the notorious Brown Marmorated Stink Bug *(Halyomorpha halys)*, which will eat anything but is partial to apples and peaches. First spotted in New York state in 2008, the bug is following warming temperatures north and may someday have two breeding seasons annually here, as it does in Virginia and North Carolina. At the same time, heat stress could kill them off in the Southeast.

The stink bug *Wikipedia*

Part 1: Runaway Train (May 4; see highlandscurrent.com)

Part 2: Rising Waters (May 11; see highlandscurrent.com)

What's Ahead

Part 4: Wildlife and Nature

Rising temperatures and waters will have a dramatic effect on the wetlands, wildlife and trees along the Hudson — and on human health, as pollen and tick levels climb and poison ivy and algae blooms expand. What changes can we expect?

Part 5: What Now?

A state initiative called Climate Smart Communities has pushed towns and cities to make changes; Kingston, a river community of 25,000, was an early adapter. But what are the political challenges, and who, in the end, will pay?

(from previous page)

expensive tactic that inverted colder air near the ground with warmer air above.

Many of the innovative practices designed to counter the threats of a changing climate — drip irrigation, growing tunnels and field and road design to direct stormwater — are in place here. But none are effective against storms. Doyle says the farm has already lost a week of work dealing with the May 14 damage at a time when all attention needs to be on fields and orchards. As he's pulled away to speak with the insurance adjuster, Doyle concedes, "It's pretty dire."

Tollgate Dairy Farm

Dairy farmers such as Jim Davenport need to keep both plants and animals thriving. He has to grow enough corn to feed his cows through the winter, and he has to be able to keep them cool during the increasingly hot summers.

With his wife, Karen, Davenport manages a herd of 65 milking cows and 70 younger cows at the 140-acre Tollgate Farm in Ancramdale. He says he's always on the lookout for innovations, and over the past 10 years has been adapting his farming to climate change.

Like people, cows don't like hot and humid days. Their milk production decreases and continues to drop the hotter and more humid it gets. Davenport said that, for now, his barns have a natural breeze and fans to keep the air moving. "Once the heat index is over 100, though, despite all your best intentions, the cows are going to be uncomfortable," he said.

While both he and Karen have degrees in animal science, they also grow corn to feed the cows, and so are keenly aware of what must be done. "The old way of farming, using tilling, leads to highly erodible land and we need to preserve soil," he says. "Civilization depends on this, and we live off this."

Davenport says he would like to see a carbon tax in New York to encourage farmers to use techniques that keep CO_2 in the soil. "I've seen the results," he says. "As practices start to result in more profits, more farmers will do it. If it doesn't get more screwed up than it is, we can keep ahead of it."

Jim Davenport *Photo by Bridget Herlihy*

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Honoring Those Lost
Page 24

Nelsonville Denies Permit for Cell Tower Near Cemetery

In 3-2 vote, majority cites 'adverse visual impact'

By Liz Schevtchuk Armstrong

Ending 10 months of discussion, including fierce public debate, the Nelsonville Zoning Board of Appeals voted 3-2 on Wednesday (May 30) to deny a special-use permit for a cellphone tower overlooking the Cold Spring Cemetery.

The ZBA members who voted "no" said the 110-foot, pole-like tower would have an "adverse visual impact" and conflict with village law that safeguards scenery.

The two members who voted "yes" cited the possibility of improved wireless service and the merits of making a decision in Nelsonville rather than putting the village at the mercy of a federal court if the applicants file a lawsuit.

Homeland Towers and Verizon Wireless proposed the tower for a rocky hillside off Rockledge *(Continued on Page 6)*

The audience waits at Town Hall on Wednesday night for the Nelsonville ZBA to vote on the Rockledge Road cell tower application. *Photo by L.S. Armstrong*

Back to Basics

Couple plans bookstore in Cold Spring

By Alison Rooney

Heidi and Michael Bender are eager to open the doors to Split Rock Books on Main Street in Cold Spring — the village's first bookstore since Merritt Books left in 2008 — but last week were waiting on a crucial piece of equipment: Shelves.

Besides the carpenter, they also had an appointment on Wednesday (May 30) with the sign painter.

"The hardest part [about the preparations] has been not being able to work in a bookstore every day," says Heidi. "We can't wait to open."

They expect that to happen this month. The couple, who were married last year in Garrison before moving to Cold Spring from Brooklyn, have no illusions about the challenges of owning a bookstore in a small village, or anywhere. Both are experienced booksellers.

Heidi and Michael Bender in front of the future home of Split Rock Books at 97 Main St. *Photo by A. Rooney*

"Some people love books and have great intentions, but it's a lot of hard work, navigating people and situations," says Michael. People *(Continued on Page 8)*

By Chip Rowe

If you're a warbler or hummingbird spending the winter in Central America, you figure out when to fly thousands of miles to your summer home in the Highlands by watching the position of the sun.

The problem is, while the sun's position is reliable, global warming due to carbon dioxide (CO_2) trapped in the atmosphere has changed when your food arrives. Plants "green up" and the insect population peaks sooner. The clock falls out of sync.

Climate change is already putting some species at risk. A study published last year in *Scientific Reports* found that nine of 48 species of songbirds weren't able to reach their North American breeding grounds at the optimal time, because that time was constantly shifting. Global warming is moving too fast for them.

Among animals that hibernate, the warmer temperatures fool them into thinking it's later in the spring, but when they emerge they find the food isn't ready. American black bears, for instance, are waking too early, or having trouble hibernating in the first place. Because of warmer winters and abundant food supply, they never get the signal to hit the sack. A 2017 study predicted that by 2050 black bears could be awake 15 to 39 more days per year, leading to more interaction with humans, and more conflicts when food is scarce.

"My prediction is we will have fewer cubs survive the winter, and so many bear conflicts that residents will want them to be hunted off again just like the 1800s," Rae Wynn-Grant, of the American Museum of Natural History's Center for Biodiversity and Conservation, told *The New York Times*. "Except this time we have climate change to blame."

Nature is a big, tangled web, so one small change can have a cascading effect. Species that once never interacted come face to face; others never see each other again. With less snowfall, deer will find enough food to survive the winter at the expense of smaller animals that depend on the same plants. Less snow will also mean less runoff and lower streams, which could affect fish.

Scientists are also now looking at how global warming is affecting oceans and inland lakes, and the creatures that live in them. The higher level of carbon, for example, has made seawater more acidic, thinning the shells of oysters and other animals. The effects can be unpredictable. In one study of mussels, one species relaxed in water high in CO_2, while another clamped shut.

Insects love warm weather. It allows them to grow faster, breed more frequently, become larger and make more eggs. Tick nymphs that used to peak in June are showing up in mid-May. Within a couple of decades, it may be early May.

Even the fall foliage could be at risk. Drought conditions stress trees out, and dry weather browns their leaves and sends them to the ground before they can turn yellow or red and bring green to the local economy. Heat also makes trees more vulnerable to disease and infection, which also causes them to shed their leaves before the fall.

In this, the fourth part of our series on climate change in the Highlands, we will look more closely at how global warming will affect the animals, plants and trees that live around us. As temperatures rise, we'll say goodbye to some and hello to others, but we don't get to choose.

(To Page 12)

Wrenches in the System

Temperatures warm, ranges shift and systems are disrupted

By Jeff Simms

Constitution Marsh is in danger of drowning.

The 270-acre wildlife sanctuary in Garrison, which has been managed by Audubon since 1970, could be overrun by sea-level rise caused by global warming by the end of this century.

"The rate and volume of sea-level rise that we're seeing is unprecedented," says Eric Lind, who has been the director of the Audubon Center at the marsh since 1998. "The vegetation here grows in a 'window' of water depth, and there's a strong possibility that with too much water the vegetation in these habitats will be drowned."

One of five large tidal marshes on the Hudson, the preserve provides foraging, nesting and resting habitat for more than 200 species of birds and 30 species of fish.

But because the river is an estuary, or arm of the Atlantic, as sea level rises, so too will the river. When it does, the mix of grasses, sedges and reeds that make up the marshes may be submerged, forcing inhabitants such as the marsh wren and other migratory waterfowl to move along, or die.

In other locales, marshes could move inland to higher elevations. But at Constitution Marsh, Lind says, the habitat is "hemmed in by steep slopes — the Hudson Highlands, essentially."

One solution would be to build up the river floor, giving the marsh a "platform" to grow on, which is happening naturally, but probably not quickly enough, as more frequent and intense storms dump huge volumes of sediment into the river.

Lind and his colleagues at Constitution Marsh have installed nine measuring stations to assess whether the sediment is being held by the marsh or flowing through to the Atlantic.

"It's unlikely that there will be enough sediment entering the river to maintain pace with sea-level rise," Lind concedes. "But nobody knows. The point is it's a dynamic natural system."

That may have been the greatest takeaway from my visit last week to Constitution Marsh. The natural world is infinitely complex, and it is that exceptional quality, a connectedness that runs layers and layers deep, that makes it difficult to quantify the effects of global warming on plants and animals.

Some changes are easier to observe than others. As temperatures warm, animals move to higher elevations to find temperate waters and reliable food sources. This is true for many species — fish or fowl, flora and fauna.

Similarly, the populations of invasive species like the hemlock woolly adelgid, a tiny, brown, aphid-like insect, have been jumpstarted in the Highlands by the warmer spring weather. Their voracious feeding sucks fluid from and eventually destroys hemlocks, a tree that grows along the sides of streams and helps with flood and erosion control.

There are so many corollary and intersecting effects that it's virtually impossible to say that climate change caused *this* but not *that* in the natural world, notes Lynn Christenson, a Vassar College associate professor of biology. The impacts are intricately woven together.

However, what global warming clearly threatens is biodiversity, or the healthy variety of life. But why, I asked Christenson, is a variety of life forms — from humans to habitat to microscopic organisms — important? Why does it matter?

"Biodiversity enriches the environment at the most basic level," she explains. "When we lose it, we lose functions and relation-

(Continued on next page)

Eric Lind at Constitution Marsh *Photo by Meredith Heuer*

Resilient Landscapes

Mapping tool says we're more than halfway there for the region

By Jeff Simms

The Hudson Highlands — with its steep slopes, marshy wetlands, valleys and ravines — represent the type of complex landscape that conservationists are seeking when it comes to protecting wildlife habitat, especially in the era of rapid climate change.

Diversity is a key characteristic of "resilient" landscapes, a term first used by The Nature Conservancy about a decade ago to describe the wildlife habitat most suited to endure the rapidly changing climate.

The two main characteristics of resilient lands are complexity — an assortment of "microclimates" that create a range of temperature and moisture options for species — and connectedness, which supports the continued rearrangement of species as they respond to global warming.

The thinking, says Nava Tabak, director of science, climate and stewardship for Scenic Hudson, a nonprofit environmental group, is that it's hard to predict where species will end up as their ranges shift.

"The best we can do is conserve a diverse landscape," she says, "and the Highlands is one of those places."

Clarence Fahnestock and Hudson Highlands state parks score high for resiliency, which is one reason why conservation organizations have consistently acquired and added lands to these swaths.

In 2016, Scenic Hudson introduced the Hudson Valley Conservation Strategy, a mapping tool that identifies the most "efficient" conservation projects to preserve biodiversity, resilience and connectivity.

"This doesn't give you marching orders to go out and get this or that property," Tabak says, "but it shows us important areas where there are opportunities."

In the 11-county Hudson Valley region, almost 900,000 acres have been protected by the state and private organizations such as Scenic Hudson, including the 6,000-acre Hudson Highlands State Park Preserve between Cold Spring and Beacon that provides habitat for bald eagles, black bears and timber rattlesnakes, among many other species.

On the other side of the Hudson, thousands of acres — Harriman, Bear Mountain and Storm King state parks — protect a major spring and fall flyway for migratory birds.

It's impossible to predict exactly how much more land needs to be conserved, but Scenic Hudson's tool suggests 750,000 more acres in the 11 counties would "give us a pretty good portfolio of places that would enable species to adapt with climate change," Tabak says.

That's a tall order, "but it's not out of the realm of possibility," she says. "It's something to strive for."

(from previous page)

ships that have long-term connectedness.

"Every time something shifts, there's a whole new arrangement with organisms that have to share that space. And when a system gets disrupted, the ability of diseases and pathogens to move through that system can increase. If we have poor nutrition or we don't have a safe place to live, we're more susceptible to catching a virus or a bacterial infection. That's why biodiversity is important."

Back at Constitution Marsh, Eric Lind tells me during a hike why he is drawn to the natural world. While growing up in Putnam County, being outside was a huge part of his childhood, he says. "I found things and heard things," he recalls. "I realized how full the world was. Later, when I began to study things like migratory birds or fishes, I realized these were connections that I had with the rest of the world.

"As a child, I heard a bird singing in a treetop in my neighborhood one day. It was a scarlet tanager," which is now threatened by climate change, Lind says. "It was this incredibly clear spring day. The bird was vivid red, the trees were vivid green and the sky was vivid blue. When I saw that, it seared the image. It was unforgettable."

The idea that images like that could someday be lost is painful.

"The news is bad," he says. "It gets worse every year. It's troubling at best and terrifying at times. We're talking about decades, but it's difficult to think beyond what you have to do next week. Day-to-day, the changes here just aren't that obvious."

Saying Goodbye

We asked Audubon's Eric Lind to identify three birds seen at Constitution Marsh that face dire circumstances due to global warming. He notes that "these examples are already under pressure due to habitat degradation or loss, collisions with buildings and other man-made structures, environmental contaminants and invasive species. Major stresses from climate change add to a fate that is complex and uncertain."

Least bittern

"Currently listed as a threatened species in New York state, it needs large freshwater and brackish marshes with tall and dense emergent vegetation, interspersed with patches of open water. The numbers are stable in the marsh, likely due to our management of invasive plants. It may experience a shift in range from the South to our area, but this won't matter if the marsh is severely diminished from sea-level rise."

Bald eagle

"The increasing severity of storms threaten its chicks, as the large size of the nests make them prone to being blown down. By 2080, only about 25 percent of the bald eagle's current range is expected to remain. While new areas may open up with the warming climate, they will not assure a sustained population. Forested areas adjacent to large bodies of water with abundant, large fish are also needed. In New York, we are seeing eagles breeding earlier in the season."

Louisiana waterthrush

"They nest only along clear, clean streams that flow through hilly dense forests. Audubon's climate model projects a 97 percent loss of current breeding range in eastern North America by 2080."

Least bittern

Louisiana waterthrush

Bald eagle

Could Trees Save Us?

Don't hold your breath

By Jeff Simms

Bill Schuster, a biologist and the executive director of the Black Rock Forest Consortium, the nonprofit organization that manages the nearly 4,000-acre Black Rock Forest in Orange County, says there has been a perception since climate change entered the lexicon that "trees will save us" because they remove carbon dioxide (CO_2) from the air.

That's true, but a study conducted in part at the forest suggests the outlook is not so cheery.

Research published last fall found that plants emit more CO_2 into the atmosphere than believed. While plants and trees during photosynthesis capture about 25 percent of the carbon emissions from the burning of fossil fuels, the research found that when they "exhale," or respire, they emit around 30 percent more CO_2 than previously predicted.

In practical terms, this means that as the planet warms, plant respiration will increase significantly, likely reducing the earth's ability to absorb emissions from burning fossil fuels, explains Kevin Griffin, president of the consortium's board and a professor at the Lamont-Doherty Earth Observatory of Columbia University.

Griffin and his team sampled leaves from deciduous trees at Black Rock before comparing their findings to more than 4,000 measurements of CO_2 respiration from plants around the world. The next phase of the team's research will be to gather data on the growth respiration of leaves, which will provide information on how much CO_2 is released when trees add new leaves each year.

Bill Schuster *Photo by J. Simms*

So Long, and Thanks for All the Fish

As the climate changes, the Hudson gets weirder

By Brian PJ Cronin

No forecasting about the climate and ecological health of the Highlands can be made without taking into account how global warming will affect the most important and vulnerable part of its landscape, the Hudson River. But when it comes to the effects of climate change on the estuary, the future is here.

For years, scientists have looked at the declining numbers of migratory fish returning to the Hudson, such as shad, sturgeon and striped bass, and blamed aggressive offshore fishing operations. But now many are thinking that rising water temperatures may be at fault, as cold-water species bypass the river for cooler latitudes.

"We're seeing evidence of what sure looks like climate change affecting distributions of where fish are, and seeing habitats that no longer are as good as they were before," says Karin Limburg, a professor at SUNY's College of Environmental Science and Forestry in Syracuse.

At the same time, invaders arriving from the South are working their way upriver from the Atlantic. Over the past 15 years, scientists have seen a steadily increasing number of "tropical marine strays" in the Hudson, she says.

How these species will coexist with native fish, and what diseases they may bring with them, is anyone's guess. But unlike birds migrating north, many fish species will never reach the Highlands. "They can't just hop on the bus," says David Strayer, a freshwater ecologist at the Cary Institute. "There's going to be this asymmetry for at least a few centuries. We'll see more extinctions than arrivals."

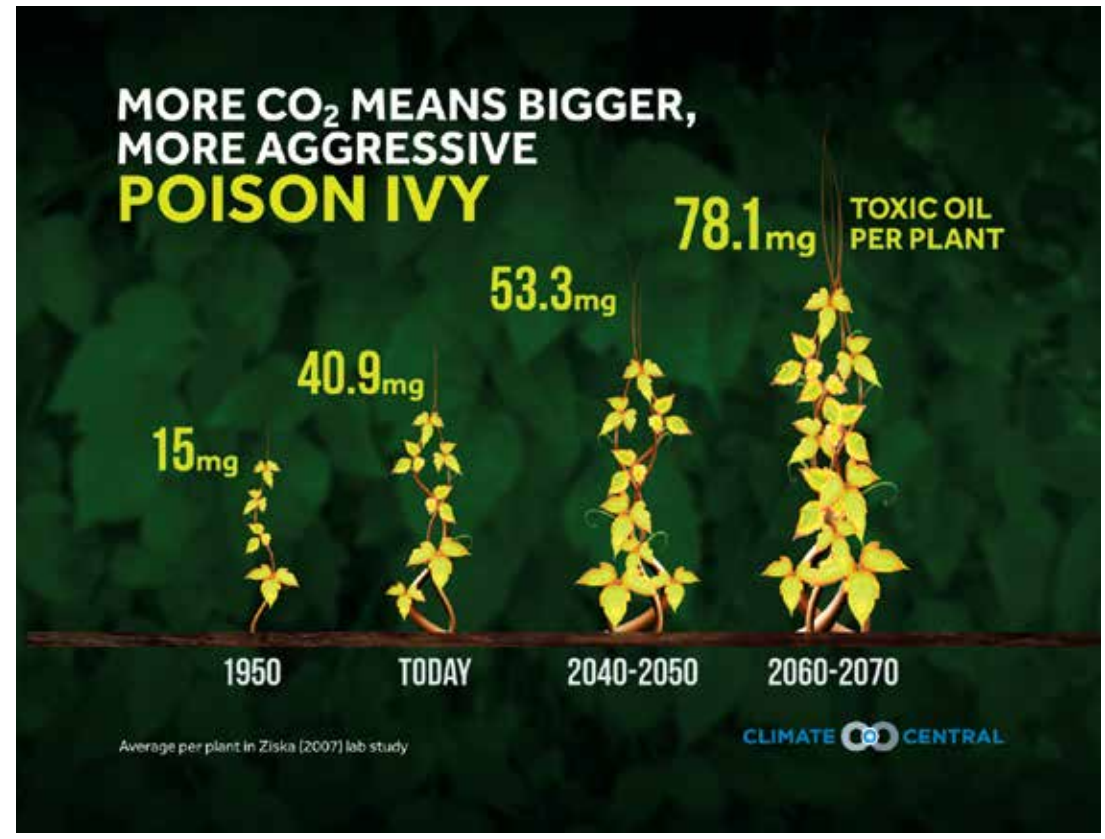
Meanwhile, the warmer water temperatures will make life rough for some unwelcome transplants, such as the zebra mussel. Native to Russia and the Ukraine, the voracious plankton feeders began showing up in American waterways in the late 1980s after stowing away in the ballast of ships. Although they quickly wreaked havoc on ecosystems, the bivalves are extremely sensitive to temperature changes, and even minimal increases could cause massive die-offs.

Does that mean some aspects of climate change in the river could be ... *beneficial?*

"There's going to be a wide range of impacts," says Strayer. "It very much depends on your viewpoint. The Coast Guard spends a lot of money breaking ice in the river to maintain its navigability. So if there's less ice because of warmer temperatures, the Coast Guard will rejoice, but the ice boaters will weep."

Global warming will expose the Hudson's vulnerabilities. The river has one of the world's highest "nutrient-loading rates," a measure of the concentration of organic matter coming in from outside sources.

With the Hudson, that's mainly sewage. If the sewage sticks around, it gets consumed by microbes, which leads to



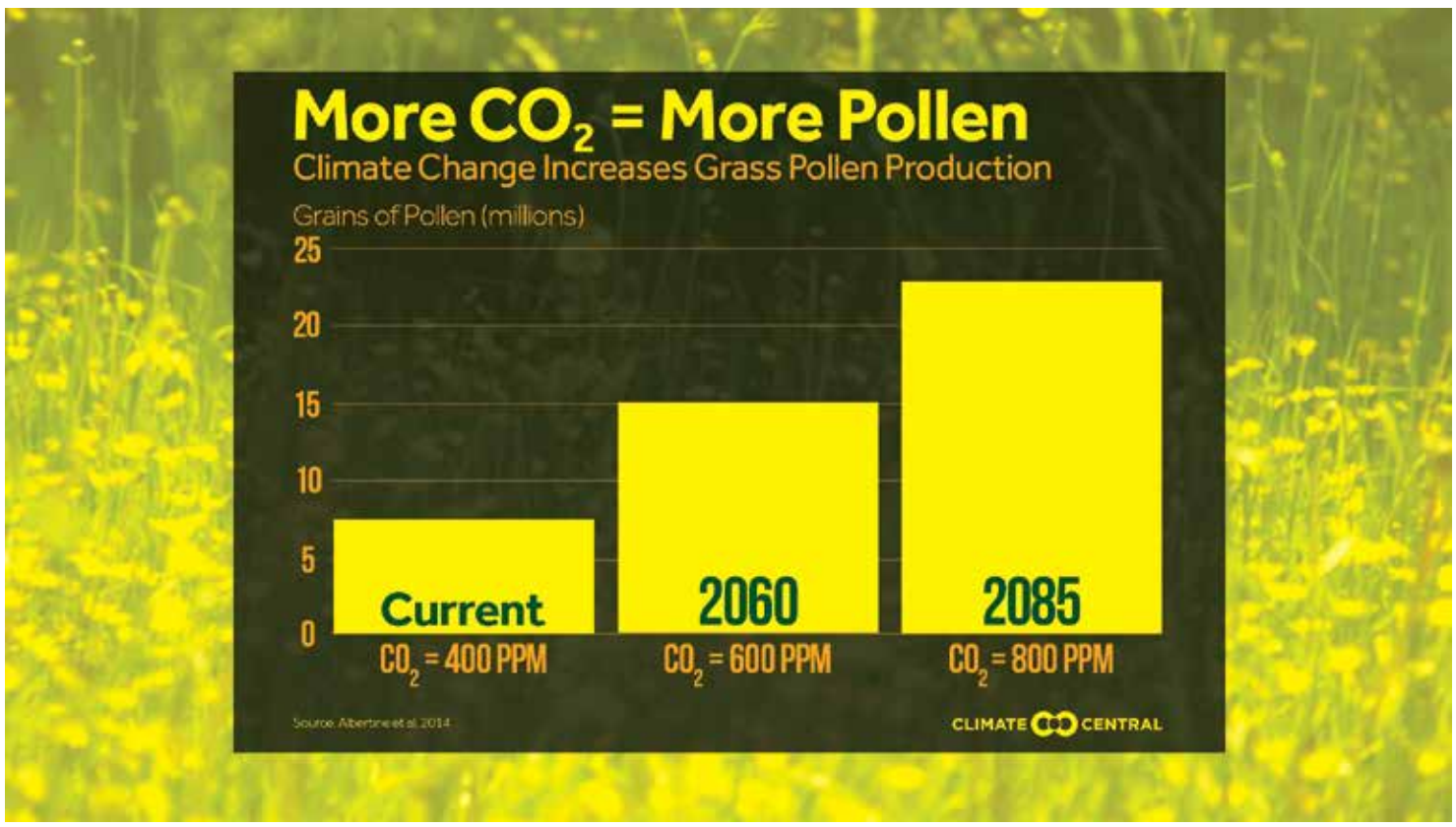
> *"We know that the storms are changing in intensity, frequency and magnitude, but there are probably going to be more droughts too."*

runaway algae blooms that can suffocate marine ecosystems. For now, the Hudson flushes itself well, clearing out organic matter before it turns into blooms, but Limburg notes that flow rates can change. "We know that the storms are changing in intensity, frequency and magnitude, but there are probably going to be more droughts, too. And in droughts, the flow rates drop way down."

Finally, there's the question of how the river will react to whatever we construct to counter the effects of climate change. For instance, a flood gate near Manhattan could impede the flow of migratory fish. If Metro-North builds bulkheads to raise the train line, the infrastructure could further isolate the river from the floodplains, altering the river's flow rates even further.

If the infrastructure is designed thoughtfully, with its ecological impacts in mind, the damage to the river could be minimized. But if it ends up being designed and implemented quickly in response to an immediate disaster, scientists worry these considerations won't be taken into account.

"Ecologists are always accused of responding to everything with 'Well, it depends,' " says Strayer. "But in this case it really does depend. All we can say is that these actions are going to range from having a modest to an enormous ecological impact."



The Climate for Lyme

Reporter traces connection between ticks and warming

By Michael Turton

In her new book, *Lyme: The First Epidemic of Climate Change,* former *Poughkeepsie Journal* reporter Mary Beth Pfeiffer examines how the dramatic increase in Lyme disease in the U.S. since the 1970s correlates with climate change. In an interview last week, she discussed her findings and the risks facing the Highlands. Her responses have been condensed.

You reviewed quite a bit of research on Lyme disease, which is spread through tick bites. What did you find most compelling?

What clinched it for me was a 2014 Environmental Protection Agency report that listed *(continued on next page)*

Mary Beth Pfeiffer

Photo by Jim Smith

"We need to protect our children; 5- to 14-year-olds are the largest group infected each year. Make your yard safe. Don't have leaf or brush piles. Open it up to the sun."

(from previous page) three health indicators used to track climate change: the longer, earlier and more intense weed pollen season; the number of health-related deaths; and the number of Lyme disease cases. Lyme is the only disease the government uses to track climate change.

Scientists are finding that as places become warmer, there are more ticks. In Canada, ticks are moving farther north each year. And data in the 1950s showed that ticks only survived at a certain altitude on a mountain in Eastern Europe. Forty years later, ticks were found at much higher altitudes. That is a microcosm of what is going on around the planet.

Pfeiffer removes a tick from her dog, Bushwick. *Photo by Janet Graham Gottlieb*

It's not just the black-legged tick, which is common in the Northeast, that is moving because of climate change. The lone star tick has migrated from the South and arrived in Long Island, where it is causing big problems.

How do birds factor into the spread of Lyme?

For eons birds carried ticks as they migrated north from South and Central America. But in the past, if they dropped a tick from Brazil in the Eastern U.S., the tick would die. Now they survive, and they also carry more pathogens.

If the Highlands become hotter and drier, would that reduce the tick population?

It's unlikely we will get too dry. We may have periods of drought and intense heat that make it more difficult for ticks. But even in the South, where it's very hot and getting hotter, it's still very humid. Ticks can go beneath leaves or into the soil and stay moist, coming out when it's humid enough to survive.

In the book, you discuss how the threat of the Zika virus was reduced by genetically modifying mosquitoes so they only produced male offspring. Could that work with ticks?

A mosquito has a two-week life span; ticks live for two or three years. It would take many generations of ticks for that approach to take hold. But I would love to see research along those lines.

Are there more promising solutions?

The Cary Institute of Ecosystem Studies in Millbrook is conducting a five-year tick project aimed at controlling ticks in neighborhood yards. But we need a lot more money spent on figuring out how to control ticks, such as a vaccine that would kill a tick when it bites a human. A vaccine could also be used to kill ticks as they feed on mice and deer. It could stop the epidemic dead in its tracks.

What can be done in the meantime?

People need be vigilant. Cover up when you go outside, check yourself when you come inside. Use permethrin-impregnated clothing; it kills or causes ticks to fall off when they come in contact. That clothing is rather expensive although permethrin itself isn't. You spray it on, let it dry; it survives about six launderings.

We need to protect our children; 5- to 14-year-olds are the largest group infected each year. Make your yard safe. Don't have leaf or brush piles. Open it up to the sun. Ticks generally don't like hot, sunny areas.

Can we stop Lyme?

We have the ability to conquer it. I'm a little pessimistic because we haven't had the will or put the money into it. We need to convince the powers that be that this is a serious, underestimated epidemic that leaves many people ill long after they're infected. Then, the will and the money will follow.

Part 1: Runaway Train (May 4; see highlandscurrent.com)
Part 2: Rising Waters (May 11; see highlandscurrent.com)
Part 3: Farm = Food (May 25; see highlandscurrent.com)

What's Ahead

Part 5: What Now?

A state initiative called Climate Smart Communities has pushed towns and cities to make changes; Kingston, a river community of 25,000, was an early adapter. But what are the political challenges, and who, in the end, will pay?

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Montgomery Wants County Seat

Also, Maloney joins race for attorney general

By Chip Rowe

Nancy Montgomery *File photo by Ross Corsair*

Nancy Montgomery, a three-term member of the Philipstown Town Board, will run in November for the seat held in the Putnam County Legislature by Barbara Scuccimarra. The district includes Philipstown and part of Putnam Valley.

Montgomery, a Democrat, has been on the Town Board since 2008. On Wednesday (June 6), Philipstown Democrats announced a campaign event scheduled for June 15 in *(Continued on Page 2)*

Shelley Boris on a patio at Dolly's *Photo by A. Rooney*

Final Touches at Dolly's

Ten years later, new cafe in Guinan's building

By Alison Rooney

The long-awaited opening of Dolly's, a cafe and restaurant on Garrison's Landing where the iconic Guinan's Pub and Country Store once stood, is nearly here.

Shelley Boris and Kimball Gell, co-owners of Fresh Company, a Philipstown-based catering firm, say they have a few bells and whistles to hang — molding, mirrors, shelving, artwork — before a soft opening in the next few weeks with breakfast and lunch service. Dinner service will follow.

The name, Dolly's, is a nod to the film *Hello, Dolly!,* which was filmed in part on Garrison's Landing in 1968, the anniversary of which is being celebrated this summer with a festival.

"Dolly's feels like there's a sense of fun, that it's all not too serious," Boris says, adding that, for her, it also evokes "*Guys and Dolls*, Dolly Parton, kids playing with dolls, all those things. It feels like it can be a lot of different things to people, and that's what we want it to be like."

A tour of the newly renovated, three-story space overlooking the Hudson began with the large front room with windows open to the river. The back room — the former pub — is dominated by the familiar stone fireplace. There are two outdoor patios, one near *(Continued on Page 5)*

By Chip Rowe

According to the best science available, based on a method of inquiry that has served civilization for centuries, the earth's climate will continue to heat up at a pace never before recorded. This may not change *our* lives so much, but our children and grandchildren are in for a wild ride. We can slow down the warming, but it will take a tremendous, sustained effort over generations, because climate change due to increasing amounts of carbon dioxide trapped in the atmosphere appears to be accelerating so fast it has its own momentum.

When the planet's health was easier to see and comprehend — smog, acid rain, the polluted Hudson — politicians from both parties worked together to find solutions. But this danger is distant, and complex, with uncertain outcomes. And somewhere along the way scientists — thousands of scientists, in multiple disciplines — have become cast by naysayers as clueless villains who hope for unexplained reasons to destroy the economy by sabotaging the most profitable product ever devised: fossil fuels dug from the earth.

There is a clear and consistent divide between the two major parties on global warming that extends right down to our own Congressional district. According to a study published in 2015 in the journal *Climatic Change* that examined different views of climate change at the local level, 84 percent of Democrats in the 18th are convinced global warming is happening, but only 57 percent of Republicans. More than 75 percent of Democrats say they are concerned, versus 41 percent of Republicans.

Fred Rich, a Garrison resident who is the author of *Getting to Green*, a book that outlined (before President Trump) how the parties might find common ground on environmental issues, argues that polls are skewed by the third of Republicans who are hardcore deniers. Results also vary by state: Republicans in New York, Delaware and Alaska are more likely to believe that rapid climate change is underway than Republicans elsewhere.

In this, the fifth and final part of our series, we spoke with Rich and other Highlands residents who are doing what they can to get things moving. New York State has promised grants to communities that mitigate and adapt for what is coming, but only Philipstown has made much progress. Passionate activists such as Krystal Ford in Garrison and members of the newly formed chapter of the Citizens' Climate Lobby in Beacon are attempting to add urgency to the conversation. But it's a hard sell, and politicians think in terms of two to eight years, not 50 to 100. Fred Rich points out that people respond better to hope than gloom. So, where is it?

(To Page 10)

Climate Smart

State pushes local governments to make changes

By Liz Schevtchuk Armstrong

Philipstown wants to be smart. Certifiably smart. Climate smart.

It's not alone. As of June, 230 governments in towns and cities stretching from Long Island to the Canadian border had enlisted in the state's Climate Smart Communities initiative.

Of those, 18 were not only certified, but had reached a bronze or silver ranking after completing additional projects. They include Dobbs Ferry, Kingston and Ulster County (silver) and Cortlandt and Orange County (bronze). No municipality has reached the gold level yet.

The remaining 212 hopefuls include Beacon and Philipstown, the only Putnam County community to participate.

In an attempt to reduce greenhouse gas emissions that contribute to global warming by trapping heat in the atmosphere, New York launched the Climate Smart program in 2009. To encourage municipalities to participate, the state has promised that certification will help win grants.

To join, municipalities must pass measures declaring their intent. Beacon did so in 2009 and Philipstown in June 2017. Next, the local government organizes a task force and appoints a coordinator to tackle assignments on a list of more than 100 projects.

Philipstown's comprehensive plan, passed in 2006, included many Climate Smart-style goals. In January the town appointed a coordinator, Cold Spring resident Roberto Muller, who earns $500 per month. The Town Board also sought volunteers, resulting in a 20-member taskforce that will make recommendations to the Town Board, which will make final decisions.

In Beacon, the City Council passed a resolution in 2009 to join the Climate Smart program but has made little progress since. Its Conservation Advisory Committee hopes to have a Natural Resources Inventory completed by the fall that could make the city eligible for Climate Smart grants. City Administrator Anthony Ruggiero said this week that the council was close to naming a Climate Smart coordinator, who would then lead the city through certification.

The Cold Spring Village Board briefly discussed the Climate Smart program in 2012 but went no further. Muller has briefed the Cold Spring board and the Nelsonville Village Board and says he intends to follow up with both. He noted that either village could team up with Philipstown and suggested one task force goal, providing stations for recharging electric cars, is ideal for collaboration.

How it works

With the completion of each Climate Smart project, a municipality earns points; it needs 120 for certification. Muller said most communities take two to three years to attain certification.

The tasks include initiatives such as conducting an inventory of how the municipality and the community produce greenhouse gases and drafting plans to reduce them; installing water-saving fixtures and LED street lamps; initiating employee car pools, upgrading HVAC systems; shifting to solar and wind energy; promoting composting and recycling; planning bicycle and walking paths; and issuing an annual progress report.

At a May 3 Town Board meeting, Supervisor Richard Shea said reducing greenhouse gases, starting with the town government itself, tops Philipstown's immediate Climate Smart to-do list.

"We need to look at where we're getting our power from, where our electricity is coming from, what kind of vehicles we're driving and how we're going to combat climate change," he said. "I feel like we're at the last possible moment to try to turn back the tide.

"This is no joke — the storms you see now are not like anything I've seen in 56 years," he said. "Regardless of whether you agree with climate change or the fact that it's man-made, it's happening."

Councilor Mike Leonard, the board's liaison to the Climate Smart task force, said that as global warming continues, "there will be certain things we have to adapt to. Whether we did them or nature did them, things have happened. The more we start early and work on these issues, the more choices we have. The longer we wait, we'll be forced to do things we're not going to be happy with."

A month later, in an interview, Muller sounded the same alarm.

"We've done our part to do the damage, as well as every other municipality around the planet," he said, and now must accept responsibility. "There's this window, perhaps, to make changes," before it's too late. Internationally, "we should care because climate change will destabilize democracies around the world," he said.

Closer to home, Muller said, Highlands residents should care because climate change will upset local agriculture; force local governments to spend money on the after-effects of violent weather, which could conceivably lead to tax increases; and generally make life difficult, especially for those who don't have wealth to create "a cushion against chaos" because "those who live on the edge of poverty have very little backup."

Muller said the Philipstown task force is focusing on creating an inventory of town government greenhouse gas emissions. Then comes the community inventory. Muller said the group plans to gather more data than is typical in such surveys. But that requires funding. So far, it has raised $10,000 with the help of the Ecological Citizens Project and hopes to receive a matching state grant, he said.

The precise inventory will gather such details as how many miles a vehicle is driven or the type of windows and insulation in buildings, Muller said. "The idea is to have more real data" to better measure the progress made with upgrades.

Muller said a 2010 regional study suggested that "people drive way too much in Putnam County and that deforestation is an issue. Philipstown might be a little different," he said, because residents and the board are "already savvy about this. We're seeking to become a Climate Smart Community, but that doesn't mean a lot of things aren't already happening."

The town's 2006 comprehensive plan called for conserving its farmland, forests, shoreline and scenery; developing paths for bikes, hiking and horses; minimizing sprawl; tightening land-use laws; and promoting recycling and renewable energy. Five years later, the Town Board changed the zoning code to turn plan recommendations into law. It also created a Conservation Board, which safeguards wetlands and water supplies. More recently, the town government started looking at installing solar panels at the Recreation Center in Garrison.

Being Climate Smart "goes hand-in-hand with all these initiatives," Shea said.

(Continued on Page 11)

Roberto Muller at the Cold Spring waterfront *Photo by L.S. Armstrong*

Climate Smart *(from Page 10)*

What does it take?

Kingston, a riverfront community like Cold Spring and Beacon, is the Climate Smart program's only "silver" city. It has a population of about 23,000.

The husband-and-wife team of Steve and Julie Noble championed the city's response to climate change, even before Climate Smart, while working for the parks and recreation department. Julie was appointed Climate Smart coordinator and, in 2016, Steve was elected mayor.

"Kingston has always leaned toward being a green, sustainable city," the mayor said. "We recognized it's a way for us to save money, which taxpayers love."

Some of Kingston's projects include a city fleet with four hybrid and three electric cars; LED lighting on all city streets; a mile of central roadway revamped to include a protected bicycle lane; rain garden tree pits and pervious pavers to reduce stormwater runoff, paid for with a $750,000 Climate Smart grant; the replacement of 100 single-pane windows at City Hall, paid for with a $100,000 state grant; providing residents with composters, recycling bins and rain barrels; and figuring out how to make the city fully accessible by bike or foot.

Steve Noble says the city has used a soft touch with residents. "We've never taken the approach that it's the law and you must do that," he said of mitigation and adaptation efforts. Instead, he said, the city leads by example, by composting and recycling, using fuel-efficient vehicles and switching to LED lighting.

Noble said one major benefit of achieving silver status has been increased access to funding, including grants through Climate Smart Communities and the Clean Energy Communities program run by the New York State Energy Research and Development Authority (NYSERDA).

"We have done a lot of long-term planning," he said. "We've taken a look at our waterfronts because sea-level rise is already happening." At high tide, "our waterfronts are flooding more now than they used to." The city has also revisited its comprehensive plan to ensure that it looks far enough into the future.

He says Kingston officials are asking tough questions about the effect of rising water levels on infrastructure: should sidewalks and roads be raised; should certain areas be abandoned and returned to nature? "The community recognizes that our waterfront is such a special place," Noble said. "To lose it would be terrible."

Julie Noble, the city's environmental education and sustainability coordinator, also chairs the Climate Smart Kingston Commission, which implements the city's 2012 Climate Action Plan. The 21-member panel consists of staff from departments such as planning, public works and economic development, as well as community stakeholders and professionals from fields that include renewable energy, education and shoreline management.

Its work provides "the match" often required for grant funding, she said. The commission handles some projects; city departments tend to others.

"We've tried to change the mindset regarding how people can collectively move Kingston toward a more sustainable future," Julie Noble said. That change can vary from neighborhood to neighborhood. "In some areas it might be about recycling or better composting," she said. "In other areas it might be about green infrastructure, electric vehicles, altering buildings or bicycle infrastructure."

Noble said she regularly gets calls from officials in other municipalities asking about Kingston's success. "The most important thing any community can do is to hire someone to work on environmental issues," she said. "That's how things get done."

Michael Turton and Jeff Simms contributed reporting.

The Bottom Line

Want less carbon in the atmosphere? Start making it expensive

By Brian PJ Cronin

For years, David Strayer, a freshwater ecologist at the Cary Institute in Millbrook, traveled to Albany to explain to lawmakers the dangers of invasive species.

His experience at the state Capitol was always the same. No matter their party, the representatives were always receptive. They got it. Yet the meetings always ended the same way.

"They'd say, 'How come I never hear from my constituents about this, if this is such a big deal?,' " Strayer recalls. With global warming, "people aren't making that connection that they need to be writing to somebody in Washington or Albany. Unless they get some letters, they're going to work on economic development instead of climate change."

In the wake of a contentious election, many Highlands residents are attempting to change the conversation in Albany and Washington, looking for large-scale solutions to the growing level of greenhouse gases in the atmosphere, which contributes to global warming. Although the earth is already locked into a certain amount of climate change over the next century and beyond, scientists say there is still time to push toward a disrupted, but manageable, future.

Unfortunately, it's going to take a big push on the levers of institutional power to make that happen. One method is to make money talk. Investors can pressure companies to lower their carbon footprints, or risk losing their support.

Bevis Longstreth *Photo by B. Cronin*

Bevis Longstreth, a Garrison resident, literally wrote the book on the subject. A member of the Securities and Exchange Commission under President Reagan (and a current member of the board of Highlands Current Inc., which publishes this newspaper), Longstreth explained 30 years ago in *Modern Investment Management and the Prudent Man Rule* how nonprofits, pension fund managers and other fiduciaries can make investments that best exemplify the ethics and goals of their clients.

Now Longstreth is at the forefront of the divestment movement, which urges institutions to divest from oil and gas companies unless they commit themselves to renewable energy. He was appointed in March by Gov. Andrew Cuomo to the state's newly formed, six-member Decarbonization Advisory Panel, which will advise Comptroller Thomas DiNapoli on how climate change and the emergent renewable energy sector could affect investments made in the state's $209 billion pension fund.

Longstreth argues there's a moral obligation to divest from companies that are contributing to *(to next page)*

(from previous page) global warming, especially for institutions such as universities and states that are committed to the continued well-being of the people under their care.

"When you invest in Exxon, you are investing in the hope that you will profit from the sale of their oil," he said. "That's their business. So you are hoping to profit from further fossil-fuel burning, which means further carbon in the air, which means exactly what we shouldn't be doing. And so to profit from that activity seems to me, to a public-spirited institution, or one that is entrusted with the protection of its people, to be fundamentally wrong."

Longstreth understands the challenge of telling Wall Street investors not to pursue profits, although he points to studies that show the returns on oil are about what you get in the long term in the overall market. "Fossil fuels have been the spark plug for the economy we've enjoyed all these decades, so it's hard to disenthrall yourself," he says. "Imagine telling a Nantucket whaler in 1840 that you can't go out there and look for whales anymore, because we're not going to burn whale oil in lamps."

Yet, in that case, less than 20 years later, crude oil was discovered in Pennsylvania and the whaling industry fell into rapid decline. Which leads to Longstreth's second reason for divestment. Even if you remove the moral component, he says, in a world in which renewable energy is becoming cheaper and fossil fuels are in limited supply, investing in oil companies creates what he calls an "asymmetrical risk."

Hot Earth, or Hot Air?

For a review of the positions taken on climate change by elected state and federal officials, from Galef to Trump, see highlandscurrent.com.

"The risk is that oil is going to cease to have any value," he said. "Here you have not just the natural economic forces at work and technology and advances in solar and other things, but you have the pressure of the world's governments — except our own — pressing on doing something fast in order to hold the temperature down. So the risk of your investment having no value is extraordinary. And it's an unacceptable risk if there's no reward equivalent."

A study published this month in *Nature Climate Change* suggests that even without government intervention, the "carbon bubble" will burst by 2035, sending the value of oil and gas companies crashing. "Someday very soon it will be imprudent, per se, to hold stocks in Exxon," Longstreth says. "Just like it would be imprudent to hold stocks in a whaling fleet in 1860."

Expensive carbon

For those without access to hefty institutional stock portfolios, there's still a way to push industries to produce less carbon: Laws that make it expensive. That's the mission of the Citizens' Climate Lobby (CCL): To build the political will to enact a carbon fee in the U.S. of $15 per ton of carbon dioxide (CO_2) emissions, with the fees distributed as dividends to every American household.

"The goal is not that this is the only thing that ever gets done," said Sean Dague, a leader in a CCL chapter based in Beacon. "But a price on carbon makes every other effort to shift our economy to something cleaner go that much faster."

Kate Stryker and Olga Anderson founded the Beacon CCL chapter, which serves House District 18, last year. After the 2016 election, "a lot more people decided that they wanted to get more actively engaged in citizenship," Dague said. "We seem to spend a lot of time fighting over things at the national ideological level without talking to our neighbors."

CCL's members are building what Dague refers to as "grass tops" support. The chapter identifies influential civic leaders and institutions and seeks their support on carbon pricing, then uses that support to lobby federal leaders. "When you've built consensus at the local level," said Dague, "it means your representatives have to follow through."

Contacting those representatives is where Krystal Ford comes in. A member of the Philipstown Climate Smart Community task force (see Page 10), Ford joined CCL a year ago and a month later found herself in Washington being trained how to lobby for carbon pricing. She's met with several members of Congress pushing for a bill, and on June 12 she will visit in D.C. with staff members of Rep. Sean Patrick Maloney, the Democrat who represents District 18, which includes the Highlands.

Krystal Ford at her home in Garrison *Photo by Meredith Heuer*

Sean Dague, Olga Anderson and Kate Stryker of the Citizens' Climate Lobby at Long Dock Park in Beacon *Photo by Meredith Heuer*

Climate education

Locally, Ford has been pushing school districts to put more emphasis on climate change by setting targets for reducing greenhouse gas emissions, increasing composting and recycling, teaching subjects such as outdoor education and climate justice, and partnering with groups like Hudson Valley Seed.

"We have school boards, whose members are elected officials, whose mandate is to look out for the welfare of our children," she said. "And then we have all the other elected officials who are silent on climate change, if not in outright denial. If we can get school boards to say climate change is real, there's a scientific consensus, and it's a children's issue because they're the ones who are going to be most harmed by this, we can start looking at what we can do.

"It's unfortunately a problem our children are going to inherit," she said. "We need to teach them to be globally minded and civically engaged."

Ford has already inspired eighth-grade students at the Garrison School to calculate how much money the district could save by switching to geothermal energy (a system in place in the Putnam Valley district), and sixth-graders to make documentaries about climate change. She led a group of eighth-graders on April 20 to a Youth Climate Summit at Columbia University, which prompted them to investigate how to introduce composting at their schools.

"It's important for kids to realize that they have a voice and power," she said. "I tell them: You can go to town hall meetings and talk. You can go to school board meetings and talk. People will listen to you!"

If young people don't get involved, noted David Strayer at the Cary Institute, we will have to trust that the next generation or the next, will. "If we don't start more aggressively on this stuff, someday your granddaughter is going to be interviewing my great-grandson and asking what we can do about climate change in the Hudson Valley."

Can We All Get Along?

An argument for the center

By Chip Rowe

Fred Rich, a retired Wall Street lawyer, is the author of *Getting to Green — Saving Nature: A Bipartisan Solution*. We spoke June 3 at his home in Garrison.

How did you come to this topic?

I've been involved in environmental organizations since moving to Garrison in 1989 and was board chair of Scenic Hudson Land Trust for more than 20 years. As a lawyer, I represented oil and mining companies so was positioned to see the issue from both sides. I also was a registered Republican until 2012, when I couldn't take it anymore.

You describe the relationship between the major parties on environmental issues as "the great estrangement." What do you mean?

Part of the reason we're in this pickle is that it's complicated and hard to dumb down. Conservation used to be a bipartisan cause but climate change is not smog or acid rain. Arguing that we can find common ground doesn't mean we can't disagree about how much sacrifice to make. We should be debating the best approach to the problem, not whether it exists.

Nuclear to me is a great litmus test. We're sitting here with Indian Point around the corner. I'm thrilled to see it shut down, but that's a totally selfish thing. If we had some climate scientists sitting here, they would say if you are serious about climate change, you should support nuclear. We should assume nuclear is going to go bad so you have to site it where the damage can be contained. For example, not outside New York City. But to take a knee-jerk anti-nuclear stance is one of the hypocrisies that a lot of people on the right see on the left.

Various polls show most Republicans do not consider global warming to be a threat, or even real. That's more than a disagreement over what to do.

You have to go behind the polls. Far-right conservatives deny it's a problem, but among the balance of Republicans, the number who are concerned is not so far off the national average. The majority of the country — the huge chunk in the middle — is ready to move forward. Many Republicans may favor a market approach over a regulatory approach. They may support a revenue-neutral carbon tax over a revenue-positive carbon tax. But those are details.

Because of our primary system and gerrymandering, the 30 percent of the population on the hard right make it impossible for moderate Republicans to win primaries. But change is possible. Look at same-sex marriage. In 2010 it looked like it was going down in flames, but by 2012 it reached a tipping point.

Many scientists express frustration. Their view is we can't keep talking about it and finally do something in 2100.

I get the frustration, but we have to be deeply pragmatic. The perfect is the enemy of the good. The environmental movement didn't want to be incremental, and so it rejected mitigation on the basis it wasn't enough. And then 20 years passed. When the State of Washington tried to set up a carbon tax, environmental groups opposed it because it was revenue-neutral and they wanted it to be revenue-positive so there would be money for research and development. Environmentalists also tried to work at a global level, but the right hates treaties and "derogation of sovereignty" and all that stuff. The Paris Agreement in 2015 was great but it was clear it would never accomplish anything unless Democrats controlled both houses [of Congress] and the presidency. Everything Obama did has been destroyed. There's a lesson there. If we keep shifting back and forth, why bother?

How do you change hearts and minds?

We tried, "It's the apocalypse, we're going to be under water!" That didn't work. People respond to hope. Martin Luther King Jr. said, "I have a dream," and 40 years later we had an African-American president, while environmentalists said, "I have a nightmare" and 40 years later we haven't solved the problem.

There have been many betrayals by Donald Trump of his supporters but one of the worst was withdrawing from the Paris Agreement. He gave China leadership of green energy technology. There's no scenario where people in the coal industry will keep their jobs, because natural gas killed the industry. But the jobs that coal miners and their children might have had in green energy are going to China. If you want to make America great again, make us lead the industries of the future.

What could be done?

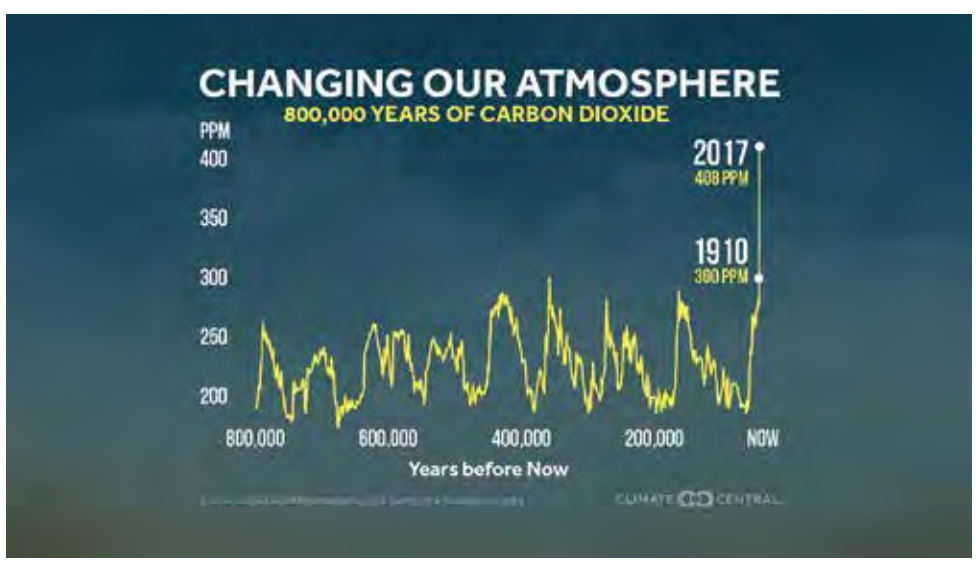
With acid rain, scientists told Congress, the stuff coming out of smokestacks is killing the forests and lakes and fish. Republican leaders didn't say, "It's not real," but asked, "What are we doing to do? We don't like regulation, but want to minimize the expense to the economy." Instead of saying every plant had to add pollution controls, they set an aggregate goal. That's cap and trade. The people who can reduce pollution at the lowest cost do it and those with the highest cost don't, but pay something.

So it's at the feet of the Republican leadership in Washington?

I was hopeful, but Trumpism knocked the thesis of my book for a loop. If any other Republican had won, we'd have a carbon tax or cap and trade. His election moved the action to the state and local and corporate level. Huge parts of the corporate sector are doing carbon-positive things every day, because it realizes sustainability will be profitable in the long term. And local governments are less dependent on party politics. If everybody does what they can do, that's how the world changes. It's not enough, which drives scientists crazy, but it's a start.

Fred Rich on the balcony of his Garrison home, with the Bear Mountain Bridge in the distance

Photo by C. Rowe



Part 1: *Runaway Train (May 4)*

Part 2: *Rising Waters (May 11)*

Part 3: *Farm = Food (May 25)*

Part 4: *Into the Wild (June 1}*

See highlandscurrent. com.