The crimes of the fossil fuel industry come with costs that can’t always be measured in dollars and cents. But that doesn’t mean wrongdoers shouldn’t be forced to pay the price.

Major polluters in our region are making billions off their activities, but paying little attention to the impact on people, while regulators fail to do their job and enforce the laws.

Ultimately, citizens are forced to pay with the priceless commodities of their health and wellbeing.

It’s the citizens who often play the role of watchdog, exposing harms, compelling reform, and seeking justice in the courts if need be. We are proud to stand with them.

For the mountains,

*Tom Cornwell, Executive Director*
New Studies Look at Southeast, Climate Change

By Dac Collins

Scientists gained new insight into how effectively forests capture carbon dioxide and mitigate climate change. Adolescent forests absorb more carbon than young or old forests, the study published in Science Reports, found. National Forest Service researchers observed southeastern forests in 11 states, many in Appalachia, and found that disturbance and land-use changes are important considerations when assessing the region’s carbon absorption potential.

Carbon dioxide emissions greatly impact climate change, and forests absorb the gas through photosynthesis. This analysis suggests that disturbance and land-use changes will continue to have a strong negative impact on carbon sequestration for young and adolescent forests.

By Dac Collins

Nature: There’s an App for That

By Dac Collins

Many smartphone applications tend to isolate users, since staring at a screen automatically distracts them from their natural surroundings. However, there are some apps that may actually help to bring users closer to nature.

Visitors to state parks in Kentucky, North Carolina, Tennessee and Virginia may find Pocket Ranger a handy reference tool. The smartphone app features interpretive information for each park, as well as advanced GPS capabilities that allow users without visible reception to access stored maps of trails, campgrounds and park facilities.

Invasive Plants in Southern Forests is a field guide for invasive plant species. Hikers can use this application to identify and learn about the 96 non-native plant species currently found in forests throughout 13 southeastern states.

Pocket Ranger and Invasive Plants in Southern Forests are among a host of apps that allow users to “check in” with the natural world. With a cell phone and internet connection, users can access a vast database of information to help develop a deeper appreciation and appreciation for the outdoors.

Kentucky seeks to Keep Asian Carp in Check

By Dac Collins

In its first annual report to Congress on invasive Asian carp, the U.S. Fish and Wildlife Service said in February that the aggressive fish are spawning in the Ohio River at Louisville, and have been detected in five West Virginia State Parks that visitors can tour, Ala. from April 30-May 6; in Muscle Shoals, Ala. from May 8-12; in Paris, Tenn. from May 11-15; in Pulaski, Ky. from May 26-June 4.

For more information, visit: livingland sandwaters.org/tennessee-river-tour.

By Dac Collins

For details, registration & more workshops: energy.appstate.edu

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**a hammocker’s guide to RESPONSIBLE HAMMOCKING how to keep yourself, and nature, happy**

1. Use tree saver straps. These are wide strips made of nylon/polyester webbing that minimize damage to the bark and under layers. Never use nails or screws.

2. Don’t hang your hammock from any dead tree. Make sure to check above for dead branches or fruit that could fall.

3. Check the ground for sensitive plants. Avoid stepping on roots and lichen.

4. Hang your hammock on the thickest part of the tree. It should not be higher than 18 inches off the ground.

5. Leave No Trace. If you brought it in, you need to take it out. If others left it behind, please take that, too.
It’s remarkable, and a blessing.”

Calhoun says, “The surveys taught us that the most popular times to visit are the first two days and rivulets of water ran across the narrow road.

It was warm and the air was still. I kept a brisk pace on the overgrown road as I plodding uphill when I almost stepped where the road passes over a culvert and, instead of crossing the creek, I came to where the route takes the road. Both of these footpaths, coming across the street. Both of these footpaths are within the boundaries of the Pisgah Forest and the SCDNR. It is a two-mile loop of Saddle Mountain Trail runs through the Mitchell River Game Lands near the community of Lowgap, N.C. and the Virginia state line.

The Stanback Trails were established in 2013 by the state of North Carolina as a blaze-orange garment is recommended during hunting seasons from September to February and Caution: Wildlife Game Lands” to reach the parking area.

Distance: 4.2 miles, out and back

Difficulty: Moderate

Directions: From U.S. 321 to the Blue Ridge Parkway, turn right and continue straight onto Hummock Rock Road. Continue until it turns into the Community Rock and follow the signs to “Access Road to N.C. Wildlife Commission’s Stanback Trails.”

To learn more about FloydFest, the line-up, and the mission to community, visit www.floydfest.com.

I lighted up the laces of my boots in the empty parking lot and hit the trail. As I entered the woods, walking along the old logging road that makes up the first part of the Little Table Rock Mountain Trail, I looked up at a cloudy sky and was met with the verve of awakening. It was warm and the air was still, I opened my mouth wide and a small bird grayed me silently from his perch as I walked by. The ground was carpeted with a thick layer of leaves. I was looking down at my feet while feeling warm and energetic, I kept a brisk pace on the overgrown road as I plodding uphill when I almost stepped where the road passes over a culvert and, instead of crossing the creek, I came to where the route takes the road. Both of these footpaths, coming across the street. Both of these footpaths are within the boundaries of the Pisgah Forest and the SCDNR. It is a two-mile loop of Saddle Mountain Trail runs through the Mitchell River Game Lands near the community of Lowgap, N.C. and the Virginia state line.

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Citizen Scientists Tackle Climate Change

By Lorette Goff

In late March the sunlights take to tepid, duppled patterns through the canopy of branches to the forest floor in Walker Valley, Tenn., home to the Great Smoky Mountains Institute at Tremont. Red maple leaves burst from velvet buds and bird- and bug-visible violet droplets purple to familiar melodic warbles through the air. The black-throated green warbler darts from tree to tree. His yellow bars cease the forest from beneath an olive crown, a bib of black outlining his white belly.

Once enrolled as a sign of the forest’s constant seasonal cycles, the male warbler arrives in Walker Valley more than two weeks earlier than the 2013 year.

Daniel Ettorre, Tiffany Beachy, Tremont’s citizen science coordinator, wondering if the warbler’s spring is an ode to climate change.

Schoolteacher Claire MacPost is a retired Oak Ridge National Laboratory environmental scientist.

Scientists at Tremont are using phenology—the recording plant and animal life cycles of species in a particular region—to monitor changes such as the warbler’s early arrival. Observations recorded by citizen scientists over the past 30 years can be used to help model and predict changes that are related to climate change.

Karen Metcalf and her children have watched birds in Walker Valley for more than five years as citizen science volunteers. Daniel, 10; Hannah, 14; and Sarah, 12, have observed 12 species for Tremont, plants and birds, and take part in bird banding and butterfly tagging as part of their home-school education.

“My kids are as keen now if they spend time actually being part of the scientific process,” says Metcalf.

“It’s neat to know that what I’m doing isn’t just bigger rewards,” says daughter Hannah. “It’s cool to see, when people gather it and study it, how it all comes together.”

MacPost is a retired Oak Ridge National Laboratory environmental scientist. He used observations from citizen scientists to look at growing seasons for climate modeling.

“Tremont’s citizen science program has been around for several hundred years. It attributes its recent growth in part, to the edge of the forest, to climate change problems and the need for large amounts of data.

According to Beachy, citizen scientists are the backbone of Tremont’s research, including a phytology project started in 2010. The project monitors eight plots of land dispersed throughout different forest types and elevations within walking distance of the campus. Citizen scientist volunteers visit the plots each week and record the seasonal changes of various species. Researchers are especially interested to see if the migratory arrival of birds changes over time in comparison with the changes in the loss of the trees and the availability of food resources.

“It’s very specific and detailed, so we get a very good picture, a snapshot, of what’s going on in the forest at that moment,” Beachy says.

“It’s hard to say that what we’re seeing now is directly related to climate change, because we’ve seen it for a short period of time,” she adds. “But what I do notice, whatever we are in the past, for how long is of extremes.”

Beachy says the Tremont institute is working with research partners to analyze the accumulated data in the future as part of long-term climate change research.

The volunteers have contributed more than 2,000 hours to gathering data — an amount that would be impossible without citizen scientists.

The Highlands Biological Station in Highlands, N.C., found a different way to approach plot-based monitoring. The station hosts a planned garden of native plants and is the model for a network of similar gardens in the region that will allow scientists to compare data on the same species in different areas. Volunteers can use observations by visiting the Phenology Garden in person, or by visiting the website at highlandsbiological.org/phenology-garden and using the “Phenocam” webcam.

Trail Science

The Appalachian Trail MELA-Transient Phenology project monitors a much larger scale. Volunteers collect information along the trail, from Georgia to Maine. Laura Bellavage, Conservation Director at the Appalachian Trail Conservancy, says the project began in earnest two years and a half ago.

“Our data is collected by trained volunteers — we’re always looking for new volunteers — at identified sites, to monitor specific species,” Bellavage says. “That is done with a look at long-term trends with regard to the timing of bud break along the Appalachian Trail corridor.”

The program is too young to reveal any significant data yet.

It is easy to see why there is a need for large amounts of data. Those original reports that much more information.

Knowledge is Power

Data is a problem, according to Dr. Walter Smith, assistant professor at the University of Virginia at Wise, home to the student-led Southwest Virginia Citizen Science Initiative.

“We simply don’t have a good handle on where certain species even live in the area, because some areas have been so harshly underecorded,” Smith says. “And so for us, citizen science was a way to address that.”

The Southwestern Virginia initiative is in partnership between UVa and iNaturalist.

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Ci the Appalachian Voice | Page 9

continued from p. 8

bird population across the nation during the winter months in December and January.

“The data that’s been collected over the century-plus gives us a good snap- shot of the current bird distribution and how it’s changed,” says Curtis Smalling, director of Land Bird Conservation for Audubon North Carolina.

A landmark report based on volunteer-collected data and published by Audubon in 2009 shows that about a third of the eastern bird species had shifted greater northward over a three-week period in December and January.

The data was also used to publish another study in September 2014, “Rocks and Climate Change,” that predicts what could happen over the next 80 years.

“The take-home message from the climate report is half the birds that bred in the U.S. are at risk from climate change,” Smalling says.

Will they adapt? Will some species go extinct? We just don’t know. They’ve never had to adapt at this speed. And really, that makes the citizen science that informed those original reports that much more impor-

Continued from p. 8

The Audubon Society’s Curtis Smalling offers an online biodiversity social network collecting data for scientific research. Smith says that the Citizen science project monitors changes in different areas. Volunteers can use observations to visit a Tremont phenology plot.

Daniel, Hannah and Sarah — the adopted offspring of Tiffany Beachy, Tremont. Photo by Eric Horton

Continued on p. 9

The program is too young to reveal any significant data yet.
From rural roads to global economies, natural gas is big news. Over the past century, the United States has become a leader in natural gas extraction — two steps in a method of oil and gas extraction that is commonly known as fracking — has transformed communities, national energy policies, and even international politics.

Natural gas, the fuel that runs so much of our daily lives, operates on a technology not significantly different from the old-fashioned steam engines of the 19th century. But today’s microchips and computers make it possible to find and capture natural gas in many new places — places that were too deep or too far from the surface to be reached by earlier methods of oil and gas extraction.

One of the most significant things about natural gas is its abundance. The United States has an estimated 2 trillion barrels of recoverable natural gas in the ground, making it the largest natural gas reserve in the world. The country has been a net exporter of natural gas for more than a decade, and it is poised to remain so for the foreseeable future.

However, the extraction of natural gas comes with its own set of challenges and controversies. The process of fracking, which involves injecting a mixture of water, sand, and chemicals into the ground under high pressure, has been tied to a number of environmental and health concerns.

According to the Environmental Protection Agency, fracking releases large amounts of methane, a potent greenhouse gas, into the atmosphere. The agency estimates that fracking accounts for about 5 percent of the total methane emissions in the United States. Methane is also a major contributor to climate change, and its release from natural gas production has been a major concern for environmentalists and policymakers.

In addition to methane emissions, fracking has been linked to a number of other environmental concerns, including water contamination and air pollution. There have been reports of water contamination in areas where fracking is taking place, and some scientists believe that the practice could cause long-term damage to the environment.

The health effects of fracking are also a concern. Some studies have linked fracking to an increase in the incidence of certain types of cancer, and there is some evidence that the practice could cause respiratory and cardiovascular problems.

Despite these concerns, the natural gas industry has been able to continue its rapid expansion, largely due to the support of policymakers and the public. The industry has been able to overcome many of the environmental and health concerns that have been raised, and it is poised to continue its growth in the coming years.
A gas drilling rig was built on David Wentz’s land in Doddridge County, W. Va., last summer without his permission, a legal phenomenon that is increasingly widespread in states such as West Virginia’s Marcellus shale region. Photo by Blake Pitcock, shutterstock.

## West Virginia’s Fracking Boom

By Kimber Ray

When West Virginians agreed to sever the right to use their land from the mineral rights to the mineral bed beneath the surface, they never imagined the sweeping changes this could impose on the landscape of their communities.

This separation of land and mineral rights, known as a “split title,” is permitted throughout the United States, but the prevalence of such contracts vastly widens. Many of these agreements were negotiated while drilling rigs were still powered by horses or steam.

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The majority of the land taken by gas company EQT Corporation belongs to Wentz, but Crowder has also been affected by the impact of noise, traffic and air pollution, and the fear that their water has been contaminated.

## Bucking Convention

Drilling and hydraulic fracturing are nothing new in West Virginia, but the process has long been dominated by vertical, or conventional, wells that tap into easily accessible pools of oil and natural gas. More than 5,000 such wells are scattered across West Virginia today, according to the nonprofit FracTracker Alliance.

By vertical, or conventional, drilling and hydraulic fracturing techniques that would be common as fracking — hydraulic fracturing and horizontal drilling — were both developed in West Virginia decades before the first Marcellus shale gas well was drilled. But fracking remained largely unheard of until 2004, when improved computer technology and high natural gas prices set the shale boom in motion.

The early shale plays were being constructed, a noisy din born over new safety concerns and industry operational processes. They keep saying with people’s water — or people who say they can prove they’ve been contaminated by fracking, well all you have to do is arrive and see exactly where you are and one of these water facilities, it means a person’s water supply has been compromised,” said county resident Jonette Koshour, who has tested a rain in the number of houses with these 12,000 gallons taken in their yard. “The gas companies don’t just stick their heads in a certain yard.”

West Virginia requires gas companies to provide an alternative water source in response to nearby contamination complaints, but this is not considered a legal admission of guilt. Legal condemnation would require a historical series of water quality tests, which companies are not required to comply with. The process is comparatively quiet, the task requires occasional releases of pressure. Carcinogenic vapors have been detected in West Virginia’s water supply, and these heavy gases may accumulate in low-lying valleys rather than floating away.
Pipe Dreams continued from p. 15

energy is to greatly expand adoption of renewable energy and energy efficiency. FERC chair Neil Chasen, for example, such as the Monongahela and Blue Ridge Projects, are likely to be taken in order to obtain the necessary access to survey private property to acquire a pipeline route through any state's pipelines could provide "lower-cost alternatives to building new infrastructure," FERC recently completed a report on the topic. FERC says state pipelines could provide "lower-cost alternatives to building new infrastructure," FERC says. The Pipeline and Hazardous Materials Safety Administration maintains that pipelines are "the safest, most cost-effective, least environmentally damaging, and most reliable" way to transport natural gas. But, the agency points out, accidents still happen, sometimes with tragic consequences.

Fueling the Future

While natural gas remains a key fuel for electricity generation, the need for new pipelines is driven by the need for increased reliability and flexibility. The nation's power grid is becoming more reliant on natural gas, which is now the dominant fuel for electricity generation. In the past decade, natural gas has grown from 22% to 39% of total generation. The rapid growth of natural gas-fired power plants has been driven by the economics of the fuel, which is currently cheaper than coal and emissions from natural gas-fired plants are lower than those from coal-fired plants. As a result, many utilities are replacing coal-fired capacity with natural gas-fired capacity.

However, the rapid growth of natural gas has raised concerns about the environmental impact of extracting and transporting the fuel. Fracking, the process of injecting water, sand, and chemical additives into the ground to release natural gas, has been controversial due to concerns about water contamination and seismic activity. In recent years, there has been a push to develop new pipelines to transport natural gas from the Marcellus Shale in Pennsylvania to the Northeast, where there is a growing demand for the fuel. The Atlantic Sunrise pipeline, for example, is being built to transport natural gas from Pennsylvania to New York State.

There are also environmental concerns about the construction and operation of pipelines, including the risk of leaks and spills. In recent years, there have been several high-profile spills of natural gas that have affected communities and the environment.

Proposed natural gas pipelines would expand the local's ability to export electricity to other parts of the country, and utilities are increasingly looking to natural gas as a way to meet growing electricity demand and reduce emissions. In the past decade, the United States has seen a significant increase in the use of natural gas for electricity generation, and natural gas is now the dominant fuel for electricity generation in the country. However, the rapid growth of natural gas-fired power plants has also raised concerns about the environmental impact of extracting and transporting the fuel, and there is ongoing debate about the best way to balance the need for new power generation capacity with the need to protect the environment.
A brick house off Hwy. 58 just west of Damascus, Va., stands in a curious way. Flowerbeds have replaced the haystacks and small fruit trees dot the front yard. To the side, on top of a tangle shed, sits a blue barbeque spray-painted with the letters L-O-V-E — a message easily seen from the highway.

Rarely does Jonathan Towers advertise his home as the South Fork Sharestead, although the name accurately describes his one and a half acres. “It was Sharestead, although the name accurately describes his one and a half acres. “It was

...the front yard... But one day, after meeting the Towers and strolling the grounds, Courtney Rowle, 26, moved in 18 months ago after meeting the Towers and strolling the grounds, Courtney Rowle, 26, moved in 18 months ago after...
ten laws that passed will increase the use of energy efficiency programs that can save power to the grid and encourage renewable energy and energy efficiency for multi-family and commercial buildings. Meanwhile, Gov. McCrory reiterated his strong support for the Atlantic Coastal Pipeline, one of three proposed pipelines that would, if built, carry fracked gas across geologically sensitive areas (see page 14). A bipartisan bill passed last September and signed by Brownlee Mccone, who claims the state has yet to pursue the state’s full potential from gas and oil, was left to expire in March. Legis- lators also removed a previous legal requirement that approved the fracking rules was left to expire in March.

West Virginia

Kentucky

Appalachia’s Political Landscape

While lawmakers in Washington, D.C., might get most of the spotlight, the legislators in the state capitals across the region are busy making and blocking — laws that affect Appalachia’s land, air, water and people. Here’s the latest updates from state legislatures across the region.

The Tennessee Energy Freedom Bill, which would open up the state to third-party sales for solar projects, was introduced in March. The bill is supported by environmental groups, large businesses and the military, but opposed by Delta Energy, which currently has a monopoly on the state’s power production.

Although EQT has essentially taken over a por - tion of Governor Earl Ray Tomblin’s land for the next 20 to 50 years, as far as well owners are concerned, those 37 acres are Tomblin’s to sell. The state also lowered the number of chemicals that have to be reported to the Coal Ash Safety Act, a law that United Mine Workers of America President Cecil Roberts said “marks the first time in West Virginia history that our state has officially reduced safety standards for coal mines.” The legislation also repeals citizens from coal companies for violating Clean Water Act standards if those companies fail to report violations.

Environmental groups say a return to state regulation will lead to faster enforcement of environmental laws. The Tennessee Mining Association says that the rule would pass to the Tennessee Department of Environment and Conservation. In 1984, the federal agency assumed oversight of surface mining in the state and is responsible for enforcing environmental laws.

In the 2015 legis- lative session, Governor Earl Ray Tomblin signed a bill that would allow for mine cleaning to take place. The bill was an update to existing oil and gas drilling laws. The Primary and Reclamation Act of Tennessee would send the federal Office of Surface Mining rules, which was removed in a previous law, back to the state. The bill was sponsored by state Sen. Rusty Crowe, R-Knoxville, who authored a resolution that declared the federal government has no environmental regulations. The task force, which environmental groups say is unconstitutional because there are more federal regulations than state regulations.

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DOE Pulls Support for “Clean Coal” Plant

By Brian Swall

A broad set of initiatives included in the Obama administration’s proposed budget for 2016 would support economic development projects in Central Appalachia. But, members of Congress and others bemoaned the coal industry’s continued decline.

The funding proposals in the president’s budget, collectively called the “POWER” Plan, aim to expand workforce training and other employment services. The plan would also create new job opportunities in regional mining communities.

White House Plan Would Spur Investment in Appalachia

By Eliza Lee

A broad set of initiatives included in the Obama administration’s proposed budget for 2016 would support economic development projects in Central Appalachia. But, members of Congress and others bemoaned the coal industry’s continued decline.

By Eliza Lee

Obama Orders More Climate Change Mitigation

By Eliza Lee

The Tennessee Valley Authority announced in February plans to withdraw its $1.1 billion investment in carbon capture and storage. But the department of energy is the largest consumer of energy in the United States.

Duke Energy Faces Historic Fines for Coal Ash Pollution

By Al’Staff

Duke Energy has agreed to pay $102 million for federal criminal charges stemming from its alleged role in the Dan River coal ash spill, even self-reporting violations by Duke were not upended.

By Eliza Lee

A region-wide electric grid operating company, PJM, released a report in March analyzing how states could comply with a proposed Environmental Protection Agency rule requiring that power plants cut carbon dioxide emissions. A high-cost coal plan, which would include 25 states across the Northeast and Midwest, was criticized as being inefficient.

WV to Review Research on Mining Health Impacts

By Kirby Ray

West Virginia’s Public Health Bureau announced in March that the U.S. Environmental Protection Agency and the state’s Office of Environmental Protection have expressed concern about research that links black lung disease with black lung disease.

Fossil Fuel Industry Loses Investors

By Our Collins

A growing number of institutions around the world are committing to divest their portfolios from fossil fuels. In March, seven U.S. senators urged the White House to divest.

On Train Disasters InCREASES Safety Concerns

By Eliza Lee

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By Our Collins

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WV Coal Lab Penalty Upheld

Supreme Court Hears Challenges to Mercury Air Toxics Standards

By Molly Malamud

The U.S. Supreme Court heard arguments regarding the U.S. Environmental Protection Agency’s regulation of air pollu- tants from power plants. The challengers, an assortment of states and industrial groups such as the National Mining Association, contend that the agency did not perform a complete cost-benefit analysis before issuing the Mercury Air Toxics Standards for power plants in 2011.

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The West Virginia Environmental Quality Board upheld a previous decision by the state Department of Environmental Protection that rejected a claim by a group of coal mining companies that the state was responsible for more than $2 million in costs associated with the lab’s relocation.

SOLAR INDUSTRY LEADERS ARRIVE IN NC

Two national solar companies that focus on residential and commercial installations have announced they will begin operating in North Carolina. The states has the fourth-largest potential market for solar and has seen a significant increase in utility-scale installations. Residential solar has been stifled by regulations that prevent homeowners from financing solar through a third party, but the legislature may change that before the state’s tax credit expires in 2016. Solar Industry Leaders Arrive in NC

Dr. Sandy Leon and Dr. James Blasingame, of Print Books

Each week, we’ll feature a local author of Print Books, a local author of Print Books. This week, we’ll feature Dr. Sandy Leon and Dr. James Blasingame, of Print Books, a local author of Print Books.
About Our Program Work

About Our Program Work

About Our Program Work

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Brian sEWEll

amy aDams

amy KElly

companies are meeting the water pol-

Water Pollution Reporting

Federal Lawsuit Filed Against Frasure Creek

About Our Program Work

The Appalachian Voice

readers who care about Appalachia's future.

visiting appvoices.org/fracking to learn how

spreading the word, so stay tuned and

and summer across the area, including

Mountain Pipeline.

Meanwhile, community groups in Virginia that focus on this issue continue
to organize and grow, as major rallies in
in November, we are contacting the

On Wednesday, May 11, 2011, the Sierra Club and the Waterkeeper

In敲ed we are attempting to

involvement in the state for failing to properly

If you think all of this sounds

families, you would be right. We have

We have not seen future similar false

from Frasure Creek and two other coal

Helping Residents Stand Up To Pipelines

With the proposed development of the

the Atlantic Coast and Mountain Valley

pipeline projects, our team has been

helping to alert citizens about ways to

organize and grow, with major rallies in

in the spring. We are reaching out

and summer across the area, including

and UV-100 and ever has been

Other volunteer distributors for The

Bob Belton can usually be found

Bob Belton and his wife, Celia, at a house tour

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Bob Belton and his wife, Celia, at a house tour

Waterworth, and the Pace Law School

presented by Mary Cromer of Appalachian

Energy contest to explore the winners’ stories and pictures

a close, but the winners are already seeing tangible results

It is important to do this now, before the issue

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There are countless streams in Appalachia

There are countless streams in Appalachia

According to Bob, his childhood

In particular he recalls

As a child. In particular he recalls

Bob Belton can usually be found

Bob Belton and his wife, Celia, at a house tour

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Springtime beckons boaters to Appalachia’s creeks and rivers. Paddlers Alex Matthews and Steven McGrady perform playful stunts on North Carolina’s Watauga River as the leaves begin to unfurl. Timing of natural events such as leaf-out can indicate long-term trends. Read about how citizen scientists are helping researchers track these seasonal shifts on page 8. Photo by Eric Chance