

POST-FLOOD CLENDENIN
A June 2016 flood devastated Clendenin, West Virginia. Drone photography taken afterward shows the city's vulnerabilities.

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THE UPSIDE OF DOWNSTREAM

CLENDENIN, WEST VIRGINIA'S DESTINY IS IN THE FLOODPLAIN. MATCHING LOCALITY WITH FEDERAL DOLLARS COULD MAKE THE DIFFERENCE.

BY JEFF BINK

WWW.YOUTUBE.COM/JDT189





CLOCKWISE FROM BOTTOM LEFT
Floodwater inundated parts of U.S. Route 119 and Clendenin's historic Main Street; steep terrain in Clay County led to flash floods that ravaged houses and vehicles.



EFT
The Reverend J. F. Lacaria surveys flood damage in Clendenin.



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SHORTLY AFTER 10:00 A.M. on June 23, 2016, Dave Knight saw the backwater coming down the mountain tributaries that feed into the Elk River. The Elk is a muddy waterway that cuts through Clendenin, West Virginia, a river valley town of roughly 1,000 people where Knight serves on the city council and is a member of 25045-A New Clendenin, a nonprofit economic development group that formed in 2003 to bring new investment and development to the town.

Knight got a tip that the basement of a former middle school was starting to flood. Years after the school relocated in 2000, 25045-A New Clendenin had funded the renovation of the school into apartments for older adults and a health clinic, preserving select below-grade spaces for use by community groups. When Knight arrived, no one was in those spaces—a gym and a daycare—but eight of the senior apartments, also underground, were at risk. Around dusk, water started rushing into them.

Knight scooped buckets of water for hours, then left to check on his house, which sits across town on high ground near a bridge. By this time the fire department had come to move people to higher floors, and eventually to a hill above the elevated ballast of a decommissioned railroad, the former route of the Elk River Railroad, Inc.

DAVID STEPHENSON

MIKE DUDGEON/UNITED METHODIST NEWS, TOP LEFT; GISELE/RYAN.COM, RIGHT

Arriving home, chest-deep in water, Knight saw the engorged river begin to inundate his home, a yellow wood-frame Victorian built in the early 1900s. He drove his truck to a dollar store on an embankment farther up the river, then arranged for two older neighbors, Lola James and Patty Rose, to stay at his home

because theirs were no longer safe. They sat on a landing in the stairwell with a blanket and pillows. He recalls shoes floating through the hallway, the sound of the refrigerator tipping over, his dog seeking refuge on the second floor.

"We just sat there and watched the water come up," he says.

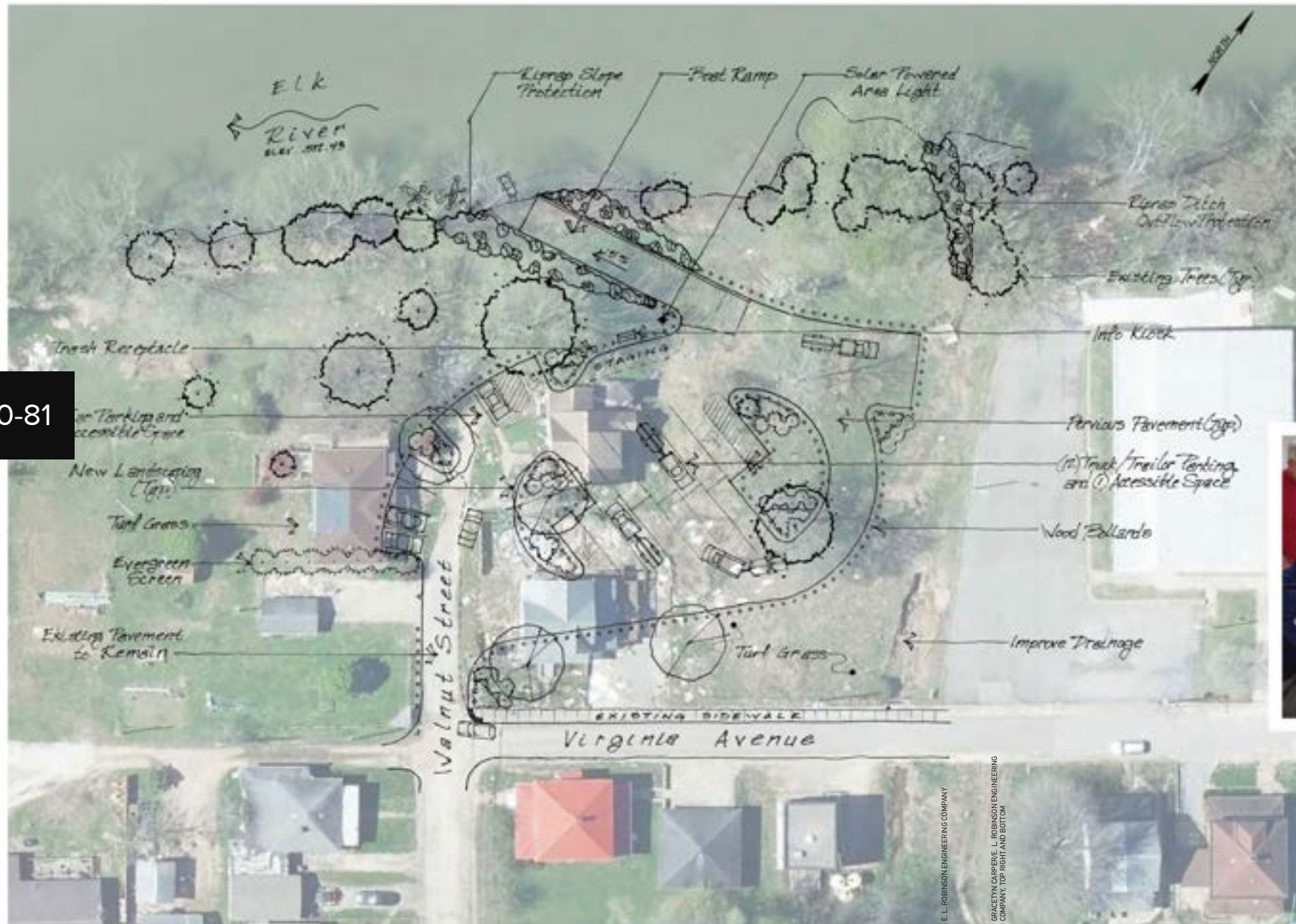
The rain stopped at about 3:00 a.m., and the water began to recede. But the 1,000-year flood devastated the

community and many parts of the state, killing 23 people and rising to record levels in hard-hit areas such as Greenbrier County, where up to 10 inches of rain fell within 12 hours, according to National Weather Service data. All in all, thousands of homes and businesses were damaged or destroyed, with an estimated \$1.1 billion in property damage.

In Clendenin, the aftermath was especially striking. Knight estimates that 90 percent of homes in the



CLENDENIN BOAT RAMP-CONCEPT OVER PRE-STORM AERIAL



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here,” Knight says. “They had to move out of town, buy another residence while they were cleaning up everything. But there were deer still running around Clendenin. It reminded me of the

TOP RIGHT Infrastructure damage in Clendenin was extensive after the flood. Scoping the range of needed repairs was integral to recovery and resilience planning.

Will Smith movie *I, Robot*; it just didn't seem real.”

BOTTOM INSET Adam Mull and Todd Schoolcraft, ASLA, of E. L. Robinson (seated) review the proposed design of an environmentally friendly boat ramp with Clendenin's floodplain manager John Shelton Jr. and Mayor Kay Summers (standing).

town, which in 2019 had a median property value of \$66,000, were flooded. Many were identified as unfit to live in and condemned by the Federal Emergency Management Agency (FEMA). About 200 residents, including several of Knight's friends, left town and didn't return.

In the weeks and months following the storm, Knight told me, emergency relief workers from FEMA, religious groups, city agencies, work-release programs, and the National Guard came to help with the recovery, towing sodden cars, hauling property from front lots, and cleaning and

“I'd come home at night and there wasn't a soul on my block, living





RIGHT
A FEMA-funded project to repair a 14-mile section of the Buffalo Creek and Gauley Railroad corridor included the reconstruction of the Mine War Bridge, which pro-union miners exploded in 1952.



6R CETYA C RPER/E. L. ROBINSON ENGINEERING COMP. NY

IF FLOODING IS A CENTURIES-OLD PROBLEM IN WEST VIRGINIA, LAND-BASED APPROACHES TO ADAPTATION AND RESILIENCE ARE STILL IN THEIR INFANCY.

disinfecting homes caked in mud and growing black mold. Homeowners without flood insurance could face painful choices: move and rebuild from scratch at a higher elevation, or, under FEMA's commonly known 50 Percent Rule, elevate properties with damage exceeding 50 percent of their market value to or above the 100-year floodplain.

I had come to West Virginia to better understand these realities. In particular, I wanted to learn how money from the \$1.2 trillion Infrastructure Investment and Jobs Act and the proposed, but currently stalled, \$1.75 trillion Build Back Better Act might help fund riverfront resilience and green infrastructure projects in places like Clendenin. Senator Stephen Baldwin, who lives in Greenbrier County and serves on the state legislature's Joint Committee on Flooding, told me that the infusion of federal money could have a dramatic impact across the state, particularly in rural areas. Federal funds could be applied to update

outdated stormwater systems, modernize roads and bridges, and dredge and restore streams—work that is sorely needed in a state hard-hit by floods and reeling from job losses in the coal, gas, and timber industries.

“All the help we can get through the infrastructure bill, we will welcome it, because this has been a problem as long as the history of West Virginia,” Baldwin says. “With a steep terrain, there’s just nowhere for the water to go.”

But if flooding is a centuries-old problem in West Virginia, land-based approaches to adaptation and resilience are still in their infancy.

Todd Schoolcraft, ASLA, is the landscape architecture manager at the Charleston-based firm E. L. Robinson Engineering Company. Schoolcraft grew up in Clendenin, and as he drove me through the still-ravaged town this past February, the challenges the terrain poses for water diversion—and for residents and

business owners in the floodplain—became starkly apparent. Alongside the Elk River, a barbershop and a family diner lay in ruins. Further on, an access road cutting through the bedrock of a limestone-rich, forested hillside led to the site for the new Herbert Hoover High School. Nearly six years after the flood, the town’s students are still packed into temporary trailers perched on steel I beams.

None of this is for a lack of concern or effort. “In a place like West Virginia and much of Appalachia, there simply isn’t flatland to build on, and it may not be economically feasible to put houses or schools on a ridgetop, and all the infrastructure—sewer, water, electricity, roads—to tie into that community,” says Nicolas Pierre Zegre, the director of the Mountain Hydrology Lab at West Virginia University. “And, on top of that, many communities simply don’t have the resources, nor the time, to figure out how to deal with this.”

The other complicating factor is climate change, a lexical albatross in a state where many residents and political leaders including Senator Joe Manchin and Governor Jim Justice, as widely reported, have financial ties to the coal industry.

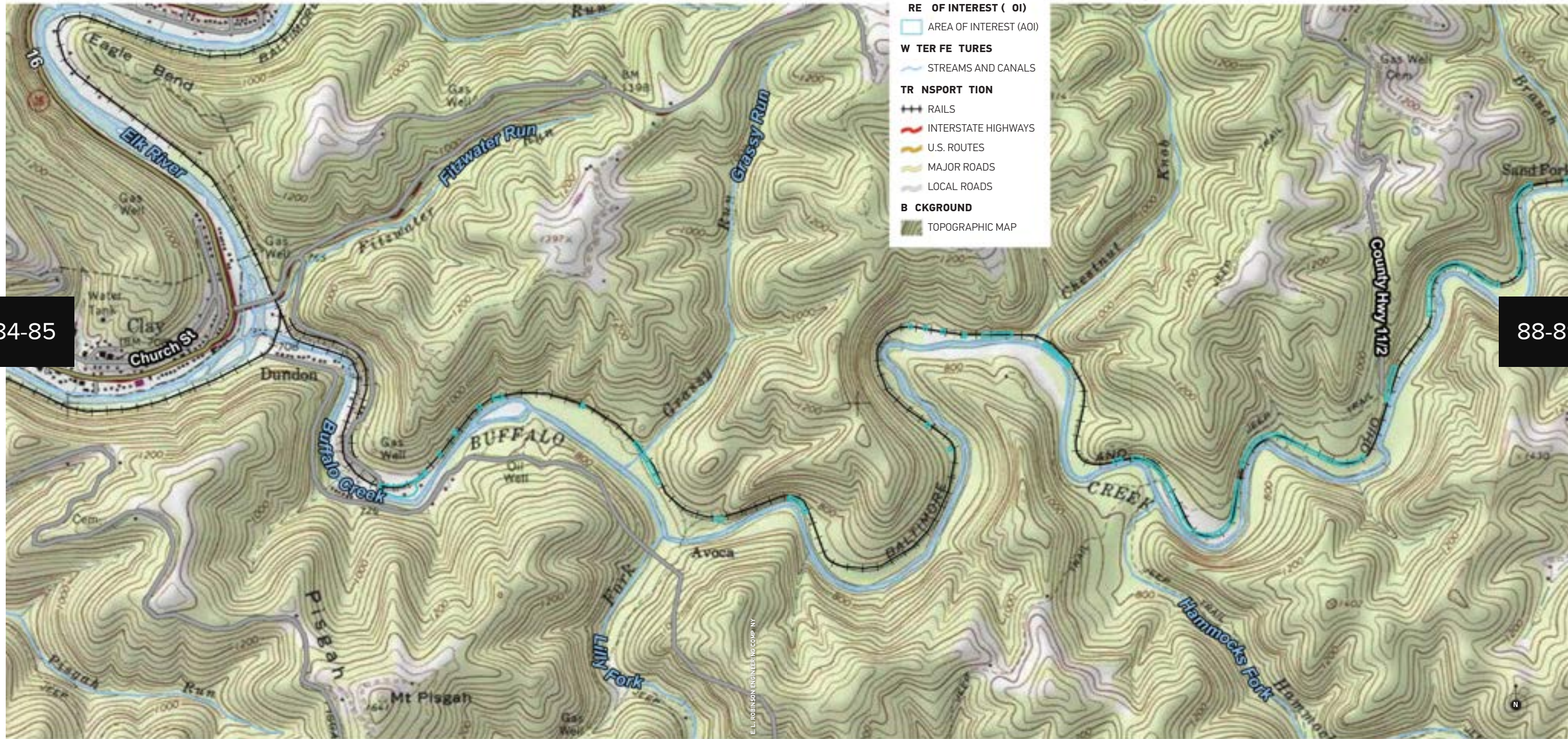
“Nobody has wanted to connect our flood problem, which everybody acknowledges, with quote, unquote climate change,” Baldwin says. “It’s just a topic that nobody wants to discuss. But the reality of the situation is, because storms are growing more powerful, it means you get more rain in shorter periods. And, with our topography, that means we’re going to have more flooding.”

Climate change is undoubtedly warming the air, Zegre told me, allowing it to store more moisture and, across the northeastern United States and elsewhere, causing more “intense and frequent rainfall.” In West Virginia, the problem of increasing precipitation is magnified by forest-clearing activities such





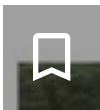
REGIONAL TOPOGRAPHY ALONG BUFFALO CREEK ON THE ELK RIVER



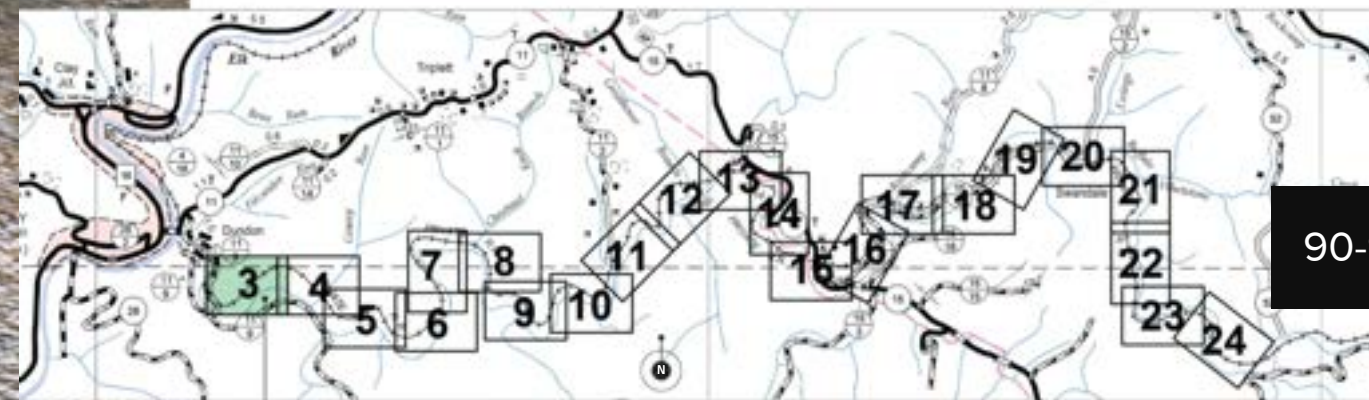
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FLOOD REPAIRS ALONG THE BUFFALO CREEK & GAULEY RAIL TRAIL



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→ as surface mining, agriculture, and timber harvesting that strip the land of absorptive root systems and allow more water to flow downslope more quickly.

In fact, flood data from the First Street Foundation shows that no state in the contiguous United States is more vulnerable to flood

damage than West Virginia. Currently, 379,400 properties, including 61 percent of the state's power stations and 46 percent of the state's roads, are at risk from a 100-year flood, a spokesperson for the foundation reported in an email. By 2052, environmental changes will drive the number of at-risk properties to 384,200.

So what can landscape architects do about it?

Quite a few things, says Peter Butler, an associate professor of landscape architecture at West Virginia University's Davis College of Agriculture, Natural Resources, and Design. Butler leads a community resource economic development team that,

in accordance with the educational service mandate of the land-grant university, works with extension agents deployed across the state to identify the needs of distressed watersheds and communities.

"We want to be part of the solution in terms of how to visualize and plan new housing, and then how to create more resilient landscapes in those floodplains," Butler says.

Part of the vision for the extension program, as Butler described it to me, is for student-led design charrettes and master plans to form the basis for detailed site plans and construction drawings. With renderings cre-

ated and stakeholders aligned around placemaking visions, projects have a better chance of moving forward.

One example is Discovery Junction Community Park, a gateway park that sits in a 100-year floodplain beside the Pocahontas Opera House in Marlinton, West Virginia. Designed at early stages by two students in Butler's graduate studio—Carly Clevestine, Associate ASLA, who is now a project designer at the Aspen, Colorado, office of Design Workshop, and Niharika Alahari, a freelance designer living in Pittsburgh—the park includes a timber-frame stage, a rain garden, a pollinator garden, and a spray pad. The city, supported by an \$86,391 Land and Water Conservation Fund grant, commissioned

E. L. Robinson to develop the site plan based on the students' concept.

The park is within walking distance of the Greenbrier River Trail at the edge of the Monongahela National Forest, and hosts farmers' markets and weekend concerts, making it a vital economic asset, says Lauren Bennett, the director of Pocahontas County Parks and Recreation, who served as a community liaison for the project. Situated at a low point in the town where stormwater collects when the Greenbrier River and Knapp Creek run high, it is susceptible to seasonal flooding. Turfgrass across much of the one-third-acre site, formerly a vacant gravel lot, is designed to absorb runoff and offer space for concertgoers to set up chairs.

ABOVE Construction drawings indexed repairs to the BC&G rail line and included plans for erosion control.

OPPOSITE A single steel rail tie remained of the historic railway crossing at the Mine War Bridge. New steel box girders and a concrete center pier are specified in restoration plans.

GRACIYA CARBERE, E. L. ROBINSON
ENGINEERING COMPANY

E. L. ROBINSON ENGINEERING COMPANY/
STONE CONSULTING, LLC





“THESE SPACES ARE STILL GOING TO FUNCTION AS FLOODPLAINS. BUT THEY COULD ALSO FUNCTION AS COMMUNITY SPACES.”

—NIN CH SE, SL

DETAIL OF BC&G RAIL TRAIL REPAIRS (SECTION 3)

LEGEND

	RAILROAD CENTERLINE
	4" STONE RESURFACING
	6" STONE RESURFACING
	8" STONE RESURFACING
	10" STONE RESURFACING
	12" STONE RESURFACING
	14" STONE RESURFACING
	16" STONE RESURFACING
	18" STONE RESURFACING
	20" STONE RESURFACING
	24" STONE RESURFACING
	30" STONE RESURFACING
	36" STONE RESURFACING
	48" STONE RESURFACING
	6" STONE RESURFACING



“[The extension program] is doing a good service to all these communities that, at the beginning, don't have funding to pay for a consultant to do these elaborate concept plans,” Schoolcraft says. “It gives the community a document they can take and apply for a grant to do the detailed design and construction drawings for the project.”

Nina Chase, ASLA, a Morgantown native who, with Chris Merritt, ASLA, founded the landscape architecture firm Merritt Chase, sees many opportunities in floodplains beyond housing. “These spaces are still going to function as floodplains,” she says. “But they could also function as community spaces—boat ramps, rail trails, or gathering spaces—that can flood and also bounce back more quickly.”

For a view of what that might look like on the ground, Schoolcraft drove me to the proposed site of the Clendenin public access boat ramp on the Elk River, a grassy, sycamore-

shaded plot where soil bores had been dug. The site, owned by the city and roughly two-tenths of a mile from Knight's house, shows the faintly perceptible traces of three FEMA-condemned homes that were demolished after the 2016 flood. In their absence, one can imagine the presence of Knight's relocated neighbors.

Clendenin, in partnership with the West Virginia Division of Natural Resources (DNR), hired E. L. Robinson in 2020 to prepare a topographical survey, geotechnical evaluation, and construction plans for the proposed boat launch; the project will go out to bid later this year. If all goes as planned, a concrete ramp built to the river's edge will allow vehicles hauling johnboats, small outboard motorboats, kayaks, or canoes to back up to the river and unload their trailers or roof racks. Parking, lighting, native trees (sycamores, box elders, sugar maples), and a kiosk posted with fishing regulations are also included in the plan.

“We've seen the kayaking and canoeing industry just blossom up the Elk River,” Schoolcraft says. “There's a bunch more boat ramps going in, so you have those shorter sections to float.”

Porous asphalt pavement, in lieu of conventional asphalt, will surface the ramp. To comply with FEMA regulations, which stipulate that no new impervious surfaces can be added to a condemned floodplain site, E. L. Robinson calculated pre- and post-construction stormwater runoff volumes using models. The porous pavement reduces flood risk and saves costs that would come from adding new drain inlets, stormwater pipes, or culverts.

“We're trying to keep it as natural as possible and save as many existing trees as we can because that, obviously, soaks up and absorbs water, but it also helps hold the riverbank in place,” Schoolcraft says. After a flood, the ramp may need to be hosed down and swept of loose sediment,



CLENDENIN MAIN STREET-STREETScape CONCEPT



- LED PERIOD STREETLIGHTS WITH HANGERS AND SPEAKERS
- LED CATENARY STRING LIGHTS
- TRASH RECEPTACLE
- ~ BICYCLE RACKS
- PARK BENCHES WITH BACKS
- BACKLESS PARK BENCHES
- OUTDOOR DINETTE SET
- 1 ELK RIVER RAIL TRAIL (PAVED)
- 2 GAZEBO WITH WHEELCHAIR ACCESS
- 3 PERIOD STREETLIGHTS WITH POT HANGERS & SOUND SYSTEM
- 4 BRICK PAVERS IN SIDEWALK
- 5 BRICK PAVERS IN CROSSWALKS
- 6 LED CATENARY STRING LIGHTS
- 7 SEASONAL OUTDOOR DINING
- 8 STREET TREES WITH TREE WELLS
- 9 SPECIALTY PAVING "LOGO"
- 10 TIMBER-FRAME OUTDOOR STAGE
- 11 BUILDINGS TO BE DEMOLISHED
- 12 RIVERFRONT OVERLOOK PATIO
- 13 KAYAK/CANOE ACCESS
- 14 ZIP LINE RECREATION AMENITY



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"but you're not losing somebody's residence or business. It's more resilient to those conditions."

For Knight, the ramp's construction could mean a new access point for Yak House Rentals, a kayak rental business he started several years ago. He currently rents out the kayaks that he stores in a shed across the street from his house and, for a fee, ferries guests from their entry or destination points along the Elk River back to the rental shed in a van.

Asked whether the siting of a public access boat ramp so close to a private kayak business could constitute a conflict of interest, Schoolcraft dis-

missed the possibility. The launch for Yak House Rentals is accessible only by a set of steps and does not accommodate larger boats on trailers, he said. More important, the proposed ramp will work in conjunction with other West Virginia DNR-sponsored motorized boat ramps already constructed to the north, and those being built or improved to the south, in a 20-mile stretch of the Elk River between Clendenin and Charleston—part of a \$2.1 million improvement project begun in July 2020 and led by the DNR.

In some ways, Knight's kayak business, netting about \$15,000 per year, epitomizes the bootstrap ethic of

residents seeking to find their footing as the fossil fuel economy grudgingly gives way to recreational tourism. Residents and tourists can rent kayaks for \$40 for four- to six-mile trips along the river. Knight plans to expand the business by renting on Airbnb the upstairs unit of an adjacent property he purchased and offering bike rentals.

"I think tourism is our future," he says. "That's one thing I think Governor Justice does have right. Because we're not going to convince many people to come and move to West Virginia. But we can convince many people to come visit. And I think that's even better."

E. L. ROBINSON ENGINEERING COMPANY

JEFF LINK, LEFT AND CENTER; GRACIEYN CARPER, E. L. ROBINSON ENGINEERING COMPANY, RIGHT

In the meantime, parts of the 72-mile Elk River Trail State Park, which runs parallel to Elk River and a spur along Buffalo Creek, are open. This could be another boon for Clendenin and the region, Schoolcraft says. Almost every exit along Interstate 79 between Clendenin and Servia, about 30 miles away, offers access to the park. The park includes a crushed stone trail for hiking and horseback riding, paved and stone sections for cycling, and a 14-mile-long repurposed section of the Buffalo Creek & Gauley Railroad, one of the last commercially operated steam trains in the country, where jitney tour trains and recumbent pedal-operated rail bikes can be run on the rails. The Elk River Trail Foundation estimates the route will have an annual economic impact of \$4.5 million.

Schoolcraft drove us to a small white building outside the town of Clay to meet Mitch DeBoard, the president of the Clay County Business Development Authority, who immediately warned me he was "not politically correct." Rather, Schoolcraft told me, he is the kind of enterprising, self-possessed firebrand you need "beating the drum as a catalyst to make some of these projects happen." Years before the state's vision for the park came into view, DeBoard struck a deal with the Buffalo Creek & Gauley Railroad owner to lease the rail corridor, working with volunteers and local businesses to repair culverts, clear brush, rebuild bridges, and install handrails. These efforts ground to a halt, however, when the flash floods of 2016 left the Buffalo Creek riverbank and much of the BC&G railroad scarred by trail

erosion, sediment deposition, washouts, and bridge displacements.

Undeterred, the authority applied for FEMA Public Assistance funding, securing \$5.6 million to repair the riverbank and track. E. L. Robinson and Stone Consulting, Inc. were chosen as the design team, and the project took on a second life. The railroad carves through a landscape rich in history and, as documented in placards along the trail, is tied to the union labor movement and a legacy of coal and timber extraction. It crosses two bridges destroyed during the historic Mine Wars when striking miners, outraged by working

ABOVE
A timber-frame performance stage is under construction. Reinforced footings anchored in bedrock will elevate the stage above the floodplain to help withstand future floods.

LEFT AND CENTER
Clendenin plans to convert a former railroad grade to a paved trail that will become part of the Elk River Rail Trail.





RIGHT
Todd Schoolcraft, ASLA, and his daughter celebrate a bike ride on a converted trestle near Ivydale in Clay County, West Virginia.



KELLY SCHOOLCRAFT

“PEOPLE DON’T CARE WHY FLOODS ARE HAPPENING MORE FREQUENTLY. BUT THEY DO CARE ABOUT NOT BEING IMPACTED BY THEM.”

—NICOL S PIERRE ZEGRE

conditions, exploded sections of the Sand Fork Bridge and Mine War Bridge with dynamite.

To preserve the physical artifacts of this history, Schoolcraft says, coordination was key. As a former combat engineer for the National Guard, he was no stranger to big, hydra-headed projects. So when E. L. Robinson convened a team of geotechnical engineers, structural engineers, and civil engineers to develop detailed design and FEMA-approved construction plans, he knew how to fit the pieces together.

“We don’t want to build something back that will just get washed out again next year,” Schoolcraft says. “It could happen. But hopefully we’re making it a little bit more durable so that it won’t.”

The goal, he told me, is to build back bridges, railroad tracks, culverts, and trails as closely as possible to pre-flood conditions, but fortify slopes against future erosion by reestablish-

ing vegetation and upsizing culvert pipes to manage runoff from heavy storms.

Whether federal funds from the Infrastructure Investment and Jobs Act will filter down to rural towns like Clendenin for similar projects remains an open question. Stephanie Tyree is the executive director of the West Virginia Community

Development Hub, an organization that provides technical assistance and advice to rural communities seeking resources for economic development. Tyree says that rural communities often have limited capacity to compete at a regional or national level for federal grants that can have applications hundreds of pages in length and often require matching funds.

“Traditionally, if you have, say, a \$10 million project you’re applying for, you have to bring \$2 million to the table. The challenge here is the money is just not there,” she says. “What we have recognized is you can put as much money on the table as you can dream up, but if there are systemic barriers to accessing funds, the money will flow through the path of least resistance. So it might come to West Virginia, but it will probably come to the largest cities in the state and not the most highly distressed rural areas. It might come to Appalachia, but it’ll probably go to Pittsburgh and Knoxville and places like that.”

Zegre, with the Mountain Hydrology Lab, is equally wary: “I think that those federal dollars will trickle down at the community level to replace things like culverts and bridges and repair roads, which is part of the solution,” he says. “But, I think, funny enough, the money is going to come too fast, too quickly, for the slower process of coproduction of solutions with communities.”

What is clear is that flooding in West Virginia is not going to abate, and low-income communities in the floodplain are likely to experience the worst effects. But ironically, the recent devastation that flooding has caused may work to upend a long-standing cultural and economic ethos tied to natural resource extraction.

Zegre, referencing a grant proposal to the National Oceanic and Atmospheric Administration for a community development project in which young people would map areas of flood vulnerability and risk, said this: “The approach we’re taking to engage with communities is, ‘Let’s not talk about climate change’; ‘Let’s not talk about the impacts of surface mining on environmental health and human health.’ Because, at the end of the day, when we’re talking about flooding, we’re talking about vulnerability. And people don’t care why floods are happening more frequently. But they do care about not being impacted by them.”

In Clendenin at least, that seems to be a message people are taking to heart.

“The flood was horrible. But we made good come out of bad,” Knight says. “It made us kind of reinvent Clendenin to rely more on our natural resources, our assets like the Elk River and the trail. So I think we will actually come back better than what we were before the flood.”

JEFF LINK IS AN AWARD-WINNING WRITER BASED IN CHICAGO. HIS WORK HAS APPEARED IN *FAST COMPANY* AND *DWELL*, AMONG OTHER PUBLICATIONS.

Project Credits

OWNER CLAY COUNTY BUSINESS DEVELOPMENT AUTHORITY, CLAY, WEST VIRGINIA. **RAILROAD AND BRIDGE ENGINEERING** STONE CONSULTING, INC., WARREN, PENNSYLVANIA. **LANDSCAPE ARCHITECT/GEOTECHNICAL ENGINEER/STRUCTURAL ENGINEER/CIVIL ENGINEER** E. L. ROBINSON ENGINEERING COMPANY, CHARLESTON, WEST VIRGINIA. **GENERAL CONTRACTOR** CHESAPEAKE THERMITE WELDING, LLC, PORT HAYWOOD, VIRGINIA. **SUBCONTRACTOR** LYCOMING SUPPLY INC., WILLIAMSPORT, PENNSYLVANIA.

