Our Once and Future Rivers

BY DAVE KARCZYNSKI

All across the Great Lakes states, GLRI dollars are hard at work re-establishing the kind of natural riparian processes that will allow coldwater ecosystems to thrive alongside human development.

I'll be honest: for much of my life I've suffered from the fallacy that just *being* a trout angler meant I knew something about what made for a healthy coldwater stream. Unlike lowly canoers and kayakers, I knew my bellwether bugs, could parse a riseform with reasonable accuracy and had a general handle on the most common invasives, as well as how to prevent their spread. I took comfort any time I heard the words *conservation* and *restoration* and got my debit card out for those words on a regular basis.

But that was where my blind spots began.

Sure I knew what conservation and restoration meant in the abstract, but when it came to linking those words to real, specific, hands-on practices and processes, I was a little remiss. My ignorance was brought into stark relief when I learned that the Great Lakes Restoration Initiative, launched in 2010 to expedite efforts to protect and restore the largest system of fresh water in the world, had run head-first into a presidential budget that sought to completely cut the Initiative's annual funding of $300 million, despite overwhelming bi-partisan Congressional support. Much would be lost if the president's budget were approved, the radio and newspaper and websites were telling me. But what, exactly?

And so I set out to get some answers. How did GLRI-supported projects benefit inland trout anglers like myself? And what exactly did modern restoration look like, anyways?

PROJECT #1

The Peshtigo

The first leg of my journey took me to Northeast Wisconsin's timber and brook trout country to meet Great Lakes Stream Restoration Manager, Laura MacFarland. For the past few years Laura has been hard at work making the lives of the Peshtigo River brook trout better than they have been for the past century—or two. Having survived the severe habitat degradation of the timber heyday, the brook trout of the modern Peshtigo are now confronted with another problem: lack of access to headwater tributaries due to poorly designed road crossings and the culverts tha

"Our restoration projects all fall under the heading of *connectivity*," Laura explained. "It's not a word we thought too much about decades ago, but that's because we didn't know just how much our brook trout rely on an intact river ecosystem. Just like people, it's very important for them to be able to access different habitats for different life stages: for spawning, for growing up, for finding relief from summer heat, for surviving the winter. At the moment, the brook trout of the Peshtigo don't have that freedom."

To underscore the urgency of the problem, Laura waves a map on which every Peshtigo River culvert is indicated by a black dot—there's so many it looks like she's spilled three jars of peppercorns on it. When she tells me the exact number of road crossings—1,290—I'm beyond taken aback. "Of these," Laura explained, "2/3 negatively impact fish and aquatic organism movement through the watershed. The problem is especially severe on small headwater streams like these. They may not look like much from the road, but when you add up all the miles, headwater tributaries actually make up the majority of a river system."

The problem with many of these culverts is that they were designed with faulty numbers from past fisheries managers who overestimated the flow rates that brook trout seeking to move upstream could handle, which they determined to be three feet per second. While this might have been possible in a natural river, where any given 30-foot riffle will have tiny slow pockets and resting crevices, it's not the case within the laminar flow through an aluminum pipe scoured clean of sediment and cobble. The unbroken flows within aluminum pipes offer no resting spots, however small. To many fish, these are impassable barriers.

"It's not so much that the engineers of the past were reckless, or had a grudge against brook trout," Laura tells me as we poke around one of the projects slated for replacement in fall of 2017. "It's more that they were ill-informed."

In this case, ill-informed is another way of saying partially informed. Until the 1990s, culverts were designed with a single person—a hydrologist—and a single goal—to withstand floods at minimal cost. There was no thinking about the ecosystem. Contrast that with the modern "stream simulation" approach, which involves a team of people from a number of disciplines, including biologists, all working together to create a crossing that is indistinguishable from the streambed above and below. Developed by the U.S. Forest Service and others, stream simulation designs mean that new road crossings retain ecosystem processes through the culvert, not just for salmonids, but all species: invertebrates, amphibians, mammals and reptiles.

I ask Laura if there's any opposition to her work, then steel myself for the usual litany of green infrastructure naysayers. To my surprise, there are none. Everyone's on board. And there's a reason for that, Laura explains. "When we choose projects, we look for road crossings that are both negatively impacting the ecosystem *and* have structural problems. Many of these older culverts are nearing the end of their life span of 30 years. Our new designs have a 70-year life span and are more likely to withstand floods, so over the life of the structure, they pay for themselves. These projects also stimulate the local economy. We hire local contractors to rip up and replace the road. They buy food and gas at local shops. It's a win-win-win situation."

Before parting for the day, Laura and I spend a bit of time fishing. I whip out my 3-weight and make a cast upstream beneath an overhang of bare May alders. It blinks in and out of shadow for a few moments before disappearing completely in the pucker of a juvenile brookie. A few seconds Laura nets my catch, a perfectly bejeweled Northwoods Wisconsin specimen. We admire it for a few seconds before letting it swim back into what will very soon be a much bigger, much more connected world.

"You're not going to catch big trout up here in these headwaters," Laura says as she watches the brook trout stitch itself into a logjam. "But without access to these places, you're not going to catch big trout in the lower Peshtigo, either."

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– Laura MacFarland

Laura MacFarland talks through the removal and replacement of one of the hundreds of poorly designed culverts on the Peshtigo system. Road crossings like this one essentially operate as a dam, barring not only fish passage but the movement of macroinvertebrates and amphibians throughout the system.

Left: Thanks to strategic culvert redesign, main stream Peshtigo brook trout like this one will have access to the spawning habitat and thermal refuges of headwater tributaries for the first time in generations.

PROJECT #2

Huron-Manistee National Forest

My next trip was to Michigan to meet ecologist Jeremy Geist, a kind of watershed MacGyver tasked with a variety of restoration projects focusing on the upper Manistee River and its tributaries. Like its more famous brother the Au Sable, the Manistee has some of the most stable flows in the entire United States as it carves its way south, gaining size as it's refreshed by dozens of cold feeder creeks.

The first GLRI-supported project site we visit, Big Cannon Creek, is one of these feeders. Though it's relatively large for a tributary, it's still considered a headwater stream due to its habitat conditions, which consist of over 10 miles of prime spawning and nursery habitat. It's also considerably colder than the Manistee mainstream, which makes it a great thermal refuge from the summer heat—that is, if you're a trout lucky enough to have been born here. As Jeremy points out, the weaponized water blasting out of twin undersized culverts ensure that any flow of trout traffic on Big Cannon is a one-way street: downstream.

"It's basically a dam," Jeremy explains. "Inside the pipes there's no velocity refuge, just one scorching laminar flow of eight feet per second with nowhere to rest. And these flows have scoured and dropped the actual streambed, making this culvert perched, like a waterfall. The chances of any fish getting up here are slim to none."

But impeding the movement of fish through the pipeline is just one of the problems poorly designed culverts present. They also seriously affect the streambed both upstream and downstream of the culvert. Upstream, current slows and fine sediment collects, flattening the gradient. Downstream, the streambed is scoured away, increasing the gradient. The ultimate result is a stretch of river of two extremes—one too silty and too flat, the other too scoured and too pitched—with the culvert operating as the hinge-point. This sort of structure is not conducive to fish or the macroinvertebrates they depend on. It's also not conducive to the survival of the road crossing. If this culvert weren't replaced, it would fail sooner than later.

But connectivity projects aren't the only work Jeremy is doing. We next tour a smaller tributary where Jeremy is trying to restore a decades-old sand-trap. Fairly common throughout Michigan, sand-traps were originally designed to collect excess sedimentation that resulted from the increased erosion of the logging era. The idea was to widen the river so that flows would slow and fine sediment would collect in a designated dug-out area, which was then emptied several times a year with a backhoe. Not only did it require expensive and regular maintenance, but it turned out to be a poor substitute for simply encouraging a stream's natural ability to transport sediment in the first place.

This bank restoration project on a tributary of Michigan's Pine River uses natural processes and materials to narrow a channel artificially widened by past generations. Their goal had been to trap excess sedimentation resulting from the logging. It didn't work.

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To narrow the channel, Jeremy is simply expediting the natural floodplain building process. "We've installed brush piles along where the old river channel used to be, Jeremy explains. "During higher flows, water comes over the tops of the brush piles and slows down, allowing sediment to fall out of suspension. After higher flows recede, sediment and organic matter are left in these areas and vegetation starts to grow. By the time the bank is restored the brush piles will dissolve. You won't be able to tell we were ever here."

While this sand-trap project begins in the stream proper, it certainly doesn't end there. Jeremy and his crews always try to complement their in-stream work with a bank project to ensure that the surrounding forest is also healthy. Here, they've planted a copse of next generation, disease-resistant elms—the very tree that once loomed over the banks of most of Michigan's coldwater streams before Dutch elm disease struck.

"Streams and their adjacent forests are intimately connected through their exchange of organic materials," Jeremy tells me. "Invertebrates eat the leaves and through their bodies make the nutrients available to trout. In a very real way, fish eat trees via invertebrates. When we think of stream restoration we often think of things that are happening in the water, but a big part of the health of a stream is the forest that surrounds it."

This focus on the bank—and much farther on the bank than I ever imagined—would be highlighted on the third and final leg of my journey, a visit to Southwest Michigan's Rogue River.

Angler Tom Hazelton inspects the intake of a twin set of culverts of a Manistee River tributary. Narrow intakes such as this flatten upstream gradient and increase sedimentation, severely comprising what should be prime spawning habitat.

PROJECT #3

Rogue

Of the three watersheds I visited, the Rogue was unique in its location near one of the fastest growing urban areas in Michigan, the Grand Rapids metropolitan area, which boasts over one million people. Over beers at a brewery adjacent to their most recent project in downtown Rockford, a small town just 14 miles north of the city, Nichol DeMol, Project Manager of the Rogue River Home Rivers Initiative, tells me about that most severe of urban and suburban watershed problems—storm runoff and the constellation of issues that surround it.

"In rural areas, 40 percent of rainwater and snowmelt enters the groundwater through porous terrain like forests, wetlands and meadows. In suburban areas, where there are more paved, impenetrable areas, that number goes down to 30 percent. And in heavily paved urban area, it's as low as 20 percent. Instead of soaking into the ground to become groundwater that enters the river slowly, keeping it running cool during the summer months, this stormwater run-off washes into the river all at once, raising water temperatures, adding unwanted sediment and chemicals, and doing nothing for the aquifer. And the impact of run-off on water levels is chronic. When you see low water levels on any given day, it's not only due to lack of rain that week. It's because rainwater was not captured by the soil weeks or even months ago."

Cold groundwater input is an especially big deal on rivers like the Rogue, which are right on the thermal cusp when it comes to salmonid habitability. A recent study based on fish population estimates in Michigan found that as mean July temperatures approach 70 degrees Fahrenheit, brown trout densities decrease dramatically. From 2009 to 2011, the average mean July temperature in the Rogue River at the measurement site was 69 degrees Fahrenheit.

We check out Nichol's first project, located just outside the brewery alongside a popular walking and biking trail that runs along the river.

"Here we converted a large patch of an invasive plant called phragmites to native plants," Nichol says, pointing to what to me looks like lush, dense prairie. "Phragmites is really aggressive and outcompetes natives. That's a problem because the natives have deep root systems that suck in stormwater, filter pollutants and direct it down into the groundwater. Phragmites, on the other hand, has a very shallow root system, and it just ushers run-off into the river. Also, because it doesn't support native insects and birds, wherever phragmites travels, you see less ecological diversity."

Just a few hundred yards away lies another project, a massive clutch of native plants forming a depression in the ground with a storm drain at the center. The idea is to capture as much water as possible before it enters the Municipality's underground stormwater management system.

"This is currently functioning as a demonstration area so the public can see how their individual choices about lawns really impact a watershed," Nichol explains. "Again, these plants collect rainwater and redirect it vertically into the groundwater, whereas grass doesn't. We'd like to see this sort of work done on private property in the future, with something we call our rain-scaping program. If more water is collected before it hits the streets and enters stormdrains, our river will be in much better, much cooler, much cleaner shape."

Nichol explains that while working in urban and surburban areas has its challenges, it also has unique opportunities in the number and type of collaborators—like young people. "I sat down with city officials and schoolteachers and said, 'Let's use this work we're doing as a hands-on teaching opportunity for kids.' Then we went to our contractors and said, 'We have youth that want to get involved.' The result has been our Green Team program that involves kids on a volunteer basis in a variety of restoration projects. It's been an amazing success. Many alums of the program have gone on to study sustainability practices in college and beyond."

It's not just anglers that are benefitting from Nichol's work.

"Just last week someone stopped me on the street and said, 'Before I looked out my window and just saw a lawn, now I see butterflies and other native species,'" Nichol smiles. "That was pretty neat."

Western Michigan's Rogue River is one of the few places in the U.S. where excellent coldwater resources flow through distinctly urban settings.

Above left: By the time excess rainwater reaches this storm drain, much of it will already have been directed into the soil, where it will become groundwater to feed and cool the river during the hot summer months.

Above right: Project manager Nichol DeMol points to a GLRI project in downtown Rockford, Michigan, where native riparian plants have been re-established near the banks of the Rogue River. Their deep root systems direct rainwater down into the soil before it reaches storm drains and becomes run-off.

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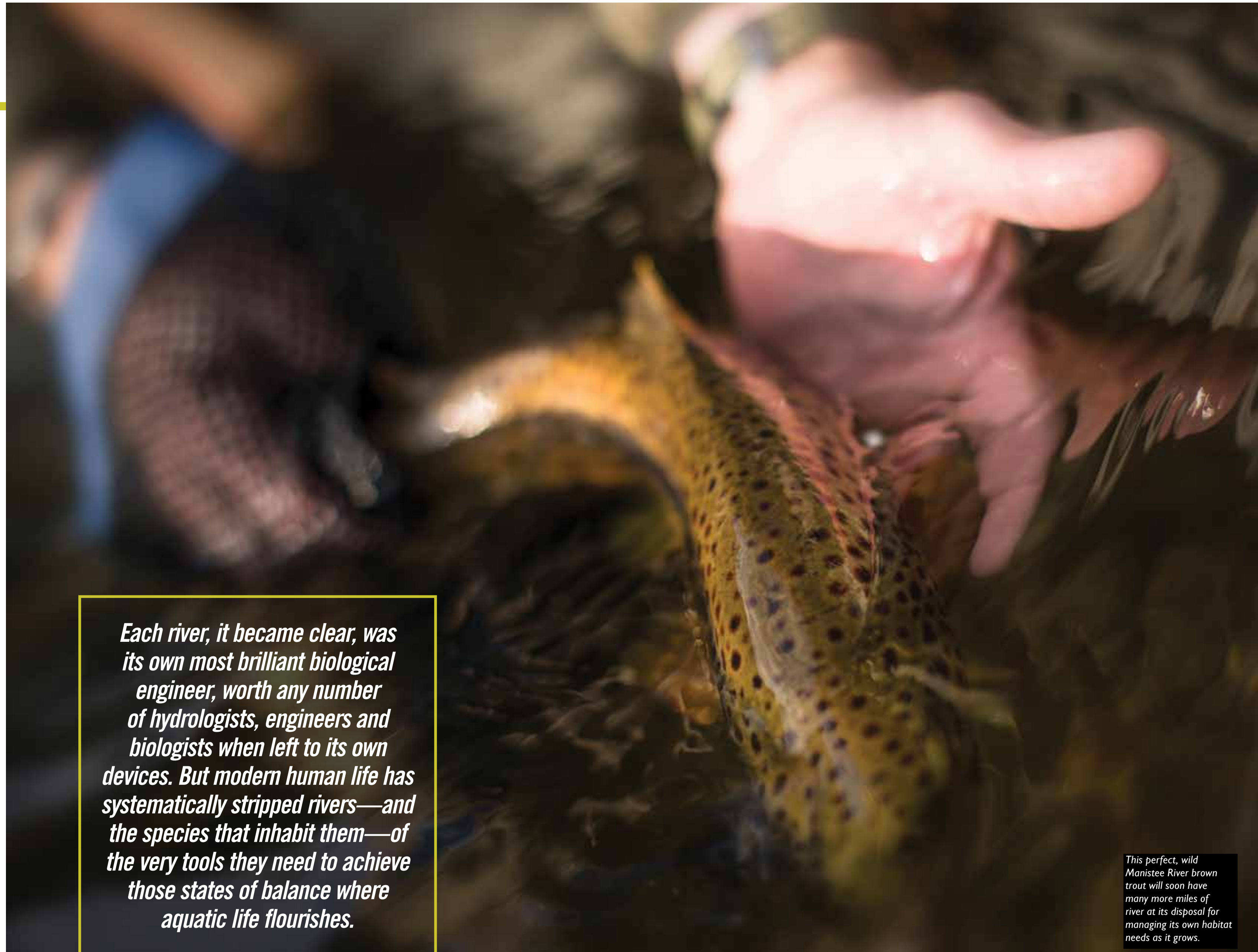
> – Nichol DeMol

Conclusion

By the end of my GLRI watershed tour, I learned that far more interesting than the lunker structures and trout hotels that made my fishing easier were all the intelligent natural processes at work in any given watershed. Each river, it became clear, was its own most brilliant biological engineer, worth any number of hydrologists, engineers and biologists when left to its own devices. But modern human life has systematically stripped rivers—and the species that inhabit them—of the very tools they need to achieve those states of balance where aquatic life flourishes. And that's exactly what makes these and other GLRI-supported projects so inspiring. At their best they constitute a sort of time travel, a bringing into the present a distant past that modern anglers could previously only read or dream about. The fact that state of Michigan is in the process of actively restoring the arctic grayling—historically Michigan's most widespread salmonid—is evidence that anglers may soon see their wildest daydreams come true. But this can only continue to happen if successes like the GLRI are celebrated for what they are and have been for the past seven years—clear proof that that the modern human world can co-habitat with the natural world in a way that is both environmentally and politically sustainable. And we can all do our part to help. Not all of us can be a Laura MacFarland or Jeremy Geist or a Nichol DeMol, but we can support them by supporting those politicians who make their work easier, more widespread and more long-lasting. Our once and future brilliant rivers depend on it.



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This perfect, wild Manistee River brown trout will soon have many more miles of river at its disposal for managing its own habitat needs as it grows.