A brook trout from Ash Creek, Richland County, Wis. (John Lyons)

An Uncertain Future for Driftless Trout

By John Lyons

I've been an avid trout angler all my life, so when I came to the University of Wisconsin-Madison for graduate school in 1979, one of my first orders of business was to figure out where to fish for trout. People in Madison told me to head west into the "Driftless Area." I explored this region whenever I could, and after I joined the Wisconsin Department of Natural Resources (DNR), in 1985, my professional duties often involved studying the fishes of Driftless Area streams and rivers.

I found a few good spots for brown trout, but many trout streams had just a few small, stocked brown trout. Brook trout, a more sensitive species, were rare, and I could count on one hand the number of naturally reproducing populations that I discovered.

However, by the early 1990s, trout populations were on the upswing in the Driftless Area. Decades of slowly improving land use and hard work by state agencies and many conservation groups had improved stream temperatures, water quality and habitat to the point where brown trout reproduction and survival were increasing. By the 2000s, many marginal streams supported dense brown trout populations. Brook trout numbers also began to improve.

A good example was Gordon Creek, about 25 miles west of Madison. When I began visiting this stream, in the 1980s, it had small pockets of reproducing brown trout, but it depended on stocked fish. There were no reproducing brook trout. DNR records and old-timers told us that conditions were worse in the 1950s and 1960s. By the early 1990s, reproducing brown trout increased and began to spread throughout the creek and its tributaries. Stocking was gradually decreased, and the DNR and local conservation groups launched habitat-improvement projects. By the 2000s, Gordon Creek was one of the best and most popular trout fisheries in southern Wisconsin, and reproducing brook trout were found in the headwaters for the first time.

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Similar stories have played out throughout the Driftless Area over the last 40 to 60 years, and one could argue that Driftless Area trout anglers are now living in a golden age. Trout numbers are as high as they were in the mid-1800s. Some streams are so full of trout that on a good day dozens can be caught. Others contain trophies over 20 inches. While brown trout still dominate, the beautiful native brook trout has become common in smaller headwaters. Public access and stream habitat improvements are at all-time highs.

But golden ages don't last forever. The specter of climate change, with warming temperatures and more extreme droughts and floods, casts a long shadow over the future. Trout fishing is likely to decline, but with appropriate land and stream management losses can be reduced.

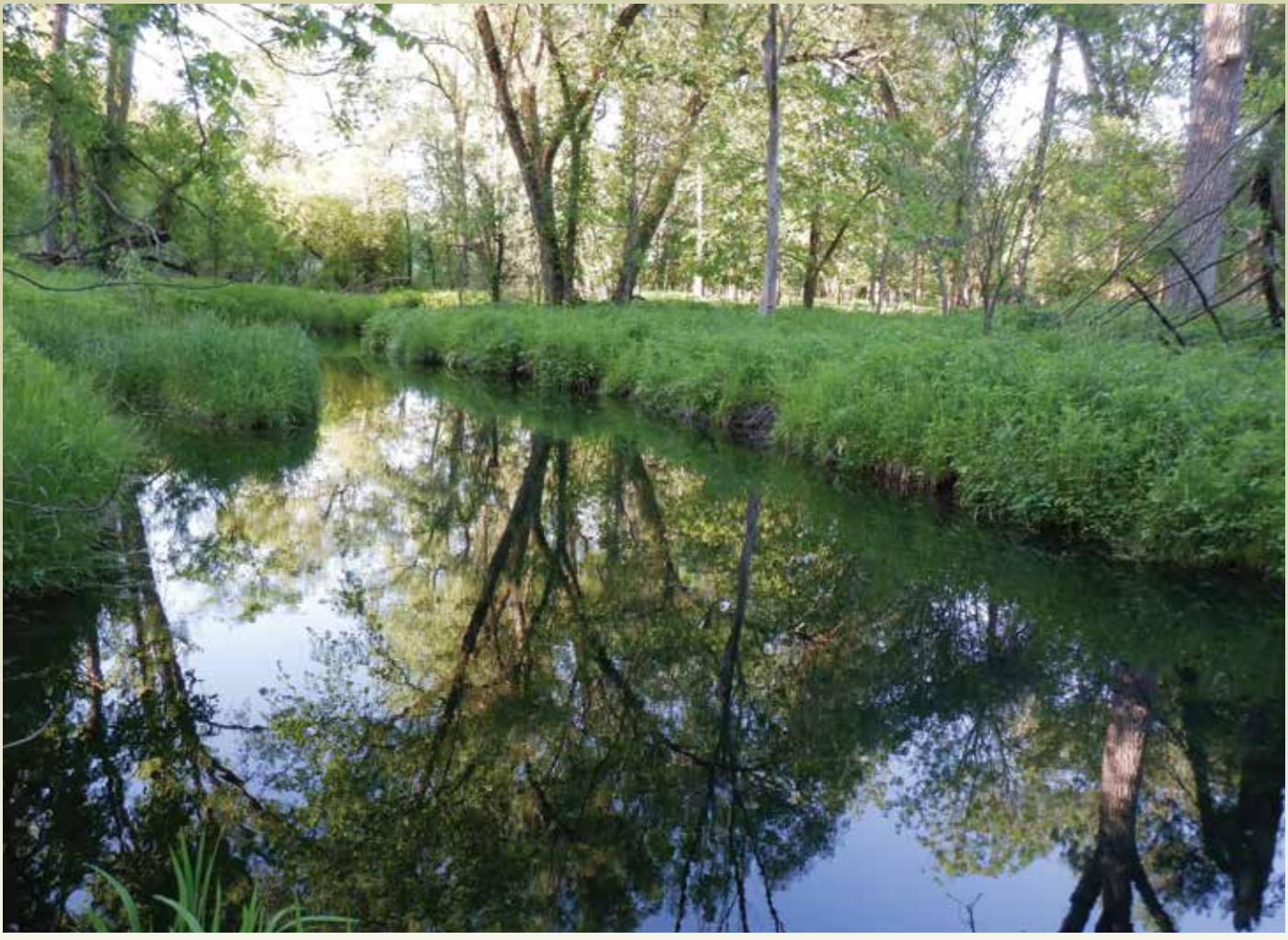
The Driftless Area is about 24,000 square miles, including most of south-

western Wisconsin, portions of southeastern Minnesota and northeastern Iowa, and a small piece of northwestern Illinois. The Mississippi River runs through the heart of it. Most of the region was never covered by glaciers during the last ice age, which began 2.5 million years ago. Consequently it has little to no glacial "drift," the sediments brought by glaciers. Hence the name Driftless. The glaciers never scraped and flattened the landscape as in surrounding areas, leaving the ancient ridges and steep-sided valleys formed by eons of natural erosion from streams and rivers. Bedrock, consisting of alternating layers of limestones and sandstones, is near the surface and is usually covered with productive but highly erodible silty soils. The limestone bedrock is cracked, allowing groundwater to flow through it creating caves, sinkholes and many large springs. These springs and many smaller groundwater seeps keep stream flows steady and cold during hot and dry periods, making for excellent trout habitat.

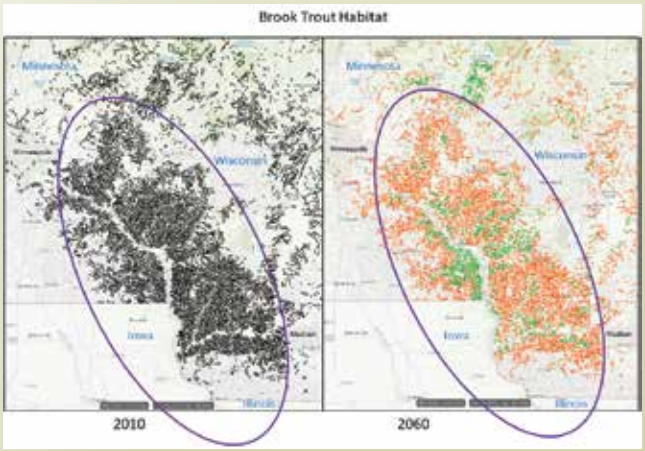
Learning Curve

When Euro-American settlers first arrived here in the early to mid-1800s, they found clear cold streams full of brook trout, surrounded by forests, oak savannas, prairies and wetlands. They quickly put the valley floors and ridge tops to the plow, drained and filled many wetlands, and put livestock on the steep slopes to graze. Wheat fields and later corn fields and pastures replaced the natural vegetation, and soil erosion accelerated. In just a few decades the valley floors were filled with two to more than six feet of soil washed from ridge tops. Streams were choked with silt, covering the gravel and cobble bottoms the trout need for feeding and spawning. Stream banks grew high and unstable, and the water became cloudy. Precipitation rapidly ran off the land into streams before it had time to soak in and replenish the groundwater. Flooding became common and severe, while the water table dropped until streams became sluggish and the water too warm for trout during hot, dry periods. Sediment was carried down to the Mississippi, where it filled sloughs and backwaters. By the early 1900s, the Driftless landscape was devastated, farming yields had dropped, and trout were nearly gone.

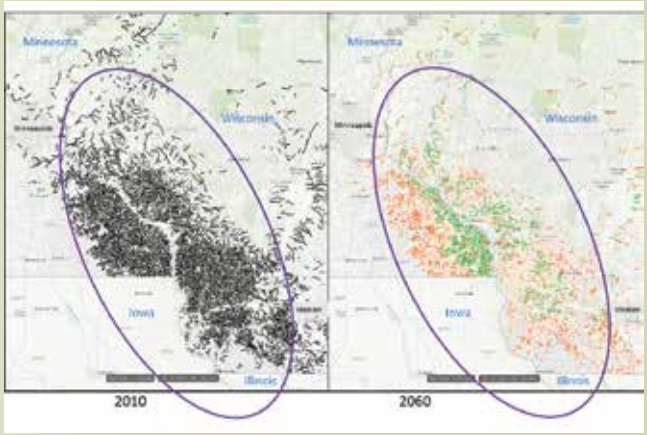
The recovery began in the 1930s. Erosion and declining farm productivity was so severe that area leaders, led by conservationist Aldo Leopold, convinced the U.S. government to establish the first ever "Soil Demonstration Area," in the Coon Creek watershed,



A shaded stream stays cooler, creating a better habitat for trout. (Reggie McLeod)



These maps show how Driftless Area trout streams in Wisconsin and Minnesota may change in the future, based on FishVis modeling. The maps on the left show streams in black that could support brook trout (above) and brown trout (below) in 2010. The 2060 maps, on the right, estimate how the streams will change in the next 40 years if land-use practices do not improve to compensate for the effects of climate change. Bright green streams would still be suitable, dull green to dull orange streams would become marginal and bright orange streams would no longer support brook trout (above) and brown trout (below).



southeast of La Crosse, Wis., in 1934. The Civilian Conservation Corps, university and government scientists, and local farmers worked together to develop techniques to reduce erosion, eliminate gullies, improve streams and wildlife habitat, and restore farm productivity. Gradually these techniques were applied throughout the Driftless Area and beyond. The recovery was gradual and slow, taking more than 50 years, but by the 1990s erosion had been much reduced, stream flows, water temperatures and quality were improved, and trout populations began to thrive again. Local conservation groups worked with government agencies to restock areas where trout had been eliminated. By the 2000s, the Driftless Area had become a nationally known trout fishing destination.

Planning for the Future

However, Driftless Area trout streams still face substantial threats. Many suffer from excessive erosion and storm runoff, creating miles of high eroding banks. Silt from these banks and surrounding lands smothers trout habitat in places. Fertilizer and manure washed from farmlands degrades water quality. Leakage from manure storage sites cause major fish kills. Nutrients in streams promote excessive algae and plant growth that can deplete oxygen in the stream at night and impede flow during dry spells. The same fractured bedrock that feeds springs also readily carries nitrogen from manure and fertilizer into the groundwater. One family of nitrogen compounds, nitrates, have reached unhealthy levels in many private wells in the Driftless Area, presenting a danger to people as well as to trout.

On a broader scale, most of the pollutants in the Mississippi get there via streams and smaller rivers. Some of the nitrogen in streams reaches the Mississippi then the Gulf of Mexico where it creates a vast summer "dead zone" where few organisms can survive. Improving the water in streams also benefits the Mississippi and even the Gulf of Mexico.

Driftless Area trout streams have long been popular, but the anglers using them have changed over the last 40 to 60 years. During the 1950s through the early 1980s, most were locals, traveling only a few miles to reach their favorite fishing spot. They fished mainly with bait or spinners and kept a large share of the trout they caught. Fishing pressure was high but mostly concentrated in the spring. State agencies raised and stocked myriad "catchable-sized" trout to meet the heavy demand.

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Since the early 1980s, angling patterns have shifted substantially. Now most anglers fishing in the Driftless Area live somewhere else and drive 25 to 250 miles or more to their favorite fishing spots. Bait and spin fishing are still widely practiced, but fly fishing has increased dramatically as well as "catch-and-release" fishing. Improved habitat and catch-and-release have dramatically reduced the need for stocking trout. Exact changes in fishing pressure are hard to gauge, but it looks as if the number of trout anglers may have declined slightly, although the average angler may fish more days. Individual streams see fewer anglers because they are spread out over more good streams. Fishing is still highest in the spring, but it is more spread out over the entire year.

The modern out-of-town trout angler typically spends more money per fishing trip than the local angler, so catering to visiting anglers has become an important economic activity in many parts of the Driftless Area. A study commissioned by Trout Unlimited estimated that in 2016 trout fishing brought in up to $1.6 billion and supported 6,500 jobs in the region.

Stream Time Machine

For the last 15 years, I have worked with a team of scientists from the Wisconsin and Michigan DNRs, U.S. Geological Survey, University of Wisconsin-Madison and Michigan State University, funded by the U.S. Fish and Wildlife Service and

A brown trout from Trout Creek, Iowa County, Wis. (John Lyons)

the U.S. Environmental Protection Agency, developing computer models to estimate the responses of streams and fishes to a range of possible land-use and climate changes. The analyses cover all the streams and rivers in Wisconsin and Minnesota (and Michigan and New York) but unfortunately do not include the Driftless Area of Iowa or Illinois. You can explore these models on an interactive website, FishVis, which provides estimates of current and future (40 to 90 years hence) habitat suitability for both brown trout and brook trout — as well as 12 other fish species. You can zoom out and look at the whole Driftless Area or even the entire U.S. Great Lakes region, or zoom in to look at a small watershed or just a few hundred feet of your favorite stream.

FishVis projects substantial declines in trout stream health in the Driftless Area if no climate-change-adaptation activities are pursued. Losses are greater for brook trout, which require colder water, than for brown trout. The biggest declines occur on the edges of the Driftless Area, with the heart of the region, near the Mississippi River, showing the least change. All told, about two-thirds of current brook trout and over one-third of current brown trout habitats are expected to become unsuitable if current climate-change trends and land-use patterns continue.

Not all of these losses are inevitable. Land can be managed to reduce the impacts of a warmer and more variable climate. If groundwater levels can be maintained or improved, trout will continue to thrive in streams. Groundwater is best conserved by maintaining areas where rainfall and snowmelt can soak into the ground to recharge the water table. These recharge areas are mainly where there is undisturbed natural vegetation, including forests, grasslands and especially wetlands. Developed areas where soils are compacted or, even worse, covered by pavement, buildings or other impervious surfaces reduce groundwater replenishment.

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If trout are to thrive, extensive naturally vegetated areas, especially wetlands, must be maintained. Land development must be planned so as to minimize its effects on groundwater. Some of this may require complicated planning and new approaches, or it may be as simple as directing rainfall and snowmelt to wetlands, rain gardens or other recharge areas rather than to roads or storm sewers.

Agricultural land use will also have a major effect on groundwater. Many farming practices reduce recharge and increase runoff, but others provide more perennially vegetated land that increases recharge. Examples of regenerative agriculture include "rotational grazing" to improve soil and pasture health, and reduce the need for fertilizers, pesticides and antibiotics, and decrease the potential for manure contamination. "Cover crops" protect and restore soils in fallow fields. "No-till" cultivation minimizes soil loss. "Buffer areas" of natural vegetation or well-managed pasture along streambanks and around springs and wetlands can help groundwater recharge as well. All of these practices also reduce soil erosion and nutrient runoff to streams, further conserving water, trout habitat and the Mississippi River watershed.

Planting and maintaining streambank shrubs and trees that tolerate occasional flooding — such as willows, cottonwood, swamp white oak, red maples and silver maples — will yield shaded banks, cooler water and stable streambanks. When unchecked, erosion tends to widen streams and expose more water to the full sun.

Climate change is a huge threat to trout streams everywhere, but it doesn't mean the end of trout in the Driftless Area. If the land and water are cared for and managed well, our descendants should be able to enjoy some of the same great trout fishing that we enjoy today.

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