Huron River Report

Published quarterly by the Huron River Watershed Council **FALL 2014**

feature story

Trail Towns of the Huron

Part 4 in a series: the Village of Milford

The start of the Huron River Water Trail is an up-north, down-south gem known well by paddlers. Drop the boats in at Proud Lake State Recreation Area and enjoy the seemingly unspoiled landscape with clear waters inhabited by scores of bird species and other wildlife. On weekends and holidays, families and groups flock to the river for the 4.5-mile trip to Milford.

At River Mile 100

Milford, a village of 6,300, is home to river miles 100 through 98 on the Huron River Water Trail and the first Trail Town to greet trail users paddling on to Lake Erie for the full104-mile journey. While new to being a Water Trail Town, Milford is no stranger to welcoming trail users on the extensive equestrian, cycling, and hiking trails weaving through and around the Village. The Milford Trail links downtown to miles of scenic open space and panoramic views of the

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Great Lakes Paddlers enjoy a New Year's Day trip. Sections of the river are floatable in winter for the intrepid paddler. credit: Great Lakes Paddlers

Hardworking Trees • *Low-cost watershed workers*

When thinking of the Huron, most picture the river itself. But it's the natural areas – the forests, grass-lands, and wetlands – in the Huron's watershed that provide the ecological services that keep the river and its tributaries healthy.

Nine Types of Ecosystems

Forests are ecosystems where trees cover a majority of the area. Southeast Michigan is home to many types of forests, ranging from swamps of tamaracks or hardwoods such as ash or silver maple, to beech-maple forests on rich uplands, to the oak-hickory and black and white oak forests, which were and still are the most common in the watershed. In fact, ecologists have classified nine different forested ecosystems that are native to the watershed. Each of these ecosystems supports its own compliment of flora and fauna.

The Benefits of Forests

Natural areas such as forests provide a host of "ecosystem services" that keep our air and water clean and maintain our quality of life. A few of the many ways trees help preserve

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Laura's Stream of Consciousness

On July 13, we honored Congressman John Dingell, the longest serving member of the U.S. House of Representatives and our champion for clean water, with a party on the river following Huron River Day. Congressman Dingell is retiring at the end of this year, and we wanted to recognize his significant contribution to clean water and conservation efforts. For many of us in the environmental and conservation movement, he has been a leader, role-model, and friend.

Congressman Dingell was an architect of the Clean Water Act in 1972, the Wetlands Act in the early 1960s, the Water Quality Act of 1965, the bill banning ocean dumping, the Marine Mammal Protection Act, the Endangered Species Act, the Energy Policy and Conservation Act, and the Clean Air Act. In addition to crafting and passing strong policies, he has stayed vigilant to advocate and secure funding for these programs and policies as well.

Thanks in part to this legislation, funding, and local programs, the water quality in the Huron has improved, and wastewater treatment plants and other industries are employing the best available control technologies for controlling and treating pollution. Also, the Clean Water Act gives us stronger tools to address nonpoint source pollution, currently the major source of pollution in the Huron River watershed.

When the Congressman's district expanded, including more of the Huron River watershed, he challenged HRWC and its partners to expand our vision and strategies. Out of that came RiverUp! and the vision for a Huron River renaissance — a strategy to realize the goal of a vibrant, robust, and fully restored river as a destination for residents and tourists. These efforts include cleanups of contaminated properties, land and water trail development, portage improvements, economic development opportunities such as restaurants, liveries and redevelopment, and public outreach. As water quality has improved in the Huron River, we are embarking on a path to rejuvenate the Huron and its communities, residents, and businesses.

Thank you, Congressman Dingell, for your vision and leadership on clean water.

– Laura Rubin

Clockwise, from lower left:

Eunice Burns, HRWC co-founder, catching up with Congressman John Dingell; Laura and John share a laugh; the "cupcake map" of the watershed was popular and tasty; and Paul Cousins donates his culinary skills to the event.

credit: HRWC

Green Infrastructure Innovation

Coming Soon to a Neighborhood Near You!

Grant to Help Swift Run

HRWC has been awarded a grant from the Michigan Department of Environmental Quality (MDEQ) and U.S. Environmental Protection Agency to install and study the effects of new "Green Infrastructure" practices in a southeast Ann Arbor neighborhood. The $700,000 grant was one of only seven awards selected by MDEQ in 2014. The grant funding is being matched with $240,000 from project partners at the City of Ann Arbor and the Washtenaw County Water Resources Commissioner's office for a total project value of almost $950,000.

"This project is great for the watershed," says HRWC's Laura Rubin. "It builds on information we've learned about 'green' systems and shows what can be done with community partners who know the value of infrastructure investment. Most importantly, we can really improve the water quality in one of our degraded streams!"

The new project will apply innovative techniques to improve stormwater drainage in public and private areas in a 4-block neighborhood in the Swift Run watershed, a tributary of the Huron River. The project's innovation is capturing stormwater throughout an existing neighborhood using "green," or natural, living systems rather than in hardened "grey" infrastructure such as detention ponds, stormdrains, and pipes.

Rain gardens (gardens planted with wetland plants that temporarily hold and infiltrate stormwater runoff) along numerous parks, streets and right-of-way sections throughout the neighborhood will play a key role. In addition, residents will have special opportunities to participate in city and county programs to install rain gardens on their own properties and disconnect downspouts that send runoff to the city's stormwater system. HRWC anticipates the project will significantly reduce runoff, return the creek to more natural flows, reduce pollution entering Geddes Pond and the Huron River, and allow for aquatic life to return to the creek.

Focus on Results

As part of the project, HRWC will measure water quality and flow in Swift Run up and downstream of the neighborhood before, during, and after the project. Swift Run has suffered from a lack of stormwater controls in the project area, which was built prior to modern development standards.

Neighborhood Meetings

Prior to installation, HRWC and project partners will host a series of neighborhood meetings to provide residents with details on the plans, gather feedback, and find out who is interested in installing rain gardens or other property enhancements.

The project will launch this fall. It builds on Green Infrastructure planning by HRWC that can be found at www.hrwc.org/green-infrastructure. The Swift Run neighborhood is a high priority candidate for Green Infrastructure enhancements as it is impaired by altered flow, high in phosphorus and bacteria, and has a low diversity of aquatic life.

A Model Worth Replicating

The project developed for Swift Run follows a model implemented in 2009 by HRWC in a Millers Creek neighborhood on the northeast side of Ann Arbor. In that project, HRWC and partners engaged residents in a series of meetings and hands-on projects that resulted in two larger community rain gardens, the installation of a plant buffer and repairs to a stormwater pond, and multiple rain barrels and rain gardens at private homes. Post-project, there were measurable reductions in both the volume and rate of stormwater entering the creek.

HRWC seeks to use this model in other neighborhoods throughout the watershed that are having similar impacts on stream flows. Neighborhoods interested in participating in a Green Infrastructure project should contact HRWC, as well as their local government representatives, to begin the process of consideration.

— Ric Lawson

Roadside rain gardens like these will be installed near Swift Run to capture street runoff before it gets into the stormdrains and then to the creek.

credit: K. Motawi

Trail Towns *continued from page cover*

Huron River valley. Milford offers the perfect arrangement for a paddle and pedal: float the Huron River and then explore the ribbon of regional parks surrounding the village on a bike. Boat rentals are available through Heavner Canoe and Kayak Rental (www.heavenercanoe.com; 248-685-2379) or Village Canoe Rental (www.villagecanoerental.com; 248-685-9207). Bike rentals are available through Trail's Edge Cyclery (reserve ahead at www.trails-edge.com; 248-714-9355).

Is Milford Trail Town–Ready?

Milford boasts amenities that draw Water Trail users off the trail and into town.

The Village and its Downtown Development Authority (DDA) create a welcoming atmosphere for visitors. Ann Barnette, Executive Director of the DDA, stresses, "The Huron River is one of the community's greatest assets, and it literally flows through the center of the downtown. An important aspect of community living and economic development for downtown is to strengthen our connection with the river and its users." Part of HRWC's Trail Towns work is to help Milford develop promotions and packages tailored to the outdoor recreation crowd.

The right mix of services are available to trail users who land or launch a boat at Central Park. It's a short walk to the Old World–style downtown, where casual restaurants, ice cream shops, and general stores are abundant. An even shorter walk to the new River's Edge Brewery is on tap for any craft beer lovers. Co-owner Ryan Wiltse envisions a time when paddlers will enter the brewhouse from the Huron, as it flows next to the establishment.

Trail-oriented events include guided day trips, as well as sunset and moonlight paddles, offered by HRWC and two local outfitters. Heavner Canoe and Kayak

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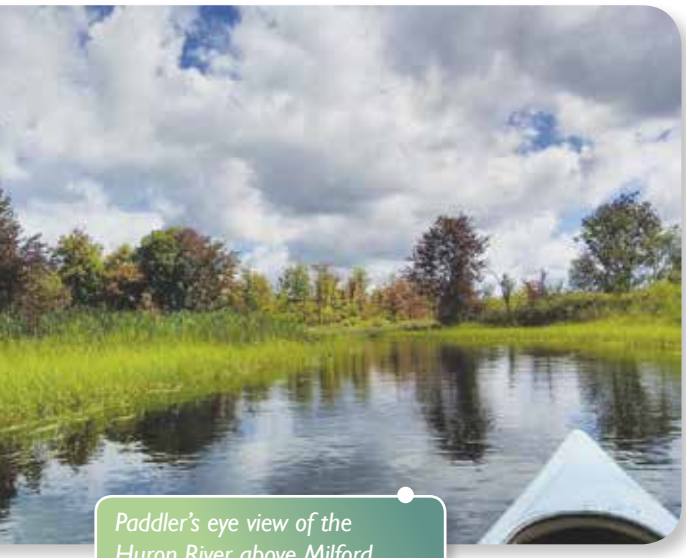
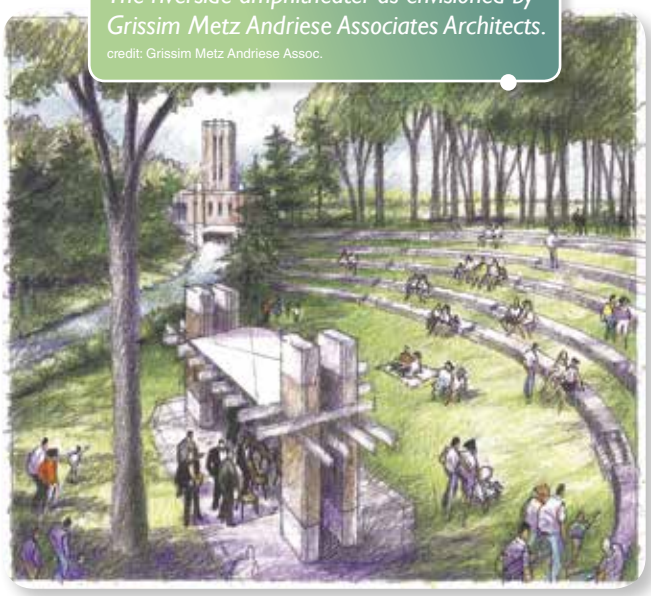


Paddler's eye view of the Huron River above Milford.
credit: Stephanie Nicholls



The riverside amphitheater as envisioned by Grissim Metz Andriese Associates Architects.
credit: Grissim Metz Andriese Assoc.

OPPORTUNITES FOR TRAIL TOWN FEATURES IN MILFORD

Opportunities exist for Milford to build on its reputation as a Trail Town.

Central Park, the 12-acre park on the river, is the logical gateway to the village and investment in the following could make it an even greater asset:

- *a well-designed canoe and kayak trailhead for rentals and private boats;*
- *a kiosk for welcoming trail users to Milford and highlighting businesses and attractions within walking distance;*
- *rental lockers specially designed for kayak and canoe storage and gear that allow trail users to secure their belongings so they can stretch their legs, get a bite to eat, or spend the night; and*
- *an inviting gateway (pedestrian-friendly) to the downtown area from the river.*

The AMP is a riverside amphitheater located within Central Park. It is a joint project of the Rotary Club, Milford DDA, and Huron Valley Chamber of Commerce (milfordAMP.org) funded primarily through private donations and grants. The AMP, when completed, will help to create a sense of place for residents and visitors. The three-phase project will take about 18 months. The amphitheater and stage will be completed first, followed by the construction of permanent restroom facilities in the park.

Rental features educational programs for all ages to explore and enjoy the outdoors. Located on Milford's east side is Village Canoe Rental, which rents canoes and kayaks.

Building the Milford Team

Through the RiverUp! campaign, HRWC assists the Trail Town team in Milford in crafting an identity around the Water Trail, and implementing Water Trail infrastructure improvements, way-finding signs, and marketing materials. The local team includes the Parks & Recreation Commission, the DDA, local business owners, the Village Manager, and HRWC. Keeping pace with the energy and enthusiasm of the Milford team has been challenging and rewarding.

Christian Wuerth, who began his role as Village Manager in January,

Milford loves a good parade! credit: Stephanie Nicholls

credits Milford's location on the river as a motivation for seeking the job. "For me," shares Wuerth, "the Trail Town designation and the current efforts in the community are about recognizing the importance of the Huron River to the community as a whole – in terms of environmental aesthetics and in terms of providing an economic development opportunity." He hopes that the Trail Town focus will allow the Village to better introduce Water Trail users – and residents – to downtown and all that the community offers. Stephanie Nicholls, Parks & Recreation Commissioner, echoes that sentiment, "Our residents fish, kayak, canoe, and enjoy the beauty of the Huron. Our hope is that the Huron River Watershed Council's experts and other Trail Towns' best practices will enrich the riverfront experience for residents and visitors to our community."

Great Beer, Great Location

Wiltse and his partners at River's Edge Brewery took their time to find the right site for their venture. They knew they had found it in the Main Street property across from Central Park and on the banks of the Huron.

"We wanted to make the river a big part of the business, from the logo to the interior to the marketing," says Wiltse. In short order, they removed the barbed wire fence that separated the parking lot from the river, dressed up the river view, and renovated the distinctive building that had been partially vacant and underutilized for many years.

While the focus of River's Edge is on providing Milford and Southeast Michigan with quality craft beers (and wine), Wiltse and the other owners see great potential in the Trail Towns concept. It turns out that a fair percentage of people who enjoy craft beer also are active in outdoor pursuits in and around Milford, and the brewery has an eye on sponsoring an event on the river in the next year or two. "Our customers are active, and we see many runners, cyclists, and paddlers," says Wiltse, "I'd like to see the brewery bring more people to Milford so they can see how cool this town is."

The story of River's Edge Brewery encapsulates the RiverUp! vision: a local business on the river that is leveraging the assets of the Huron River for enjoyment and education that just may lead to more stewardship of the blue ribbon that connects the Trail Towns.

River's Edge Brewery proudly supports Milford's Trail Town connections. credit: HRWC

Residents enjoy free summer concerts at Milford's riverside Central Park. credit: HRWC

— Elizabeth Riggs

Hardworking Trees *continued from cover*

the watershed are:

- Clean air. Trees absorb air pollutants such as ozone, nitrogen dioxide, and sulfur dioxide. They intercept dust, ash, and smoke. Evapotranspiration creates water vapor that lowers air temperature. Most important, trees (and other plants) produce oxygen; the amount of oxygen produced by an acre of trees each year equals the amount consumed by about 18 people annually.
- Climate change mitigation. Trees lock up carbon in their roots, branches, and leaves. One acre of trees removes up to 2.6 tons of carbon dioxide (the main greenhouse gas contributing to climate change) from the atmosphere annually.
- Reduced energy costs. Trees shade buildings and keep them cool; evapotranspiration produces water vapor that cools the air; and trees slow down winds, reducing the amount of heat loss from buildings.
- Clean water. Polluted stormwater runoff is the number one threat to the Huron's health. Trees soak up stormwater with their roots and intercept rainwater in their canopies. They filter pollution such as pesticides, fertilizers, and animal wastes out of runoff; and they shade the river and its streams, keeping them cool. One tree can intercept 1,763 gallons of runoff water each year. Trees planted along streams and on slopes prevent erosion, another major source of pollution in the watershed. Riparian buffers – strips of vegetation such as trees and shrubs growing along the edge of streams, rivers, wetlands and lakes – are considered by stormwater managers to be the rock stars of runoff treatment, because of their ability to remove pollutants, slow runoff speeds to waterways, and cool down runoff water.

Each of these services becomes even more important as climate change increases the frequency and amount of rainfall in the watershed. The City of Ann Arbor recently completed a management plan for the "urban forest" that constitutes all the trees within the city. They determined that Ann Arbor's public trees provide $6.4 million in these kinds of benefits every year. In fact, each tree on average provides:

- $63.64 in energy savings
- $57.95 in increased property values
- $14.10 in clean water
- $11.53 in cleaner air
- $1.39 in carbon sequestration.

Threats to Trees in the Watershed

Many forces threaten the watershed's forests and urban trees:

- Development pressure is increasing as the economy recovers
- Nonnative pest invasions can have a significant impact on native forests
- The emerald ash borer has killed most ash trees in this region
- Changes in temperature and rainfall patterns due to climate change will create an environment more favorable to some species and less favorable to others.

How to Help

Two great ways to help maintain the health of the Huron are to protect existing forests and trees from clearing for development and to plant native trees and forests. HRWC has many programs that work with communities to conserve existing forests and other natural areas by designing development around natural areas, especially riparian buffers, and by incorporating trees and other vegetation into stormwater management of developed areas.

HRWC's watershed management plans all have conservation of existing natural areas as major goals. The Portage Creek Project is working with local communities to enact ordinances to protect riparian buffers and to educate residents about their importance. The Bioreserve Project aims to assess and protect the highest quality natural areas. The Climate Resilient Communities project helps land conservancies and land managers plan for the conservation of natural areas and urban forests as local climate changes.

Local Recources

Readers who wish to help protect the Huron by adding the cleaning power of trees will find many resources available, including:

- Releaf Michigan has a comprehensive web site with planting tips and sales (http://releafmichigan.blogspot.com/)
- MSU Extension offers extensive information about the general requirements and care of trees, and the importance of planting native trees (http://migarden.msu.edu/trees_shrubs).

— *Kris Olsson*

Forests provide a host of ecosystem services as well as beautiful hiking spots. credit: HRWC

calendar of events

HRWC Events and Workshops

SEPTEMBER • OCTOBER • NOVEMBER • 2014

VOLUNTEER

River Roundup

October 18 • 9 AM to 3:30 PM or 10:30 AM to 5 PM

Join a small team with your friends and family for a unique activity in the River Roundup. Collect a sample of the bugs and other creatures (benthic macroinvertebrates) that live in our streams. Like canaries in a coal mine, these creatures indicate the health of the River.

Details and registration: www.hrwc.org/roundup

ID Day

Sunday, October 26 •12 Noon or 2 PM start

Discover what kinds of bugs were found at the River Roundup. Separate them into look-alike groups and then an expert helps you identify them. You then record the data and compare the results to last year's.

Details and registration: www.hrwc.org/id-day

LEARN

BOARD MEETING

Thursday, October 23 • 5:30 PM • NEW Center, 1100 N. Main St., Ann Arbor

Details and registration: lrubin@hrwc.org

Field Season Results Presentation

Thursday, November 13 • 6 to 8 PM

Join us to review the data collected and lessons learned from HRWC's 2013 field season. Which creeks are improving from our work and which are losing ground? Which are degrading and why? Presentations by HRWC's Paul Steen and Ric Lawson – with cameos by many of your other favorite staff and volunteers. Hope to see you there!

Details and registration: jfrenzel@hrwc.org

RECREATE

Paddle Hudson Mills to Dexter-Huron Metropark and Pedal Your Bike Back

Sunday, September 21 • Put-in at 10 AM

Exact location of put-in will be sent to participants upon registration.

Cost is $25 for HRWC members, $35 for nonmembers

Details and registration: www.hrwc.org/summer-events

Founded in 1965, the Huron River Watershed Council (HRWC) is southeast Michigan's oldest environmental organization dedicated to river protection. HRWC works to inspire attitudes, behaviors, and economies to protect, rehabilitate, and sustain the Huron River system.

HRWC coordinates programs and volunteer efforts that include pollution prevention, hands-on river monitoring, wetland and floodplain protection, public outreach and education, and natural resources planning.

Individuals, local businesses and more than 40 communities support HRWC's work through voluntary membership.

Huron River Watershed Council

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Graphics: Laughing Goat Arts

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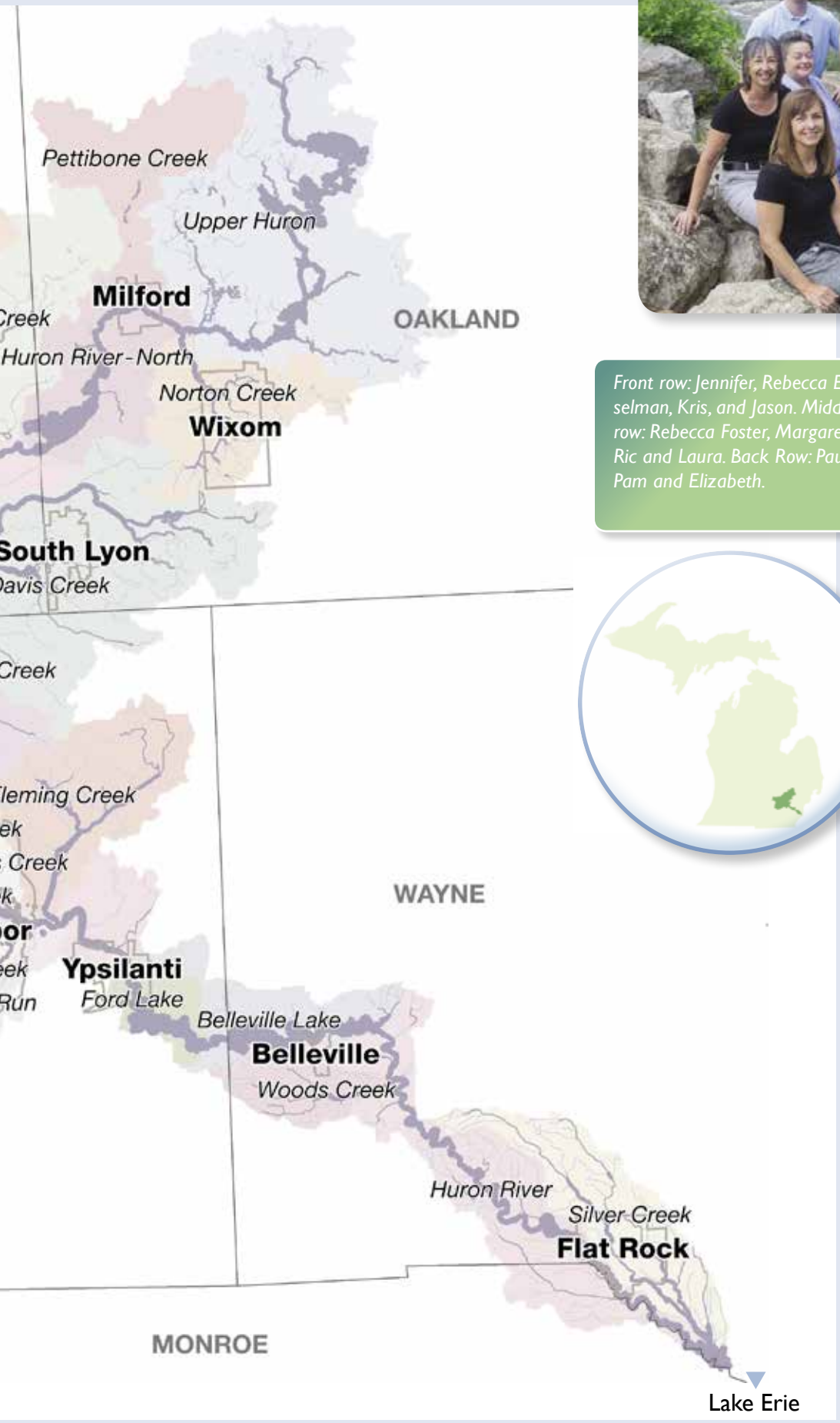
The Huron River Watershed

Front row: Jennifer, Rebecca Esselman, Kris, and Jason. Middle row: Rebecca Foster, Margaret, Ric and Laura. Back Row: Paul, Pam and Elizabeth.



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Education, HRWC-Style

Volunteers go deep with watershed-area schools

Walking through Parker Mill or Island Park this spring, one might have seen HRWC volunteers providing hands-on river education to numerous school groups. The specifics vary with the ages and interests of the classes, but all HRWC Streamside Activity days offer stations that teach about physical, biological, or chemical indicators of watershed health.

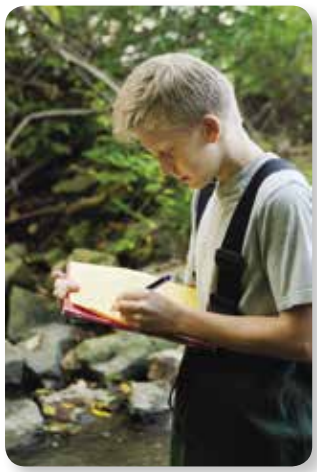
Student Study Areas

Biological stations show students benthic macro-invertebrates to help them learn how these critters are reliable indicators of stream health. Physical measures such as temperature, turbidity, or velocity help students see how changes in these variables may affect the living organisms, the shape of the stream, and the human costs of erosion. Chemical tests such as pH, dissolved oxygen, or nitrates can show older students ways to measure the less visible pollutants and their potential effects. All the activity stations culminate with discussions about how humans can impact and improve the health of the watershed.

These streamside activities were originally generated by Dave Wilson, a retired Vanderbilt University chemistry professor. He and a highly qualified stable of HRWC volunteers provided lively riverside days for public and private school students from Ann Arbor, Detroit, Pinckney and Ypsilanti. Toyota was an early funder of the program. As demand grew, so did the program. A suite of lesson plans is now online. More volunteers are being trained annually. An HRWC volunteer steering committee manages the behind-the-scenes organizational details.

The Early Days

The program started when Dave Wilson moved to Michigan in 2003. He had hardly finished unpacking when he connected with HRWC. He worked on benthic macroinvertebrates, a sediment study, and occasionally took the handoff from HRWC biologist Joan Martin



on school talks about various aspects of the Huron River watershed. Dave found local teachers who were interested in giving hands-on river-based activities a try. The program saw a notable restructuring three years ago when retired educators Janet Kahan and Lee Burton oversaw the revision of associated educational materials.

Today's Education Program

Materials now align more directly with current K-12 educational practices and allow the training of a wider array of volunteer educators, which will increase the potential for the programs' long-term impacts.

Conventional in-class talks, well-laced with slides, demonstrations, and activities for the kids were part of the menu. In some cases volunteers helped teachers put on activities of their own design. Courtney Kiley at Ann Arbor Community High, Tracey Marchyok at Ann Arbor Learning Community, and Ann Novak at Greenhills School provided helpful insights. In addition to the schools mentioned above, HRWC provided or supported activities at Pioneer, Huron, Belleville, Ypsilanti, and Pinckney High Schools; Angell, Honey Creek, St. Francis, St. Mary's, and Wiley Elementary Schools; and Keystone Academy and Rudolf Steiner School.

— Janet Kahan & Dave Wilson

Are you a teacher who would like to know more about how our program can tie into your curriculum? Ready to request a program? Please contact Jason Frenzel at jfrenzel@hrwc.org.
If you would enjoy presenting streamside, hands-on education to a variety of students, contact Jason to learn more about upcoming volunteer opportunities.

[All pics] Students from Community High School and Greenhills learn to search for macroinvertebrates, measure streams, log data, and collect stream samples. credit: H. Buffman

Oral History Project

Stories about the Huron River and its watershed

Students Collect Stream Samples

Kids in the Huron River collecting water samples for analysis. It's a familiar sight today, but when and how did it begin? It began about thirty years ago in the mid-1980s, according to Ellen Scavia, HRWC Executive Director from 1982 to1989. During her interview for the Oral History Project to celebrate HRWC's 50th Anniversary in 2015, Ellen tells us that "high school kids in the river" was the brainchild of Mark Mitchell.

Mark was a part-time staffer with HRWC while finishing his Master's Degree in the School of Natural Resources Environmental Education Program at the University of Michigan. "It was his idea," she said.

Mark wanted to get high school students into the river and teach them to sample and analyze the water for long-term water quality tracking. Working with Bill Stapp, his academic advisor, he wrote a sampling manual geared toward high school students and their teachers. High schools in the watershed have been assisting with sampling ever since.

The idea grew far beyond the Huron. By 1985, Mark Mitchell and Bill Stapp had written and published the first edition of the "Field Manual for Water Quality Monitoring." This small book was an outgrowth of Mark's intensive work with schools along the Huron River and described a model for student-based water quality monitoring. The book helped launch an explosion of student-based monitoring programs around the United States, Canada, and Mexico.

In 1989, Bill Stapp proposed a global network of water monitoring programs in a graduate seminar, and GREEN (Global Rivers Environmental Education Network) was born. For Mark and for many others it was, in Mark's words, "a very intense and satisfying journey being on the ground floor of a rapidly expanding global environmental education program."

— Interview of Ellen Scavia June 13, 2014

Bill Stapp and students, circa 1960.
credit: AAPS

Shared Stories

HRWC will turn 50 in 2015. To help celebrate, Karen Snyder, a volunteer committed to preserving our natural resources, is compiling our oral history, interviewing HRWC "old timers" and "new timers" to capture precious stories that are part of our past.

HRWC will share excerpts from these oral histories over the next year. All transcripts and photos will be turned over to the Bentley Library at the University of Michigan for preservation. If you would like to assist with or be interviewed for this project, contact Jason Frenzel, jfrenzel@hrwc.org.

Correction • *revised numbers for carbon emmissions*

HRWC has identified an error in the values published in the Spring 2014 newsletter article: "From Source to Source – the energy and carbon in our water supply." The revised estimate of the energy intensity of water treatment is 2,580 kWh/MG (from 20,350 kWh/MG) and wastewater treatment is 2,975 kWh/MG (from 70,248 kWh/MG). The value for residential energy intensity remains the same as does the conclusion that the majority of energy associated with water use is consumed in homes.

These values change the overall carbon footprint of domestic water use in the Huron River watershed to 178 million lbs of CO_2/year, equivalent to the annual emissions of nearly 17,000 passenger vehicles. The full summary report is available at www.hrwc.org.

Questions or comments may be directed to Rebecca Esselman at (734) 769-5123 x 611 or via email at resselman@hrwc.org.

Looking Under the Hood

University team studies river flows, the Huron's "engine"

HRWC tasked a graduate team from the University of Michigan with assessing flow alteration on the main stem of the Huron River, its impact on the biological community, and recommendations for dam operations. Over the course of 18 months, the team conducted analyses within the watershed on annual, monthly, daily and sub-daily hydrological data, precipitation, land cover change, and fish and benthic invertebrate communities. The Final Report and Executive Summary are available on the HRWC website under the RiverUp! Program tab.

Chuck McDowell, Xin Xu, Zhenyue Duan, Summer Roberts, and Yu-Chen Wang at the State of the Huron Conference. credit: HRWC

A river's hydrologic (or "flow") regime plays a crucial role in river ecology by shaping the physical environment, which in turn dictates the living elements of the ecosystem. Altering river flow, particularly in association with damming, has been acknowledged as a leading cause of global declines in freshwater diversity. Dams fragment nearly two-thirds of the largest rivers on Earth. In the United States, less than 2% of rivers remain undammed with intact natural flow regimes.

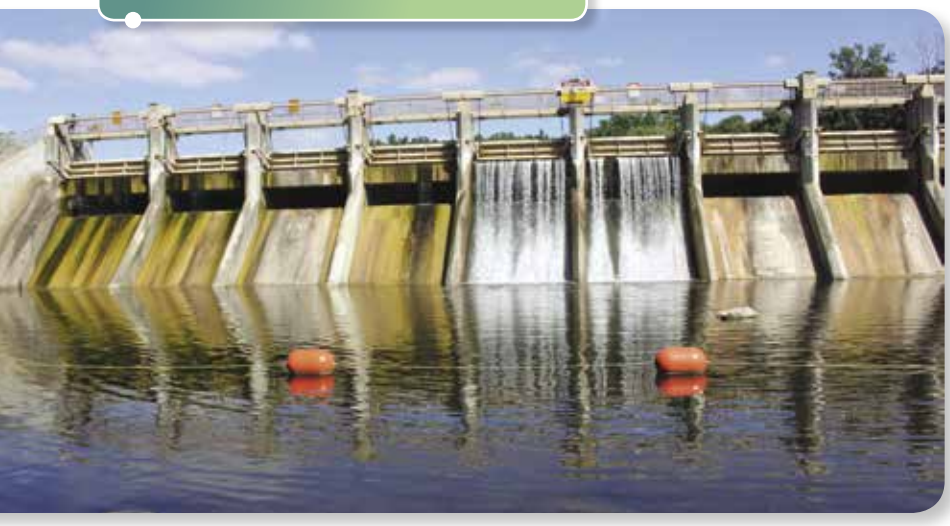
The Huron River is no exception, with 19 dams along its main stem, plus many stormwater contributions via pipes and other modifications. However, through collaboration and research, river managers can implement ecologically-based dam operation plans to dampen the undesirable impacts of an altered flow regime.

Notable trends

Most flow metrics demonstrated an upward or unchanging pattern for the most recent 100 years. Generally, flows have become more stable during this period. However, significant daily and subdaily variation can occur below dams, with the greatest variation in flow seen at the Wall Street gage in Ann Arbor.

Another increasing trend was found between precipitation and flow discharge. This result implies that a major driver of increased flow in the Huron River is increased precipitation, which agrees with climate trends for the area. With forecasted rain amounts increasing by 25%, more water is expected in the river. Furthermore, increased impervious land in the watershed has resulted in more stormwater runoff and higher flows in the river. The corresponding increase of fine substrate and pollutants also had a negative impact on stream habitats for benthic macroinvertebrates.

Barton Dam on the Huron River. credit: C. McDowell



River flows and fish

At sample sites along the river, fish communities were grouped into two "guilds" based on their habitat preferences: *impoundment* and *riverine*. In impoundment environments (e.g., Kent Lake), a high percentage of the sample species were game fish, species tolerant of warmer, less oxygenated waters, substrate generalists, piscivores (fish eaters), and species that preferred larger rivers and slow current velocity. Conversely, in riverine environments a high percentage of the sample species were darters, species intolerant of warmer, less oxygenated waters, insectivores, and those that had preferences for

continued on next page

rock or gravel substrate and a wider range of river flow velocities. These results support the theory that different flow regimes encourage different fish communities.

Recommendations

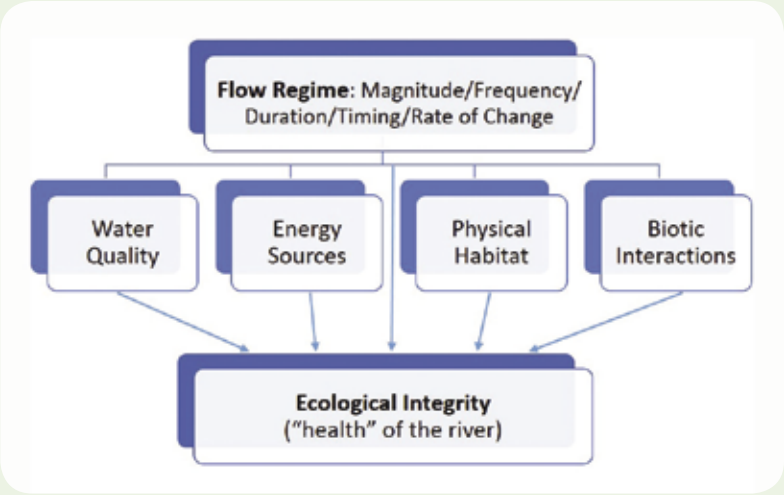
Following is a selection of recommendations to HRWC based on analyses from the study.

- Collaborate with the City of Ann Arbor to analyze flashiness at its Wall Street gage and the impact on biotic communities.
- Further collaboration and transparency with dam operators, especially detailed strategies of dam operations, would assist in understanding how dams are impacting the ecological community and what strategies could be employed to amend current operations.
- Work with stakeholders to determine desired fish communities and collaborate with dam owners to encourage the desired communities through amendments to operations.
- Add more stream gages at both riverine and impoundment sites (i.e., directly below dams), which would provide more information on dam operation and the impact of sub-daily flows.
- Conduct fish and invertebrate sampling, flow monitoring, and habitat evaluations simultaneously at the same riverine and impoundment sites, so that multiple lines of evidence can be used to explore the impact of abiotic factors on the biotic community. Future fish studies should explore species requirements and preferences throughout their life cycle and consider the current velocity limits on habitat suitability.

—Zhenyue Duan, Chuck McDowell, Summer Roberts, Yu-Chen Wang, and Xin Xu

NATURAL FLOW REGIMES

A "natural flow regime" refers to a river's naturally-occurring changes in water flow through the course of the year. Flow regime is of central importance in sustaining the ecological integrity of flowing water systems. The five components of the flow regime (see chart below) directly and indirectly influence the other primary factors of water quality, energy sources, physical habitat, and biotic interactions. Modifying flows has cascading effects on the ecological integrity of rivers.



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