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The StreamWatcher

Winter 2014/2015

StreamWatch Volunteer Water Quality Monitoring Program | A program of the Stony Brook-Millstone Watershed Association
Protecting and restoring our watershed through citizen monitoring since 1992

OVERNIGHT SAMPLING ON PEDDIE LAKE PROVIDES INVALUABLE RESULTS

If you've ever been to Hightstown Borough, an urban enclave surrounded by low-density development on the eastern side of the Millstone River watershed, you will surely have noticed Peddie Lake – the center of the town and seemingly, the center of life. The lake serves as a recreational hub for residents and visitors, offering a picturesque setting for a stroll along the water as well as opportunities for fishing, boating, and swimming. Unfortunately, poor water quality could pose a risk to people in the water.

Peddie Lake hosts the swimming portion of the annual Hightstown Triathlon. Essential as it is to protect the health and safety of Triathlon participants, the Watershed Association has monitored the lake for *Escherichia coli* (*E. coli*) prior to every swim event, including weekly practice swims throughout the summer. *E. coli* is an indicator bacteria that originates from the intestinal tract of warm-blooded animals. While not causing gastrointestinal illness itself, the existence of *E. coli* in water shows that other bacteria may cause harm to those who ingest it.

Over the past six years of monitoring, we have noticed periods of high *E. coli* levels in Peddie Lake. During both dry and rainy weather, we observed *E. coli* counts far exceeding the New Jersey water quality standard of 235 colonies or less per 100 milliliters of sample water. With hopes to stop the influx of bacteria into Peddie Lake, and to make the lake a safer place for swimmers, the Watershed Association implemented a project in 2012 to track and remediate the source of bacterial contamination. After many rounds of sampling on dry days, and discovering a tributary to the lake that had consistently high results, stormwater sampling was the obvious next step. Stormwater monitoring, as described in the Winter 2012 edition of *The Stream-Watcher*, involves collecting a water sample prior to a rain event, just after stormwater runoff begins, then 1 and 2 hours afterward. During a storm, rainwater flows over the land bringing animal waste from domestic pets, livestock, wild animals, and waterfowl (especially Canada Geese) into the water. Rain can also infiltrate broken sewer lines causing wastewater to flush into waterways. Stormwater sampling allows us to track bacteria count changes as stormwater volume does. This can help us identify the source of bacterial contamination into the lake, especially when monitoring sites are located upstream and downstream of potential pollutant inputs.



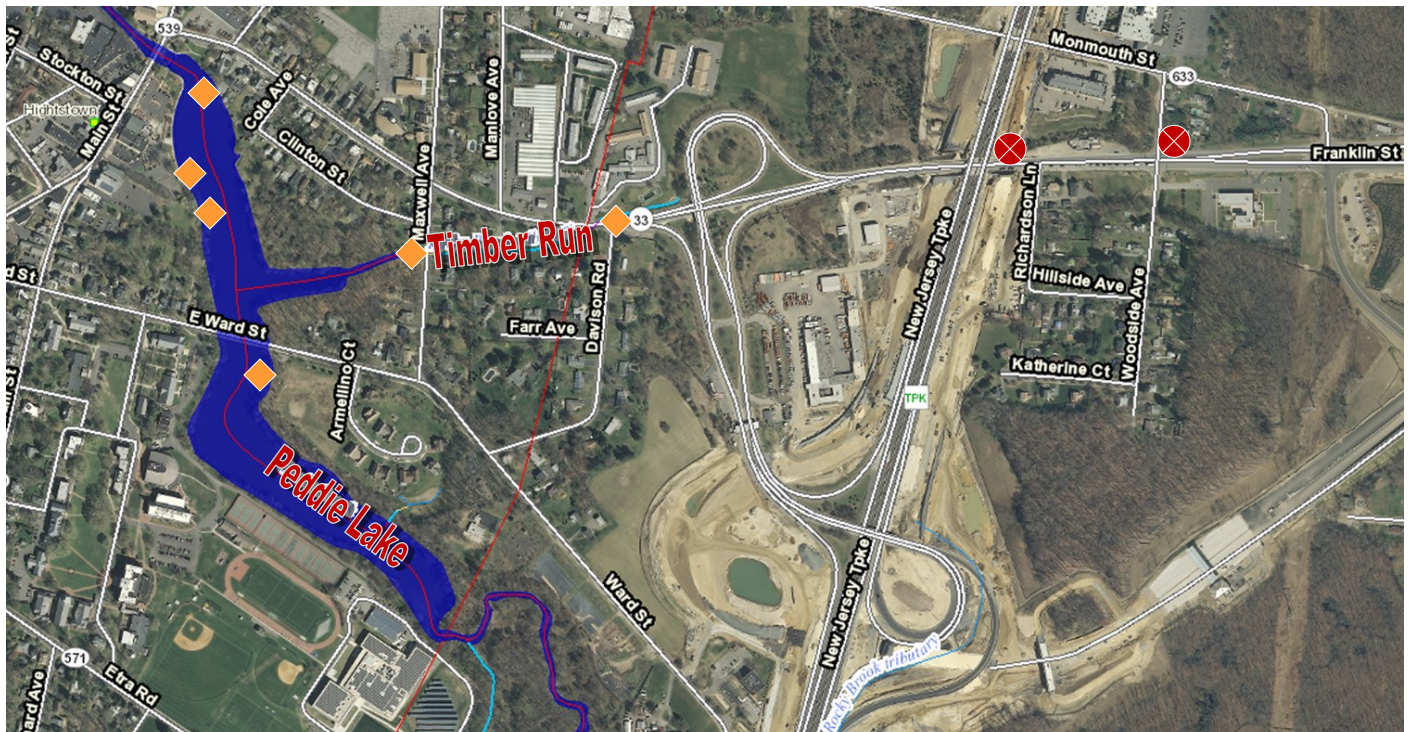
An outdoor festival along the banks of Peddie Lake

The New Jersey Department of Environmental Protection's Bureau of Marine Water Monitoring played an enormous role in helping us complete this task. They agreed to test our water samples for a suite of parameters, including *E. coli* counts, antibiotic resistance analysis, and coliphage. Antibiotic resistance determines if the bacteria present in the water originated from the gastrointestinal tract of a human, domestic animal, or wildlife. *Continued on next page...*

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[2014 Biological Monitoring Results](#) [SubWatershed Report: Focus on Bear Brook](#) [A New Era of the Watershed](#)

On a cold, rainy night in mid-November, three resilient Watershed Association staff scientists, Dr. Amy Soli, Nicholas Ho, and Erin Stretz, arrived in Hightstown to begin sampling at 9 in the evening. After waiting to observe the first signs of stormwater runoff, the team completed their last samples at around 4 in the morning. Though it was a long night, we obtained very interesting, and seemingly conclusive, results that show what the sources of bacteria might be to Peddie Lake.

We sampled four sites on Timber Run, a small tributary that originates near the NJ Turnpike in East Windsor and flows through residential areas before flowing into Peddie Lake. 50,000 colonies of *E. coli* per 100 milliliters of sample water were measured after 1 hour of stormwater runoff at the furthest upstream site. This is relatively equivalent to the amount of bacteria found in raw sewage! What's more is that when the sample was tested for antibiotic resistance, the origination of this bacteria was found to be from a human source.



Map of Peddie Lake and Timber Run stormwater sampling locations in Hightstown Borough and East Windsor Township.

◆ = Monitoring location

⊗ = Monitoring location with extremely high levels of *E. coli*

The Watershed Association's next steps will include working closely with local property owners, East Windsor Township, and Hightstown Borough to investigate further into the source of these serious issues and, ultimately, to stop the flow of bacteria into Peddie Lake. We hope that this invaluable data set will be the impetus to help us do just that.

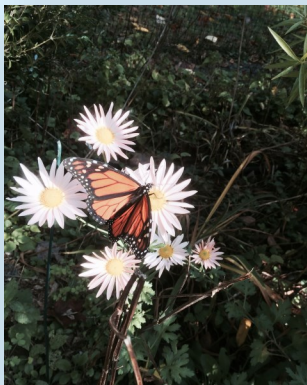


Photo courtesy of StreamWatch volunteers
Glorianne and Toni Robbi

BECOME A RIVER-FRIENDLY RESIDENT IN 2015!

Improve water quality by starting at home. Visit our website to learn more about this innovative program and to complete our questionnaire. Find out if your home and yard are River-Friendly!

www.thewatershed.org/science/river-friendly

HOW SAFE IS YOUR STREAM? AUGUST & NOVEMBER 2014 E. COLI MONITORING RESULTS

The table below lists active StreamWatch bacteria monitoring sites and whether they met the state standard for *E. coli* on our sampling dates in August and November. To meet the State standard for a single sample, meaning the bacteria levels are low enough for safe recreation in the water, there should be less than 235 colonies per 100 milliliters of sample water. When a site does not meet the standard, it is usually just after a rainfall. It is recommended to stay out of waterways for 2-3 days after rainstorms.

There was measurable rainfall prior to the both samples. Within 48 hours of the August 4 sample collection, it rained 0.16 inches in Somerville and 0.40 inches in Trenton. Prior to November 3, there was approximately 0.44 inches of rain in Trenton and 0.19 inches in Somerville. This may explain the number of samples that exceeded the State single sample standard.

AVERAGE # E. COLI COLONIES/100 ML WATER			
SITE NAME	LOCATION	AUGUST 4 2014	NOVEMBER 3 2014
BD3	Beden Brook at Great Road	590	280
CL1	Carnegie Lake below dam on the Millstone River	760	440
CL2	Central Carnegie Lake, downstream from Millstone confluence	N/A	260
HL1	Honey Lake, from dock on west bank	510	N/A
HO2	Honey Brook Pond, on SBMWA property	320	2,310
PR1	Pike Run, at Montgomery Park	1,180	290
SB2	Stony Brook, at Province Line Road	N/A	170
SB4	Stony Brook, at Pennington-Rocky Hill Road	1,220	520

Note: Exceeds State Standard of 235 E. coli colonies

NEW SAMPLE SCHEDULE FOR BACTERIA ACTION TEAM

Beginning this summer, the StreamWatch Bacteria Action Team will transition to a new monitoring schedule and improved protocol. Since its inception in 2008, the team has sampled 13 sites four times per year. While this data was useful in providing “snapshot” information, we have decided to increase the rigor of our sample schedule to become more consistent with standard NJDEP practices. According to NJDEP, a bacteria monitoring program can only be considered valid if samples are collected at least five times within 30 days. A geometric mean of all five samples is calculated, reducing the chance for outliers to skew the sample results.

Two five-week monitoring sessions will be held from June-August, with Mondays remaining the assigned sampling day. Volunteers can opt to participate in one or both sessions, however it is important that samplers make their best effort to participate in all five weeks of their selected session (since the data will be discounted if less than five samples are collected.) After collecting the sterile water samples and storing them on ice, volunteers will transport the samples to the new Watershed Center laboratory where Watershed staff will conduct *E. coli* testing.

With our new laboratory also comes new analysis tools. We were fortunate to have received funding for an IDEXX sealer, new incubator, and Colilert testing reagents. This testing protocol is an EPA- and NJDEP-approved standard method and is a great improvement over our former test methods (Coliscan Easygel.)

We look forward to starting this new and improved Bacteria Action Team! Want to volunteer your time with this new effort? Contact Erin Stretz at estretz@thewatershed.org to learn more about joining the StreamWatch program.

HOW HEALTHY IS YOUR STREAM?

2014 BIOLOGICAL MONITORING RESULTS



NABS (www.benthos.org)

Clubtail Dragonfly Nymph
Order: Odonata, Family: Gomphidae
Photo by Dave Penrose

Biological monitoring helps us to understand the health of our streams. Aquatic benthic macroinvertebrates, organisms that live on the bottom of streams and lakes, serve as valuable indicators of water quality. Macroinvertebrate species (which include insect larvae, aquatic worms, snails, crayfish, and other small aquatic organisms) have different tolerance levels to pollution. For example, mayflies, stoneflies, and caddisflies, belonging to the taxonomic orders of *Ephemeroptera*, *Plecoptera*, and *Trichoptera* (EPT) respectively, have very little tolerance to pollution and will die off when pollutants are introduced to their environment. On the other hand, organisms with a high tolerance to pollution, like leeches, worms, and midge fly larvae, will continue to survive even in impaired conditions. When EPT organisms are found as a high percentage of a macroinvertebrate population, the stream can be considered non-impaired.

CHANGING METRICS

After StreamWatch volunteers collect and identify their macroinvertebrate samples, there are many different ways to calculate the stream's level of impairment. Water quality metrics or indices can apply different values to the various aspects of macroinvertebrate populations. Many indices highly value the presence of pollution-sensitive EPT organisms, though they can differ in other measurements, such as feeding groups or habitat types.

StreamWatch BAT (Biological Action Team) sites have been assessed since 1996 with the New Jersey Impairment Score (NJIS). In 2014, we began participating in a test of a new metric, New Jersey's High Gradient Macroinvertebrate Index (HGMI). This rating system, developed by NJDEP in 2007, was created to assess specifically NJ's high-gradient habitat (rocky-bottom streams), as opposed to the coastal plain (muddy-bottom streams) and Pinelands habitats in other regions of the state. Prior to the development of these habitat-specific criteria, all habitats were assessed with the same metric—sometimes falsely elevating high-gradient sites above other habitat types. See the table below to compare the specific criteria used for each index.

New Jersey Impairment Score (NJIS)

- Family Biotic Index
- Number of EPT families
- Percent of individuals that are EPT (including Hydropsychidae)
- Total number of families
- Percent dominance of a single family

High Gradient Macroinvertebrate Index (HGMI)

- Family Biotic Index
- Number of EPT families
- Percent of individuals that are EPT (excluding Hydropsychidae)
- Percent of families that are not insects
- Number of scraper families

THE RESULTS

The results from the StreamWatch BATS 2014 samples are shown on the next page. This comparison of NJIS and HGMI scores clearly demonstrates the importance of selecting the most appropriate analysis tools for the site. It may be that the NJIS method has over-estimated the quality of our biological assessments as the HGMI method calculates just one of our sites to be considered better than "fair." Several sites that were assessed to be of "excellent" quality with NJIS were determined "fair" under HGMI criteria. This difference in analysis brings into question the actual quality of our waterways. We will continue to analyze our macroinvertebrate samples using both methods.

Continued on next page...

2014 STREAMWATCH BIOLOGICAL MONITORING RESULTS

Comparing the New Jersey Impairment Score (NJIS) with the High Gradient Macroinvertebrate Index (HGMI)

SITE	LOCATION	SPRING 2014		SUMMER 2014		FALL 2014	
		NJIS	HGMI	NJIS	HGMI	NJIS	HGMI
BB1	Big Bear Brook, at Cranbury Rd.	18	14.56	12	13.44	12	27.12
BD3	Beden Brook, at Great Rd.	18	15.83	21	26.02	27	22.61
BD4	Beden Brook, at Aunt Molly Rd.	27	36.06	24	34.09	18	52.38
BK1	Back Brook, at Bridgepoint Rd.	21	27.50	27	33.91	12	28.69
CB2	Cranbury Brook, at N. Main St.	9	13.07	12	12.81	15	11.10
SB1	Stony Brook, at Rt. 206	15	26.35	27	28.39	18	41.79
SB2	Stony Brook at Province Line Rd.	21	23.33	27	31.52	Not identified	
SB3	Stony Brook, at Pretty Brook Rd.	Too few to analyze*		24	38.77	21	25.10
SB4	Stony Brook, at Penn-Rocky Hill Rd.	12	16.68	21	22.59	18	20.85
SB5	Stony Brook, near Mine Rd. Bridge	15	25.80	Too few to analyze*		Too few to analyze*	
SM1	Six Mile Run, near the canal	21	27.88	Too few to analyze*		15	32.81
TM1	Ten Mile Run, near the canal	21	31.12	30	31.22	27	36.34

* At least 100 organisms must be counted in order to assess the population.

NJIS SCORE	HGMI SCORE	RATING
≥ 24	≥ 63	Excellent
18 - 21	< 63 - 42	Good
9 - 15	< 42 - > 21	Fair
0 - 6	< 21	Poor



Our dedicated StreamWatch volunteers sorting and identifying their macroinvertebrate samples.



SUBWATERSHED REPORT: FOCUS ON BEAR BROOK

The Bear Brook subwatershed is comprised of 7,930 acres in the southcentral part of the Millstone River watershed. Originating from the Bear Brook Greenway in East Windsor, the brook winds its way through Robbinsville, West Windsor, and Plainsboro before joining up with the Millstone River near Princeton Junction. The area is primarily suburban, with some agricultural and industrial zones near the headwaters.

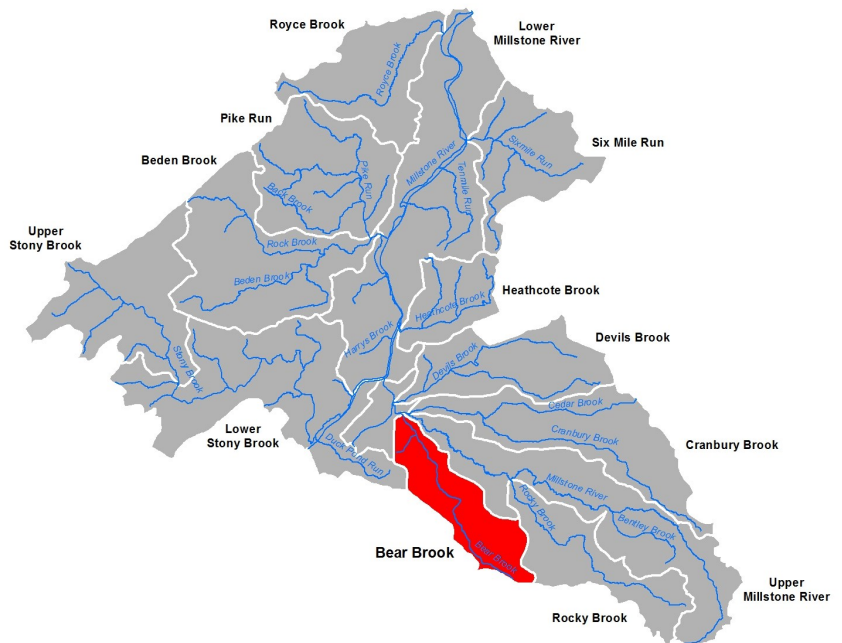
Scorecard	
Nitrogen	◆
Phosphorus	◆
Dissolved Oxygen	◆
pH	◆
Aquatic Life	◆
Recreation (<i>E. coli</i>)	◆
Impervious Cover	◆
Overall Score	◆
Rankings	
◆=Good	◆=Fairly Good
◆=Fairly Poor	◆=Poor

StreamWatch has monitored one chemical and biological site on Bear Brook since 1992. Overall the watershed is considered to be “fairly good” (see Scorecard), though monitoring has uncovered areas for improvement. Nitrate levels have remained low, below the State’s standard of 10 mg/L. Phosphorus, on the other hand, has often far exceeded the recommended maximum of 0.1 mg/L. Therefore, a decrease in phosphorus in Bear Brook by reducing nonpoint source pollution loadings is a high priority project for the State. Dissolved oxygen (DO) has also been studied in the brook. While the NJDEP recorded low levels of DO before 2010, StreamWatch monitoring has recorded great improvements since then. StreamWatch pH measurements fell below the healthy range of 6.5 to 8.5 on several occasions, resulting in the classification of pH as “fairly good.” Finally, StreamWatch biological data has consistently shown that aquatic life in Bear Brook, specifically benthic macroinvertebrate populations, are moderately impaired. Many factors can cause macroinvertebrate populations to decline, including sedimentation, habitat loss, and low dissolved oxygen.

The NJDEP conducted bacteria sampling for *E. coli* during the summers of 2010 and 2014. The 2010 sampling round routinely detected levels of *E. coli* far above the State standard of 235 colonies per 100 milliliters of sample water. In 2014, Watershed Association staff assisted by collecting weekly water samples from two Bear Brook sites over five weeks. After several days of rain, one sampling event uncovered remarkably high levels of *E. coli* – between 2,400 and 11,100 colonies per 100 ml sample water – at the sites. Rainfall will often cause animal waste on land to flow into waterways, bringing fecal bacteria with it. Subsequent samples on dry and rainy days showed that bacteria had returned to appropriate levels. While it seems that the bacteria contamination is connected to stormwater runoff, there is still cause for concern and a need to eliminate its sources.

ACKNOWLEDGEMENTS

Many thanks to StreamWatch volunteers Monica Adams, Rona Webster, and Aaron, Sonja, and Charlotte Michaluk for monitoring Bear Brook, and to Dean Bryson of the NJDEP Bureau of Freshwater and Biological Monitoring for coordinating the summer bacteria monitoring events.



StreamWatch data from 2010 to the present was used to calculate this scorecard, in addition to information provided by the New Jersey Department of Environmental Protection (NJDEP) to create the 2012 Integrated Water Quality Monitoring and Assessment Report.

A NEW ERA OF THE WATERSHED

We have been BUSY here at the Watershed Reserve. Over several chilly days at the end of December, Watershed Association staff packed up the old offices and moved next-door into our new state-of-the-art Watershed Center for Environmental Advocacy, Science, and Education. We are thrilled to be in our brand new surroundings, complete with a suite of energy-efficient measures like geothermal heating and cooling, ambient day-lighting, rainwater harvesting, solar-heated water, wastewater treatment wetlands, and so much more. The final touches are still being worked on inside our new building and our new exhibits will be installed over the coming months.

As StreamWatchers, you will grow very familiar with our new building, which will host future volunteer events like our QA/QC sessions and macroinvertebrate identifications. Take a peek inside!



Front desk



We all live downstream



Macroinvertebrate station in the Discovery Room



Muriel Buttinger exhibit

**Don't miss the Watershed Center
GRAND OPENING EVENT
on SATURDAY, MAY 2!**

Keep an eye out for more details about this exciting event—coming soon to our website!

[VISIT OUR WEBSITE FOR MORE ABOUT STREAMWATCH](#)

Click the link above for monitoring protocols, site maps, sampling schedules, data sheets, and monitoring results from our 40 monitoring sites throughout the Stony Brook-Millstone Watershed.

www.thewatershed.org/science/stream-watch

UPCOMING DATES TO REMEMBER

- March**
- 14-28: BATS Start Spring Sampling
 - 20-22: CATS Monitoring Weekend
 - 24: CATS QA/QC Session, 6-8pm, *Watershed Center Laboratory*
 - 28: BATS Macroinvertebrate ID, 9am-2pm, *Watershed Center Laboratory*
 - 28: CATS QA/QC Session, 2-4pm, *Watershed Center Laboratory*
- April**
- 11: 9th Annual Stream Cleanups — [Visit our website for locations and times](#)
 - 17-19: CATS Monitoring Weekend
 - 18: 9th Annual Stream Cleanups — [Visit our website for locations and times](#)
 - 26: Watershed Film Festival, showing *Shored Up*, 3 PM at the *Pennington Public Library*
- May**
- 2: Watershed Center GRAND OPENING — [Details coming soon on our website](#)
 - 15-17: CATS Monitoring Weekend
- June**
- 19-21: CATS Monitoring Weekend
 - 29: Bacteria Monitoring Session I Sampling Begins Today
- July**
- 6: Bacteria Monitoring Session I Sample Day 2
 - 11: BATS Start Sampling
 - 13: Bacteria Monitoring Session I Sample Day 3
 - 17-19: CATS Monitoring Weekend
 - 20: Bacteria Monitoring Session I Sample Day 4
 - 25: BATS Macroinvertebrate ID, 9am-2pm
 - 27: Bacteria Monitoring Session I Sample Day 5
- August**
- 3: Bacteria Monitoring Session II Begins
 - 8: [14th Annual Butterfly Festival](#), 10am-4pm, *Watershed Center and Reserve*
 - 10: Bacteria Monitoring Session II Sample Day 2
 - 14-16: CATS Monitoring Weekend
 - 17: Bacteria Monitoring Session I Sample Day 3
 - 25: Bacteria Monitoring Session I Sample Day 4
 - 31: Bacteria Monitoring Session I Sample Day 5

Volunteer with StreamWatch!

We hold trainings for new participants year-round. Contact Erin Stretz at 609-737-3735 x17 or estretz@thewatershed.org to get started.

STONY BROOK-MILLSTONE WATERSHED ASSOCIATION

Watershed Center for Environmental
Advocacy, Science, and Education
& Watershed Nature Reserve
31 Titus Mill Road, Pennington, NJ 08534
Phone: (609) 737-3735 | Fax: (609) 737-3075
www.thewatershed.org

SCIENCE DEPARTMENT STAFF

Jim Waltman, Executive Director
Amy M. Soli, Ph.D., Science Director
Nicholas Ho, GIS Specialist
Erin M. Stretz, StreamWatch/River-Friendly Coordinator

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