Organization for the Assabet River

Newsletter November 2010

Why does the Assabet River flood?

David Mark

The March 2010 floods rose quickly and swept away illusions that flooding of the Assabet River belonged to the past. The very low water levels this summer further begged the question—what is going on? To answer this, it helps to think of the Assabet as a short, steep, young river. It's length, from the headwaters in Westborough to the confluence with the Sudbury River to form the Concord River, is just over 30 miles. The elevation at the headwaters is 320 feet, dropping to 100 feet at the confluence in Concord.

Averaging seven feet of descent per mile puts the Assabet in stark contrast to the Sudbury River, which for long stretches through Wayland, Sudbury and Concord drops less than one foot per mile. Historically, steep rivers got mill towns while flat rivers got farming villages. New England's terrain is what was left behind by the last ice age, some 10-15,000 years ago. A combination of looking at U.S. Geological Survey data and traditional historical sources leads to an understanding of why and how the Assabet still floods every 10 to 20 years, despite a series of flood control dams.

Tracking down the data: The U.S. Geological Survey (USGS)
Searching "Assabet USGS" finds the USGS data on the Assabet River from 1941 to the present. The default display shows real-time graphs of flow in cubic feet per second (cfs) and height in feet for the most recent seven-day period. One can extend the graphed interval up to 120 days or access other options through "Summary of all available data for this site." The "Annual Statistics" selection shows an average flow for the past 70 years at slightly more than 200 cfs, but in drought years flows can be half that. During this summer's drought the flow got as low as 10 cfs. As one cubic foot equals 7.5 gallons, 200 cfs average equates to 129 million gallons per day. The 2010 flood peaked at 1,600 million gallons per day, or a rate of 2,500 cfs! For comparison, drinking water withdrawals in the Assabet watershed is estimated at 10 million gallons per day. For the last seven years both rainfall and riverflow have been about 25% above the long-term averages.

Past floods occurred on August 20, 1955, March 19, 1968, January 26, 1979, April 7, 1987 and March 15, 2010 (see "Peak Streamflow".) "Daily Statistics" further

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Community Service Project leads to DEP investigation

Dick Lawrence

In June, Sam Copeland undertook a community service project for his 9th grade Earth Science class at Concord-Carlisle High School and OAR. For his project, he decided to document snags, downed trees, and other obstacles to canoe and kayak passage along the Assabet River on its course through the town of Concord.

Paddling with his mother, long-time OAR member Sue Beede, Sam brought along maps and a handheld GPS unit. Little did they realize the surprising turns their journey down the river would take.

As Sam and Sue paddled past the site of the MCI prison, they heard the sound of running water – something flowing into the river from the direction of the prison complex. After pulling ashore to investigate, they found a broken pipe spewing a steady stream of milky-colored liquid down the bank and into the river.

"It smelled like a wet dog, and it was slightly warm," said Sue. At the outfall they also found medical gloves and other debris that had apparently come from the pipe. Since there had been no rainfall in the past few days, the steady flow indicated the source was unlikely to be just contaminated stormwater. With surrounding thick underbrush and downed trees, the site was difficult to reach and had escaped earlier detection.

Sam Copeland discovers polluted water running into the Assabet River.

Since there was a licensed wastewater treatment plant at MCI-Concord, Sue first verified that the newly-discovered discharge was completely separate from that

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Inside This Issue

OAR

The Organization for the Assabet River is a nonprofit organization established in 1986 to protect, preserve, and enhance the natural and recreational features of the Assabet River, its tributaries and watershed.

OAR Newsletter

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Speaking up for all three rivers

OAR is approaching its 25th birthday and we have exciting news to report! After extensive consultation and deliberation the OAR Board of Directors voted to add two more rivers to our work: the Sudbury River and the Concord River. To many of you, this will be no surprise. Others may wonder why, or whether it is a good idea at all. We feel confident in saying, Yes, this will be good for the three rivers and good for OAR, and now is the time to do it!

This is why:
These three rivers are intimately connected and are all part of the same river system. What happens in the Assabet or Sudbury affects the Concord, and that, in turn, has implications for the Sudbury and Assabet. There are many issues which require a system-wide approach. For example, to better understand the impacts of climate change and what can be done to help the rivers adapt; the effects of chemical pollution (such as mercury and emerging contaminants) on fish which move between all three rivers; methods of controlling invasive aquatic plants which hitchhike on our boats; and restoring river and stream continuity to protect wildlife and its habitats.

Restoring the water balance, long a concern on the Assabet, is equally a concern for the Sudbury. This year we all experienced wild swings between flooding and drought, driving home the importance of better managing stormwater to recharge our precious aquifers. What OAR has learned on the Assabet can be useful in seeking solutions for the Sudbury and Concord.

We have been monitoring water quality on the Concord River for six years already, and began monitoring on the lower Sudbury River last year. These data sets, together with 19 years of monitoring on the Assabet, will tell a more complete story of the causes of pollution and improvements (or degradation) of water quality over time. We look forward to the opportunity to tell this story, and listen to the interests and concerns of Sudbury and Concord river communities.

This addition will also be good for OAR. It will significantly broaden our grant possibilities and our opportunities for member and business support.

And lastly, and most importantly, there is no river advocacy group to speak up for the Sudbury and Concord rivers. Our partners are many, including land trusts, small grassroots pond and wildlife groups, and other watershed-wide organizations. We feel that our approach of science-based advocacy, coupled with education and recreation to build the next generation of river stewards, is unique.

This is a big step for OAR and we hope you will take it with us. It comes with a strong commitment to continuing our tradition of advocacy for the Assabet, while including the Sudbury and Concord.

A Special Members Meeting will be called in 2011 to vote to approve the change to OAR's purpose, for which we ask your vote. The opportunity to vote by proxy will be provided, although we hope as many members as possible will come to the Special Meeting.

So stay tuned—we will keep you informed along the way and value your input as we get OAR ready for its next 25 years working for our beautiful rivers!

Very truly yours,

Alison Field-Juma
Executive Director

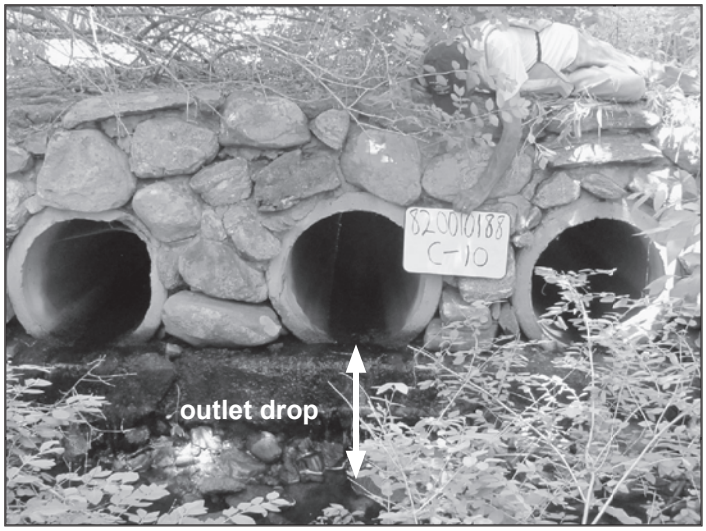
Bridges and culverts of Nashoba Brook watershed surveyed - Good news for fish!

Sue Flint

Our River Continuity Survey showed that fish can pass happily through most of the crossings surveyed along Nashoba and Fort Pond brooks. In May, nine OAR volunteers set out with waders, cameras, GPS units, and tape measures to survey bridges and culverts in Acton and Westford. Of the 59 crossings surveyed and rated, most of the crossings (34) were found to be only minor barriers to fish passage, ten met standards and three were even deemed optimal. Twelve potential problem crossings were identified and will warrant further investigation.

We're not quite done! Next spring we hope to extend our survey to other areas of the watershed and there is plenty to do. In the Sudbury, Assabet, and Concord river watershed there are over 2,300 road/stream crossings and 84 dams, all of which are potential barriers to safe passage from a fish's point of view. Statewide there are 32,000-plus crossings and dams.

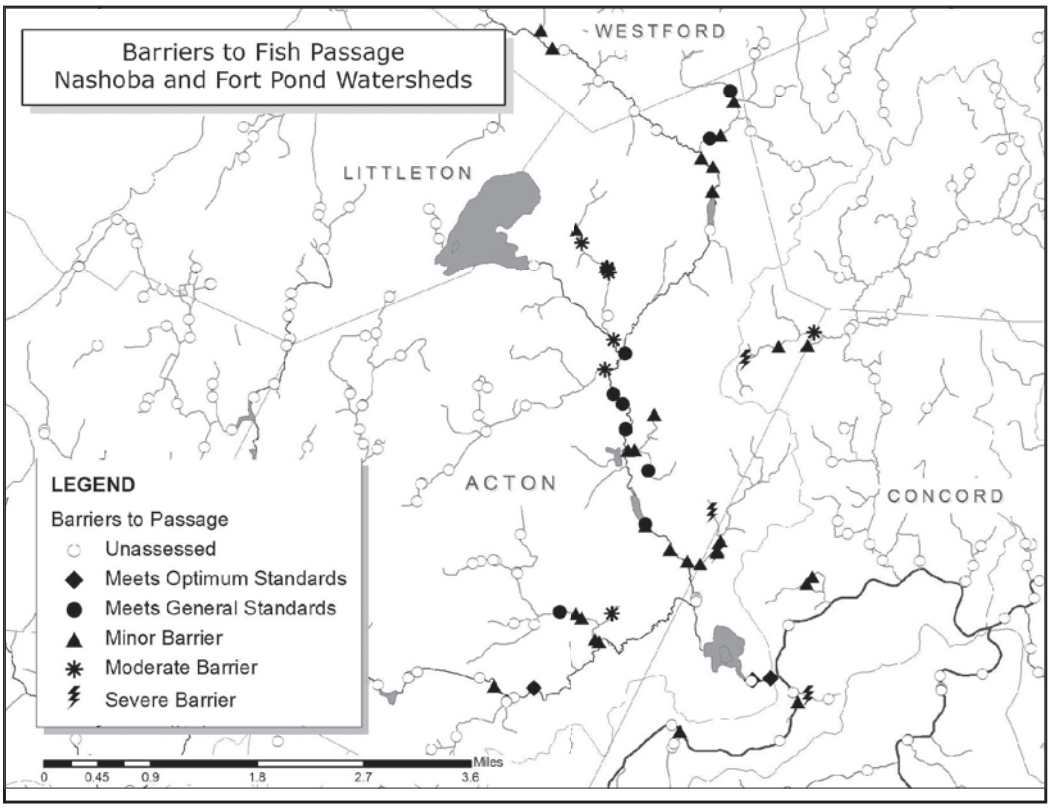
For fish (and other wildlife that depend on our streams) the ability to move safely up and down stream is critical to survival. Access to longer stretches of stream allows fish to find food, breeding places and mates, to escape predators, and to locate cool pools to escape the summer sun. Dams and poorly designed road crossings can fragment the streams, isolating populations of fish, leaving them vulnerable to predation, disease, and poor water quality conditions. Most existing culverts were designed with the principal objective of moving water under a road. Little consideration was given to ecosystem processes such as the natural hydrology and sediment movement, fish and wildlife passage, or the movement of woody debris.



Outlet drop at this culvert (Wingate Lane in Acton) is a severe barrier to fish passage.

The River and Stream Continuity Partnership (UMass Extension, The Nature Conservancy, and Mass Riverways Program) developed fish-friendly standards for new permanent stream crossings and methods for surveying existing crossings in 2000 and have been supporting efforts to survey crossings state-wide.

"Thank you!" to the volunteers who contributed an estimated 200 person-hours of field work to survey over 70 bridges and culverts.



MASSACHUSETTS ENVIRONMENTAL TRUST

This project was made possible through funding from the Massachusetts Environmental Trust (MET).

OAR Annual Meeting: New research and action on our rivers

Alison Field-Juma

After a short business session, this year's Annual Meeting featured a panel of experts showcasing OAR's science projects. Moderated by Lisa Vernegaard of Trustees of Reservations, the panelists presented on-going work on invasive aquatic plants, restoring river continuity, and a study of the effects of hormone-disrupting chemicals in wastewater on Assabet River fish.

Jeff Collins, Director of Mass Audubon's Ecological Extension Service, presented "Invasive Plants: Early Detection and Rapid Response." Jeff described the problems caused by rapid spread of invasive aquatic plants which out-compete local plants, including: shading of aquatic habitat, making it difficult for predators to hunt, removal of dissolved oxygen in the water, and the obvious impediment to enjoyable recreation and aesthetics. He emphasized the need to prevent the spread of seeds and plants by washing down and emptying boats, brushing off boots and clothes, and being on the look-out for unusual new plants. The new Sudbury-Assabet-Concord Cooperative Invasive Species Management Area (CISMA) is a partnership of concerned organizations, including OAR, to tackle this problem throughout the watershed. Its website is coming soon with information on how to detect and manage invasive species.

Sue Flint, OAR's Staff Scientist, gave an engaging presentation titled "Why did the fish cross the road?" (Answer: because the culvert was blocked!) Sue showed various ways that road-stream crossings can impact fish and other wildlife. As linear habitat systems, our streams are fragmented where they cross our extensive system of roads, railroads, driveways, and paths. Each of the 2,300 crossings in the Sudbury, Assabet and Concord River watershed poses a potential barrier to passage. Poorly designed bridges, culverts, and dams can limit the accessible river habitat, impacting the ability of fish to reproduce, find food, escape from predators, or find refuge from the summer heat. (For more details see the River Continuity article, page 3).

Katrina Kipp, Manager of the Ecosystems Assessment Unit at the EPA New England Regional Laboratory in Chelmsford, presented "Hormone-disrupting Pollutants and Assabet Fish." This cutting-edge research is being done through research collaboration between the EPA, OAR, US Fish & Wildlife Service, USGS, UMass Amherst and the National Park Service. The study is in response to concerns that ever-increasing addition of wastewater to the Assabet, which in the summer can exceed 90%, may have other effects beyond eutrophication. While phosphorus is regulated, discharge of pharmaceuticals and personal care products are not regulated and may have effects at extremely low concentrations. This summer scientists sampled the wastewater, river water and fish in the Assabet. Fish larvae were exposed in the lab to the water samples to study whether the male fish are being "feminized" by chemicals in the water. The study will continue next year to see whether the ongoing wastewater treatment plant upgrades may reduce the levels of some of these chemicals in the river water. Stay tuned for the results, which will start to come in this winter.

The river continuity study and part of the hormone-disruption study were supported by the Mass. Environmental Trust. Removal of the invasive water chestnut was wholly supported by our volunteers and members!

Many thanks to the Assabet River Nation Wildlife Refuge Visitor Center for providing a beautiful and appropriate venue for our meeting.

Welcome, New Members!

Nancy Allison
Thomas Arnold
Patrick Callahan
Erikson's Dairy
Blair Gately
Brita Learned
Claire Matthews
Vince and Mary Mattock
Matthew Middleton
Tara Kelleher Reyes
James Rice
Kris Van Naerssen
Christopher Woodcock
Charles Young

Pulling weeds from the Assabet

In June and July OAR and Intel volunteers canoed between Crow Island and Gleasondale in Stow filling their boats with invasive water chestnuts. This was the third summer we have worked in this area—eight more to go (seeds can live on the river bottom for up to 12 years!)

Thanks to Honey Pot Hill Orchard for composting the weeds, Laurie Ullmann for providing canoes, and Dick Lawrence for providing his little yellow truck.

Thanks to our River Cleanup sponsors and donors

On Saturday, September 11, OAR's 24th Annual River Cleanup was a party for the river. Sunny, warm weather and low water brought over 160 volunteers from towns along the river. Tires, bottles, car parts, refrigerators, sinks—everything that should not be in our river—was hauled out for more appropriate disposal. We are grateful for all the volunteers. Thank you to all who partipated.

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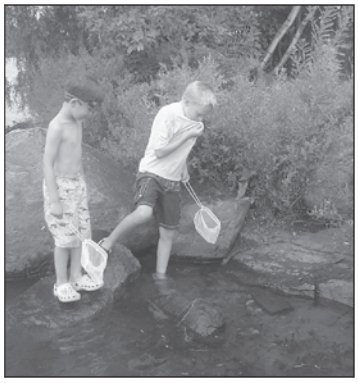
Marlborough: Classic Pizza, Home Depot
Maynard: Maynard Pizza House, Pizza Express

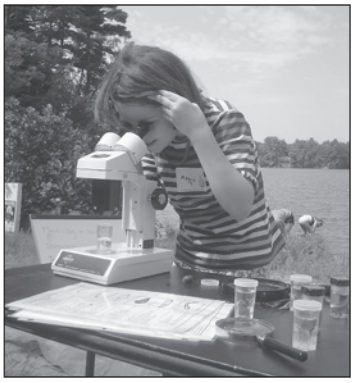
Northborough: Monti's Pizza, Northboro House of Pizza
Stow: Shaw's Supermarket
Other: B-P Trucking, McGeoghean Waste Systems

Towns:
Acton Natural Resources Department
Hudson Department of Public Works
Marlborough Department of Public Works
Maynard Department of Public Works
Northborough Department of Public Works
Stow Highway Department

Thanks to our site leaders, scouters, and boat haulers: Susan Beede, Jay Copeland, Mike Duclos, Bob Guba, Dick Lawrence, Marty Moran, Romaine Randall, Priscilla Ryder, Drew and Kathy Simmons, Betsy Stokey, Pete Tobin, and Laurie Ullmann

Water Wisdom One Drop at a Time





Future river stewards participated in our summer Water Wise Workshops held in Marlborough, Westborough, and Stow. These workshops were taught by two area high school interns, Hannah Whitehead and Varshini Prakash, under the guidance of a local science teacher, Bill Froberg. Through fun, thought-provoking, hands-on activities children were encouraged to explore the world of water and learned how to protect it. OAR was able to offer these free workshops thanks to support from Intel and Dow Chemical.

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details flow on the days leading up to and after each flood peak (see figure). It is significant how often the flood was preceded by water levels that were already above the annual average of 200 cfs, and how quickly water rose from regular flow to flood levels.

All of this flow information comes from a gauge situated next to the river in downtown Maynard, to the back and right of the Tedeschi/Dunkin Donuts parking lot. The gauge, formally Hydrologic Unit 01070005, is 142 feet above sea level. The drainage area upstream of this gauge is 114 square miles. The drained area is not the same as the complete drainage basin of 177 square miles for the entire Assabet because significant downstream tributaries—Fort Pond, Nashoba and Spencer Brooks—enter the Assabet River before it merges with the Sudbury River.

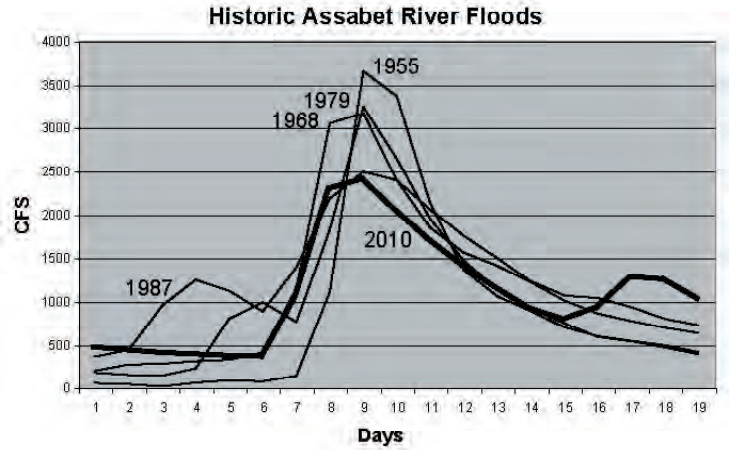
Local experiences

Historical newspaper accounts, available on microfilm at the public library, are rife with stories of bridges washing out. The November 11, 1927 issue of *The Maynard News* reported severe damage to the Papermill bridge (near where McDonald's is now). The replacement bridge was completed in 1928, and is showing its age. Jean Duggan remembers as a child her parents walking with her down Waltham Street in August of 1955 to see the high water from Hurricane Diane flowing over the bridge. Perhaps her parents were anticipating a repeat performance of what they had seen in their childhood.

For the flood of 1968, Jack MacKeen noted, "I have a clear mental picture of Ken Olsen [President of Digital Electronic Corporation] in suit and boots, helping place sandbags between the buildings." Afterwards, DEC had the river retaining wall built higher along the lowest stretch next to the Mill (now Clock Tower Place) in Maynard. The wall kept the river out of the Mill during the equally high flood of 1979.

Impact of dams and development

In Maynard, seven bridges cross the Assabet below the Ben Smith Dam, which was built in 1870. Looking downstream from a bridge one sees clear water over a primarily stony bottom draped in algae



Daily flow for the days leading up to and after each of the significant floods

and waterweeds. The lack of sediment is due to most of the upstream sediment being trapped above the dam. Above the dam, sediment thickness by Crow Island is 4 to 8 feet thick. Nearer the Ben Smith Dam sediment is 1 to 4 feet thick.

Local land use has a major effect on flooding. Recent studies show that the steady increase in paving and roofs due to development increases the amount of stormwater that runs off quickly, and polluted, into our streams and rivers. Since that rainfall does not have the chance to soak into the ground and recharge our aquifers, it is lost to the ocean instead of providing river flow in the summer.

For example, rain falling on the impoundment area upstream of the Ben Smith Dam, the Mill Pond, plus the large parking lots surrounding Clock Tower Place and downtown Maynard, contributes to flash flood potential through and below Maynard. Any rain on those sites gets into the river very, very quickly. As a result, the Maynard gauge shows a sharp upward spike after every heavy rainfall, followed by a sharp downward drop soon after the rain stops, followed by a slow rise as water from the upstream tributaries enters the river.

The other historic mill dams, in varying states of repair, are the Aluminum City Dam at Route 20, Allen Street Dam, Hudson Dam just upstream of Route 85, Gleasondale Dam near Route 62, and then downstream of the Ben Smith Dam, the Powdermill Dam and the remnants of the breached Damonmill Dam. Just like the Ben Smith dam, all of these dams have continuous flow over the top, and hence do not restrain floodwater or reduce flooding. See the OAR website for more on dams and water quality.

Flood Control Dams: Nichols and Tyler

A series of Atlantic hurricanes in the 1950s led to flood control efforts in the 1960s and 1970s. The George H. Nichols Dam inWestborough was completed in 1970. Its reservoir of a bit more than half a square mile serves as a recreational site and a supply of water for the river in times of drought. This earthen dam is next to the Westboro Country Club, just

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Ben Smith Dam in high and low water

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north of Route 30. In times of high water what backs up behind the dam is released slowly through the spillway inlet. Funding from the Recovery Act is being used in 2010-11 to bring the dam up to current safety and performance standards, thus reducing the risk of future flood damage despite land development in the area.

The other flood control dam on the Assabet is the Tyler Dam in Marlborough, about one mile south of the Solomon Pond Mall. Built in 1965, Tyler Dam is designed to not obstruct any flow during normal river conditions. You can see the river flowing under the dam most of the time. It only holds back water into the otherwise dry impoundment area in times of high flows to reduce the flood risk downstream. If the impoundment capacity is exceeded then water flows over the top and down an emergency spillway to the river.

The flood hold-back capacity of the two dams is 500 and 1,800 million gallons, respectively. The amounts sound huge, but the Assabet River's March 2010 peak of 2,500 cfs was 1,620 million gallons per day! Thus, the two dams are enough to mute the worst outcomes of these floods that occur every 10-20 years, but not enough to prevent them completely.

David Mark is a science consultant living in Maynard with his wife Jean D'Amico. Articles on the Assabet River and other topics, published as a column in Maynard's Beacon-Villager, can be viewed at the blog: www.maynardlifeoutdoors.com.

Investigation, *page 1*

effluent. Not knowing what chemicals or waste might be going into the Assabet, Sue alerted officials at the Massachusetts Department of Environmental Protection (DEP) and the U.S. Environmental Protection Agency (EPA), specifying the exact location of the pipe.

Both agencies quickly sent teams to the site to take samples. Analysis showed high levels of fecal coliform bacteria as well as detergents and ammonia, suggesting that some of the flow might be from kitchen, shower, or bathroom drains. They also detected pharmaceuticals in the outflow, further reinforcing that possibility.

Mass DEP made an unannounced visit to Concord-MCI's wastewater treatment plant on June 15th and confirmed the plant was operating properly, and was not contributing to the new pollution source found by Sam and Sue.

MCI's initial response was to propose that kitchen waste, deposited in an outdoor dumpster, had somehow leaked out and flowed into a nearby storm drain catch basin, sending the waste into the Assabet River. However, the pipe's steady flow, as well as sample test results, indicated something else was going on. Later, Concord-MCI suggested that "animals and birds within the facility's walled campus" were possible sources of pollution, a theory also rejected by Mass DEP.

Mass DEP issued an Administrative Order to Concord-MCI on June 25th, stating that the discharge violated Massachusetts' Clean Water Act. The facility was ordered to identify and report all illicit connections to the storm drain system by July 15th, to send weekly status reports of the work, and to conduct two water quality tests once repair of the drain system was complete. However, the order did not set a deadline for completion of actual repair work, or for stopping the flow of pollutants into the river.

Even before receiving DEP's order, Concord-MCI had begun dye testing in an attempt to identify the source of the pollution, and to discover where it connected to the system of storm drains. They brought in their own Department of Corrections experts to help. However, progress was slow. DEP granted Concord-MCI a time extension but, more than a month after the July 15th deadline, they still had not pinpointed the source of pollution, and waste was still pouring into the Assabet – with "extremely high fecal bacteria counts, and elevated ammonia and surfactants [detergent]," according to a strongly-worded letter sent by DEP to Concord-MCI on August 25. "Efforts of Department of Corrections (DOC) staff have failed to adequately address this problem and additional action is required," the letter continued. Mass DEP recommended that DOC get outside help: "DOC should consider using experts, outside of DOC, experienced in this specific type of work to manage and conduct the investigations."

In response, Mass DOC brought in a company specializing in tracing and mapping sewer and stormwater connections. By early October, they had tentatively identified a kitchen sink overflow pipe and three shower drains having undocumented connections to the stormwater system, and the four drains were redirected into existing sewer pipes passing to the facility's wastewater treatment plant.

According to Joe Nerden of Mass DEP, the next step would be to wait for a heavy rainfall to flush remaining contaminants from the storm drain pipes leading to the Assabet River. Heavy rain that fell on the night of October 14th was expected to accomplish this, after which there would be two more rounds of additional outflow sampling and testing. Hopefully, the results will confirm that Concord-MCI has finally identified and fixed the problem, and Sam and Sue can paddle along an Assabet River that's running a little more cleanly, thanks to their efforts.

UPDATE: MCI staff and their contractor did considerable work in September and October, identifying and closing off illicit connections between the facility's kitchen /shower drain network and the stormwater system. After repair, observed flow to the river has been substantially reduced. Several rain storms since the repairs have "flushed" the pipes, and new test samples were taken and analyzed by Mass. DEP. So far, test results have been inconclusive, and the investigation continues.

References:

Mass DEP Unilateral Administrative Order UAO-NE-10-1N001

Letter from Mass DEP to Harold Clark, Commissioner Mass DOC, of August 25, 2010

OAR

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