



**FOR THE ASSABET SUDBURY & CONCORD RIVERS**

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February 1, 2016

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Dear Board Members:

OARS have been informed by David Armstrong of the U.S. Geological Survey (USGS) that he will appear before your board to request permission to remove a beaver dam that is interfering with the proper functioning of the USGS stream-gauging station on Nashoba Brook. I write to you to express the strong support of OARS for this measure to maintain the Nashoba Brook stream gauge.

Dick Lawrence  
*Clerk*  
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I write to you as a board member and immediate past-president of OARS, but also as a 37-year resident of Acton, past member of the Acton Conservation Commission, and a professional practicing in hydrology and water quality. I am the president of HydroAnalysis, Inc., an environmental engineering and hydrologic consulting practice that has been in Acton for 28 years, and have recently retired as a Senior Lecturer in environmental engineering at MIT. I, like most other professionals in my field, have relied throughout my career upon USGS gauging data as a source of accurate and readily-available information on rivers and streams throughout the United States.

Robert Donelan  
*Concord*

Allan Fierce  
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There is a long history of the connection between the water quality of rivers and streams and public health. One need only consider the on-going problems in Flint, Michigan to understand that this connection remains pertinent today despite generally improved environmental water quality. It is impossible to assess the water quality of a river or stream without also knowing its flow regime and virtually every study of environmental water quality begins with assembling the streamflow data available from the USGS. I have used stream-gauging data in assessments of flooding and drought, wastewater disposal systems, public-water-supply wells, wastewater discharges, and hazardous waste sites—all of which have public-health implications. Indeed, streamflow is such a critical factor in water quality that published studies often relate river water quality directly to the river's flow.

Dave Griffin  
*Maynard*

Brian Kilcoyne  
*Concord*

Martin Moran  
*Hudson*

The following is an example of how OARS very recently used the information from USGS stream gauges. In December, OARS was evaluating the renewal of Massachusetts Water Management Act permits for the Concord River Basin. These permits, which govern withdrawals of ground or surface water, come up for renewal on 20-year cycle and all permits for an entire river basin are considered at the same time. Water withdrawals have the potential to affect river flow as evidenced by the Ipswich River in Massachusetts. In that basin most water is supplied locally by ground-water wells, but wastewater is discharged to MWRA sewers and sent to Deer Island for treatment and discharge to Boston Harbor. Thus, there is a net export of water which has all but dried up the Ipswich River in summer.

Pam Rockwell  
*Concord*

Peter Shanahan  
*Acton*

Lisa Vernegaard  
*Maynard*



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We wondered if a similar reduction in summer low flow could be happening in our watershed. Fortunately, continuous streamflow records are available from the USGS and we downloaded the continuous record of streamflow for the Assabet River at Maynard from 1942 to the present. We determined the annual minimum low river flow over seven continuous days, a common measure of low summer streamflow, and prepared a plot which is included here as Figure 1. To our surprise, summer low flow is not declining in the Assabet, but is instead increasing over time. Why? Fortunately, the Nashoba Brook gauge is in the same watershed and responds to the same climatic conditions. The record for Nashoba Brook is shown in Figure 2 and shows no trend of increasing summertime low flow. This helps make clear why flow is increasing in the Assabet River: increasing amounts of wastewater discharge.

It is when one considers that flow in the Assabet River is rising mostly due to increased wastewater discharge that the nexus between streamflow, water quality, and public health becomes clear. The Assabet River is mostly wastewater diluted by some natural flow in the summer. The USGS flow data suggest that the proportion of wastewater is increasing, which is consistent with population growth and increased sewerage in the basin. While this wastewater is treated, treatment is never perfect and we can expect that pathogenic bacteria are likely at higher concentrations when river flow is low. More of a concern for OARS, however, are the so-called emerging contaminants. These include endocrine-disrupting compounds, pharmaceuticals, and personal care products. A recent study showed intersex fish in the Assabet River—that is, fish showing both male and female characteristics—and attributed the phenomenon to endocrine disrupting compounds from wastewater (Iwanowicz, L. R., V. S. Blazer, et al. (2016). "Evidence of estrogenic endocrine disruption in smallmouth and largemouth bass inhabiting Northeast U.S. national wildlife refuge waters: A reconnaissance study." *Ecotoxicology and Environmental Safety* **124**: 50-59.) While this is mostly a concern for aquatic life, the Town of Billerica withdraws their drinking water from the Concord River downstream of its confluence with the Assabet. Flow data can help us assess the extent to which dilution can reduce chemical concentrations by the time Assabet River water reaches Billerica and more generally help us understand our river system.

I hope this short example makes clear how USGS streamflow data are important to analysis of river systems, river water quality, and public health. While it is impossible to draw a straight line to an immediate public health crisis from the current interference of the Nashoba Brook gauge by beaver dams, over the long term, the availability of accurate, long-term records of streamflow are a key input to assessments of environmental water quality and climate change, both of which can significantly affect public health. For this reason, OARS strongly supports the USGS's request to remove the beaver dam and maintain accurate streamflow records on Nashoba Brook.

Thank you for your careful consideration of this recommendation.

Yours sincerely,

Peter Shanahan, Ph.D., P.E.

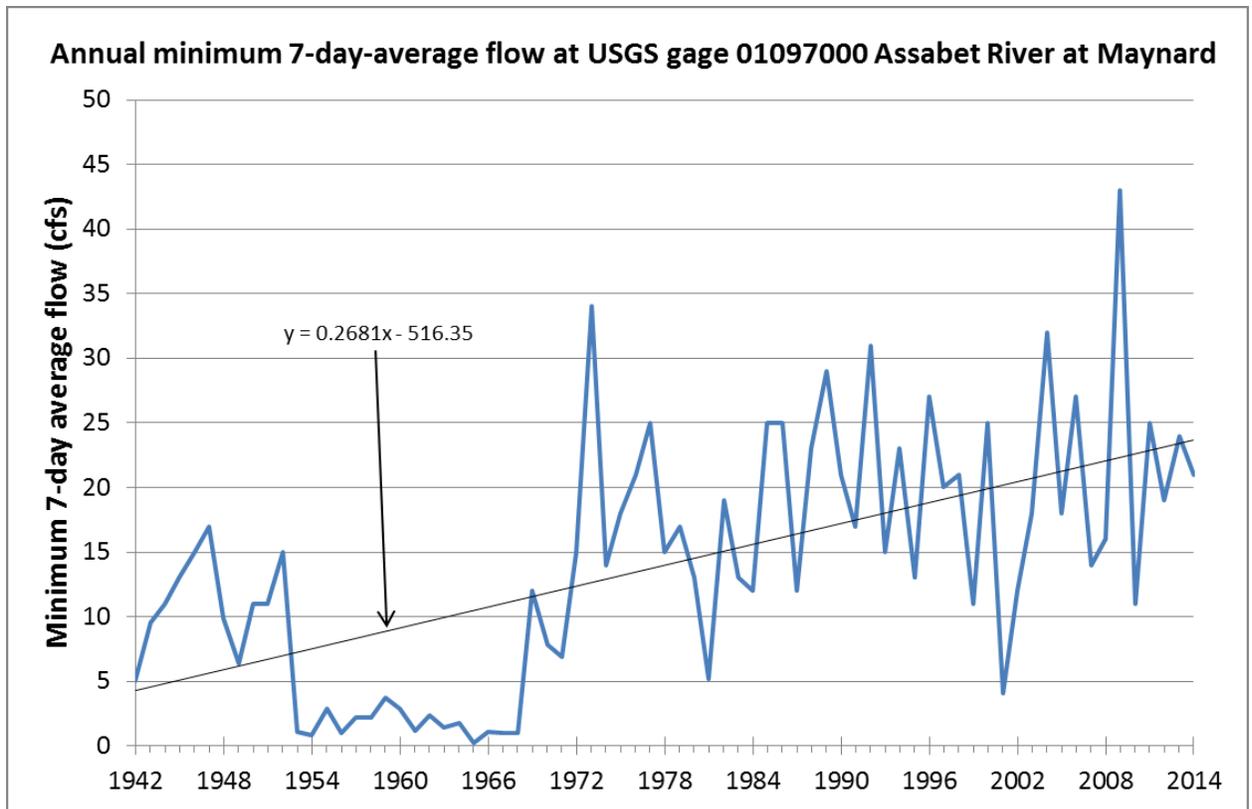


Figure 1. Historical Flow Record for the Assabet River at Maynard

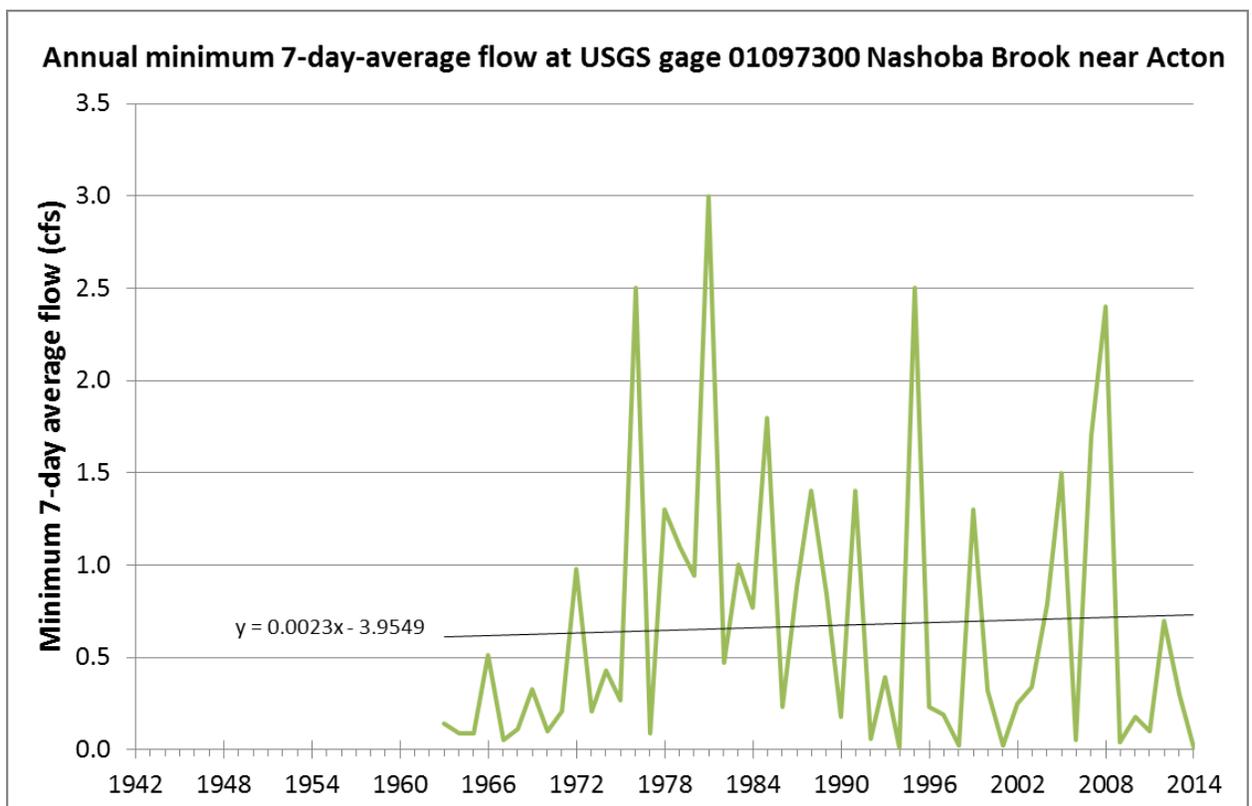


Figure 2. Historical Flow Record for Nashoba Brook near Acton