



## ***4 Rivers One River System***

### **C4RWC Bacteria Monitoring Program**

#### **2017 Season Report**



***Monitoring for healthy rivers.***

*Prepared by:*  
Keith Davies  
2/8/18

# Table of Contents

	Page:
1. Executive Summary	3
2. Introduction	4
3. Project Approach	5
Purpose	
Objectives	
Methods	
Monitoring sites	
4. Results	10
Bacteria	
Weather	
Field sheets	
Source Tracking	
5. Observations/Discussion/Recommendations	12
Maps	
Watershed Overview – Sample sites	9
Tables	
Sampling Sites	9
Bacteria Data	10
Weather Data	11
River Temperatures	11
Appendix	
2017 summer river flows	14

A digital version of this report can be found at [www.chicopeewatershed.org](http://www.chicopeewatershed.org)

## ***Executive Summary***

In 2017 the Chicopee 4Rivers Watershed Council (C4RWC) successfully conducted its third bacteria monitoring season. A group of dedicated volunteers executed this program by monitoring a total of ten (10) sites on the Swift, Ware, Quaboag and Chicopee rivers. Seven distinct sampling events were completed during the major recreational contact season.

C4R was able to maintain this program in 2017 with broad based community support. This sampling is a key part of a larger effort to engage watershed residents in greater watershed awareness and stewardship. Another component of this effort is Blue Trails: improved river access and exploration/recreation. Water-based recreational activities are determined to be appropriate based on the concentration of bacteria in the river or water body. A rivers general health can also relate to bacteria levels.

By conducting a continuing annual program of volunteer monitoring, C4RWC aims to provide watershed residents and visitors with practical information concerning the safety of using and enjoying local rivers and ultimately presenting the health of the watershed. Bacteria results were posted regularly on [www.connecticutriver.us](http://www.connecticutriver.us) through a partnership with CRC. The data collected was determined to be of reliable quality.

Third-year results indicate a generally healthy river system for a variety of types of recreation: though one event had high bacteria levels likely related to a heavy rain event that preceded the sampling.

Typically, it is wise to limit primary contact after a heavy rainstorm. Often in areas located downstream of urban centers, which collect greater amounts of stormwater runoff, it is not unusual for bacterial concentrations to run high. 2017 sampling saw a few rain events, moderate river flows, but this situation presented itself only at one rather wet event.

The success of this monitoring program illustrates the value and importance of volunteer activities to monitoring public health. As C4RWC continues its efforts to promote public recreation and enjoyment of local rivers through a series of “Blue Trails,” this volunteer monitoring program should increase in importance and engage more residents to be “the eyes and ears” of the watershed. Such stewardship efforts are vital to maintaining the health and resiliency of our watershed and the many communities that call it home.

## ***Introduction***

As part of promoting a series of recreational “Blue Trails” within the watershed, C4RWC determined that it would be beneficial to manage a “complementary” bacteria monitoring program. This program serves several purposes: first, to gauge general water quality and river health; and second, to inform the public on the safety of recreational activities on/in the river. For people to enjoy our rivers with piece of mind, it is particularly important to determine if the Blue Trail and other segments meet the MassDEP water quality contact standards.

C4RWC relies on fundraising and grants to help support program costs, mainly laboratory analyses of samples and some monitoring equipment. C4RWC is grateful for support from:

*Palmer Conservation Commission, Warren CC, Wilbraham CC, Springfield CC, Town of Ware Parks & Community Development, LWPA, QQLA, Country Bank and individual donors.*

C4RWC used the CRC, Connecticut River Conservancy, lab in Greenfield for sample analysis. Sampling kits were organized for each sample site.

Another key step was to find volunteer samplers. Outreach brought 9 people forward to help. All received training in proper sampling techniques, and bi-weekly sampling began on June 15, 2017 and ran through September 7th. In all we conducted seven sampling events at (10) sampling sites on the Ware, Swift, Quaboag and Chicopee Rivers – ALL 4 Rivers.

Volunteers also noted temperature and other site conditions observed during each sampling event. Weather conditions within 48 hours of sampling events were recorded.

The 2017 sampling year was a strong success. Volunteer samplers did well and there were few complications. Reporting on line also worked well. This third year experience illustrates C4RWC commitment to monitoring and will guide any enhancements to C4RWC’s monitoring program as we look continually to optimize the choice of monitoring sites, and encourage more people to explore the Watershed and its rivers.

### ***Special thanks to our volunteers!***

Catherine Callaghan, Tom Rouleau, Randy Weiss, John Piechota, Sarah Brodeur, Ruben Flores-Marzan, Judi Mosso, Tim Obrien, Joyce Eichacker, Keith Davies/coordinator.

# ***Project Approach***

## **Purpose**

A 2003 Mass-EOEA comprehensive watershed assessment notes that *“data gaps are most pronounced for certain ecological characteristics, including animal and habitat data, and water quality data. The latter is of particular concern since the quality of the water flowing through and out of the basin is often considered to be a reflection of its overall environmental condition or health. Water quality data is collected by a number of organizations and agencies in the Chicopee River basin, but not in a basin-wide coordinated way.”* C4RWC mission is to work towards a resolution to this deficiency.

The Chicopee River and its watershed offers many fine recreational and nature viewing opportunities. Unfortunately there is a lack of regular water quality data to determine if the river is consistently meeting the state’s surface water quality standards (SWQS). Many years ago, the river struggled with point source pollution, such as sewage discharges, which in time have been largely dealt with. Recreational activities are related to either primary or secondary contact standards, which are closely tied to the bacterial condition of the waters. Bacterial data has been too sporadic to make clear/regular contact standard determinations. Having adequate bacteria data to make a clear determination would inform people whether water recreation is safe and healthy.

MassDEP-Division of Watershed Management, (DWM), samples the Chicopee River Watershed on a five-year rotating basin schedule. Very little sampling is done in between cycles. There is a need for more regular and consistent monitoring, a local group such as C4RWC can help to provide monitoring to fill this gap.

In order to provide a more adequate data set with which to determine whether standards are being attained, having ***more sites sampled at more regular intervals***, in season, offers the means to make a clear determination. Sampling at key access sites across the watershed, 6-8 times at each, during the prime contact months, May through September, should offer an adequate baseline. Funding may limit the ability to cover this broad range continually, so C4RWC will focus on key areas and target additional sites when possible.

An expanded data set will give a broad collection of locations and time periods, more wet/dry event information to review, and even a means to begin to consider source issues. Additional new data will help C4RWC and MassDEP to make accurate water quality determinations for the Chicopee Basin.

**Definitions: (MassDEP)*****PRIMARY AND SECONDARY CONTACT RECREATIONAL USE (DEP)***

The *Primary Contact Recreational Use* is supported when conditions are suitable (fecal coliform bacteria densities, turbidity and aesthetics meet the SWQS) for any recreational or other water related activity during which there is prolonged and intimate contact with the water and there exists a significant risk of ingestion. Activities include, but are not limited to, wading, swimming, diving, surfing and water skiing.

The *Secondary Contact Recreational Use* is supported when conditions are suitable for any recreational or other water use during which contact with the water is either incidental or accidental. These include, but are not limited to, fishing, boating and limited contact related to shoreline activities.

*State limit for primary contact is 235 cfu/single date maximum and seasonal mean of 126 cfu. The secondary contact standard is 1240 cfu single day and 630 cfu seasonal mean.*

Stakeholders for this project include residents, visitors to, and recreational users of the Chicopee 4Rivers Watershed; municipalities, and state, regional and federal environmental agencies. The data produced in this study will be shared with all stakeholders, to aid them in making personal decisions on safe use of the river for recreational purposes; understanding causes and effects of weather, land use and other human activities on water quality; and developing management strategies for preservation/restoration of watershed health. All data that are reported will be compared with Massachusetts surface water quality standards.

**Objectives:**

Since key access sites across the basin have not been extensively nor annually monitored by MassDEP for bacteria loading, this project is meant to complement MassDEP's limited monitoring program by conducting bacteria sampling on waters not monitored by MassDEP in order to facilitate the ability to make water quality standard attainment determinations for primary and/or secondary contact on a regular annual basis.

This monitoring program is intended to:

- Advance improvement of the water quality of rivers and streams in the Chicopee 4Rivers Watershed that may be impaired due to bacterial contamination. Steps towards

achieving this goal may entail locating sources of bacteria contamination within targeted sub-watersheds and recommending appropriate action to initiate remediation.

- Contribute to ongoing and future assessments of whether bacterial contamination impairs the river's ability to support primary and secondary contact recreation.
- Convey this information to local, state and federal agencies and to river users through 'rapid response' analysis and communication. 24 hour turnaround of sampling results enables quick public notice.

## **Methods**

C4RWC's volunteer guide notes the procedures, reasonings, and details of the monitoring processes. These procedures have been used since 2015 and again in 2017.

Once adequate funding was secured, C4RWC began to assemble needed equipment and select a qualified lab. Sampling kits were assembled for each volunteer and each site. Coolers and ice pack sets were acquired. A sampling pole, 42 inches long with a spring clamp attached to one end, was fabricated for each volunteer. This pole enabled the sampler to reach out into the current and grab a sample from a deeper point in the stream and lessen edge effects.

Each volunteer received training in sample collection, data form completion, appropriate sample care (keeping sample cold), hold time requirements, label completion, safety concerns/requirements, Quality Control (QC) requirements, and sample delivery logistics. Volunteers followed a preset sampling schedule and were reminded of sampling events 3-4 days ahead of time and regularly resupplied with sample bottles and forms if needed. Sampling was done, rain or shine, considering safety, and fortunately no events were cancelled.

Collection was done via a "grab" type sampling procedure using a sampling pole. Samples were collected in 100 ml sterile bottles prepared with thiosulfate – as a precaution against chlorine that could be present in the water sampled below a water treatment plant and which would affect sampling results. Bottles were labeled with date and time of collection and put on ice in a cooler immediately after collection. Volunteers also completed a field sheet and internal C4RWC Chain of Custody (CoC). Samples were then brought to a central meeting place where a C4RWC runner collected all samples into a single iced cooler and transported all samples to the lab for analysis. Once there, samples were checked in and temperature and time recorded. Samples were analyzed for bacteria using a Colilert system.

Typically only 24 hours elapsed until the lab report was issued. Data was then posted on line ([www.ConnecticutRiver.us](http://www.ConnecticutRiver.us)) through a partnership with CRWC and PVPC, then tabulated by event date and site.

River and air Temperature was sampled using a conventional non-mercury spirit type thermometer which was placed in the flow and permitted to equilibrate for two minutes before reading. Temperatures were recorded on a field sheet with other site observations.

Meanwhile, the project coordinator had downloaded weather/rain data from NOAA/NWS for sites at both the Westover and Worcester airports for both the 24 and 48 hours previous to the sampling event. These airports are closest to our monitoring sites. Rainfall was recorded and tabulated for analysis. Wet weather can elevate bacteria, so viewing this data is important. River flows were also downloaded from available USGS stations.

With all this information collected and tabulated, we are able to review the rivers' contact standards.



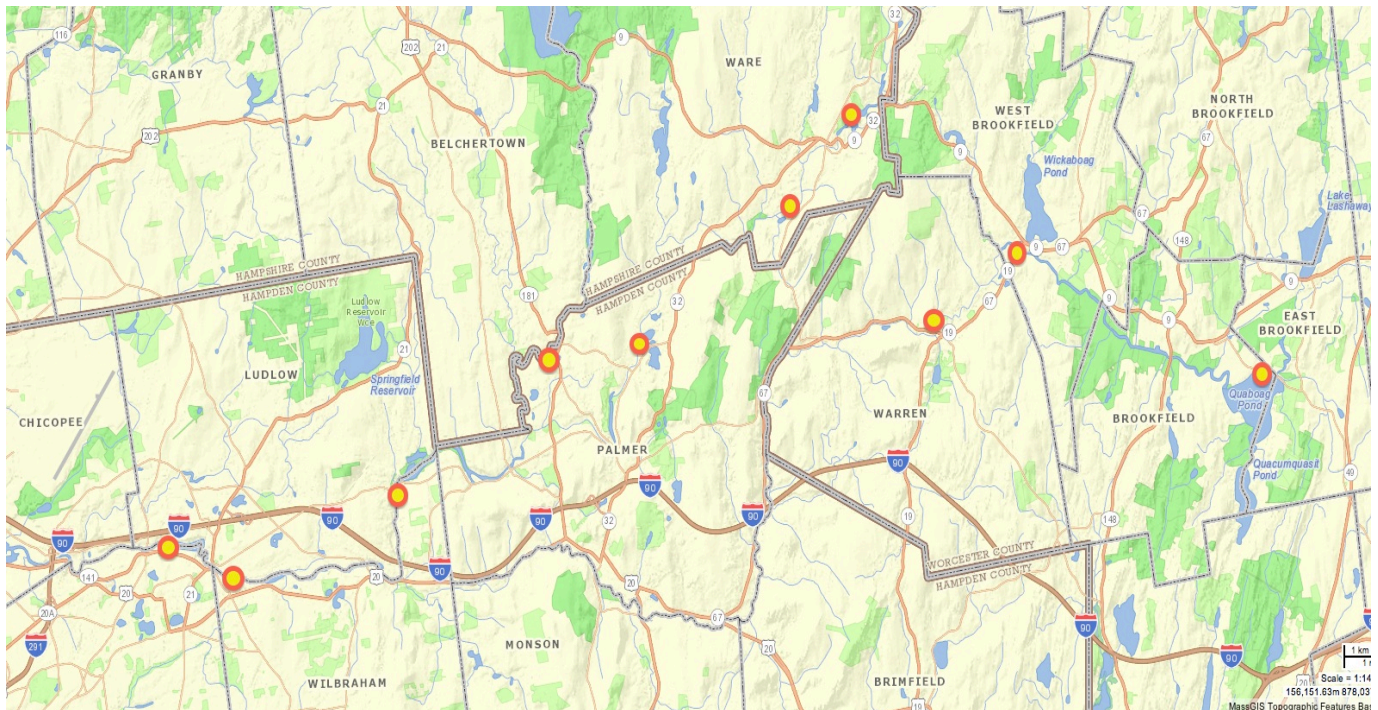
## 2017 Monitoring sites

The sites selected for monitoring have been chosen with the following factors in mind:  
geographic representation in reaches of recreational activity and ease of access.

**Table 1: 2017 Sampling Sites**

Site Name	Site ID	Location	Latitude	Longitude
Chicopee-Indian Orchard access	CIO1	Water St, Springfield	42.161	-72.50118
Chicopee-Putts Bridge access	CPB1	River Rd, Wilbraham	42.153	-72.4102
Chicopee-lower Red Bridge access	CRB1	Red Bridge Rd Wilbraham	42.17448	-72.4102
Quaboag Pond access	CQPd1	Quaboag St, Brookfield	42.20338	-72.0628
Quaboag Rt 67/9 access	CQ67-9	Rt 67 near Rt 9 W Brookfield	42.23485	-72.16203
Quaboag – Lucy Stone Park	CQLSP1	Lucy Stone Park, Old West Brookfield Rd, Warren	42.21743	-72.1841
Ware R - Bennett St	CWB1	Bennett St, old bridge	42.2084	-72.3148
Swift R – First Street access	CSFS1	First St cul-de-sac, Bondsville	42.209	-72.3495
Ware R – Greenville Park	CWGP1	Off Church St in Ware	42.26672	-72.22755
Ware R – Banas Farm	CWBF1	End of Robbins Rd, ½ mile to river	42.24423	-72.2544
Ware R - East Greenville Park	CWEGP1	Off East St/Rt 9		

## Sampling Sites Map



# Results

## Bacteria

The table below notes the bacteria levels for the 2017 sampling season. A discussion and interpretation of these results is presented in the Conclusions section.

### C4RWC 2017 Bacteria Sampling Results summary

Site Name	ID#	Bacteria Counts							Geo Mean count	Use
		Date	Date	Date	Date	Date	Date	Date		
		6/15	6/29	7/13	7/27	8/10	8/24	9/7		
Quaboag Pond access	CQPd1	12.1	8.5	7.5	13.4	114.5	29.8	4.1	14.65	primary
Quaboag 67/9 access	CQ67-9	53	47.9	53.8	98.7	67	83.6	248.9	78.76	primary
Quaboag-Lucy Stone Park	CQLSP1	58.3	54.6	53.8	98.2	57.6	57.3	613.1	85.73	primary
Swift - First St	CSFS1	26.2	41.4	37.3	25.9	16.1	18.7	30.9	26.73	primary
Ware - Grenville Park	CWGP1	63.7	116.9	178.5	93.3	90.5	178.5	2420	174.10	second
Ware - Banas Farm	CWBF1	110.6	108.1	119.8	155.3	107.6	218.7	1732.9	190.40	second
Ware - Bennett St	CWB1	63.8	74.8	105	160.7	105	155.3	980.4	144.05	second
Ware - East Grenville	CWEG1	86			155.3			2420	318.54	second
Chicopee Red Bridge	CRB1	65	104.3	178.5	104.6	49.6	95.9	228.2	104.64	primary
Chicopee Putts Bridge	CPB1	48	42.2	146.7	104.6	86	54.8	214.3	84.75	primary
Chicopee Indian Orchard	CIO1	21.8	344.8	62	41	35.5	101.4	69.1	64.71	primary

Light Red shaded spaces exceed primary contact standards.

The 9/7 date was preceded by noticeable rainfall, more towards the northeast part of the watershed. Ware River sites were all noticeably high.

*State limit for primary contact is 235 cfu/single date maximum and seasonal mean of 126 cfu. The secondary contact standard is 1240 cfu single day and 630 cfu seasonal mean.*

## **Weather**

Weather was recorded from the Westover and Worcester Airports for the 24 & 48 hour periods prior to the sampling event. During these time periods, streams are most greatly affected by stormwater runoff, which can illustrate runoff's impacts on water quality.

### **C4RWC 2017 Bacteria Sampling Results summary**

#### **Rain Data**

Site Name	Date	Date	Date	Date	Date	Date	Date
	6/15	6/29	7/13	7/27	8/10	8/24	9/7
Rain within 48 Hr	0"	0.5"+	0.25"	0"	0"	0.2-0.4"	0.95-1.5"
Determination	DRY	WET	WET	DRY	DRY	WET	WET

rain in past 24 and 48 hours

if > 0.25 in 48 hr = wet weather

if > 0.10 in past 24 hr = wet weather

## **Field sheets**

Field sheets were used by volunteers to record any observations about water color or odor as well as water temperatures.

Odor and color are somewhat subjective. By and large there were no notable odor or color observations reported, nor any on going observations of concern. Color was often clear or a slight tea tint was noted. Occasionally a musty odor was observed, no significant or troubling odors were reported. Below are water temperatures as recorded by the volunteers.

### **Table: 2017 River Temperatures**

#### **C4RWC 2015 Bacteria Sampling Results summary**

Site Name	ID#	River Temperatures F						
		Date	Date	Date	Date	Date	Date	Date
		6/15	6/29	7/13	7/27	8/10	8/24	9/7
Quaboag Pond access	CQPd1	74	72	76	75	74	74	67
Quaboag 67/9 access	CQ67-9	73	69	76	69.5	70	71.5	65
Quaboag-Lucy Stone Park	CQLSP1	71	70	76	70	72	73	65
Swift - First St	CSFS1	61	58	66	64	64	65	61
Ware - Grenville Park	CWGP1	67	70	74	70	70	71	68
Ware - Banas farm	CWBF1	65	66	75	64	68	68	63
Ware - Bennett St	CWB1	71	70	76	70	71	74	65
Chicopee Red Bridge	CRB1	72	70	75	68	69	72	65
Chicopee Putts Bridge	CPB1	69	68	73	67	67	70	62
Chicopee Indian Orchard	CIO1	70	70	73	70	70	73	70

## **Source Tracking (ST)**

There was no source tracking performed in 2017, though the last event, a WET, could have suggested a need to look further upstream along the Ware River, possibly Gilbertville and Old Furnace.

## **Training:**

All volunteers received training in sampling, sample handling, recording, labeling, and safety procedures.

## **Sample Handling/Hold Times:**

All samples were transported on ice packs, in coolers, and were received amply chilled. All samples were delivered to the lab within the six hour maximum hold-time limit. A few samples were delivered so soon that they had little time to chill. There were a few writing legibility issues in noting sample IDs on forms and these were successfully sorted out.

All source tracking sampling was collected by the lead coordinator using consistent collection techniques.

## ***Observations/Discussion***

(7) of the (10) sites met primary contact standards for the season, the Ware River sites were all secondary contact mainly due to the high 9/7 sampling event. The heavy rains seem to have caused a spike in bacteria in this area. Without 9/7, all sites would have been primary. All sites were good for boating/paddling/fishing.

Values for the primary contact sites were mostly low, a good indication of a healthy river. The secondary sites geometric means were not noticeably high, but it may be warranted to investigate upriver conditions to see if a source of the higher bacteria can be determined.

The high results for 9/7 on the Ware River point to a need to resume monitoring in Gilbertville and Old Furnace as was done in 2016. Perhaps a better profile of the bacteria spike over a longer stretch of the river could have shed light whether if a problem exists.

Last season, the Quaboag site, CQ67-9, had been an area of concern and was sampled extensively. Fortunately in 2017, the area tested fine, so whatever was at issue in 2016, seems to have abated. Still, it will be prudent to monitor this area to be sure no reoccurring problem exists.

The Indian Orchard site had good results (1 high). There is a partial CSO nearby which could spill sewage into the river at high rain events (which was not seen this summer). Continued sampling at CIO1 is strongly recommended.

Most river temperatures were in the low/mid 70s during July/August, a couple degrees cooler than last year, and began to cool slightly in September. The Swift River site is strongly influenced by the bottom draw off of flow from the Quabbin Reservoir release, thus it is noticeably cooler.

General river observations did not present any particularly startling notes. Algae was seen at a site or two, which could indicate a nutrient rich condition. More detailed observations could inform the need for nutrient sampling.

### ***Recommendations***

C4RWC should continue sampling at noted sites to continue to build a data baseline and maintain awareness of river health for river users. Sites in Hardwick along the Ware River should again be sampled.

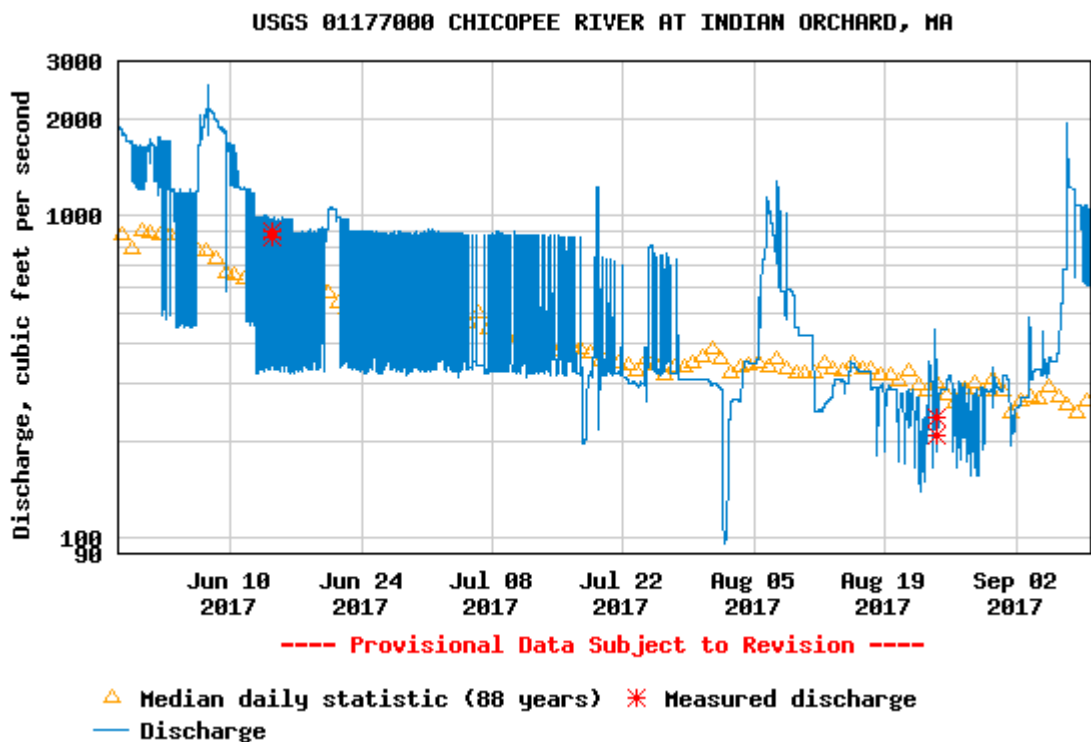
Additional sites could be added at other river sites (new Blue Trails) if funding is available to broaden the public's ability to be aware of overall watershed health.

Reserve funds should also be marshaled to help strengthen the ability to investigate areas near sites of concern, ie: source tracking. Regular monitoring keeps the public informed and engaged.

## Appendix River Flows 2017

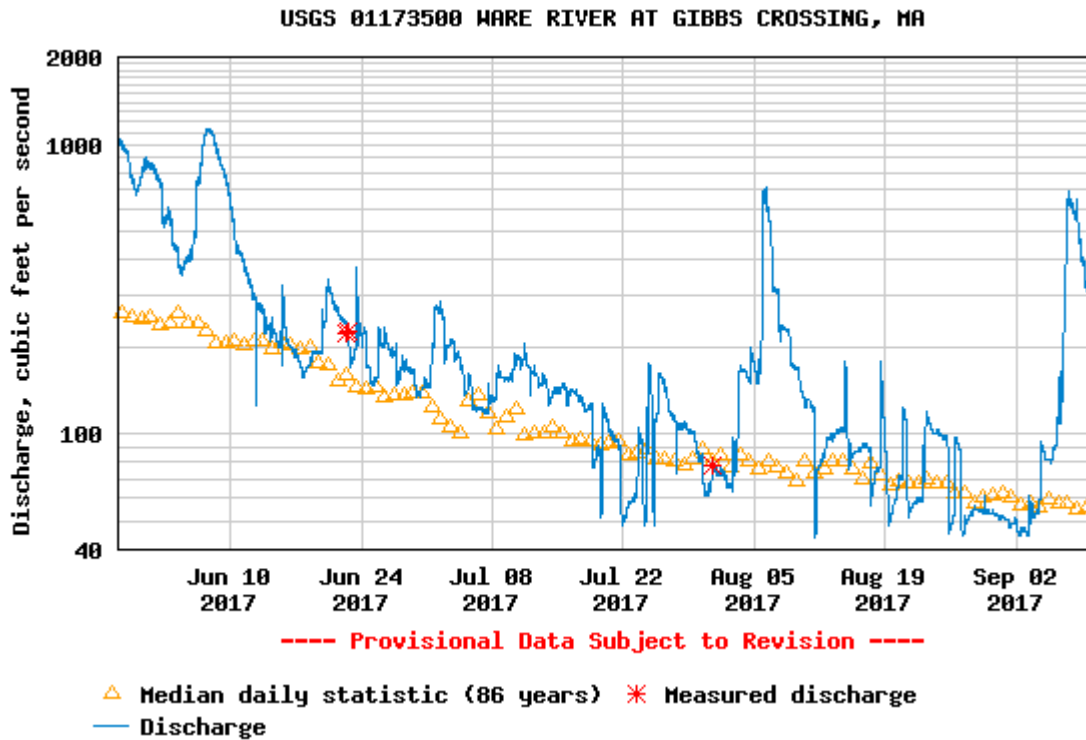
Charts for each of the 4 Rivers through the summer of 2017.  
Small triangles show median flow over 75+ years.  
2017 flows were a bit above the median.

### Chicopee River



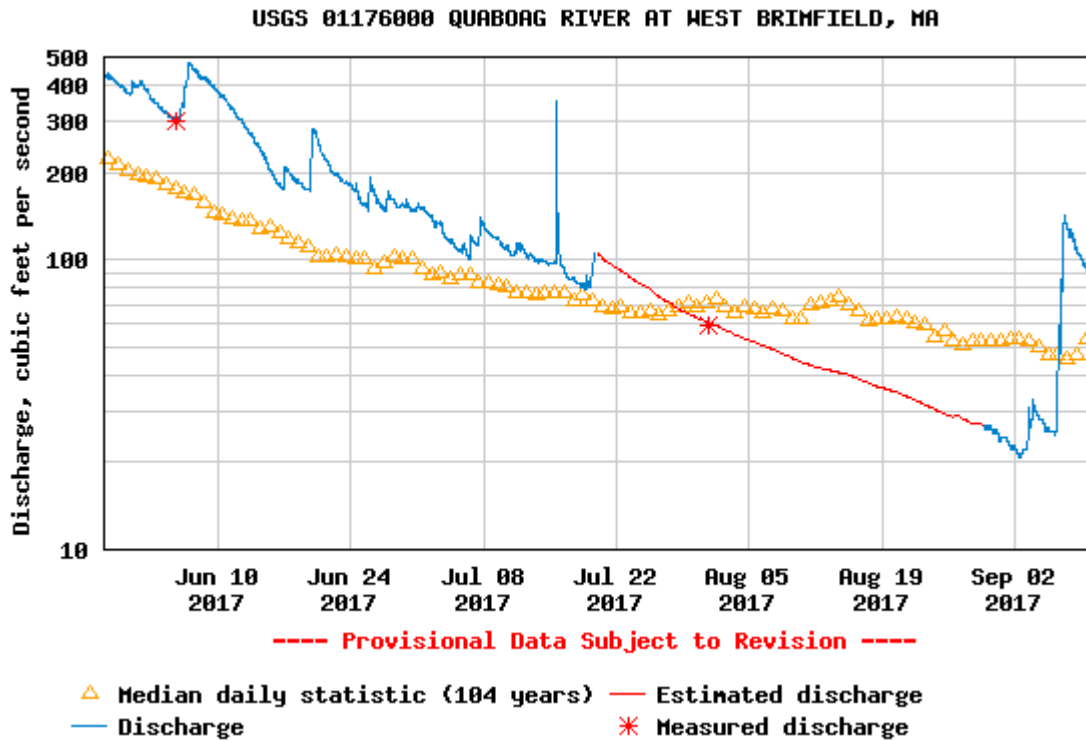
Chicopee River flow here is controlled by a small scale upstream hydro facility,  
thus the swings in flow. Best to interpret by looking at the mid range of the swing.

## Ware River



## Quaboag River

Gage may have had a problem during July/August.



**Swift River** flow is controlled out of Quabbin Reservoir, so little natural variation.

