



## OARS Bacteria Monitoring Results—2021

Updated October 12, 2021

Following is a summary of OARS’ monitoring results for 2021 for *E. coli* bacteria at the core 6 locations in the Sudbury, Assabet, and Concord rivers.

*E. coli* is used as an indicator of fecal contamination in water bodies, and the EPA has defined safety threshold values for recreational swimming and boating. The swimming threshold for single samples is 235 CFU/100 ml. The swimming threshold for the geometric mean of all samples for the season is 126 CFU/100 ml. Bacteria data are normally analyzed on a logarithmic scale because bacteria multiply exponentially.

### 2021 Results (June 7, 2021–September 13, 2021)

Site #	Description	River	Samples	Exceed-ences	% Exceeded	Geo-Mean	2019 Geo-Mean	2020 Geo-Mean
ABT-077	USGS gage, Maynard	Assabet	15	3	20%	130	121	289
ABT-162	Cox Street, Hudson	Assabet	15	2	13%	97	161	203
SUD-096	Route 20, Wayland	Sudbury	15	0	0%	33	51	113
SUD-236	Rte 135, Ashland	Sudbury	15	4	27%	147	151	348
CND-110	Rte 225 boat ramp, Bedford	Concord	15	0	0%	40	40	27
CND-009	Rogers St. Bridge, Lowell	Concord	15	3	20%	127	147	216

### 2021 Results without July 19<sup>th</sup> data

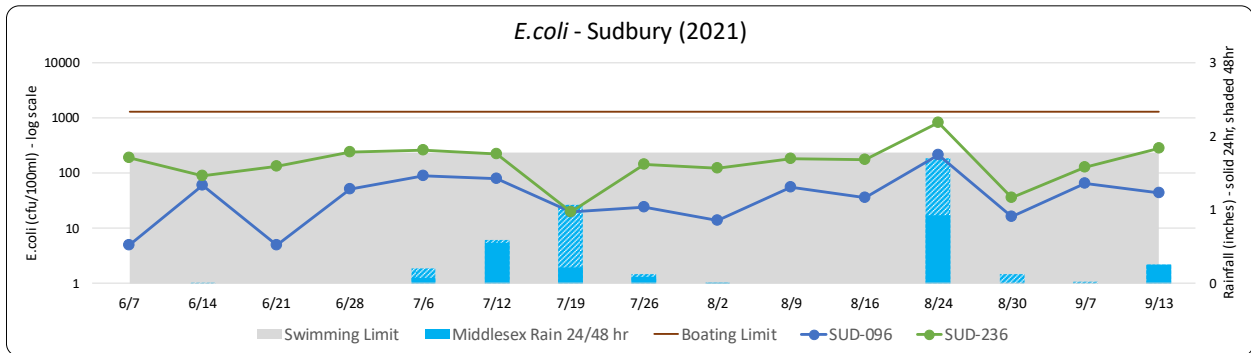
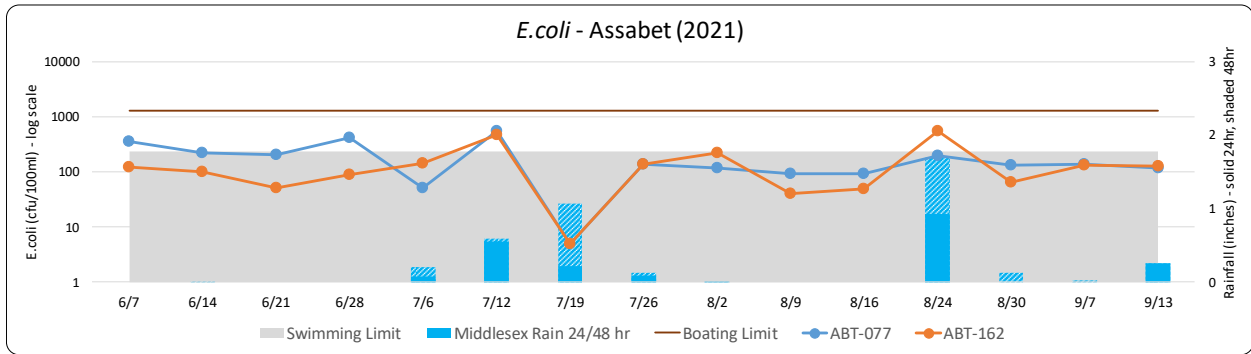
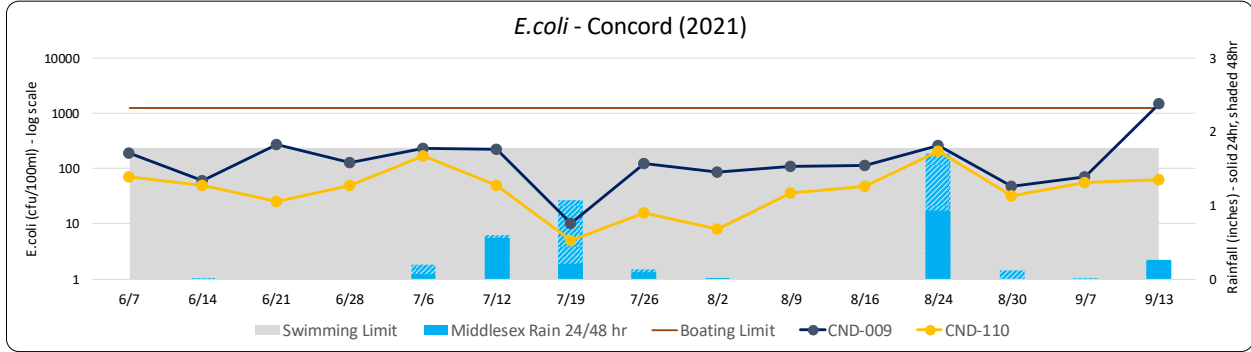
Site #	Description	River	Samples	Exceed-ences	% Exceeded	Geo-Mean
ABT-077	USGS gage, Maynard	Assabet	14	3	21%	164
ABT-162	Cox Street, Hudson	Assabet	14	2	14%	119
SUD-096	Route 20, Wayland	Sudbury	14	0	0%	34
SUD-236	Rte 135, Ashland	Sudbury	14	4	29%	169
CND-110	Rte 225 boat ramp, Bedford	Concord	14	0	0%	46
CND-009	Rogers St. Bridge, Lowell	Concord	14	3	21%	153

*(Pink shading designates > 25% exceedance of single-sample threshold or geo-mean exceedance.)  
(See graphs of data below)*

Bacteria levels in 2021 have generally confirmed the patterns we have been seeing over the past two years. Maynard, Ashland, and Lowell continue to have concerning levels of bacteria, hovering near or above the EPA swimming threshold. Also, similar to previous years, Hudson has slightly lower bacteria levels than Maynard in dry weather, but tends to have equivalent or higher levels in wet weather (see wet-weather analysis below). This indicates a dominance of surface runoff or stormwater contamination sources in Hudson. In Maynard, on the other hand, there is little difference between wet and dry weather, which indicates a high probability of sanitary sewer contamination.

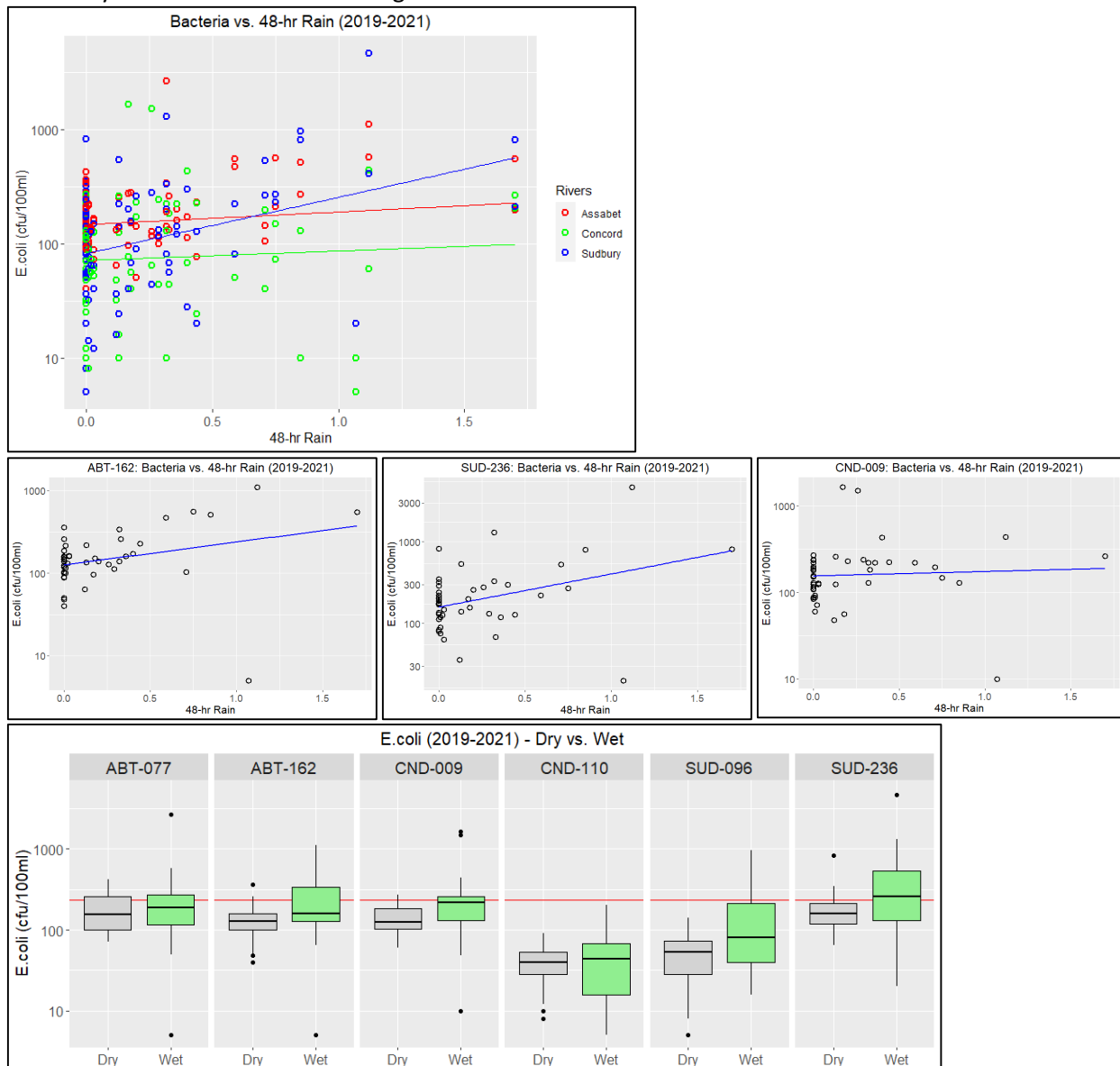
The July 19<sup>th</sup> data were interesting because bacteria levels were extremely low at all sites. July 19<sup>th</sup> was the third week in several weeks of very heavy rain and flooding, so the samples were heavily diluted by the large amount of water, and they also reflected the fact that most contaminants had already been washed out of the system by the continuous rains. The second chart above shows 2021 results excluding July 19<sup>th</sup>.

## Graphs of data by river:

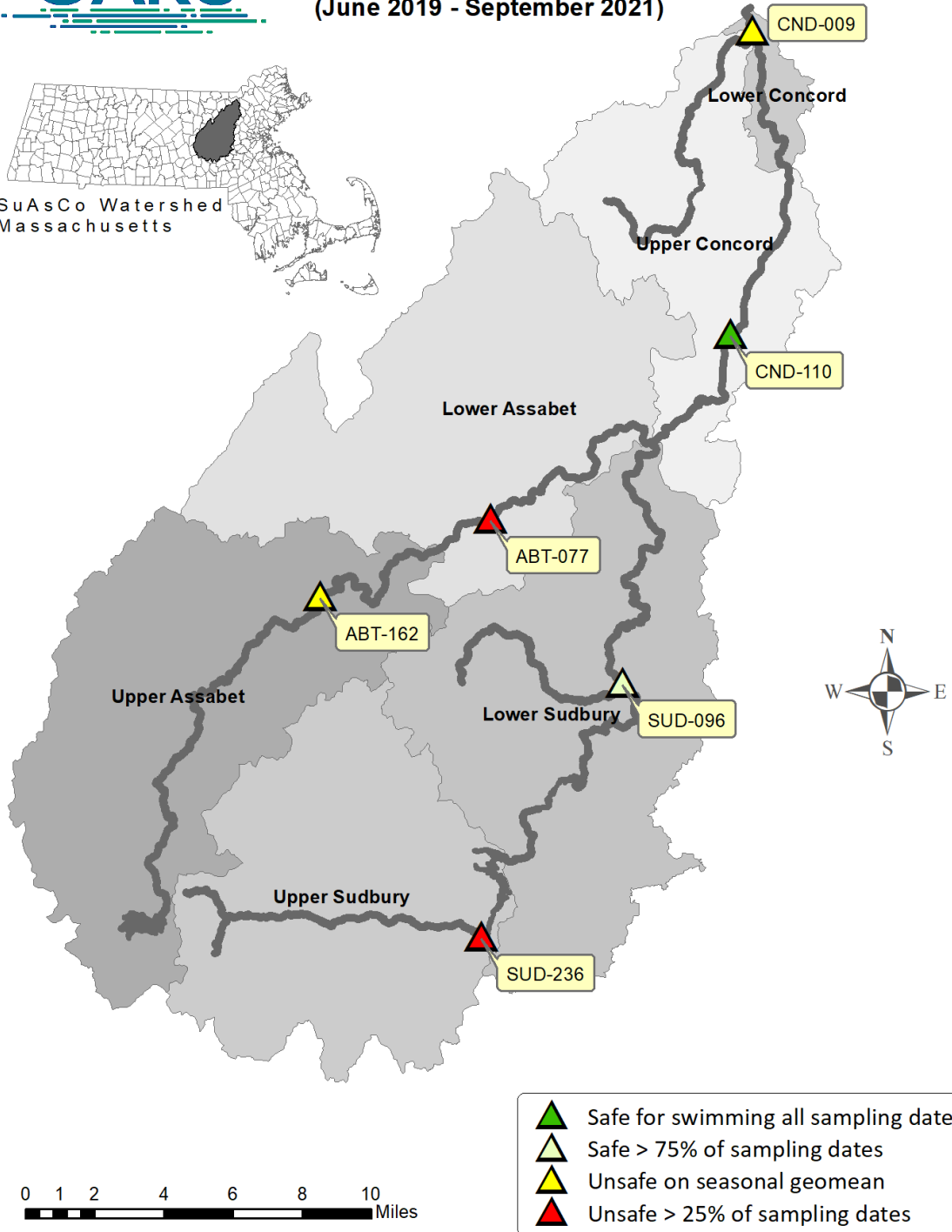
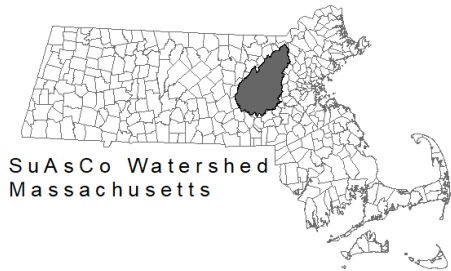


## Wet vs. Dry Weather

Bacterial contamination is known to be influenced by precipitation, however this is not a strong relationship for all sites. The graph below shows a comparison of all of our samples (2019–2021) with prior 48-hour rain. By river, only the Sudbury sites show a strong relationship with rain. This is because the relationship is moderated by sites such as Maynard, in the Assabet. When graphed by site, the strong relationship with precipitation is evident for Hudson (ABT-162), and Ashland (SUD-236). The boxplot below also shows this same relationship for all sites. (Wet-weather in the boxplot is defined as greater than 0.1 inches in 48 hours.) The boxplot also shows a significant wet-weather difference for Lowell (CND-009), but interestingly, the scatterplot does not show this strong relationship. Since CND-009, is near the mouth of the Concord River, it is diluted with the large river flow. Our hypothesis is that the wet-weather dynamics at CND-009 are related to the flashy nature of flow and bacterial pollution in River Meadow Brook, which is just upstream of CND-009. Small amounts of rain produce bacterial flashes from River Meadow Brook, but large rainfall results in large flows in the Concord which dilute any additional bacteria coming from River Meadow Brook.



(June 2019 - September 2021)



- Safe for swimming all sampling dates
- Safe > 75% of sampling dates
- Unsafe on seasonal geomean
- Unsafe > 25% of sampling dates