



**Combined Sewer Overflows:**  
*The clean water threat  
nobody likes to talk about*

**Briefing for Mayors and Town Managers**  
*Merrimack Valley Planning Commission*

*Rusty Russell and John Macone*  
*Merrimack River Watershed Council*  
*October 10, 2018*

# Clean Water Act results — hard to miss!

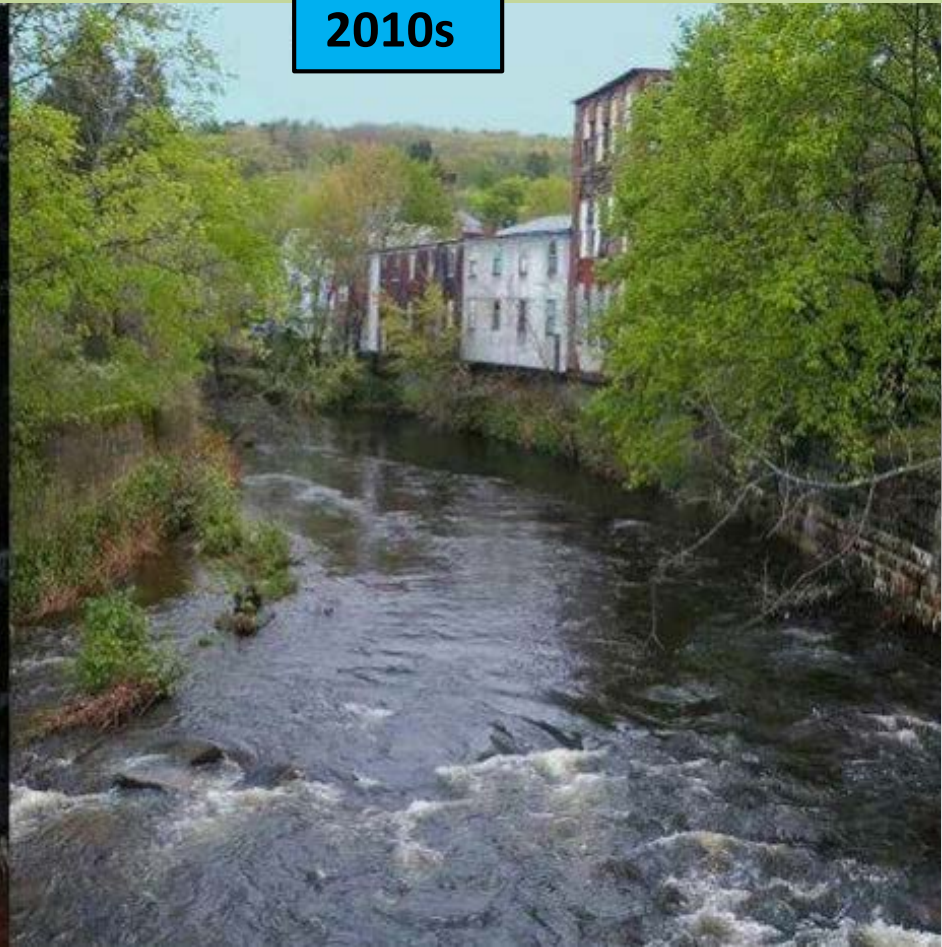
*Nashua River, a major tributary*



1960s

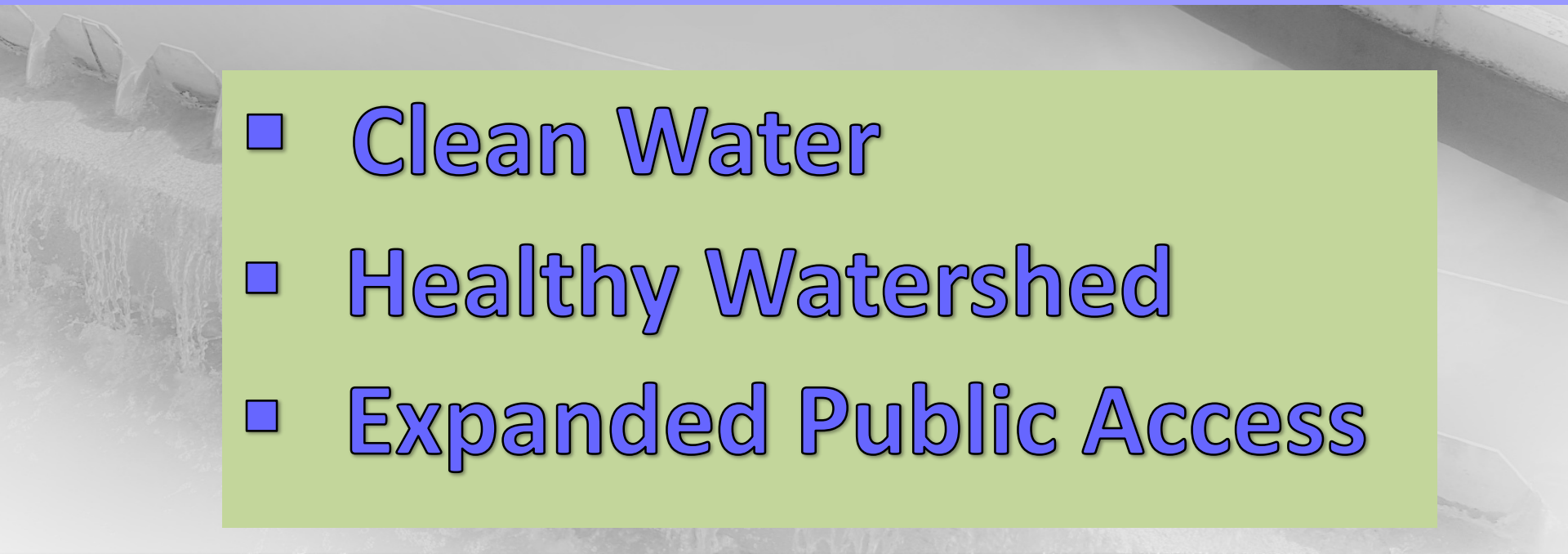


2010s





# MRWC's 3 Primary Goals

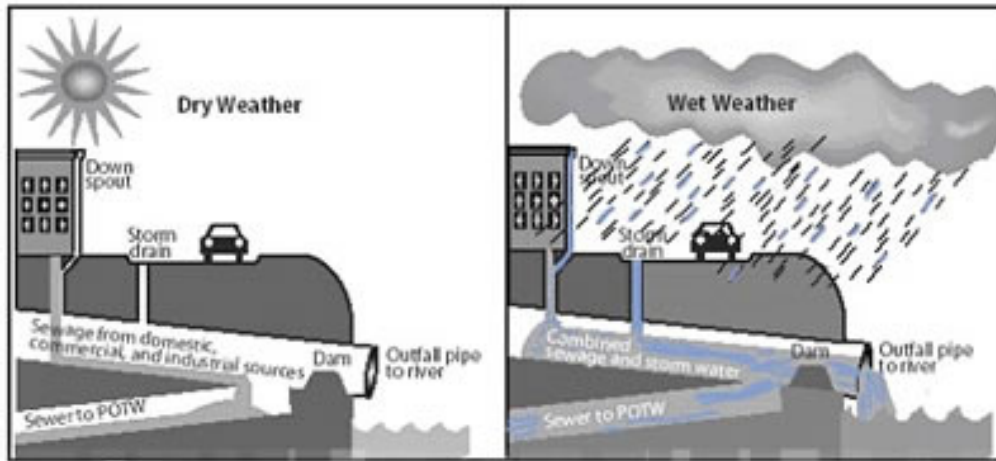
- 
- **Clean Water**
  - **Healthy Watershed**
  - **Expanded Public Access**

# Current Merrimack issues

- **Eliminating Combined Sewer Overflows (CSOs)**
- **Reducing polluted stormwater runoff**
- **Protecting vulnerable riparian land**
- **Safeguarding drinking water**
- **Studying unregulated contaminants**
- **Planning for the impacts of climate destabilization**

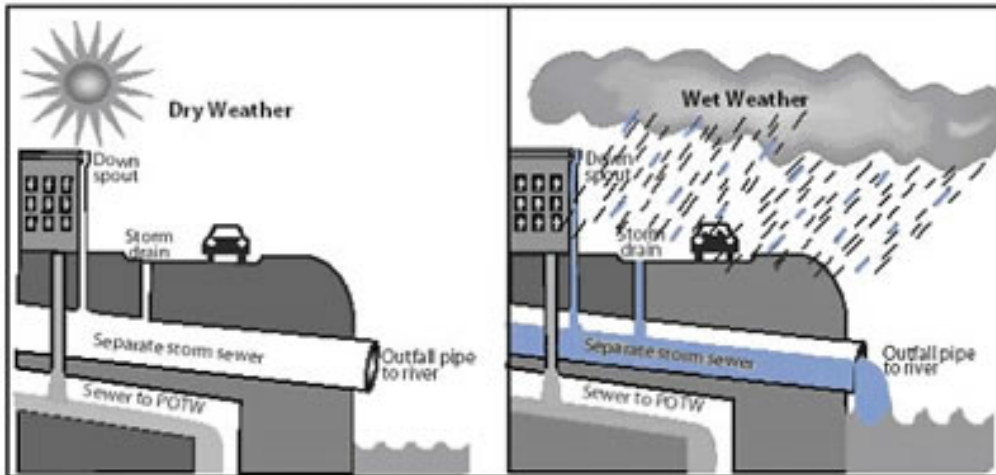
# The basic picture

**Combined sewer system (CSS):**



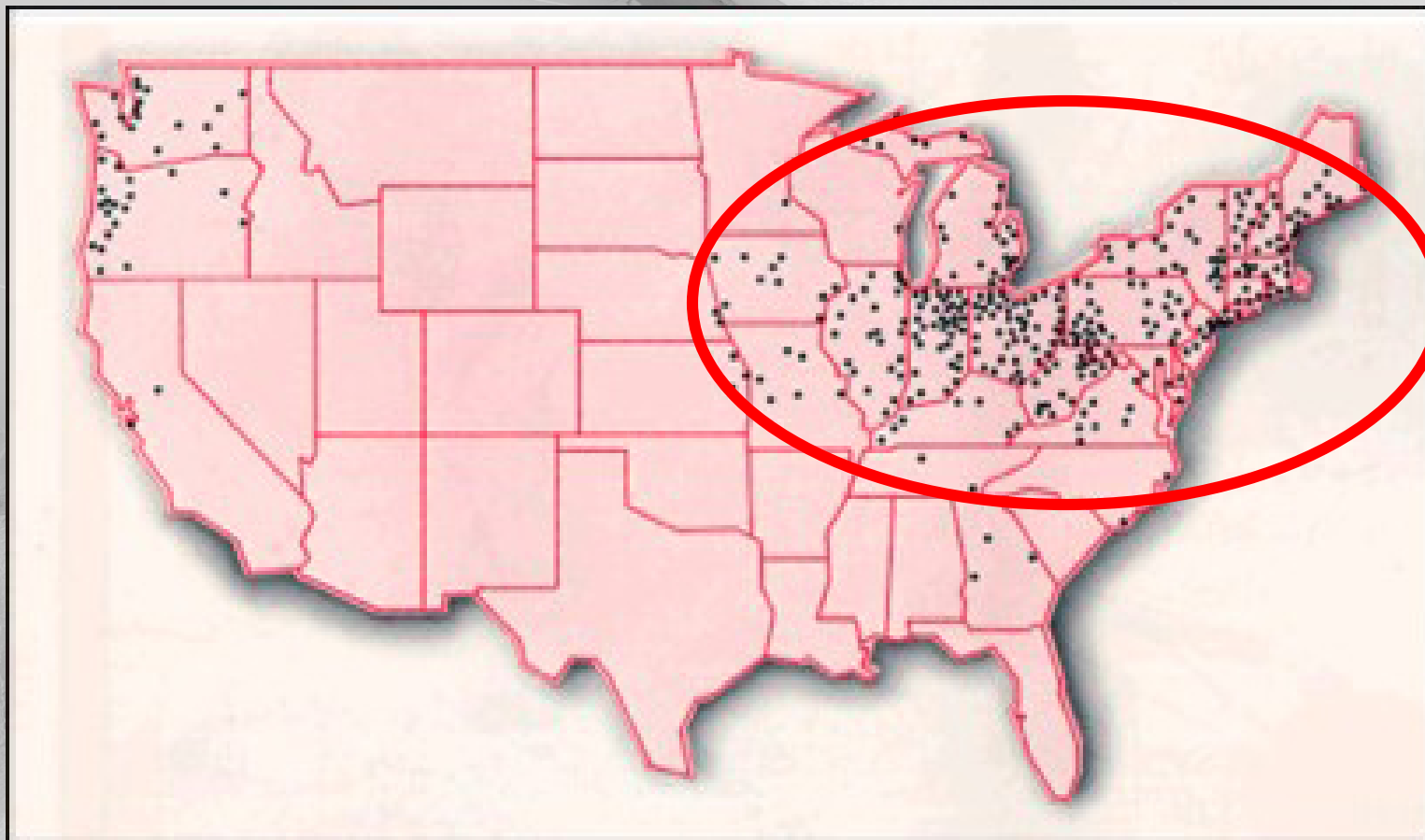
- Lowell
- Lawrence
- Haverhill
- Fitchburg
- Nashua
- Manchester

**Separated sewer system (SSS):**



- Newburyport
- Amesbury
- Salisbury
- Marlborough
- Derry
- Concord
- Franklin

# The big picture



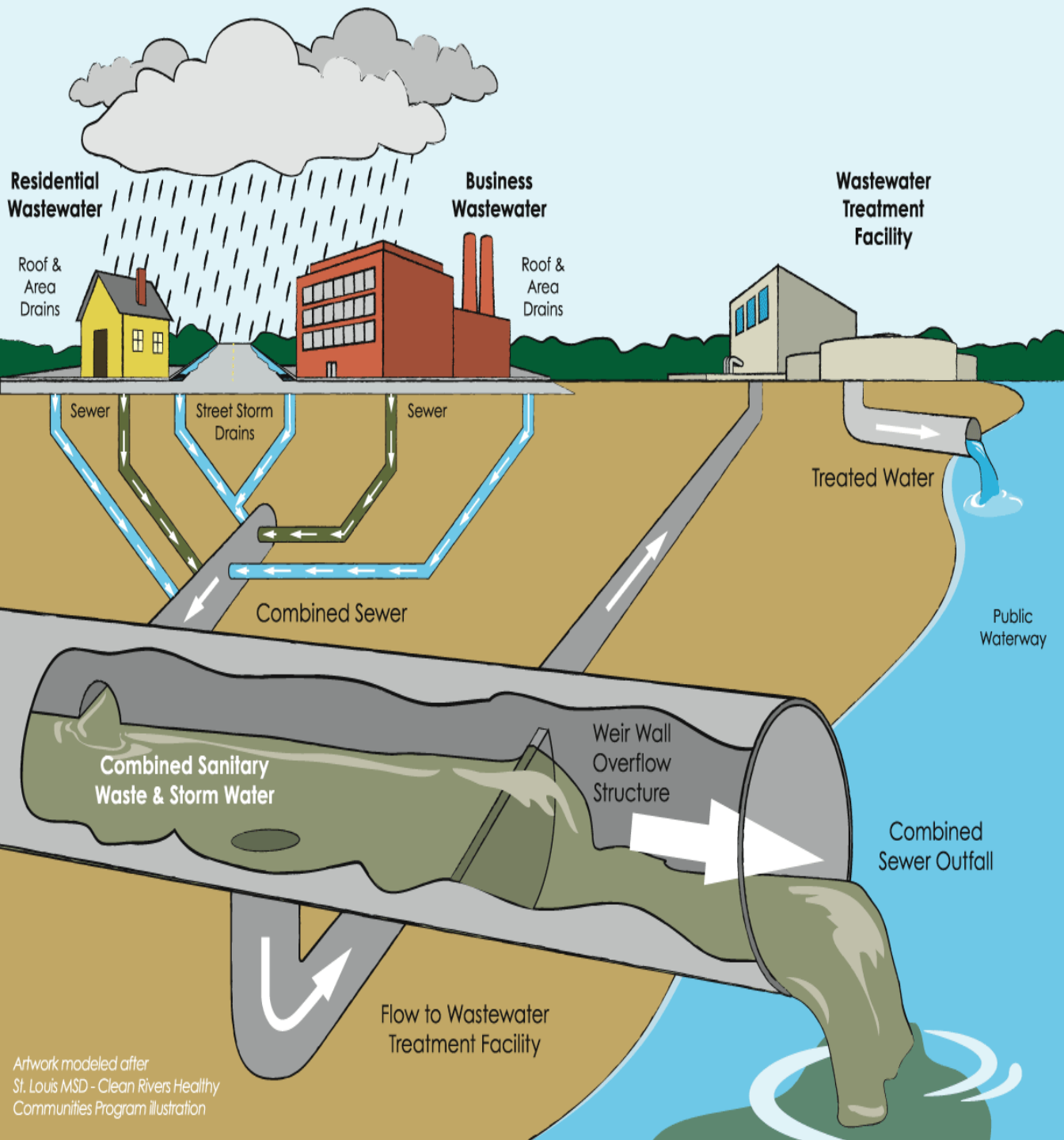
*“a priority water pollution concern for the nearly 860 municipalities across the U.S. that have [combined sewer systems]” – EPA, as of September, 2018*

***“The water works man ... must, and rightly should, accept a certain amount of sewage pollution in river water, and make the best of it.”***

- ❖ ***Allen Hazen, Clean Water and How to Get It (1914)***

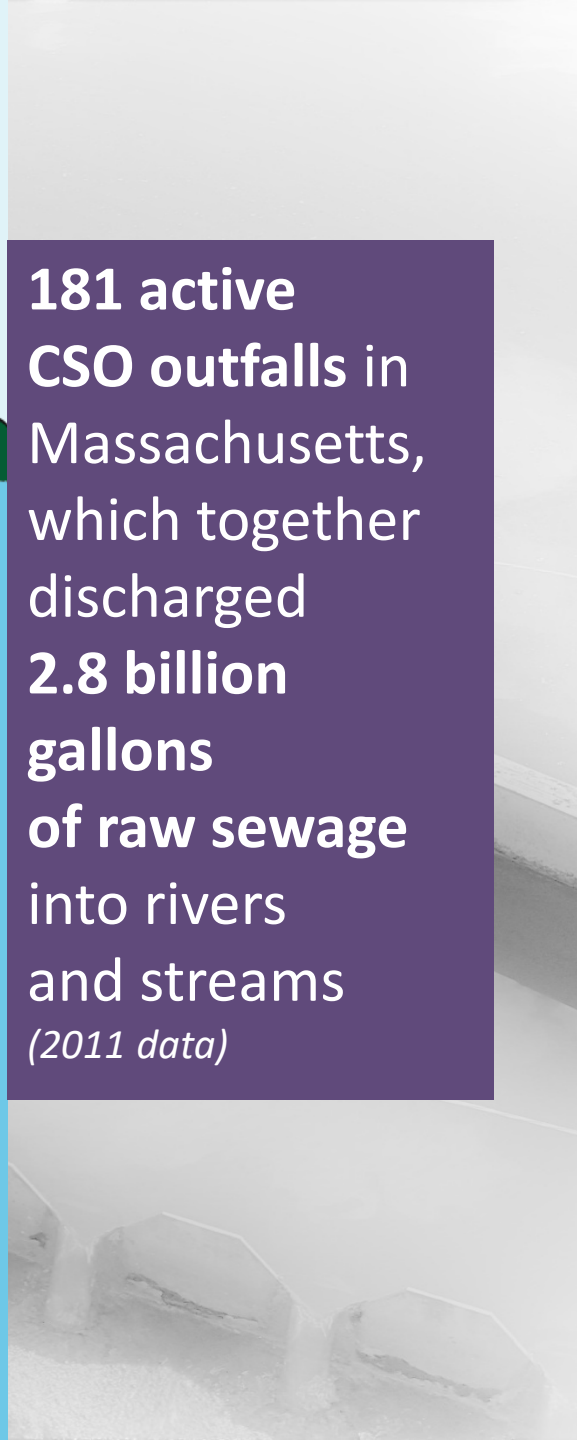


***Allen Hazen, President of the  
New England Water Works  
Association, 1911***



**181 active CSO outfalls in Massachusetts, which together discharged 2.8 billion gallons of raw sewage into rivers and streams (2011 data)**

Artwork modeled after St. Louis MSD - Clean Rivers Healthy Communities Program illustration





# Merrimack River Watershed

## *Basic facts:*

- 125 miles long (78 miles in NH, 50 miles in MA)
- Final 22 miles tidally influenced
- Drinking water for 600,000 people
- Fourth largest watershed in New England
- More than four times the size of the state of RI
- Encompasses more than a dozen smaller watersheds
- Entire length violates one or more federal clean water standards
- Yet swimmable on many days of the year

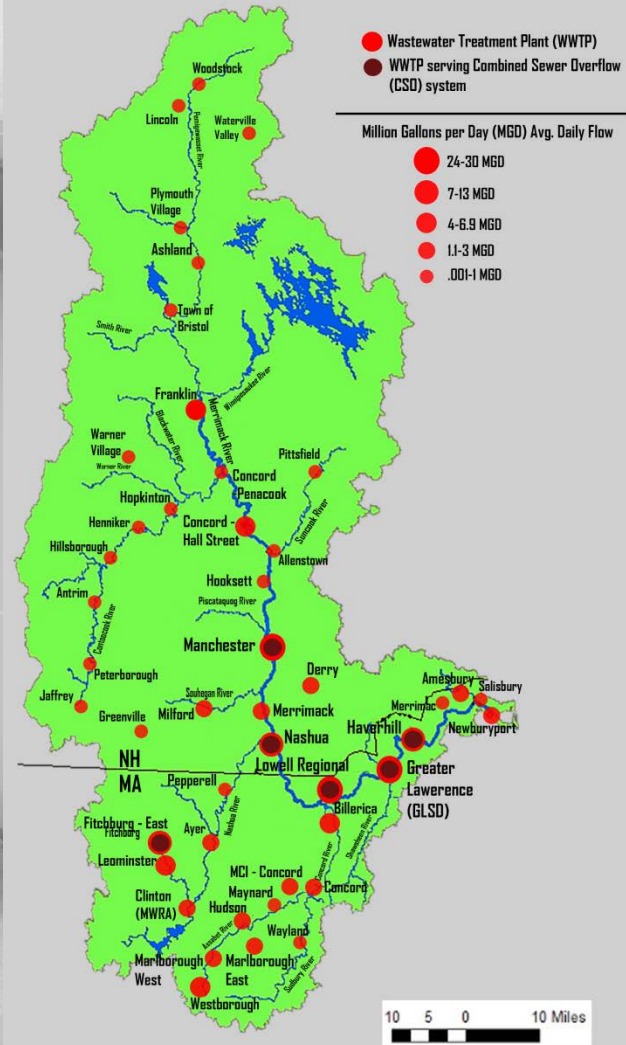
## Merrimack River Watershed



# The Sewage Story

Massachusetts Active CSOs		(DEP, 2013 -- partially updated: 1-26-18)		
#	CSO Permittee	Remaining Active CSOs	Receiving Waters	Watershed(s)
1	Boston Water & Sewer Commission (MWRA)	29	Boston Harbor, Charles River, Muddy River	Charles
2	Cambridge	8	Charles River, Alewife Brook	Charles, Mystic
3	Chelsea	4	Mystic River, Chelsea Creek	Mystic
4	Chicopee	19	Chicopee River, Connecticut River	Connecticut
5	Fall River	19	Mount Hope Bay, Taunton River, Quequechan River	
6	Fitchburg	33	Nashua River and tributaries	Nashua
7	Gloucester	5	Gloucester Harbor, Pavilion Beach	
8	GLSD (Greater Lawrence Sanitary District)	5	Merrimack River, Spicket River	Merrimack
9	Haverhill	15	Merrimack River, Little River	Merrimack
10	Holyoke	12	Connecticut River	Connecticut
11	Lowell	9	Merrimack River, Beaver Brook, Concord River	Merrimack
12	Lynn	4	Lynn Harbor, Stacy Brook, Saugus River	
13	Montague	2	Connecticut River	Connecticut
14	MWRA	9	Boston Harbor, Charles River, Mystic River, Alewife Brook	Charles, Mystic
15	New Bedford	27	Buzzard's Bay, Clark's Cove, Acushnet River	
16	Somerville	1	Mystic River, Alewife Brook	Mystic
17	Springfield	23	Connecticut River, Chicopee River, Mill River	Connecticut
18	Taunton	1	Taunton River	Taunton
19	Worcester	1	Mill Brook	Blackstone

Wastewater Treatment Plants in the Merrimack River Watershed

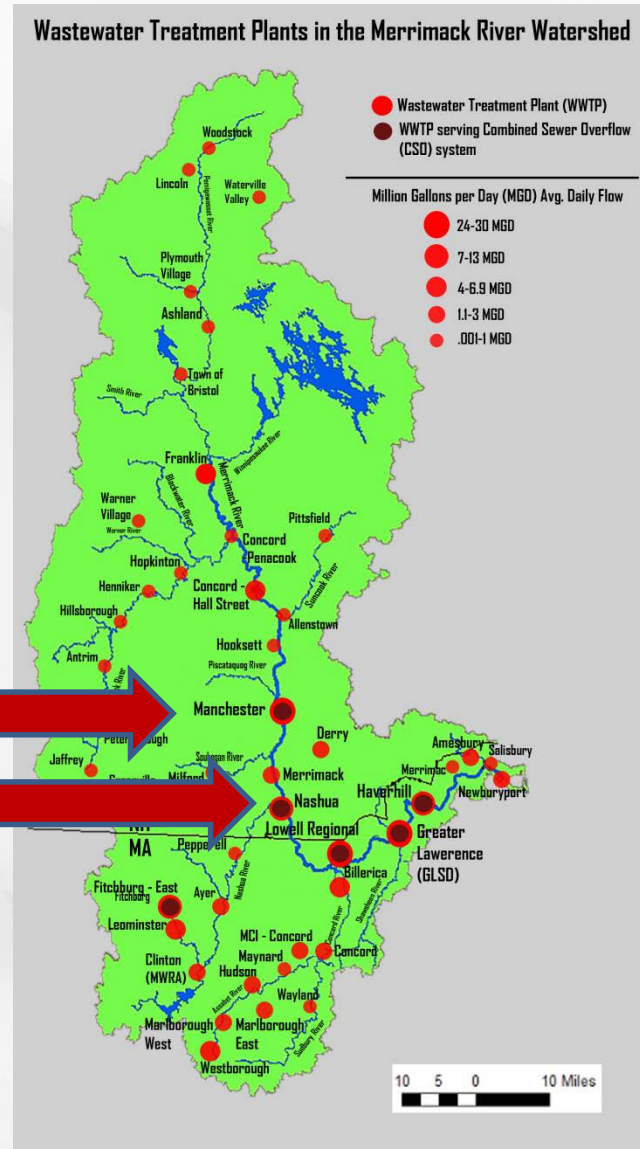


# The Sewage Story

*And .....*

Manchester, N.H.

Nashua, N.H.









***Aftermath of Tropical Storm Irene, August 2011***

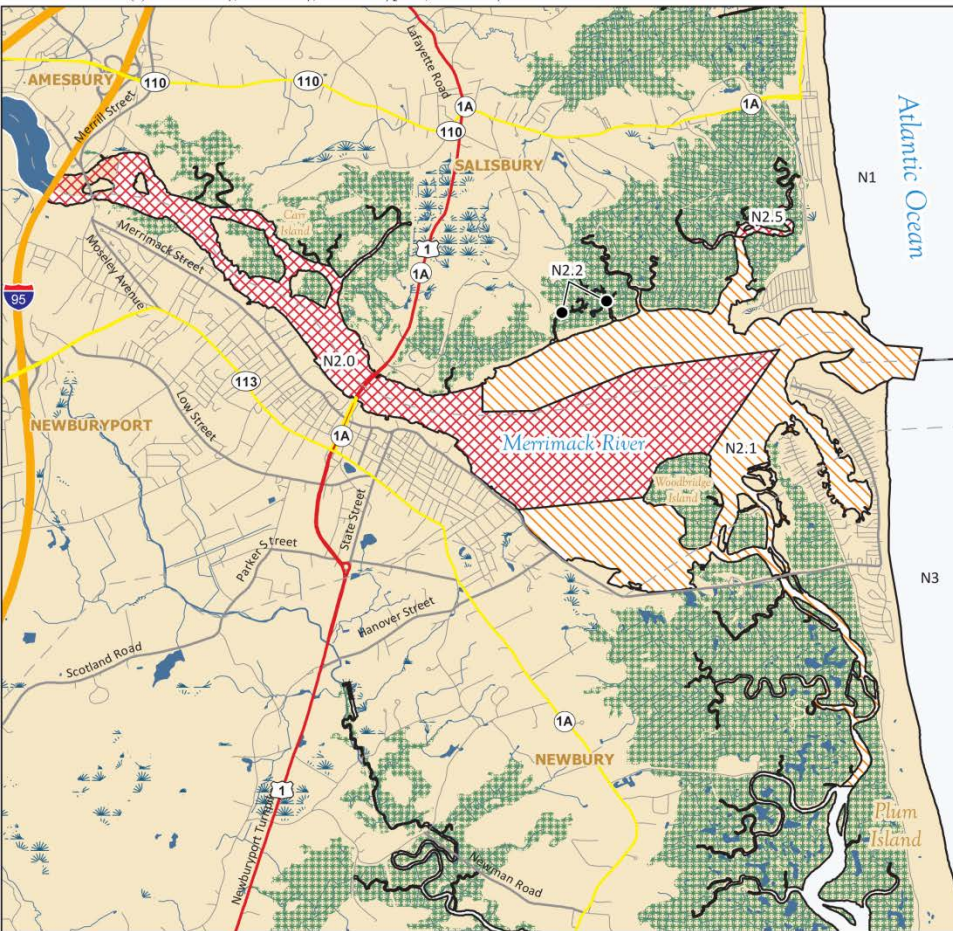


**Massachusetts**  
**Division of Marine Fisheries**  
 SHELLFISH SANITATION AND MANAGEMENT

**Shellfish Area Classification**

Approved	Conditionally Restricted
Conditionally Approved	Prohibited
Restricted	Produced: 4/4/2016

Growing Area Code: N2  
 Area Name: MERRIMACK RIVER  
 Area Town(s): Amesbury, Newbury, Newburyport, Salisbury



**Area of detail**  
 This map depicts the Marine Fisheries' sanitary classification of shellfish growing waters in accordance with the National Shellfish Sanitation Program. It does not indicate the current status, either "open" or "closed" to harvesting due to shellfish management or public health reasons. Always confirm the status with local authorities and/or Marine Fisheries. Information on this map may be out-dated or otherwise incorrect, and should not be relied upon for legal purposes.

Marsh/Wetland Saltmarsh Pond/Lake/Reservoir  
 Town Boundaries Stream/Ditch/Canal

0 0.5 1 miles

**Mouth of the Merrimack**

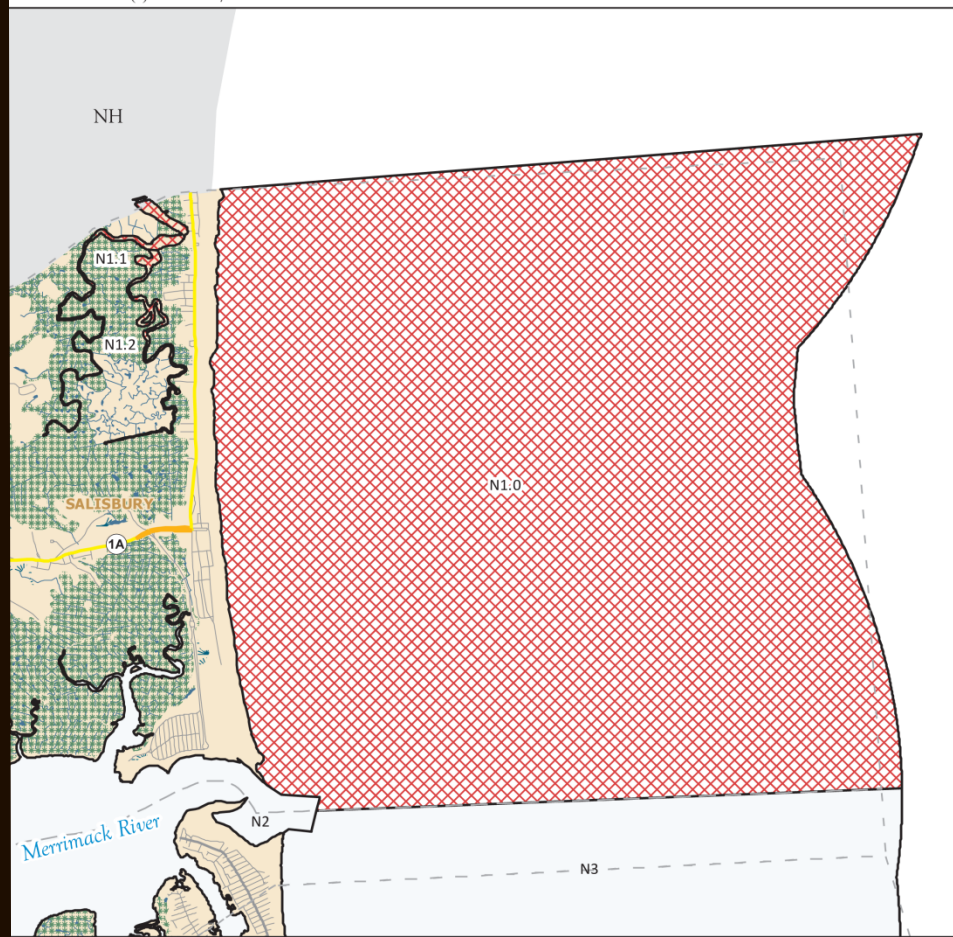


**Massachusetts**  
**Division of Marine Fisheries**  
 SHELLFISH SANITATION AND MANAGEMENT

**Shellfish Area Classification**

Approved	Conditionally Restricted
Conditionally Approved	Prohibited
Restricted	Produced: 6/28/2013

Growing Area Code: N1  
 Area Name: SALISBURY BEACH  
 Area Town(s): Salisbury



**Area of detail**  
 This map depicts the Marine Fisheries' sanitary classification of shellfish growing waters in accordance with the National Shellfish Sanitation Program. It does not indicate the current status, either "open" or "closed" to harvesting due to shellfish management or public health reasons. Always confirm the status with local authorities and/or Marine Fisheries. Information on this map may be out-dated or otherwise incorrect, and should not be relied upon for legal purposes.

Marsh/Wetland Saltmarsh Pond/Lake/Reservoir  
 Town Boundaries Stream/Ditch/Canal

0 0.5 1 miles

**Salisbury Beach**

# In early 1990s:

## *CSO annual average = 781 million gallons*

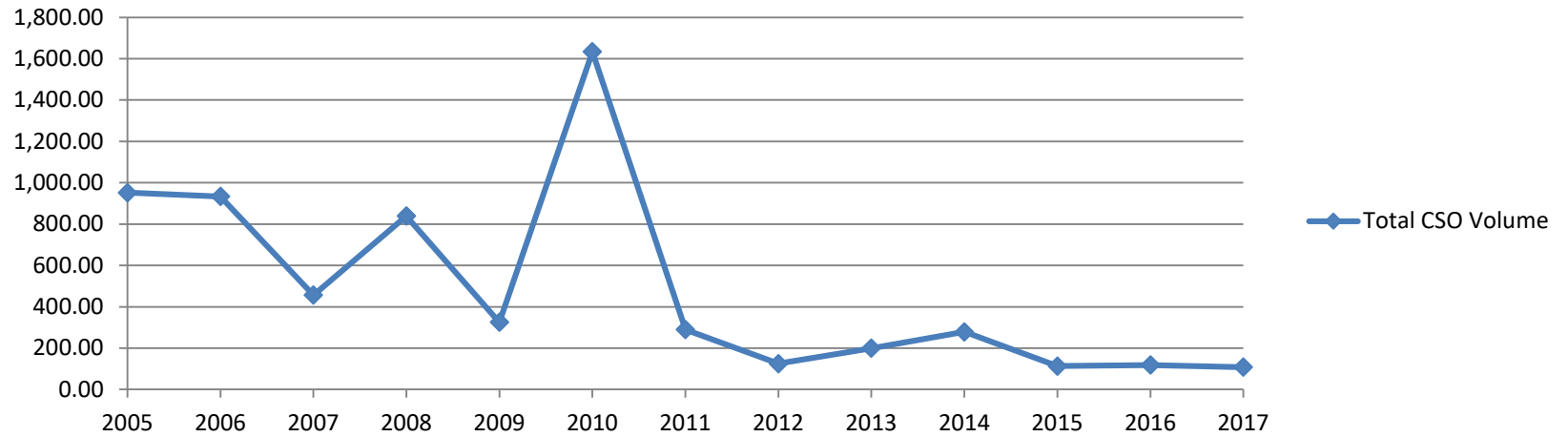
<i>Community</i>	<i># of discharge events/year</i>	<i>Average annual discharge volume (MG)</i>
Manchester, NH	49	220
Nashua, NH	25	26
Lowell, MA	37	352
GLSD, MA	14	112
Haverhill, MA	41	71
Fitchburg, MA	?	50 (*)
(*) approximate	166	<b>781</b>

*Source: 2004 CDM baseline report (prepared for U.S. Army Corps of Engineers) and Massachusetts DEP*

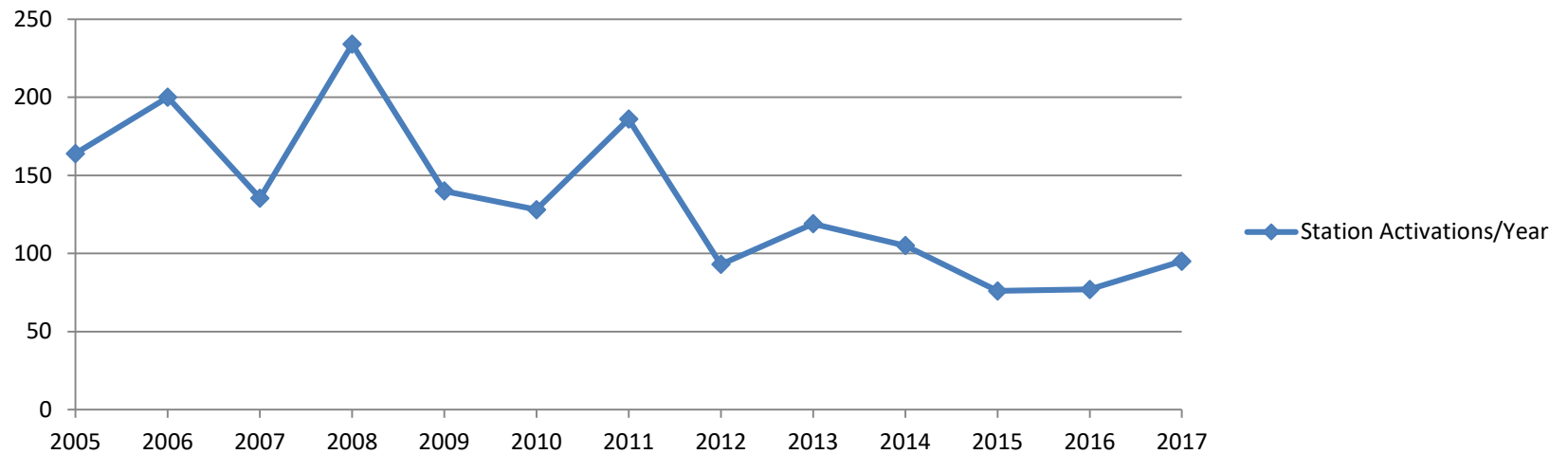


# Lowell CSOs (2005-2017)

## Total CSO Volume

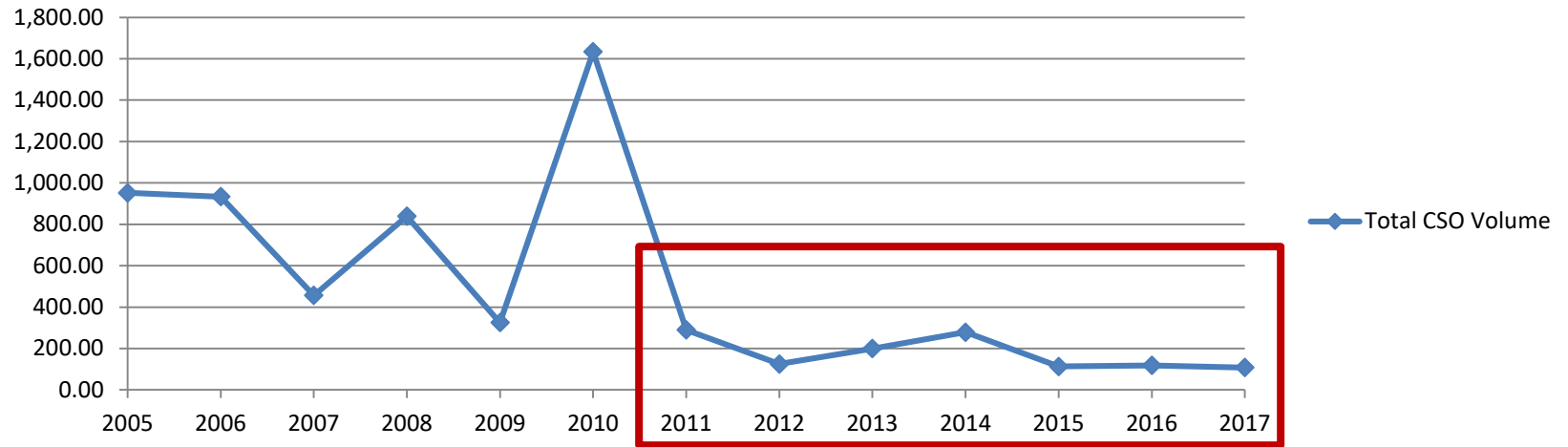


## Station Activations/Year

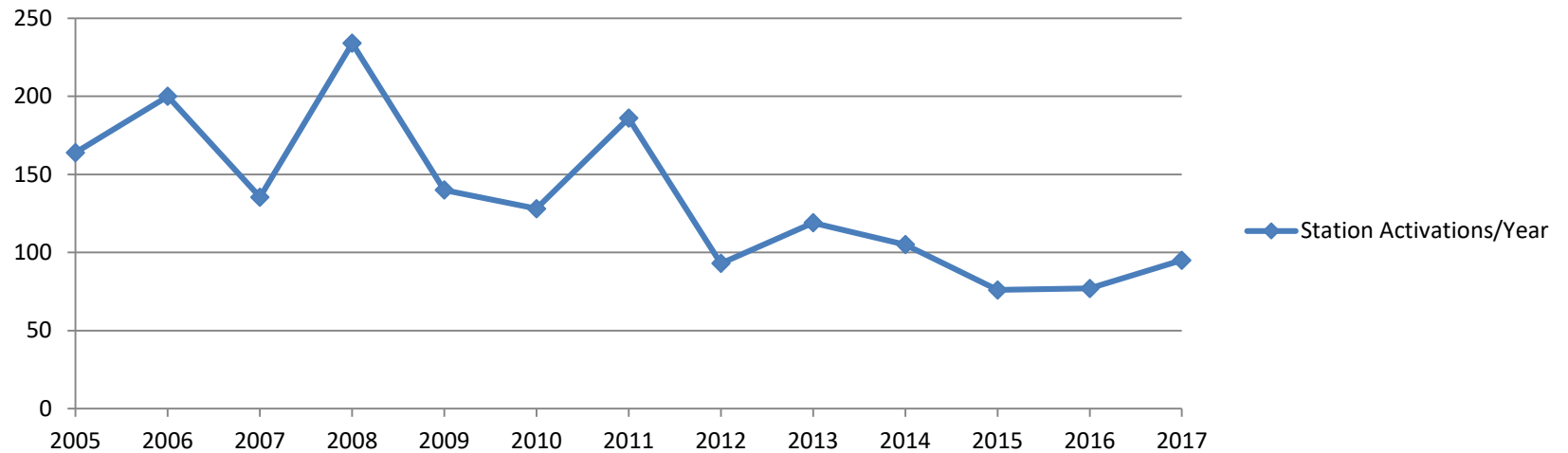


# Lowell CSOs (2005-2017)

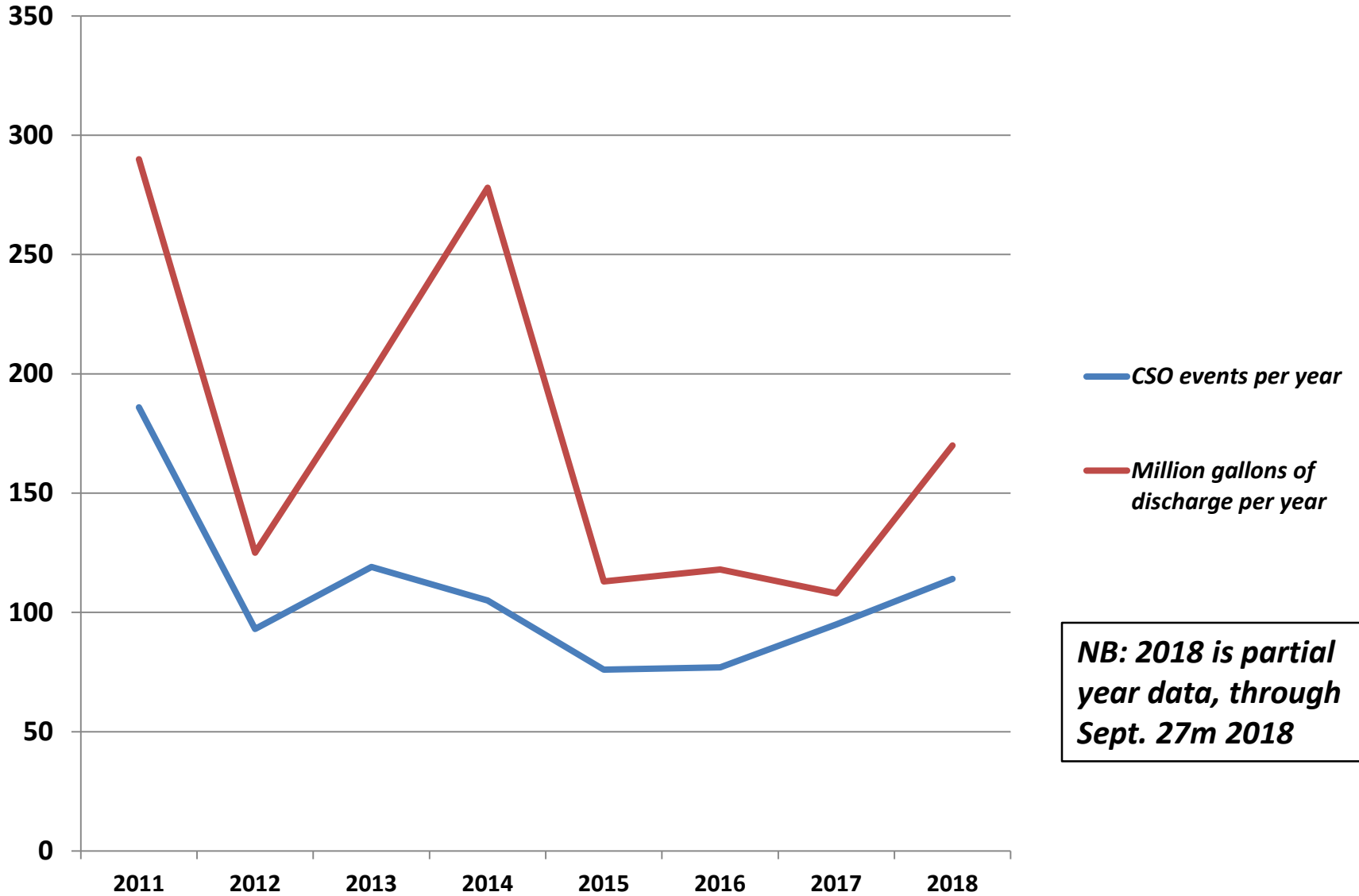
## Total CSO Volume



## Station Activations/Year

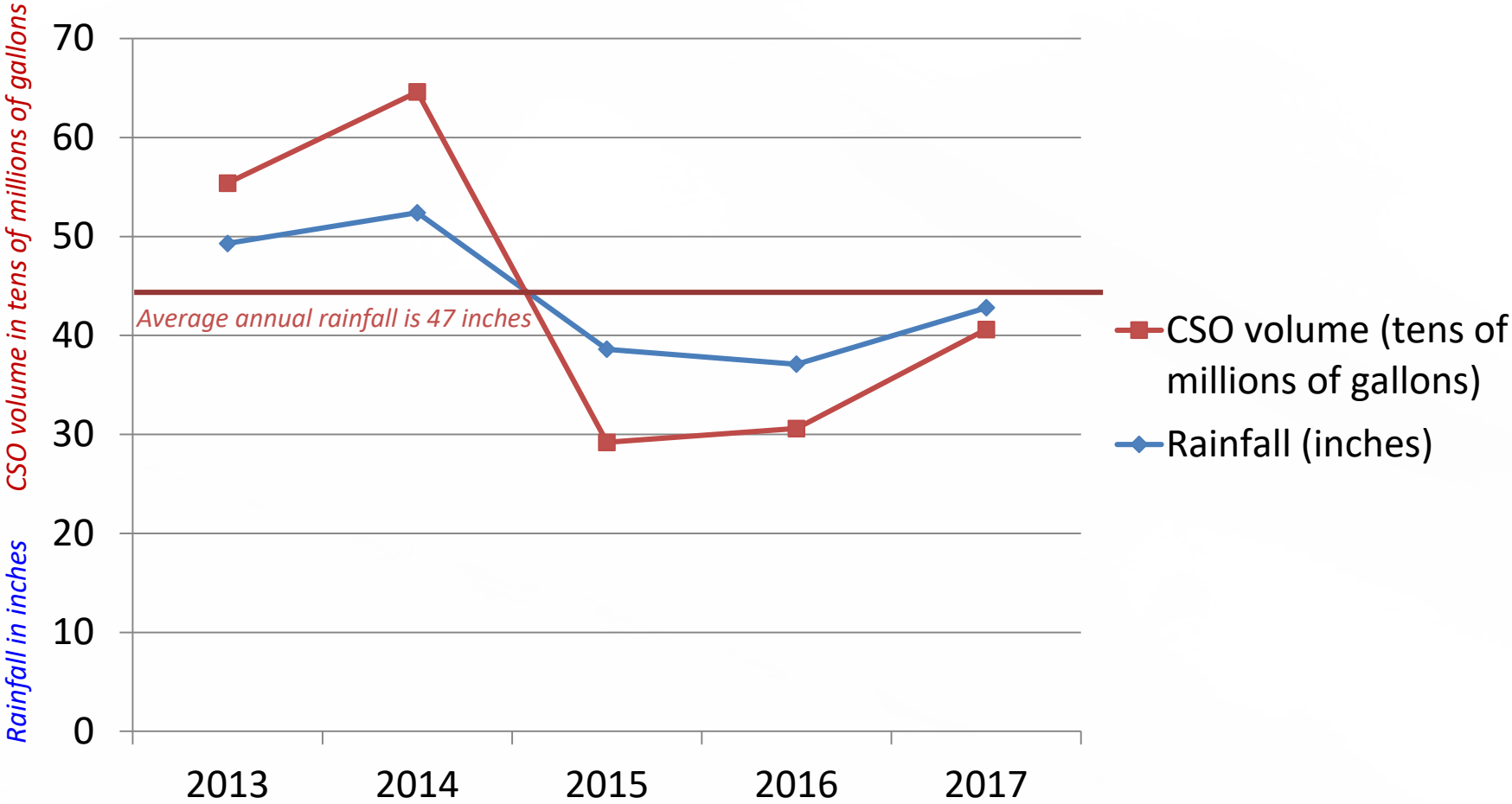


# Lowell CSOs (2011-2018)



***NB: 2018 is partial year data, through Sept. 27m 2018***

# Relationship between rainfall and CSOs



# How does 2018 look *so far*?

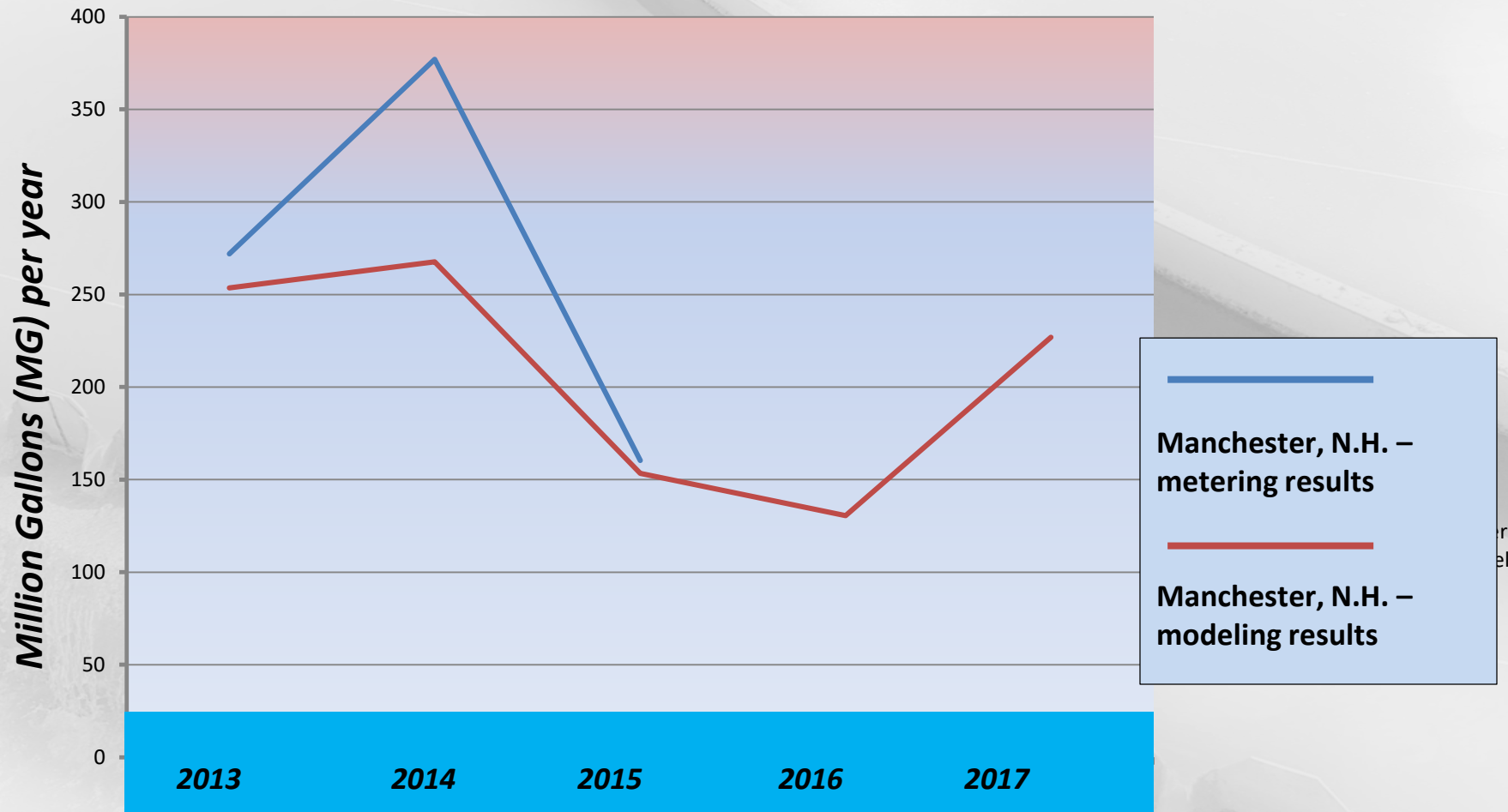
- We are running about 4.1 inches, or 14%, above average rainfall
- CSO volumes are tracking significantly higher, based on YTD data from two major plants:
  - Greater Lawrence (GLSD) has released 74 million gallons
    - ✓ From 2010-2017, GLSD averaged 33.7 MG per year
  - Lowell has released 170.1\* million gallons
    - ✓ From 2011-2017, Lowell averaged 176.1 MG per year

*(For Lowell, we did not include 2010. That year, the city had a flood anomaly, releasing a record-breaking **1.633 billion gallons**, which skews the average)*

*\* Data through September 27, 2018*

# Manchester, NH

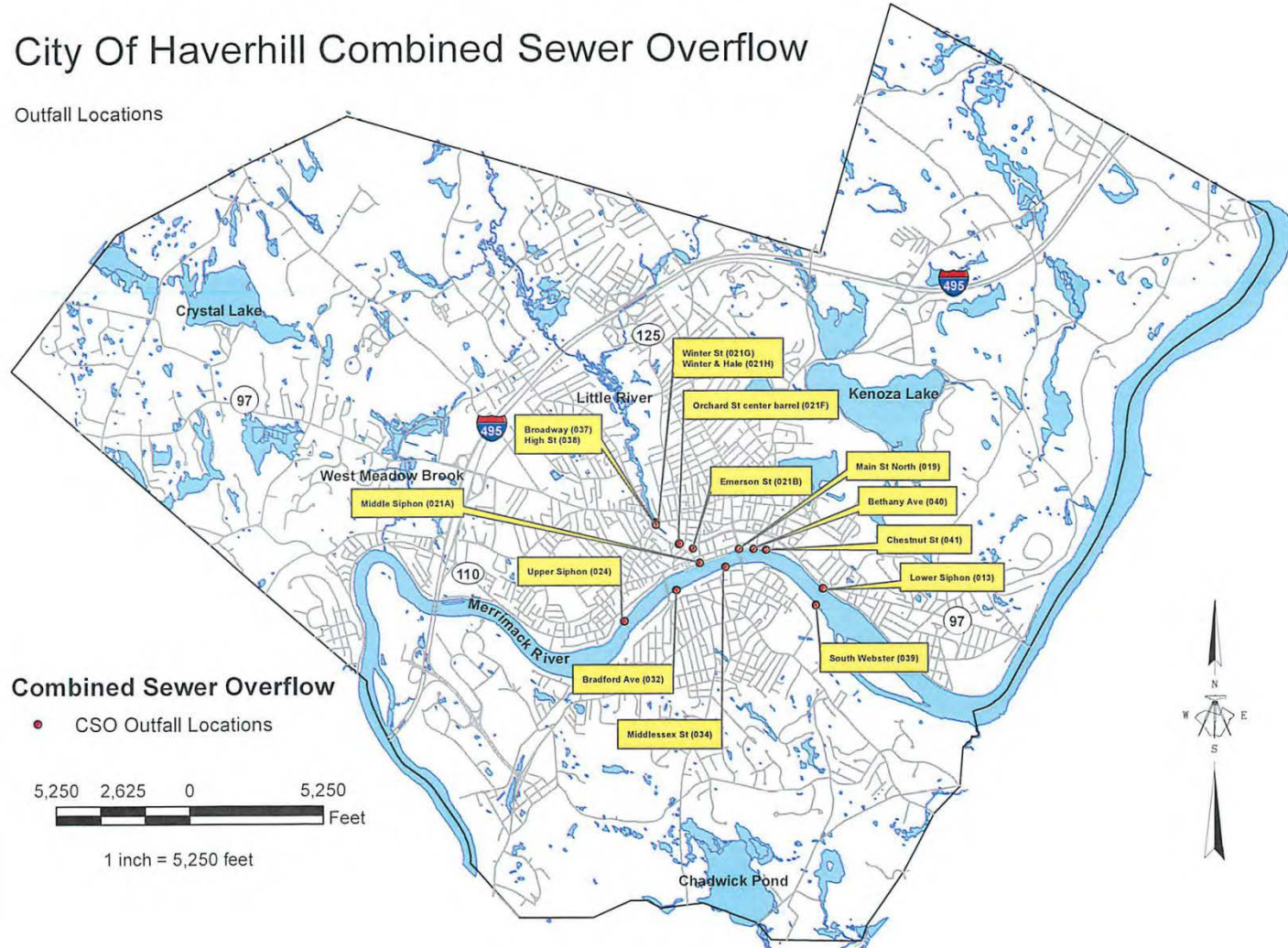
## The largest polluter on the river



# Haverhill: 15 CSOs in 13 locations

## City Of Haverhill Combined Sewer Overflow

Outfall Locations



### Combined Sewer Overflow

- CSO Outfall Locations

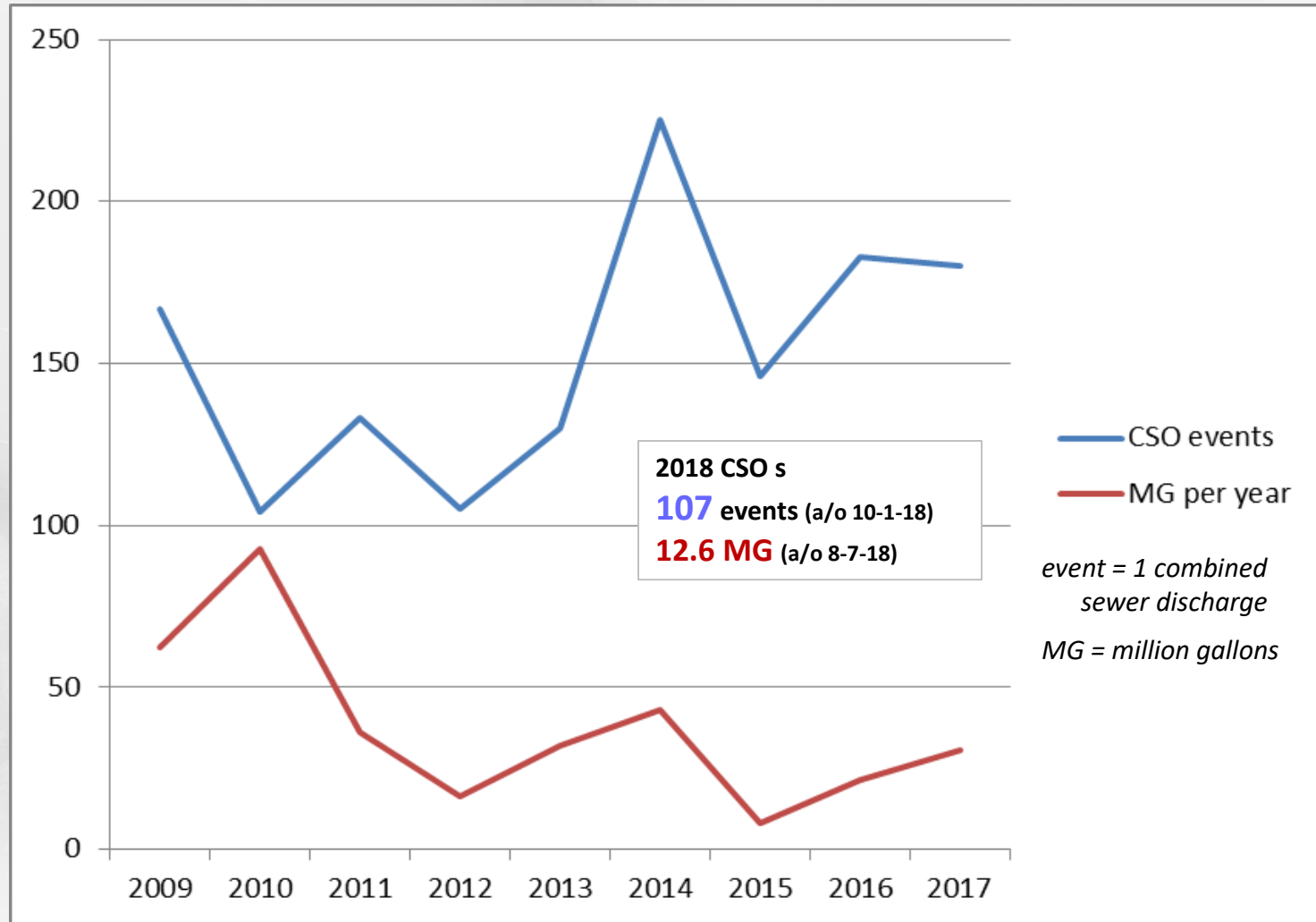
5,250 2,625 0 5,250  
Feet

1 inch = 5,250 feet

This map was produced from The City of Haverhill's Geographic Information System. The City of Haverhill expressly disclaims any liability that may result from the use of this map.

# Haverhill

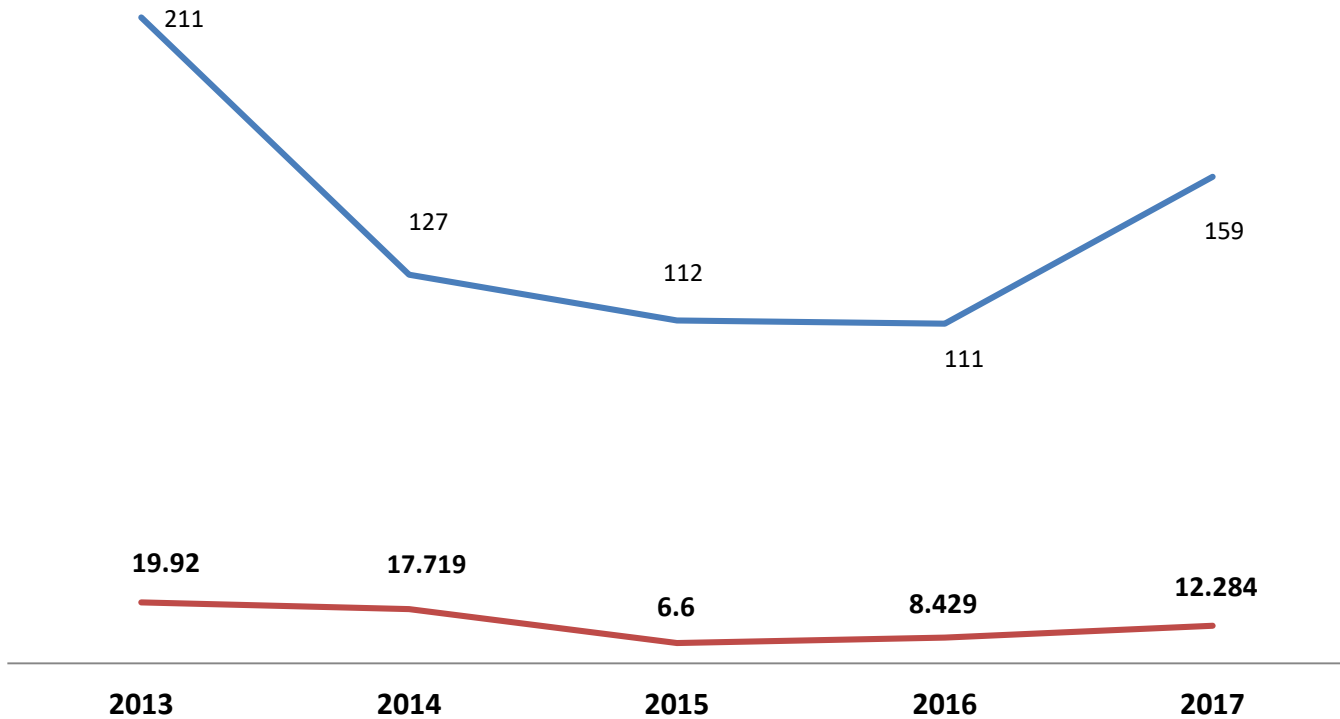
More events, lower discharge (to a point)





# Fitchburg POTW (2013-2017)

— CSO events per year      — Million Gallons of CSO overflow per year



# Status of consent orders

(per EPA a/o Sept. 2018)

## ■ Haverhill

- Process just started
- First step: a study
- No clear idea of how to proceed, given system structure

## ■ Greater Lawrence Sanitary District (GLSD)

- Goal: 4.6 → 4.2 CSO discharges per year  
*(2013-2017 average: 10.6)\**
- Storage/separation considered, rejected
- New NPDES permit projected in FY2019

*\* So far in 2018: 10 events (23 CSOs)*

# Status of consent orders

(per EPA a/o Sept. 2018)

## ■ Lowell Regional Wastewater Utility

- City wants “integrated plan” – order due in December
- Trying to maximize storage in interceptors – result unclear
- No major projects right now
- EPA concerned that bypass being used to manage system discharge

## ■ Manchester municipal sewage treatment plant

- March, 2010: city submitted revised Phase 2 long-term control plan (\$165 million over 20 years)
- EPA continues to review the plan; completion date unknown
- EPA: city has completed a few of the projects called for by the Phase 2 plan

# Bottom line: public health

*Summary of Jagai, et al., Environmental Health Perspectives study (September 2015):*

- Peer reviewed study compared emergency room (ER) visits for gastrointestinal (GI) illness within 8 days after a heavy rain to ER GI visits during other times — for period 2003-2007
  
- Focused on three geographic areas:
  - Area with combined sewer overflows (CSOs) that obtains drinking water from the source affected by CSOs (Lawrence, Mass. area)
  
  - Area with CSOs that obtains drinking water from a safe source (Boston area)
  
  - Area with no CSOs that obtains drinking water from a safe source (Plymouth, Mass. area) — the control

# Jagai study: findings

- Study identified a 13% increase in ER GI visits over typical number in Lawrence area
- Associations strongest for children under 5 and elderly over 64 years old
- No association found in other two geographic areas
- Major finding: Statistically significant association exists between ER GI visits and heavy rains in Lawrence area

# Jagai study: conclusions

- Data “suggest that extreme precipitation events may trigger CSO events that affect local drinking water quality in some areas.”
- “Only in the region with CSO outfalls to drinking water sources did we find a significant increase in the expected rate of ER visits for GI illness for all ages in the 8-day period following an extreme precipitation event after controlling for daily average temperature and time trends.”
- “With climate change, it is predicted that extreme rainfall events will increase and therefore increase the likelihood of CSO events.”

# What does it mean?

## Greater Lawrence Sanitary District (GLSD) – August 12, 2018

- Duration of event = 2.25 hours
- CSO release from GLSD POTW = 26 million gallons
- Flow of Merrimack at Lowell below Concord River =  $\sim 10,000 \text{ ft}^3/\text{sec} = 605,921,259 \text{ gallons}/2.25 \text{ hours}$  (according to USGS site)
- Ratio of the two flows: 0.0429206
- Size of "ideal" (Wikipedia) Olympic-size swimming pool = 990,000 gallons
- CSO release reduced proportionate to Olympic pool = 42,481 gallons

*So, the GLSD release would be like dumping **~775**  
55-gallon drums of raw sewage into an Olympic size pool*

Another  
way to  
look at it...

Sewage Treatment Plants in Merrimack Watershed					
#	Facility Name	City or Town	State	Design Flow (MGD)	Average Daily Flow (MGD)
1	Amesbury Water Pollution Abatement Plant	AMESBURY	MA	2.4	1.6
2	Ayer Wastewater Treatment Facility	AYER	MA	1.79	1.2
3	Billerica Wastewater Treatment Facility	BILLERICA	MA	5.52	4.4
4	Clinton Wastewater Treatment Plant (MWRA-operated)	CLINTON	MA	3.01	2.6
5	Concord Wastewater Treatment Facility	CONCORD	MA	1.2	1.1
6	MCI-Concord, Mass. Department of Correction	CONCORD	MA	0.31	0.13
7	Fitchburg East Wastewater Treatment Facility	FITCHBURG	MA	12.4	7.7
8	Haverhill Wastewater Treatment Facility	HAVERHILL	MA	18.1	10
9	Hudson Wastewater Treatment Facility	HUDSON	MA	3.05	2
10	Leominster Wastewater Treatment Facility	LEOMINSTER	MA	9.3	5.29
11	Lowell Regional Wastewater Treatment Facility	LOWELL	MA	32	25
12	Marlborough East Wastewater Treatment Plant	MARLBOROUGH	MA	5.5	3
13	Marlborough West Wastewater Treatment Plant	MARLBOROUGH	MA	2.89	2.5
14	Maynard Wastewater Treatment Facility	MAYNARD	MA	1.45	1
15	Merrimac Wastewater Treatment Plant	MERRIMAC	MA	0.45	0.35
16	Newburyport Wastewater Treatment Facility	NEWBURYPORT	MA	3.4	2.34
17	Greater Lawrence Sanitary District (GLSD)	NORTH ANDOVER	MA	52	30
18	Pepperell Wastewater Treatment Facility	PEPPERELL	MA	1.1	0.5
19	Salisbury Wastewater Treatment Facility	SALISBURY	MA	1.3	0.75
20	Wayland Wastewater Treatment Plant	WAYLAND	MA	0.05	0.025
21	Westborough Wastewater Treatment Facility	WESTBOROUGH	MA	7.7	5.1
22	Allenstown Wastewater Treatment Facility (Suncook)	ALLENSTOWN	NH	1.05	0.75
23	Antrim Wastewater Treatment Facility	ANTRIM	NH	0.21	0.105
24	Ashland Wastewater Treatment Plant	ASHLAND	NH	1.6	0.225
25	Bristol Wastewater Treatment Plant	BRISTOL	NH	0.5	0.017
26	Concord Wastewater Treatment Facility -- Hall Street	CONCORD	NH	10.1	4.5
27	Concord Wastewater Treatment Facility -- Penacook	CONCORD	NH	2.37	0.55
28	Derry Wastewater Treatment Plant	DERRY	NH	4.2	1.3
29	Franklin Wastewater Treatment Plant (operated by NHDES via Winnepesaukee River Basin Program (WRBP))	FRANKLIN	NH	11.54	6
30	Greenville Wastewater Treatment Facility	GREENVILLE	NH	2.33	0.105
31	Henniker Wastewater Treatment Facility	HENNIKER	NH	0.51	0.197
32	Hillsborough Wastewater Treatment Facility	HILLSBOROUGH	NH	0.47	0.485
33	Hooksett Wastewater Treatment Facility	HOOKSETT	NH	1.1	0.804
34	Hopkinton Wastewater Treatment Plant	HOPKINTON	NH	0.12	0.055
35	Jaffrey Wastewater Treatment Facility	JAFFREY	NH	1.25	0.5
36	Lincoln Wastewater Treatment Plant	LINCOLN	NH	1.3	0.6
37	Manchester Wastewater Treatment Facility	MANCHESTER	NH	34	24.5
38	Merrimack Waste Water Treatment Facility	MERRIMACK	NH	5	3
39	Milford Wastewater Treatment Facility	MILFORD	NH	2.15	1.49
40	Nashua Wastewater Treatment Facility	NASHUA	NH	16	13
41	Woodstock Wastewater Treatment Facility	NORTH WOODSTOCK	NH	0.38	0.17
42	Peterborough Wastewater Treatment Facility	PETERBOROUGH	NH	0.5	0.25
43	Pittsfield Wastewater Treatment Facility	PITTSFIELD	NH	0.4	0.245
44	Plymouth Village	PLYMOUTH	NH	0.7	0.482
45	Warner Village Water District Wastewater Treatment Plant	WARNER	NH	0.11	0.045
46	Waterville Valley Wastewater Treatment Plant	WATERVILLE VALLEY	NH	0.55	0.11

Total = 46 facilities

263.36 166.07



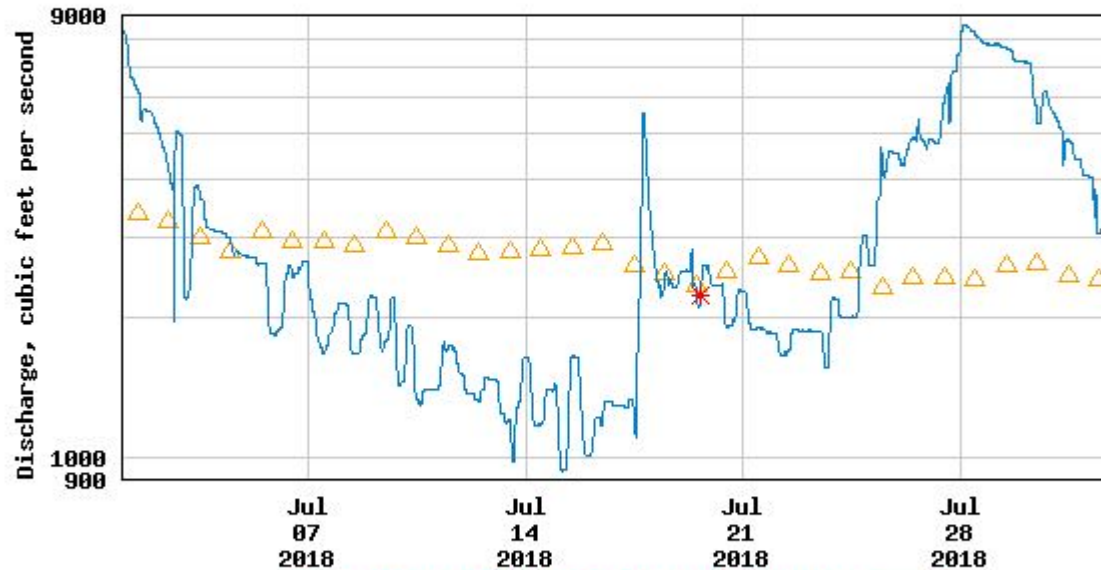
# Merrimack Summer Flow

*(it can be quite low!)*

Discharge, cubic feet per second

Most recent instantaneous value: 1670 09-04-2018 19:30 EDT

USGS 01100000 MERRIMACK RIVER BL CONCORD RIVER AT LOWELL, MA



----- Provisional Data Subject to Revision -----

△ Median daily statistic (95 years) \* Measured discharge  
— Discharge

# A river of (treated) sewage

- 1000 CFS (cubic feet/second) = 7.48052 gallons/second
- = 646,316,928 gallons/day
- All Merrimack POTWs average flow = 166,070,000 gallons/day
- Sewage plant flow = *26% of total river flow*



What to do?

# Suggested plan of action

- Support real-time public notice bill in Massachusetts
- Insist on contemporaneous public reporting by all CSO systems
- Call together EPA and major POTWs to update public on efforts to eliminate CSOs
- Help form ad hoc committee of municipalities, sewage plants, watershed associations, etc. to seek needed interim actions
- Advocate for better data flow between plant operators and representatives of the public (mayors, town managers, select boards, legislators, agency personnel, etc.)
- Work to bring New Hampshire into the process
- Interface with federal representatives (esp. Congressional delegation) to press for funding to expedite remediation and make process fairer for local communities
- Seek more definitive health studies