



# Evaluating the Progress of Multi-Decade CSO Abatement Programs

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**MAINE DEPARTMENT OF ENVIRONMENTAL PROTECTION**

*Protecting Maine's Air, Land and Water*

# A true statesman



# Clean Water Act of 1972

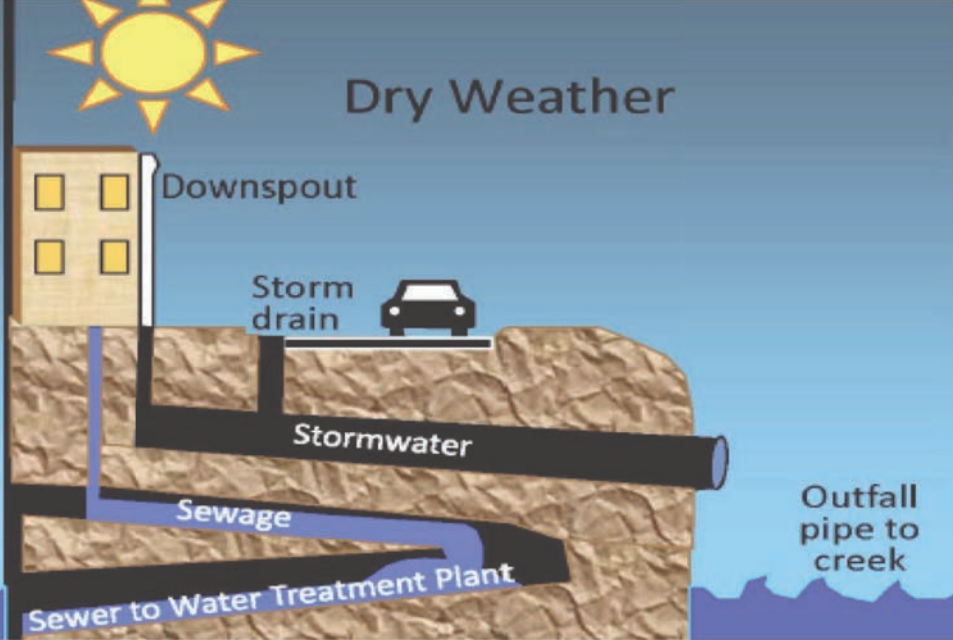
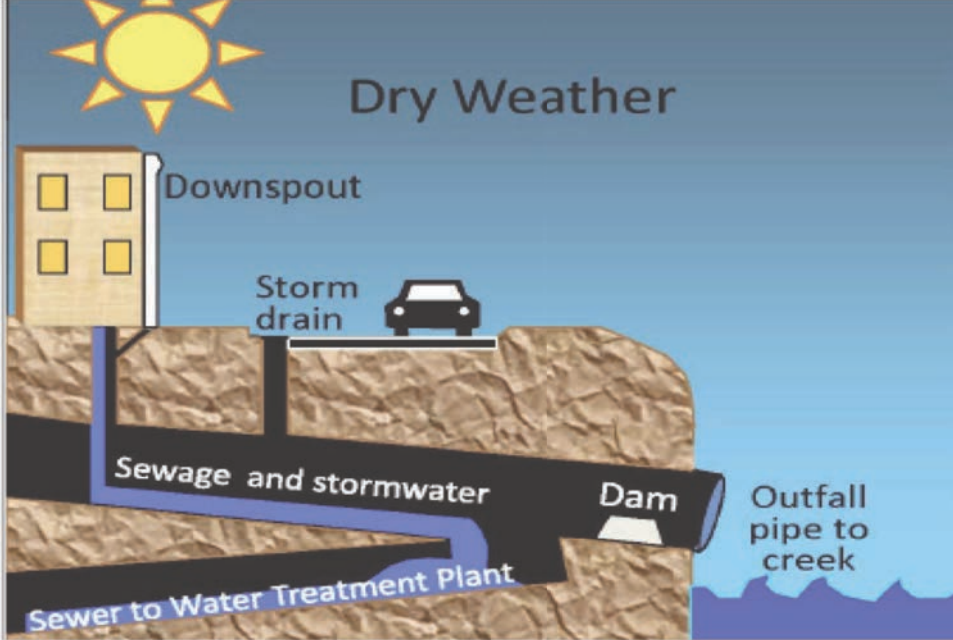
- Federal measure to regulate the discharge of pollutants into any water in the United States



# Combined Sewer Overflows (CSO's)

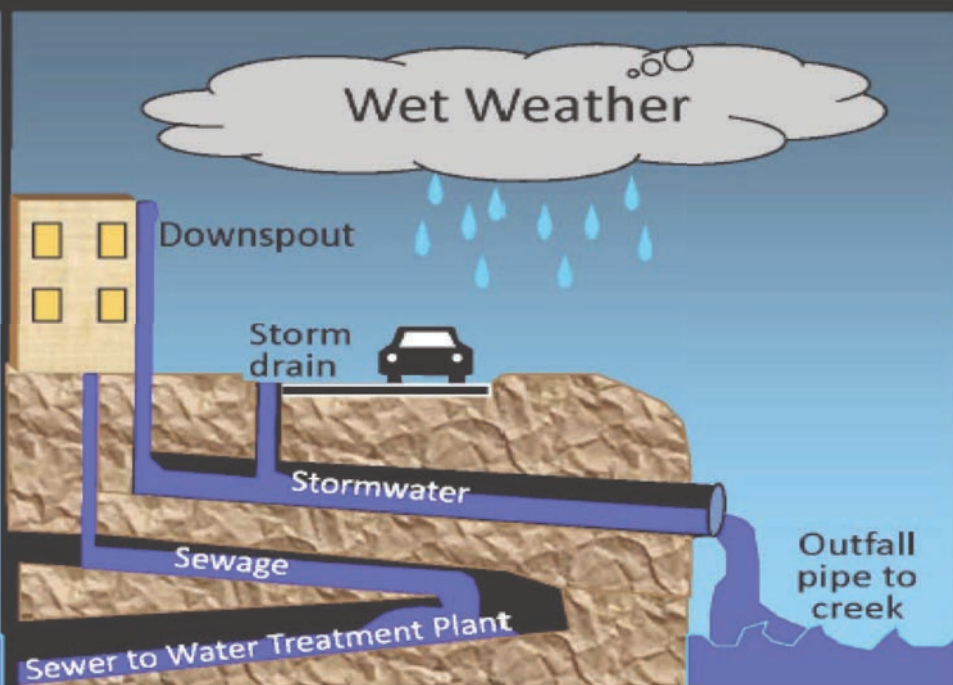
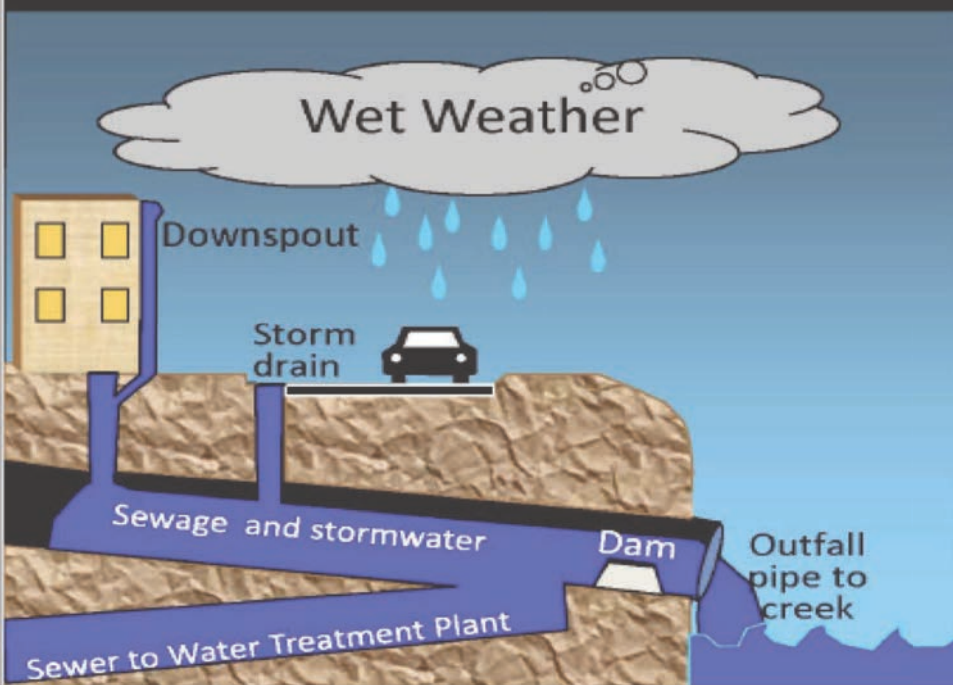
- Legacy problem we've inherited
- From a time when Sanitary and Storm Sewers Were One and the Same
- Combined sewer systems have to handle a wide range in flows between dry weather and wet weather (peaking factor)
- CSO's - when wet weather flow exceeds the conveyance capacity of the combined sewer





## Combined Sewer

## Separate Sewer



The image shows two large, circular concrete pipes discharging a thick, brown, and foamy liquid into a body of water. The liquid is splashing and creating white foam as it enters the water. The pipes are set into a concrete wall. The overall scene suggests a wastewater treatment or discharge point.

Effective CSO abatement programs take decades to implement and require millions of dollars of investment

# Why are we concerned?

- CSO's are an uncontrolled release of untreated sewage into our rivers and harbors
  - Human Health risk
  - Impact on water quality of the receiving water
  - Impact on aquatic wildlife
  - Impact on marine based economies (shell fishing)

Combined sewer overflow  
due to high flows following Hurricane Sandy

# CSO Abatement History

- 1989 – EPA publishes National CSO Control Strategy
- April 19, 1994 – EPA issues the CSO Control Policy
  - Directive to reduce CSO discharge by reducing inflow and infiltration (I&I)
- 2000 – MeDEP issued Ch. 570 titled Combined Sewer Overflow Abatement





# Goal of Sewer Collection System

- Collect and transport sanitary wastewater from each residence, business, and industry to the POTW **without any spillage**



# No spillage, you say !



- Achieve this goal regardless of the weather
- More difficult in wet weather due to the impact of inflow and infiltration (I & I)
- Public versus Private sources of I & I



# Provide System Storage

## IN LINE STORAGE



## OFF LINE STORAGE





With so much at stake,  
how do we measure the  
progress of complex,  
long-term CSO  
abatement programs  
fairly?



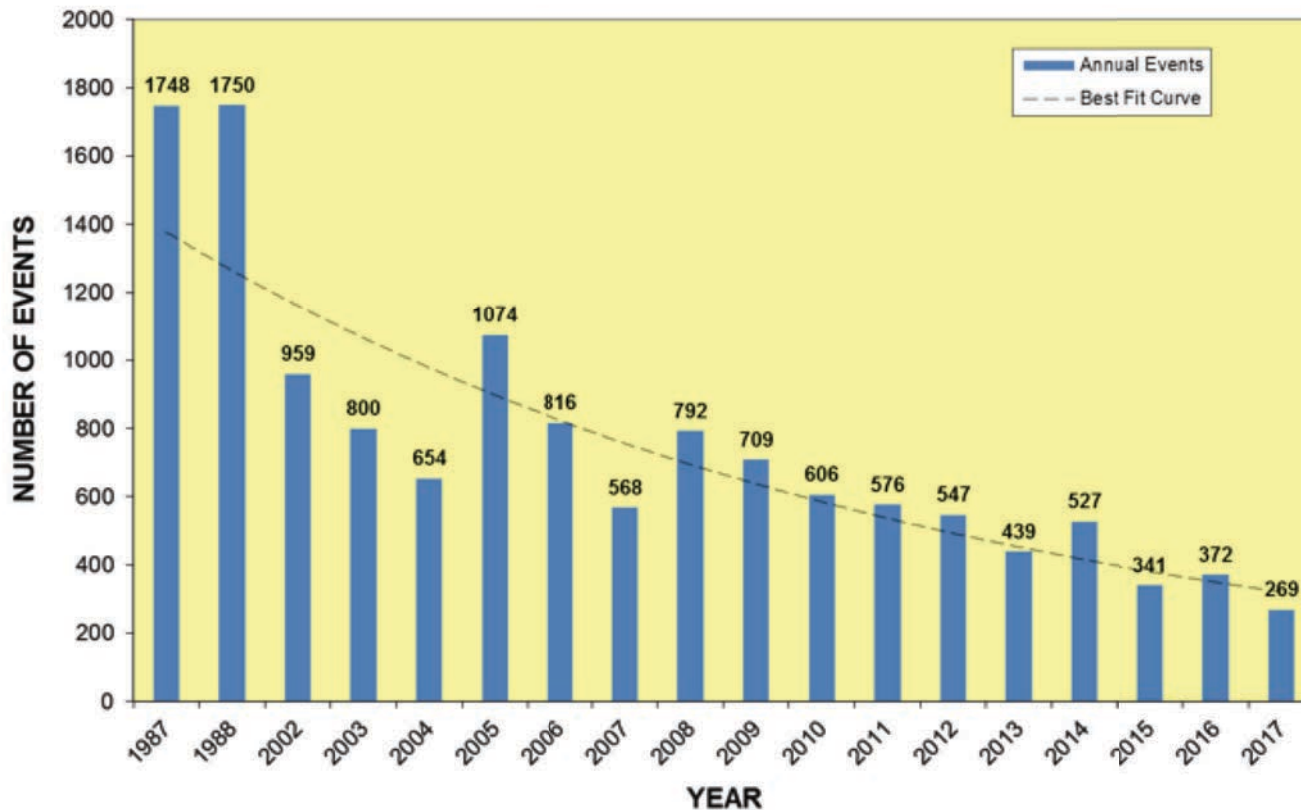
# Why is it important?

- Funding agency – make sure the money is spent to achieve the greatest benefit
- Regulatory agency – make sure the community is complying with the LTCP
- Owner – provides feedback on effectiveness of CSO program
- Rate Payer – make sure their money is spent in a cost effective manner



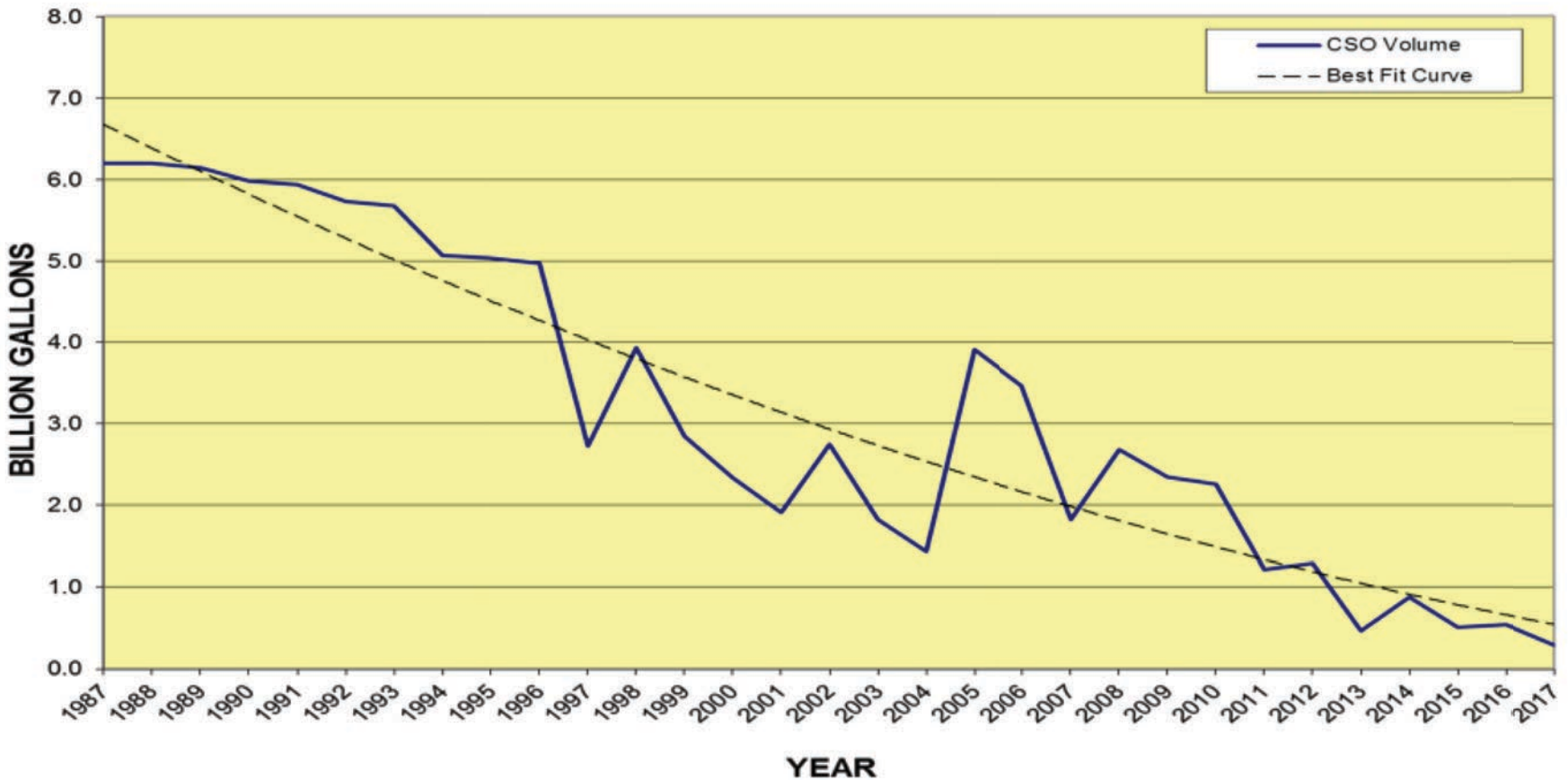
# How do we gauge statewide progress?

## MAINE - STATEWIDE COMBINED SEWER OVERFLOW (CSO) ANNUAL NUMBER OF DISCHARGE EVENTS



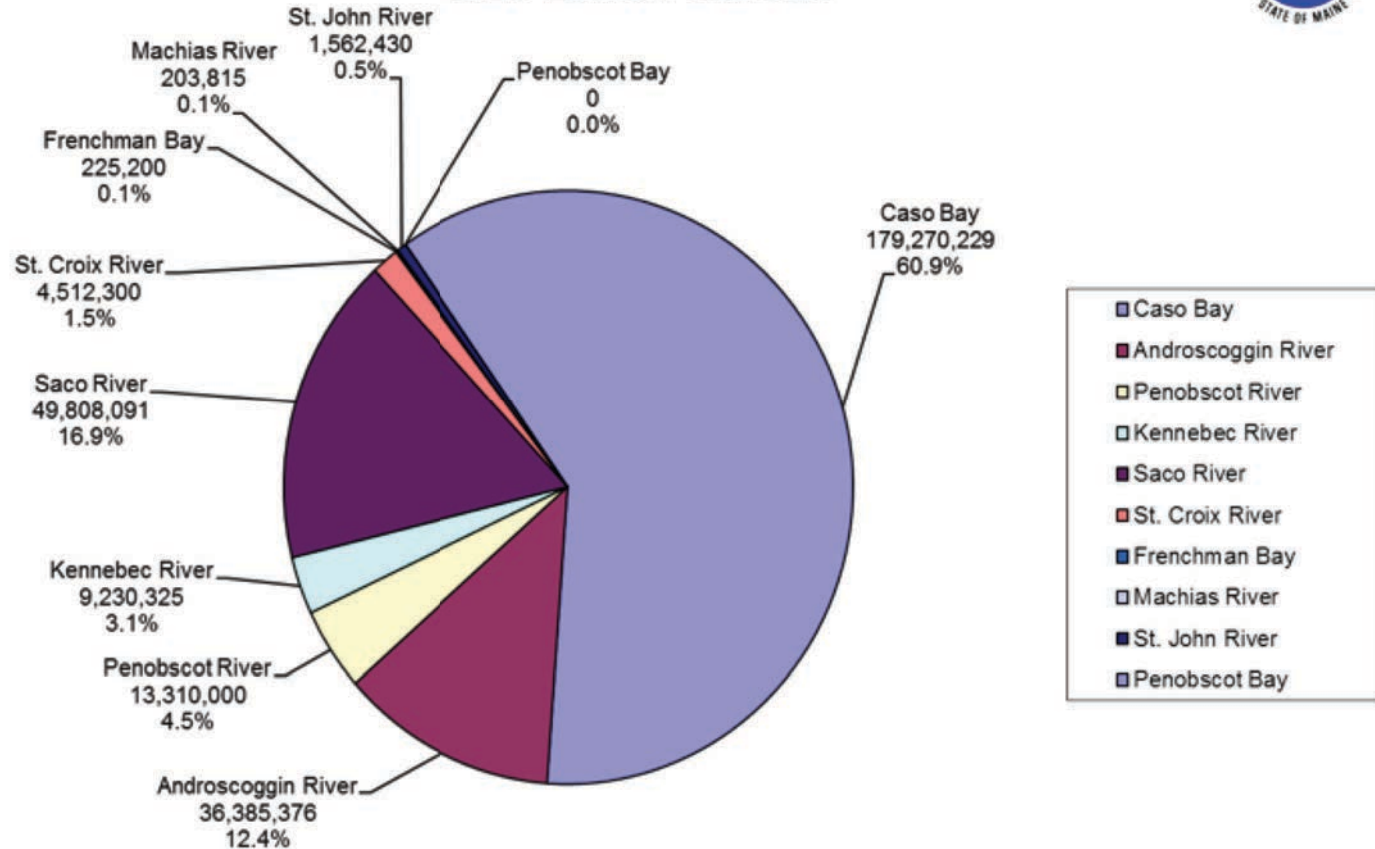
# Statewide Progress – Discharge Volume

## MAINE - STATEWIDE COMBINED SEWER OVERFLOW (CSO) VOLUME DISCHARGED



# Statewide Progress by Watershed

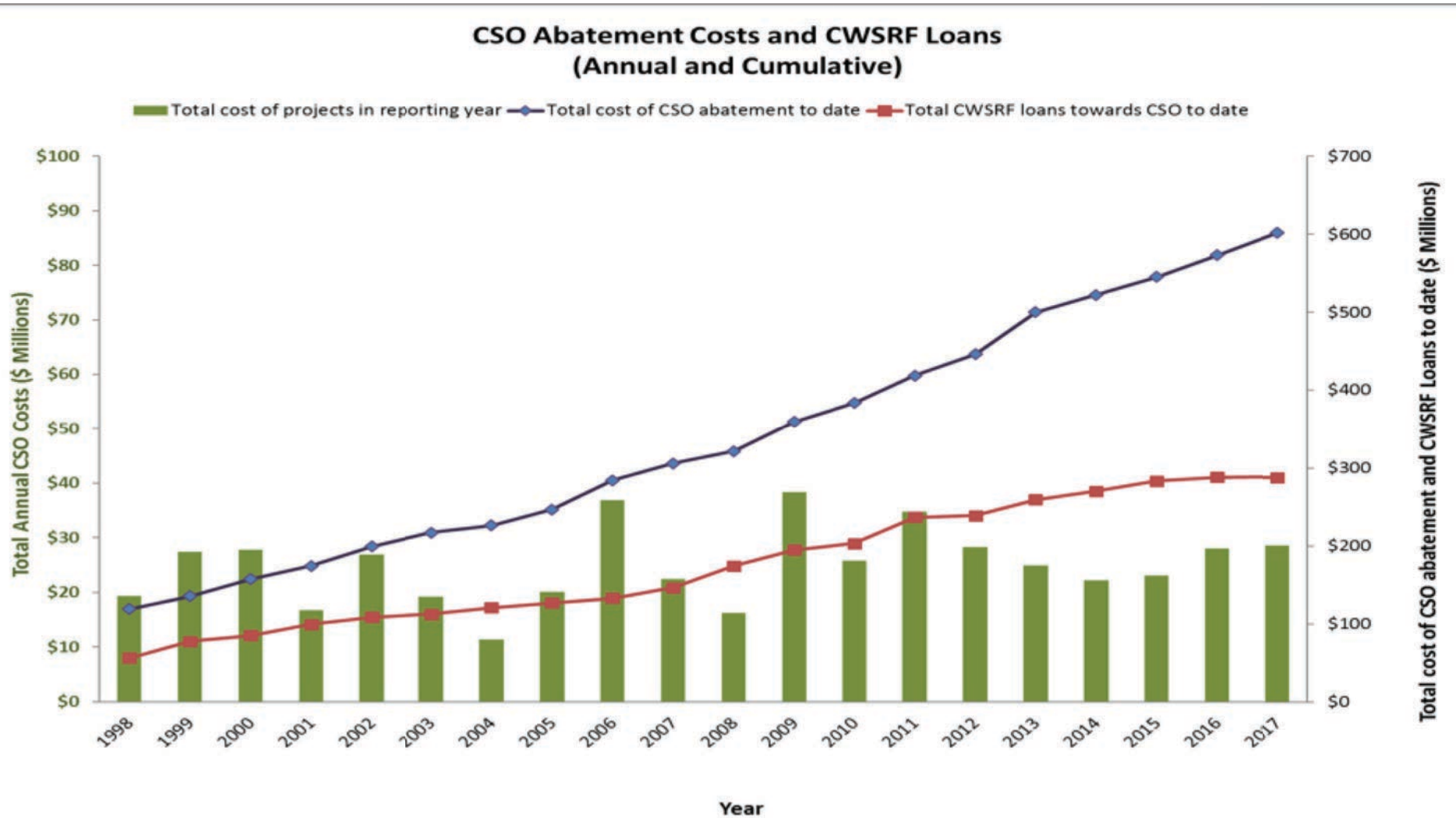
## Maine 2017 CSO Volume Discharged by Watershed 0.29 Billion Gallons



Receiving Waterbody, Overflow in Gallons, Percent of Total



# Annual Expenditures on CSO's



# Summary of Statewide CSO Statistics

Metric	1989	2017	% Reduction
# of CSO Communities	60	31	48
# of Overflow Events/Year	1,700	269	84
# of CSO Discharge Points	340	137	60
Volume Discharged (BGY)	6.2	0.29	95.3
CSO Discharge Volume per Inch of Rain (MG/inch)	128	7	94.5

# How do we gauge community progress?

- For individual CSO communities it's more difficult – can gauge annual progress relative to their own Master Plan, but it's difficult to compare with other communities progress



**Apple**



**Orange**



# Why is it so challenging?

- Number of variables involved hinder direct comparisons
  - Each CSO community began at a different starting point (late 80's, early 90's, late 90's)
  - Each chose a different timeframe to complete CSO abatement (ranging between 5 – 23 years)
  - Each selected their own level of control (1-yr 24-hr storm all the way to 100% elimination)



# Variable Starting Points

- Each began with varying levels of resources and public support to tackle the problem
  - 8 WW Districts
  - 24 WW Departments
  - 4 Contract Operations
- Each began with a debt load and rate structure unique to them
  - Sewer Rates as a % of MHI – initial range from 0.68% – 2.53%

# Variable Starting Points

- Each CSO community began with a different size collection system (35,000 to 1.2M LF)
- Each system varied in the degree that it was combined
- Each system varied in the age and condition of piping
- Each system varied with respect to the sensitivity of the receiving water

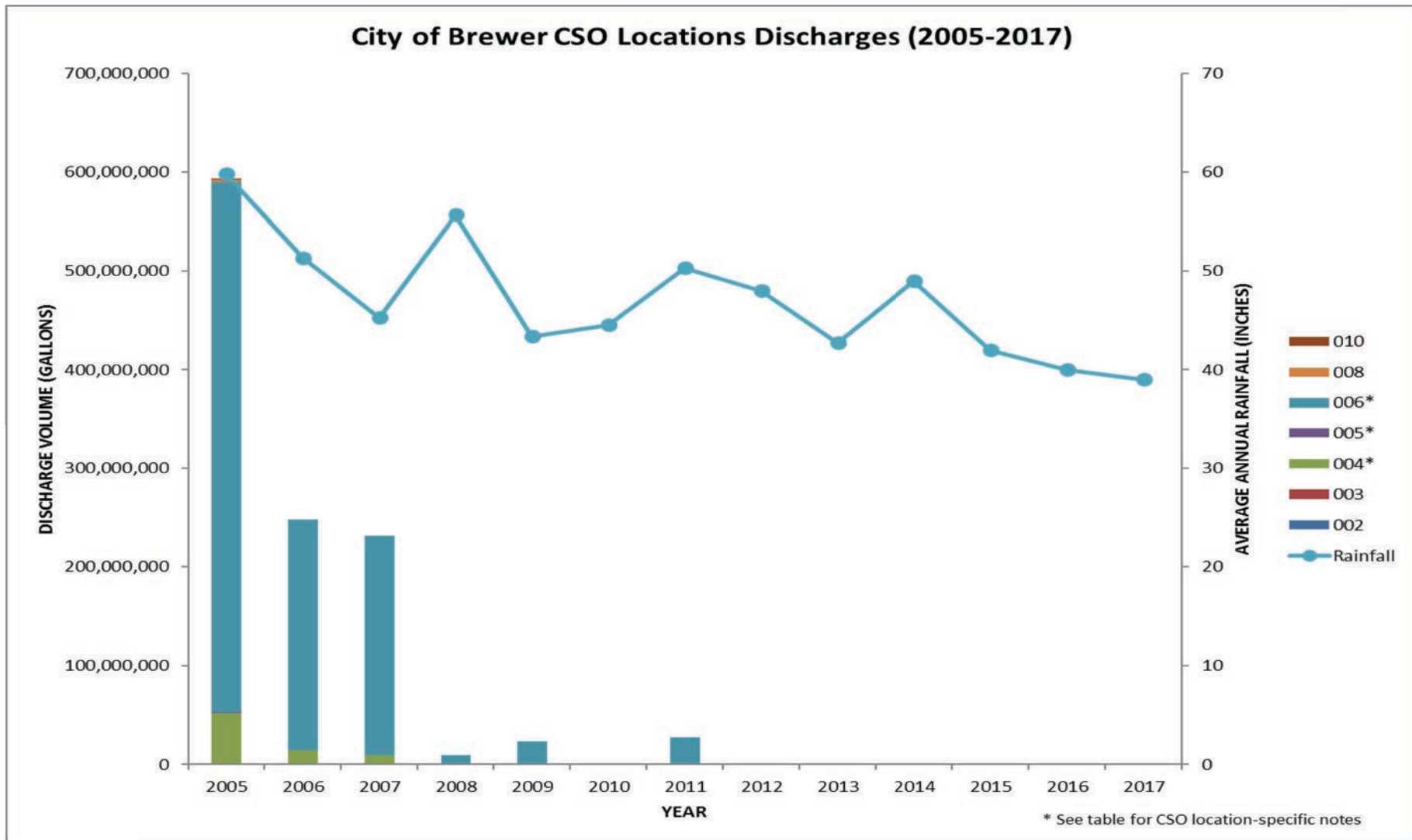


# Progress Relative to CSO Master Plan

- Compare actual CSO schedule relative to plan (% of schedule consumed)
- Compare actual CSO expenditure relative to plan (% cost expended)



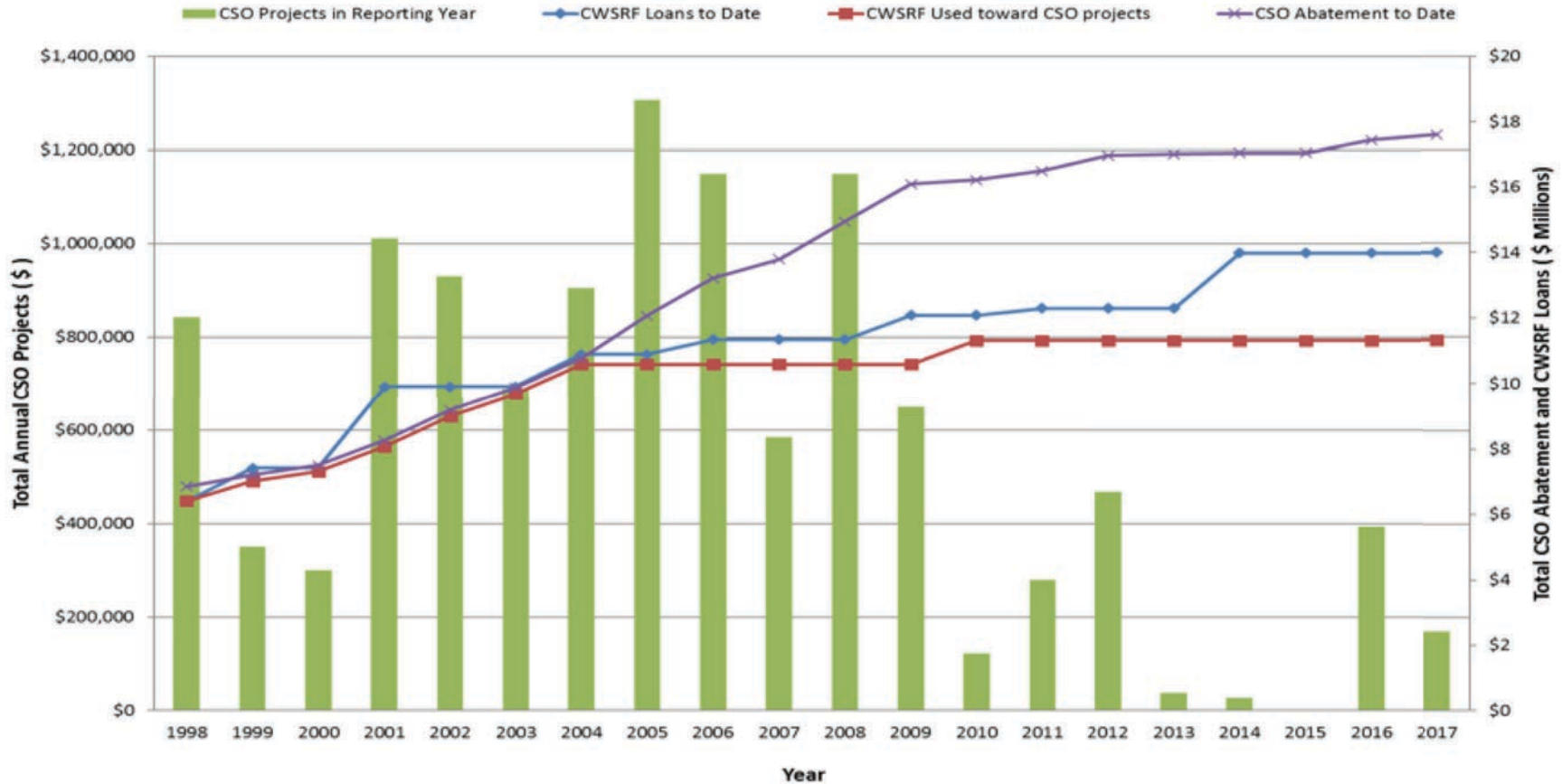
# Annual CSO Discharge Over Time





# Annual CSO Expenditure Over Time

City of Brewer  
(Abatement Costs and CWSRF Loans)



# Utilize Long Term Trends

- Reduction in CSO discharge events per year
- Reduction in # of CSO discharge points
- Reduction in annual discharge volume
- # of Catch Basins which remain connected and pace of removal
- Lineal feet of sewer pipe replaced or relined

# Sewer Systems react differently to wet weather

- Due to the different number of CSO discharge points (Range 1 to 30)
- Due to a different number of Catch Basins connected to the sewer (zero to 6,167)
- The mix of older (more combined) neighborhoods versus newer (less combined)
- The degree of public versus private I & I
- Whether any satellite systems are connected



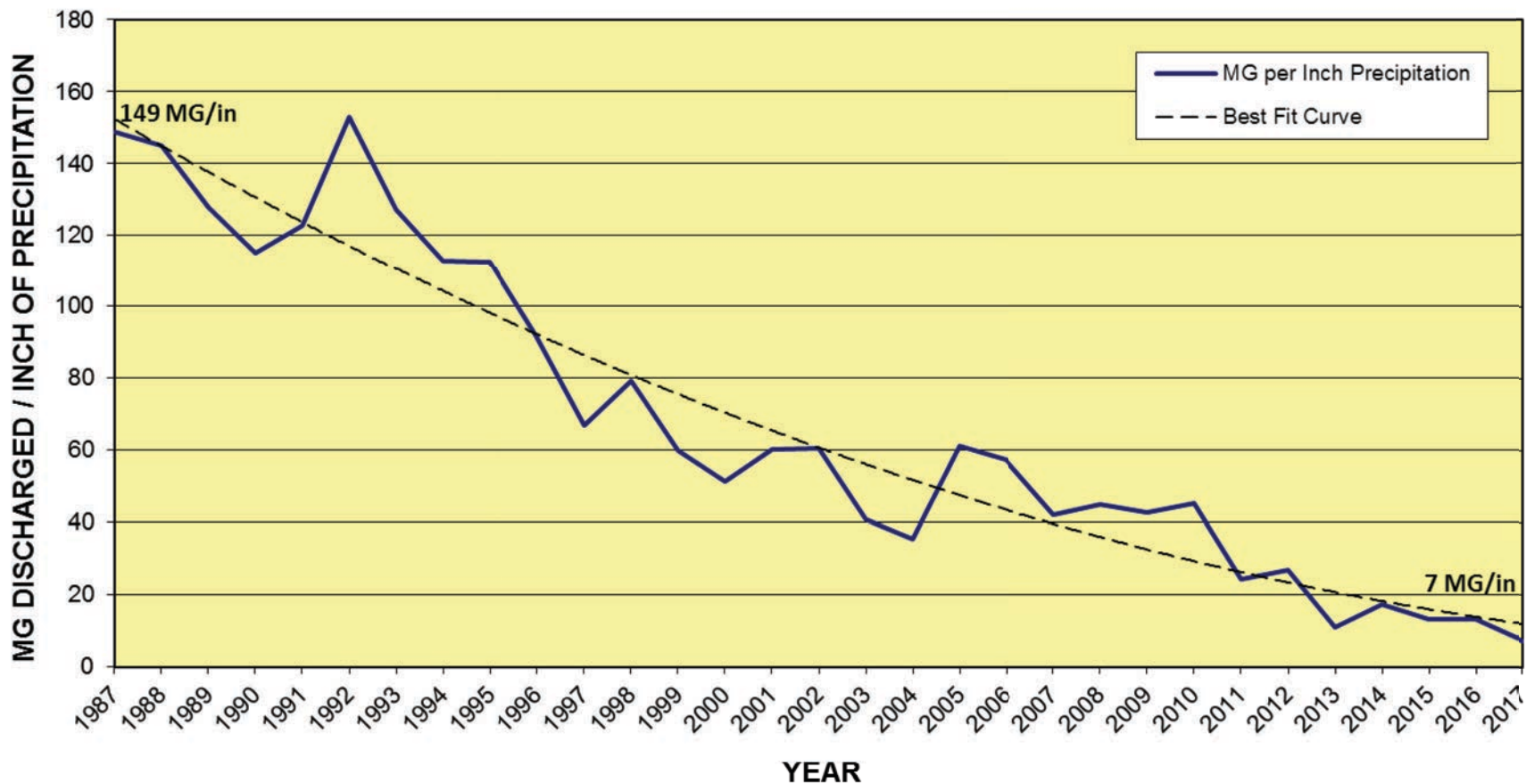
# Is there a way to compare CSO programs with all these variables?

- Try to remove the impact of the variable by unitizing it.
- What are biggest variables that have the most impact ?
  - Precipitation
  - Area of collection system in acreage

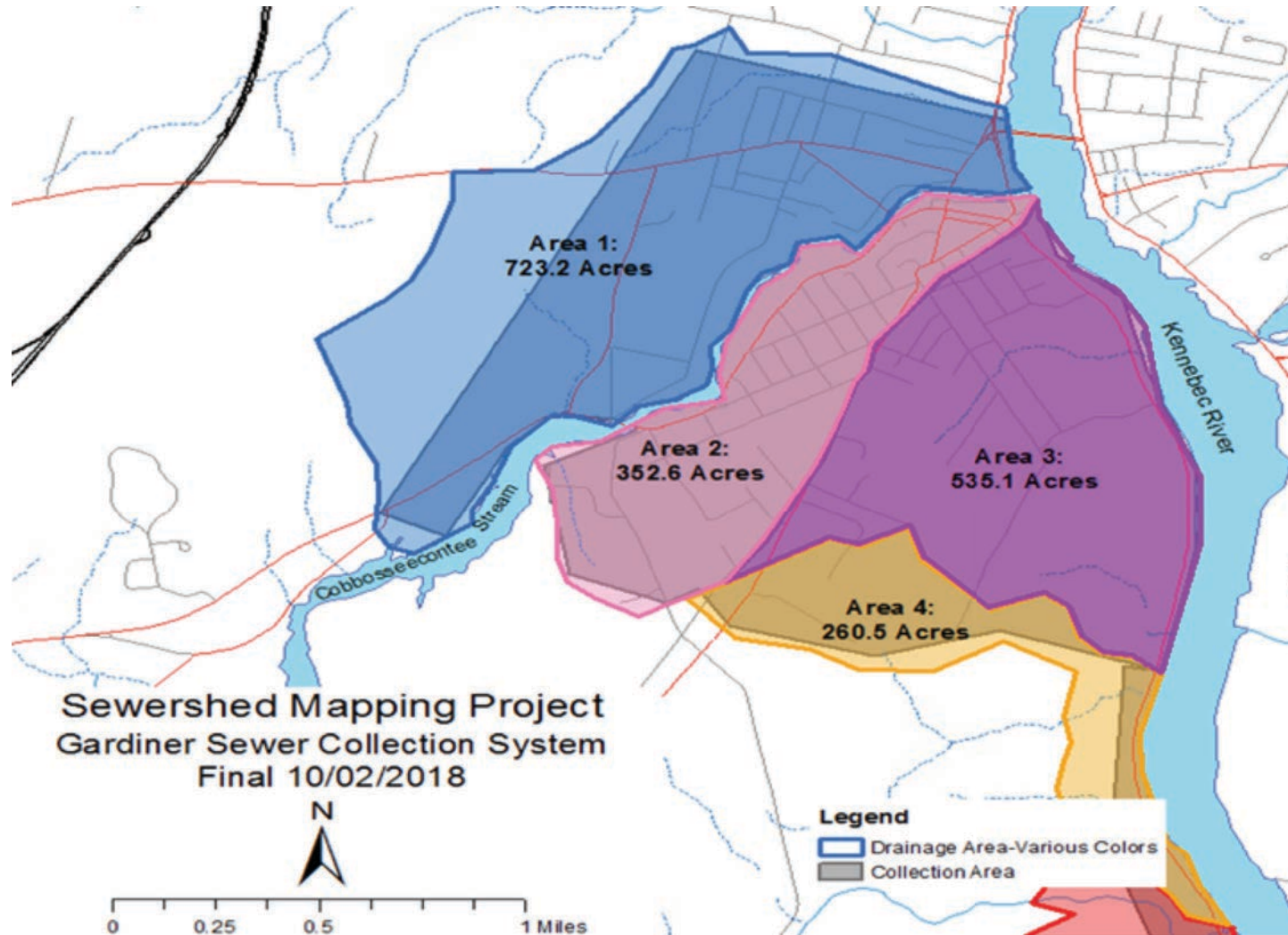




# MAINE COMBINED SEWER OVERFLOWS ANNUAL VOLUME DISCHARGED PER INCH OF PRECIPITATION



# Unitize CSO Discharge per Acre



# Apples to apples comparison?

- Unitize precipitation to arrive at CSO discharge per inch of precipitation
- Unitize area of collection system to arrive at CSO discharge per acre of drainage area
- Combine the two to arrive at
  - CSO Discharge/inch of ppt/acre of drainage

# Those that don't remember history...





# The smell of \$\$\$\$\$





***Thank You!***  
***Any questions call:***

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