

# **CHLORIDE TOTAL MAXIMUM DAILY LOAD STUDIES IN THE INTERSTATE 93 CORRIDOR**

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**NH Department of Environmental Services**

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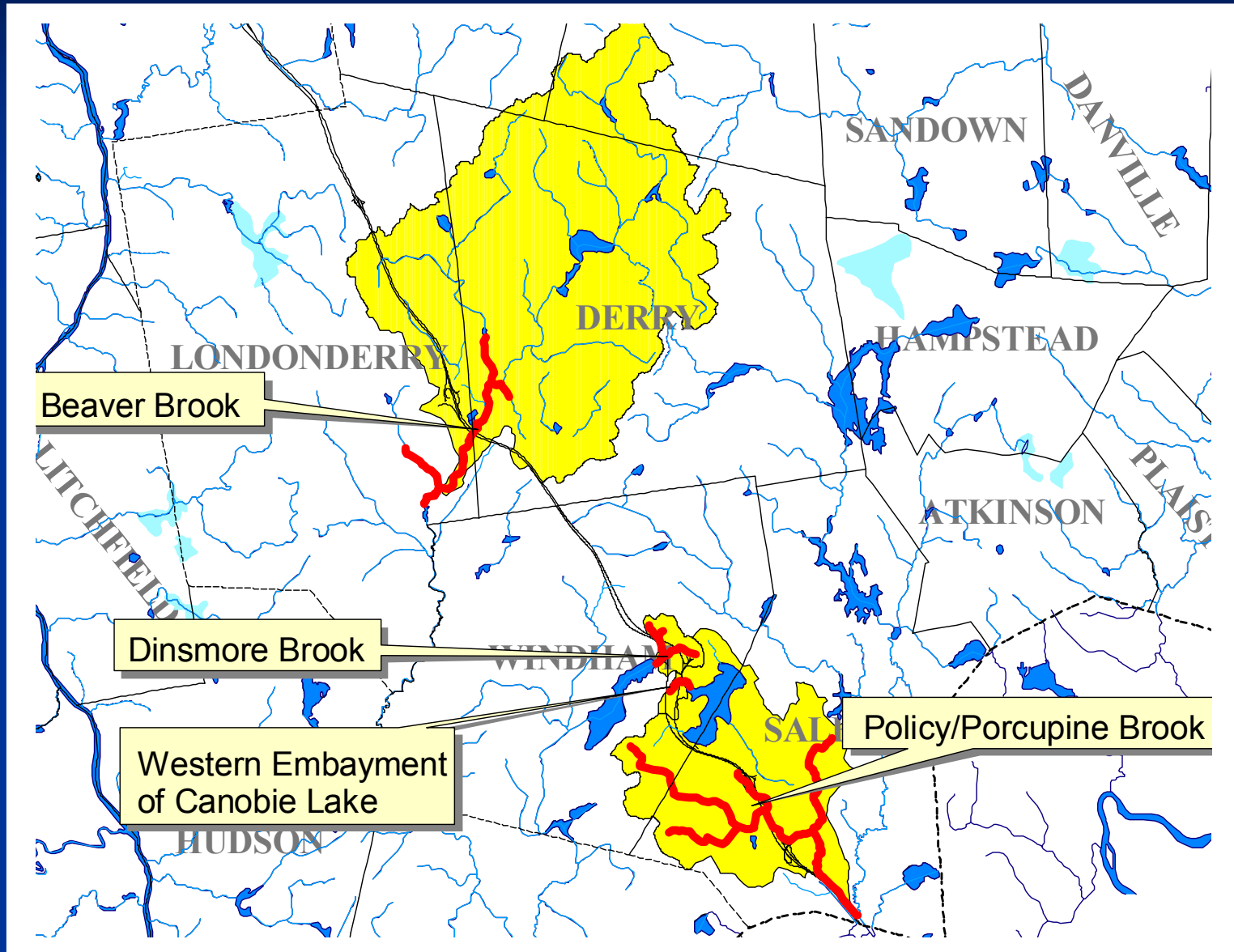
# Motivation and Jurisdiction

- Section 303(d) of the Clean Water Act
  - Each State shall identify those waters not meeting applicable water quality standards (“impaired waters”).
  - For the impaired waters, each State shall establish the **total maximum daily load** for the pollutants causing the impairment. Such load shall be established at a level necessary to implement the applicable water quality standards with seasonal variations and a margin of safety.
- Four streams in the I-93 corridor have been shown to be impaired for chlorides with road salt presumed as the primary source.

# Streams Impaired for Chloride

<u>Watershed Name</u>	<u>Impaired Assessment Unit</u>	<u>Size (acres)</u>
Policy Brook and Unnamed Tributary to Policy Brook	NHRIV700061102-18	6,557
Dinsmore Brook	NHRIV700061204-01	380
Beaver Brook	NHRIV700061203-16	17,041
Unnamed Tributary to Western Embayment of Canobie Lake	NHRIV700061102-23	127

# Impaired Streams with Watersheds



# TMDL Study Questions

- How frequently and by how much do chloride concentrations exceed water quality standards at the outlet of each TMDL watershed?
- What are the critical conditions in terms of flow and seasons for chloride impairments?
- Are there “hot spots” in the watershed with higher than average chloride concentrations where implementation actions would be most effective?
- How much chloride is currently contributed annually by each major source category (e.g., I-93, state roads, municipal roads, parking lots) in the watershed?

# TMDL Study Questions (cont.)

- What is the maximum load of chlorides that each of the impaired assessment units can assimilate without violating the water quality standards?
- How much chloride loading should be allocated to each major source category in the watershed in order to meet water quality standards?
- What actions are needed by state, municipal and private entities to reduce chloride loadings to the TMDL?
- After the recommended actions are implemented, how will we know whether chloride concentrations are decreasing in the impaired assessment units?

# TMDL Tasks and Schedule

<u>Activity</u>	<u>Start</u>	<u>End</u>
Activity #1: Chloride Impairment Characterization Monitoring	7/1/06	6/30/07
Activity #2: Chloride Source Identification Monitoring	1/1/07	3/31/07
Activity #3: Chloride Loading Rate Research	7/1/06	6/30/07

# TMDL Schedule (cont.)

Activity #4: Draft TMDL Report preparation	7/1/07	9/30/07
Activity #5: Implementation Plan Development	10/1/07	9/30/08
Final TMDL report preparation	10/1/07	9/30/08
Activity #6: TMDL Implementation Monitoring	7/1/07	6/30/16

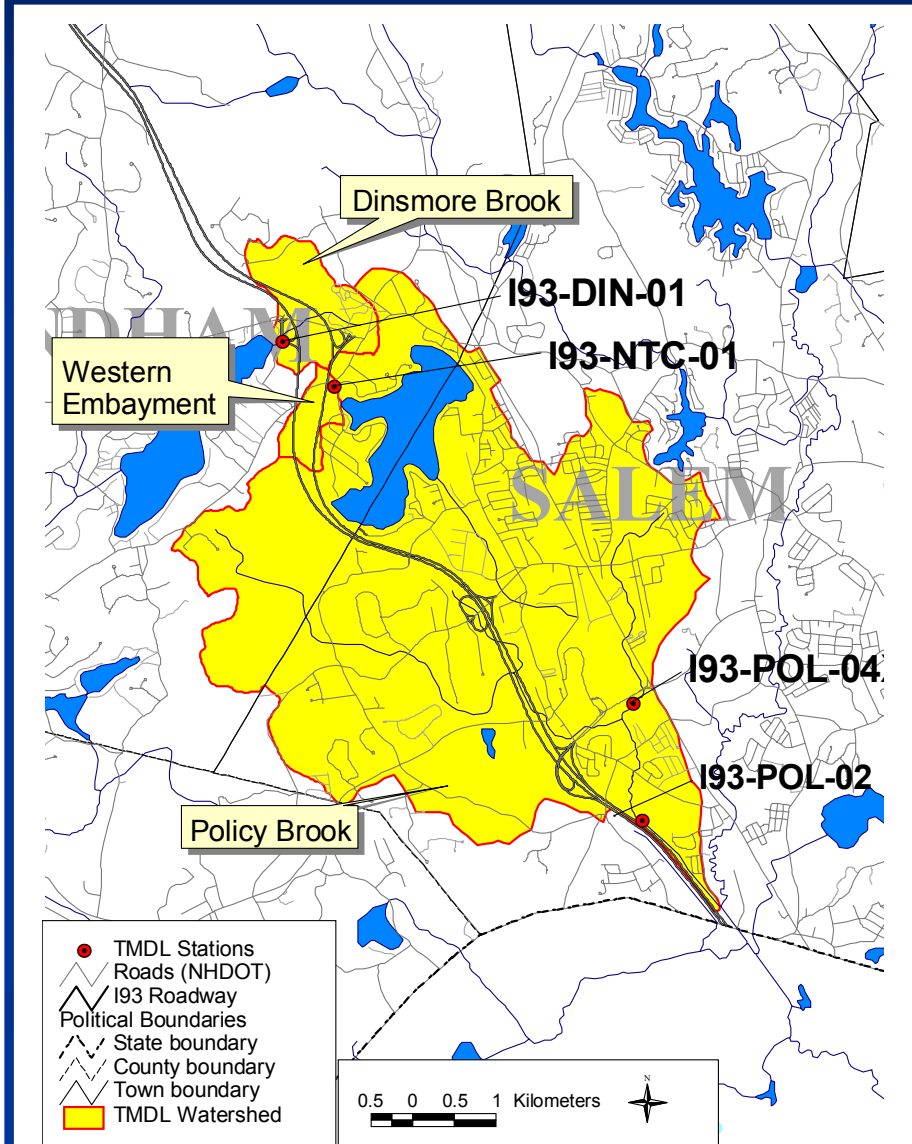
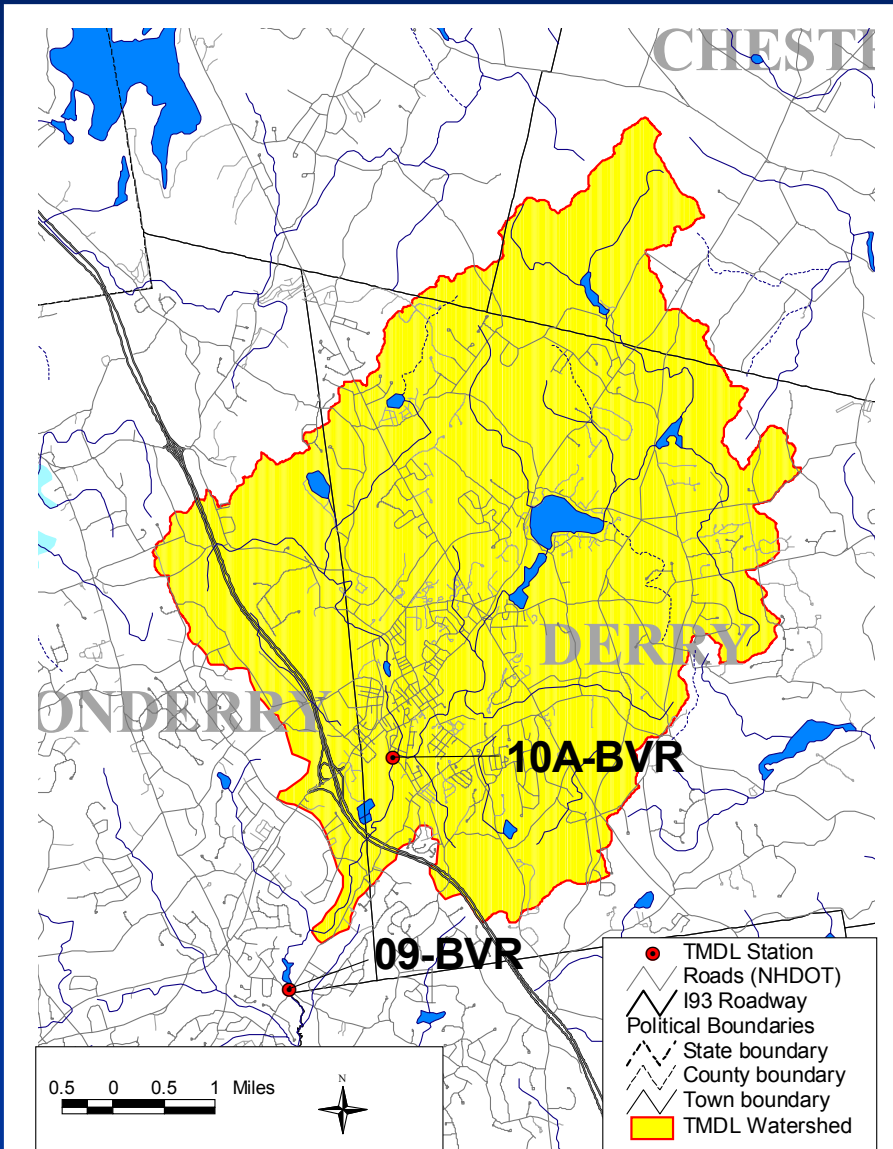


# Chloride and Flow Monitoring

## (Activities #1, #2)

- Near continuous measurements of specific conductance and flow at 6 sites for one year (7/1/06 to 6/30/07).
- Winter “hot-spot” monitoring for specific conductance at 15-20 locations from 1/1/07 to 3/31/07.

# Primary Sampling Locations

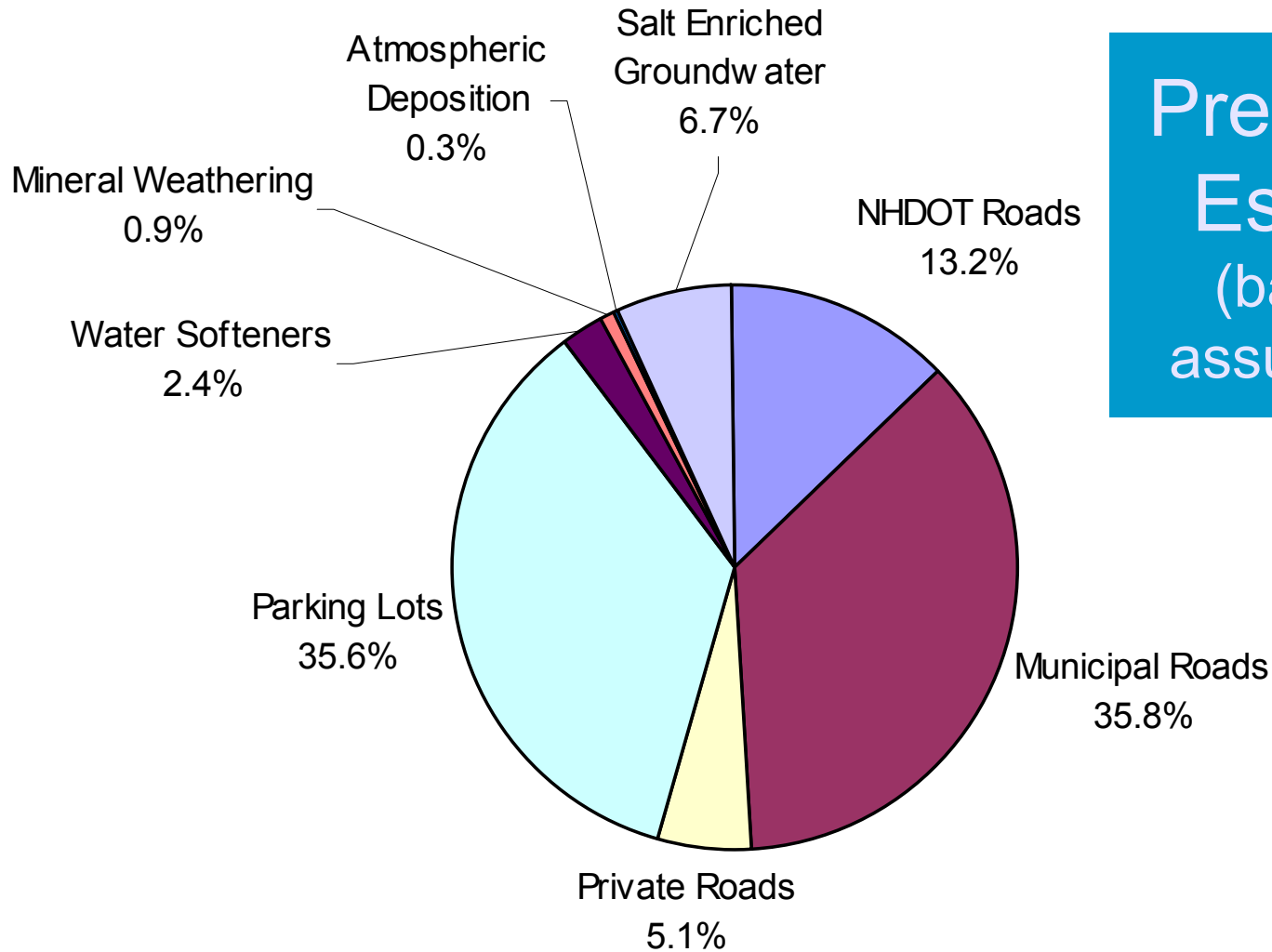


# Chloride Loading Research

## (Activity #3)

- Salt applied to roadways and parking lots for deicing in the watersheds by DOT, municipalities, private contractors
- Groundwater discharge
- Atmospheric deposition
- Water softeners
- Runoff from uncovered salt piles

## Percent of Salt Load for Each Source (Policy Brook)



**Preliminary Estimate**  
(based on assumptions)

**Total: 6,550 tons/yr (salt) or 4,000 tons/yr (Cl)**

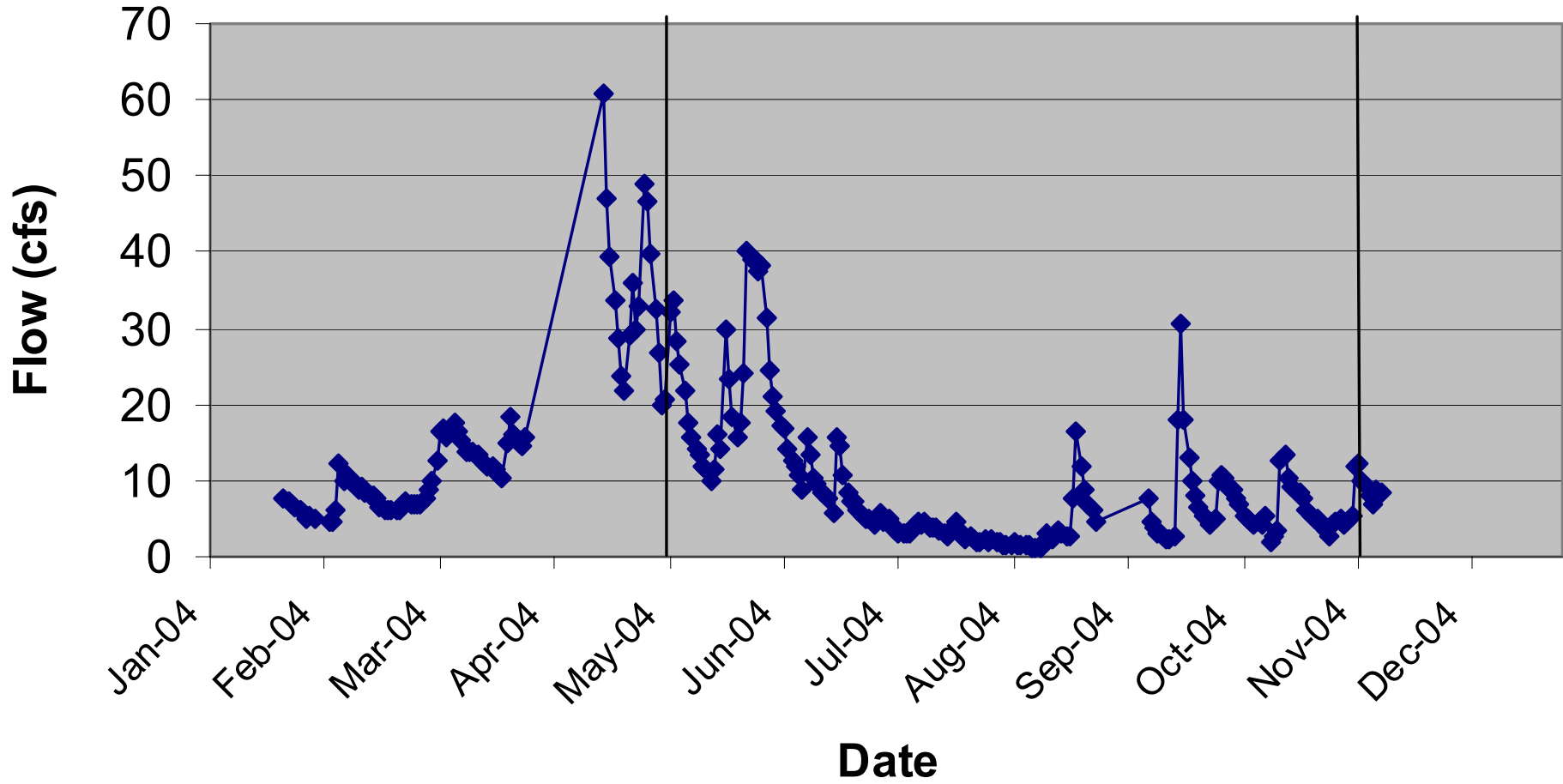
# TMDL Calculation and Report

## (Activity #4)

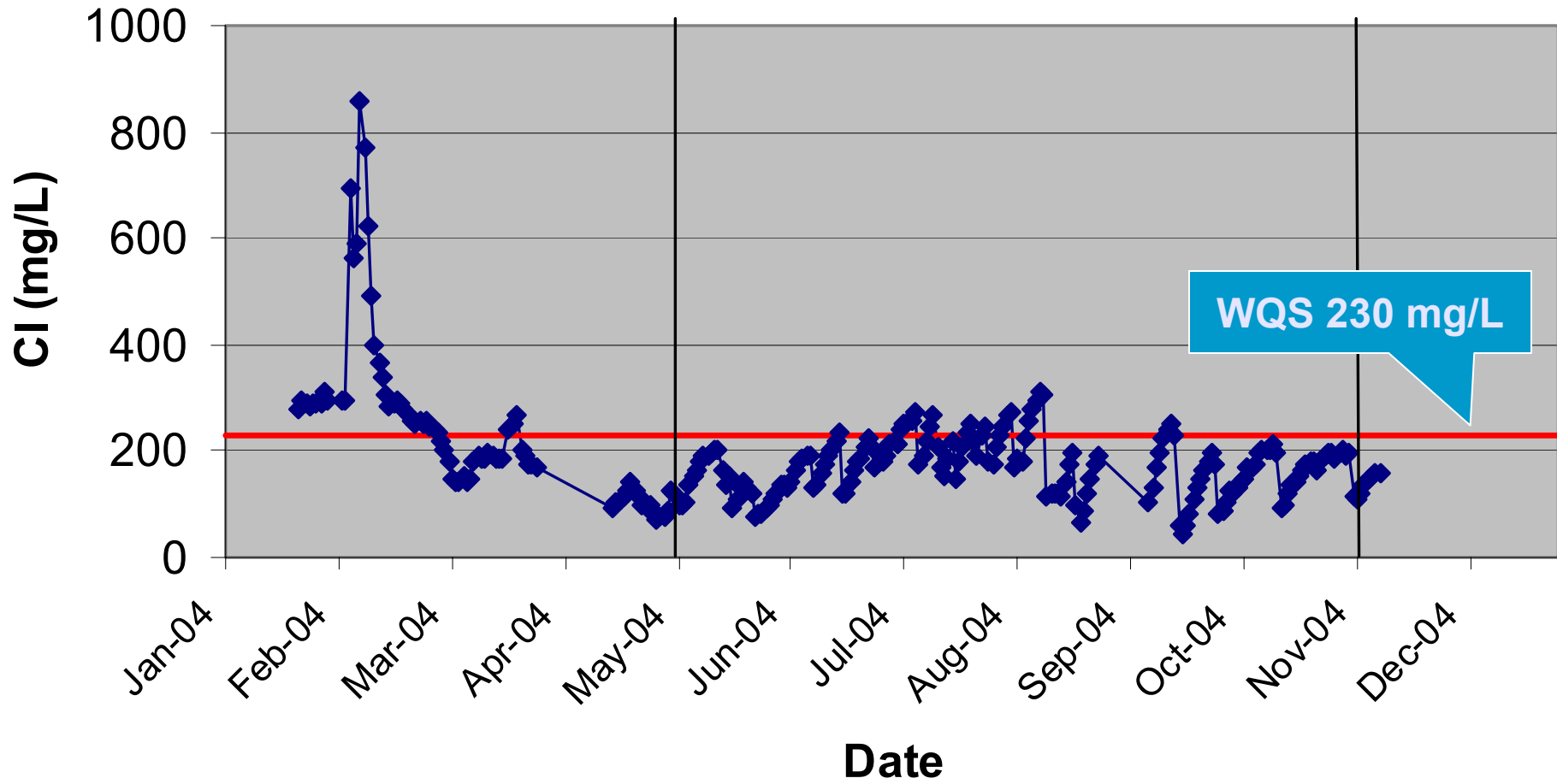
1. Establish a TMDL load duration curve for critical conditions in each watershed.
  - Generate flow duration curves
  - $\text{TMDL} = \text{flow duration curve} \times \text{WQS} \times 0.9$
2. Express the TMDL load duration curve as a percent reduction in chloride loads.
  - Compare measured loads to TMDL load duration curve to calculate percent reduction

**Example for Policy Brook follows**

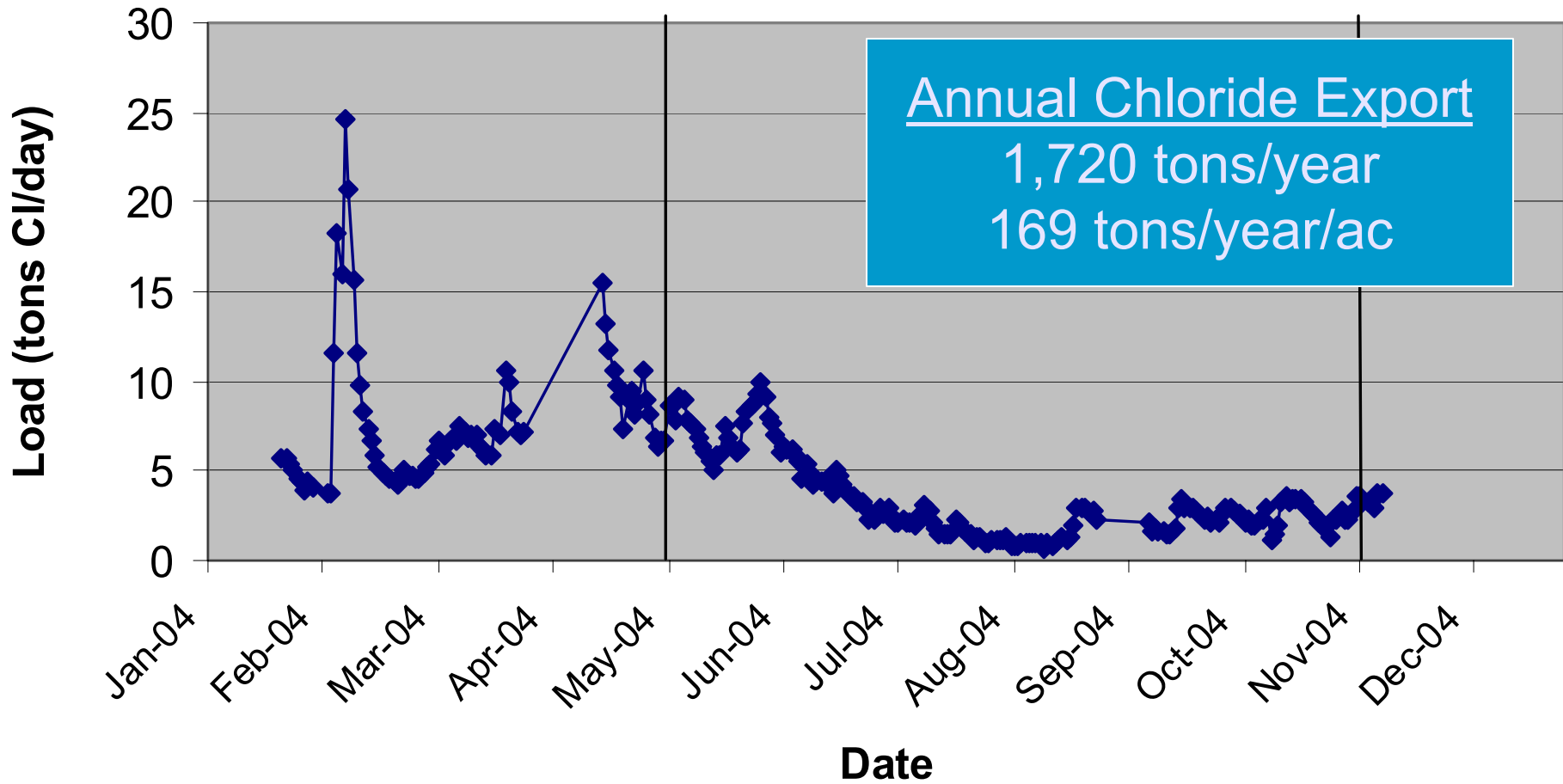
# Flow at I93-POL-02 in 2004



## Chloride Concentration at I93-POL-02 in 2004

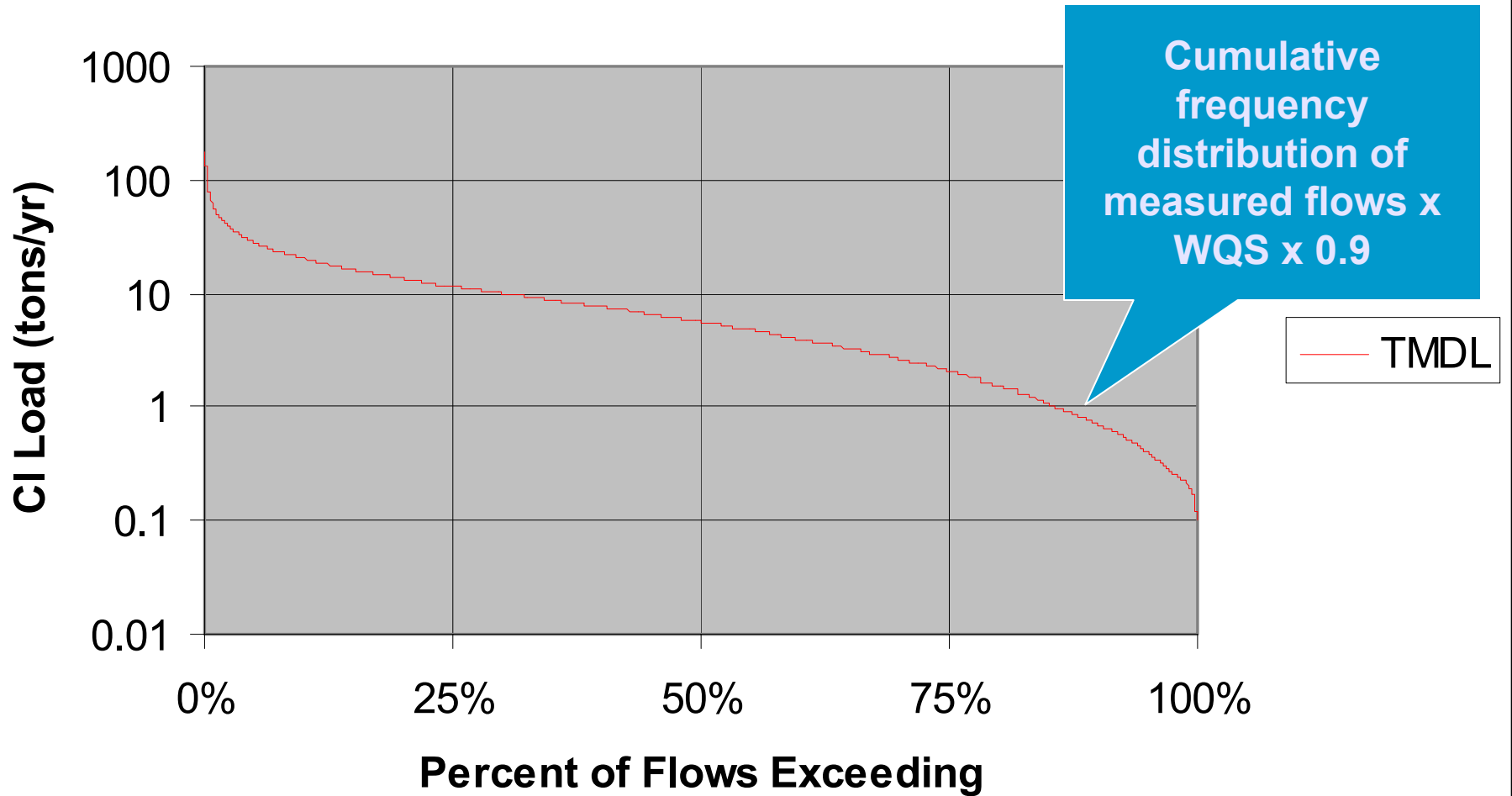


## Chloride Export at I93-POL-02 in 2004

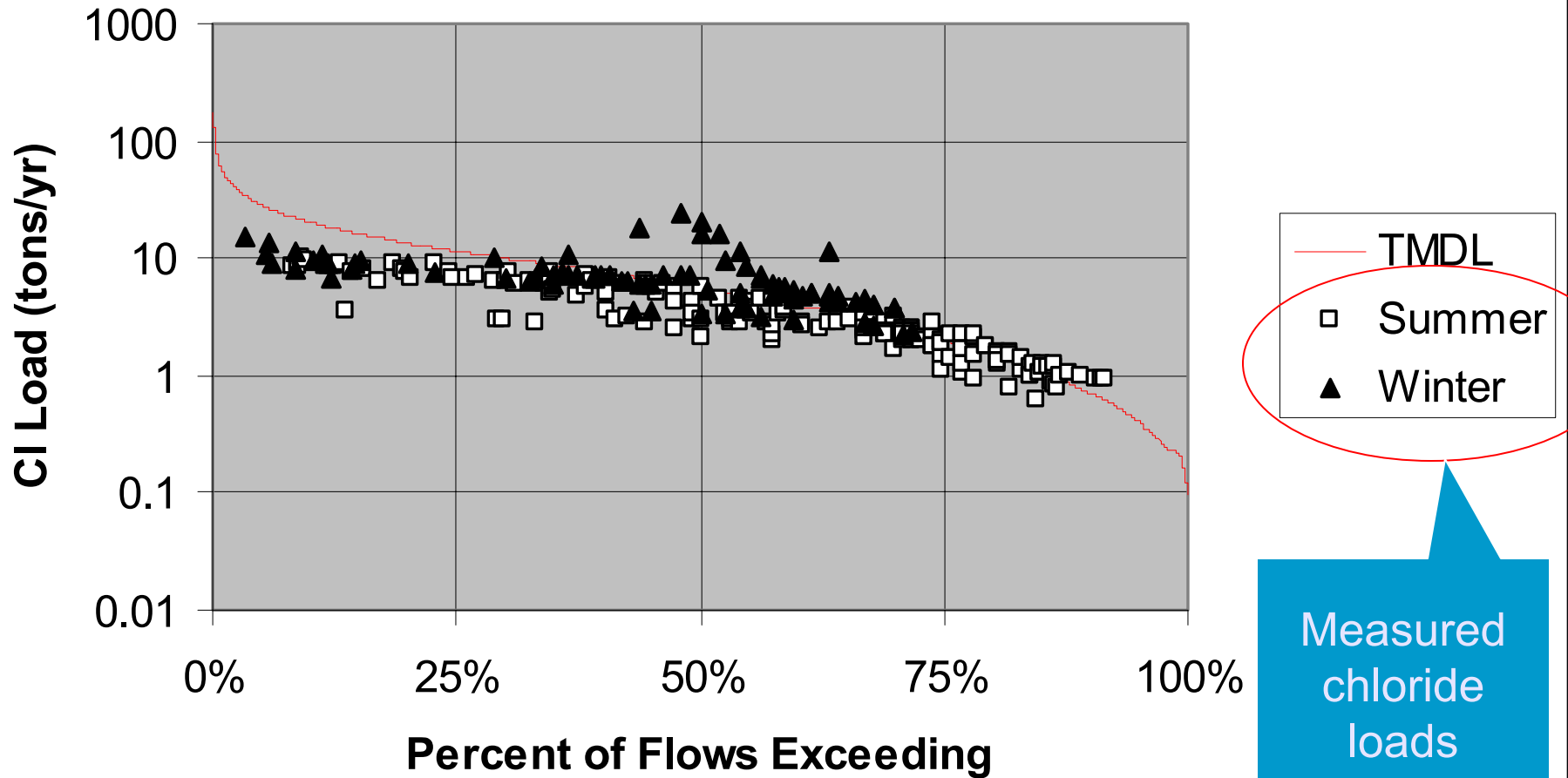




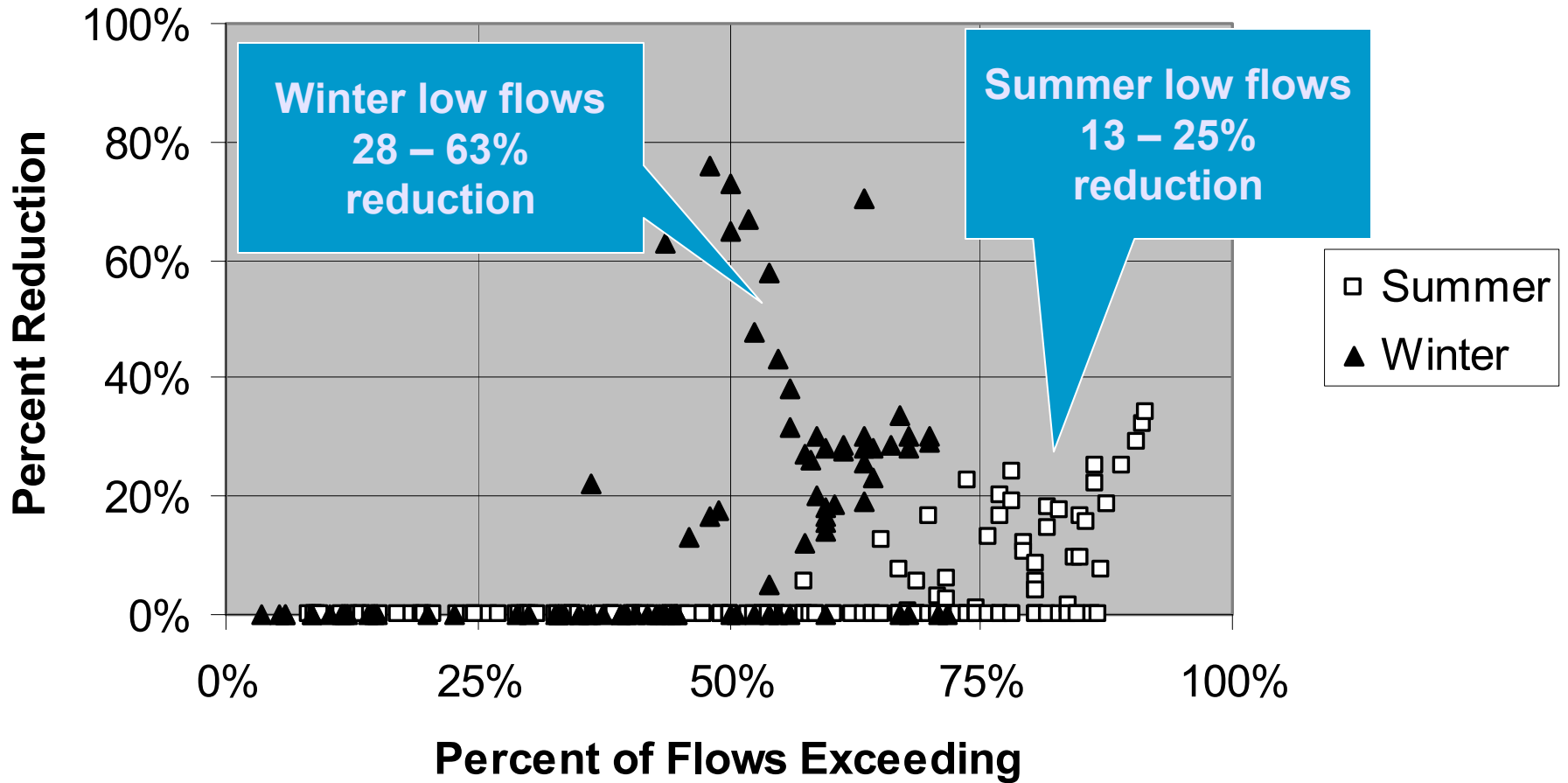
## Policy Brook 2004 - Daily Averages



## Policy Brook 2004 - Daily Averages



# Policy Brook 2004 - Daily Averages



# TMDL Implementation Plan

## (Activity #5)

- To be developed by the Salt Reduction Group between 10/1/07 and 9/30/08.
- Allocate chloride loadings between the various sources.
- List action items that need to be done to reach the TMDL target.

# Implementation Monitoring

## (Activity #6)

- Continue monitoring for specific conductance at 3 sites in the winter and one site all year.
- Perform similar analyses on the data as for the TMDL to track trends.
- Monitoring scheduled through 2016.
- First trend analysis in 2012.

# Partners

- NH Department of Transportation
- Environmental Protection Agency
- U.S. Geological Survey
- Plymouth State University
- Municipalities
- You!

# Questions

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