

CHLORIDE TOTAL MAXIMUM DAILY LOAD STUDIES IN THE INTERSTATE 93 CORRIDOR

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Watershed Management Bureau

NH Department of Environmental Services

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Acknowledgments

- Federal Highway Administration
- NH Department of Transportation
- Environmental Protection Agency
- U.S. Geological Survey
- Plymouth State University
- Town of Derry, NH
- Town of Londonderry, NH
- Town of Windham, NH
- Town of Salem, NH
- And many others...

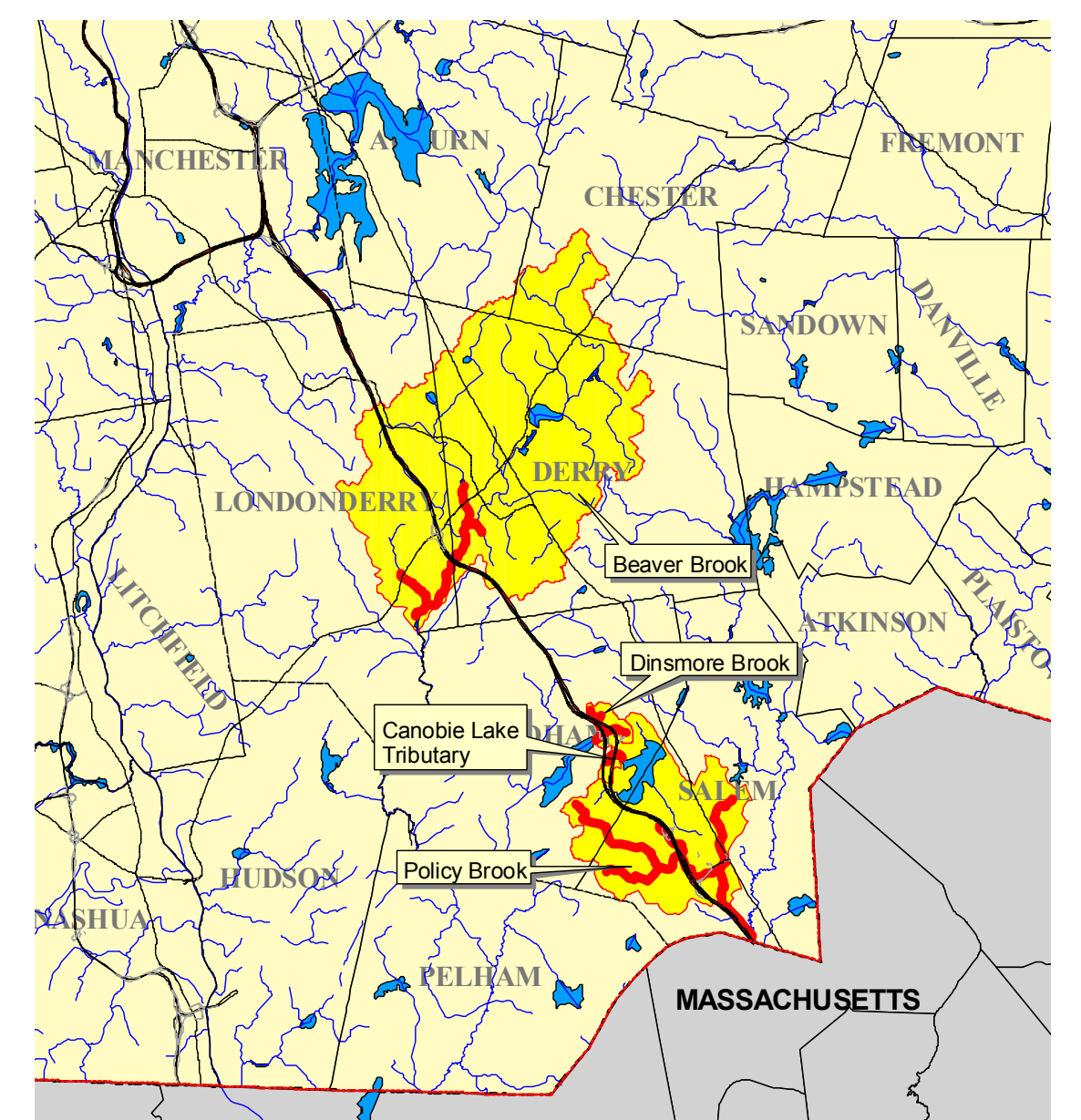
Motivation and Jurisdiction

- 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-Porcupine Brook	NHRIV700061102-18	6,557
Dinsmore Brook	NHRIV700061204-01	380
Beaver Brook	NHRIV700061203-16	17,041
North Tributary to Canobie Lake	NHRIV700061102-23	127

Impaired Streams with Watersheds

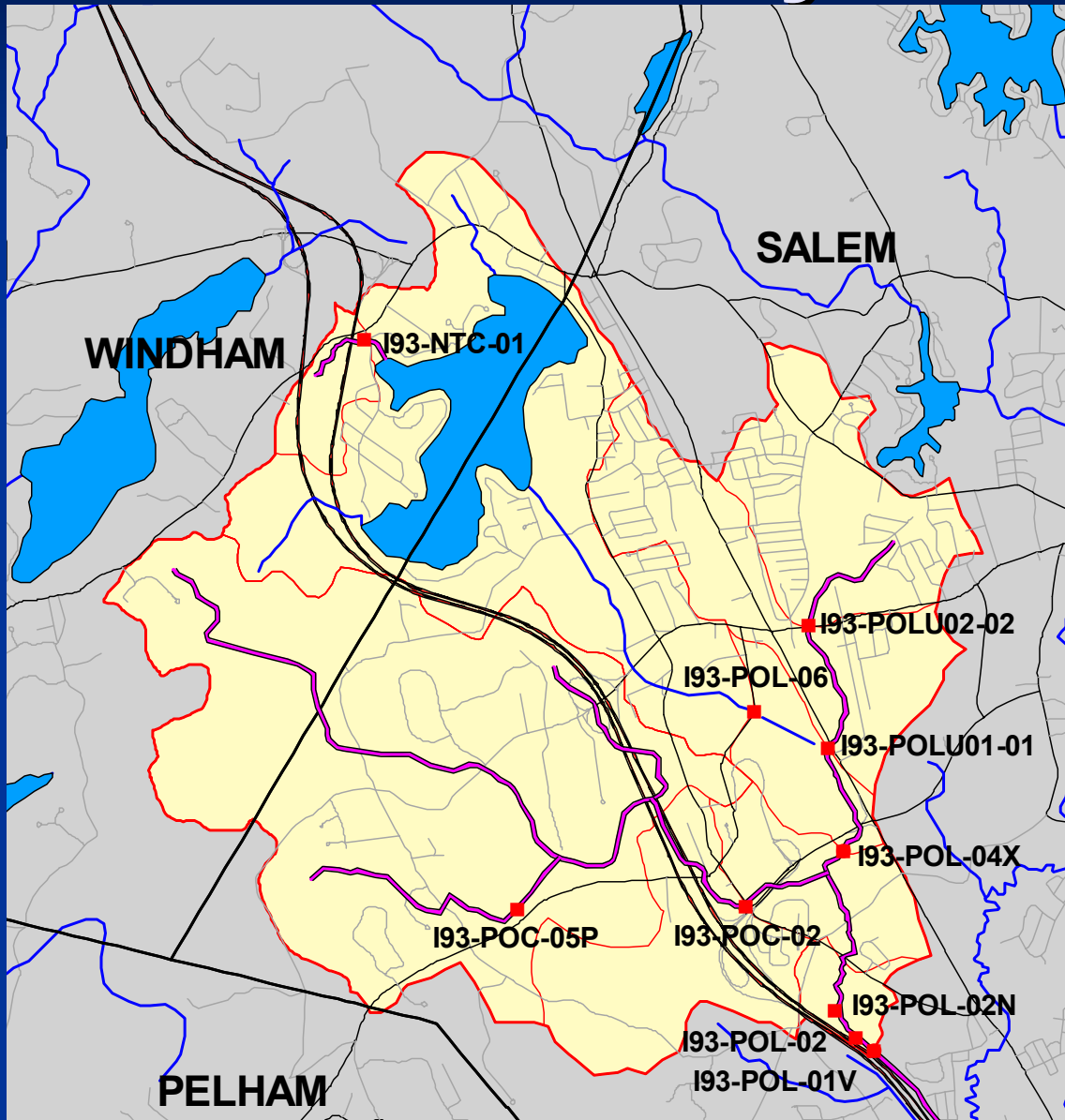


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**Policy-Porcupine Brook
in Salem and Windham, NH**



Waterbody Description



Policy Brook Key Facts

Drainage area:
10.18 sq.mi.

Population:
10,463

23% developed

98.4% urbanized
area classification

Applicable Water Quality Standards (WQS)

- All surface waters of the State must meet WQS in order to protect their designated uses.
- The WQS for chloride in nontidal Class B waterbodies to protect aquatic life is 860 mg/L for acute exposures or 230 mg/L for chronic exposures (Env-Ws 1703.21).
- The acute and chronic WQS are based on average concentrations over a one-hour period and a four day period, respectively (EPA, 1991).
- The frequency of violations of WQS should be less than once every three years (EPA, 1991).

Policy Brook Receiving Water Quality Characterization

- Aquatic Life Use Support “impairments” from New Hampshire’s 2006 Section 303(d) list:
 - Chloride
 - pH
 - Benthic macroinvertebrate assessment
 - Benthic habitat assessment.
- Fish consumption designated use is also impaired due to the state-wide fish consumption advisory for mercury.

Water Quality Data from FY07

Key Facts

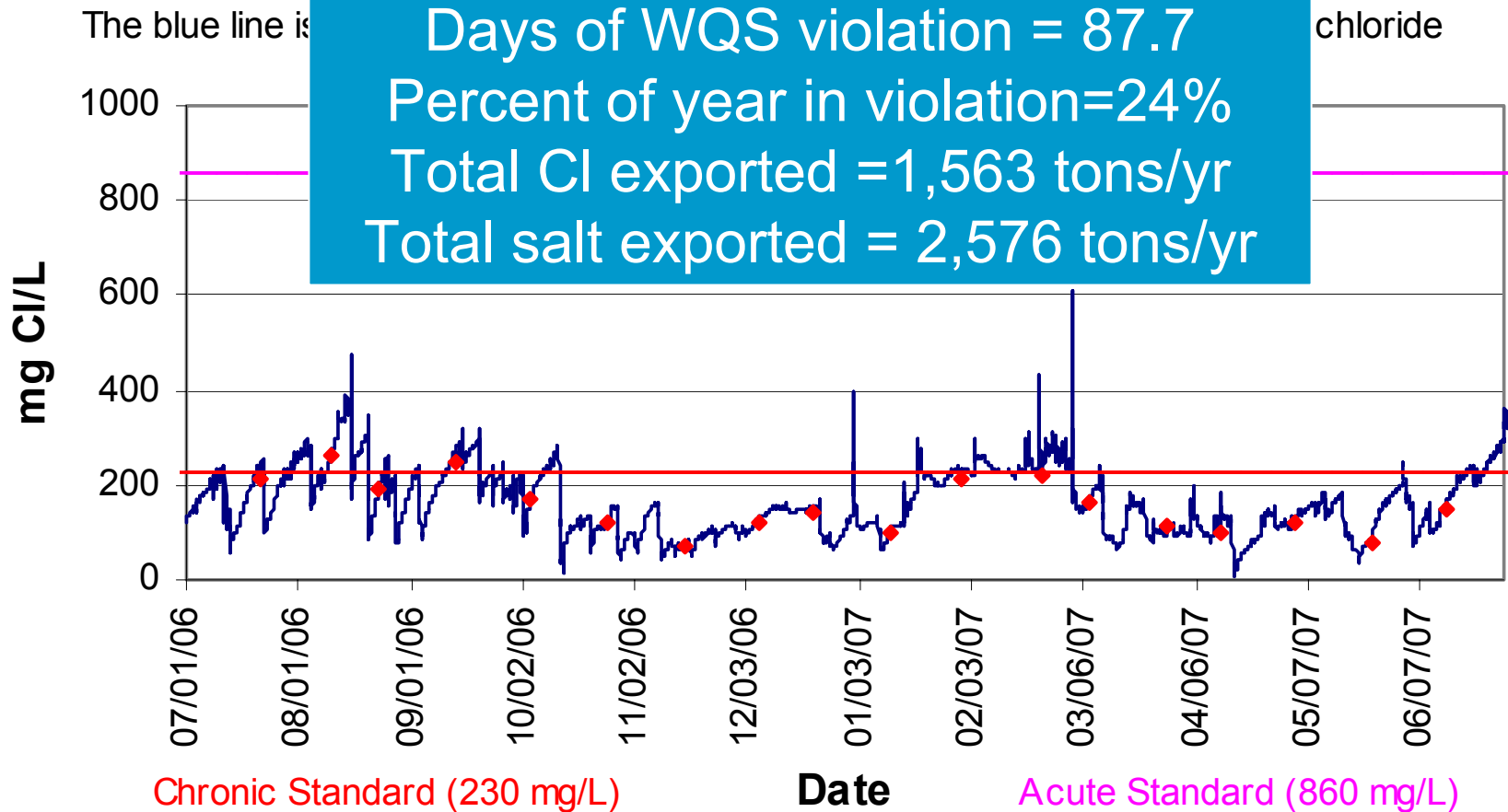
Average chloride conc. = 163 mg/L

Days of WQS violation = 87.7

Percent of year in violation = 24%

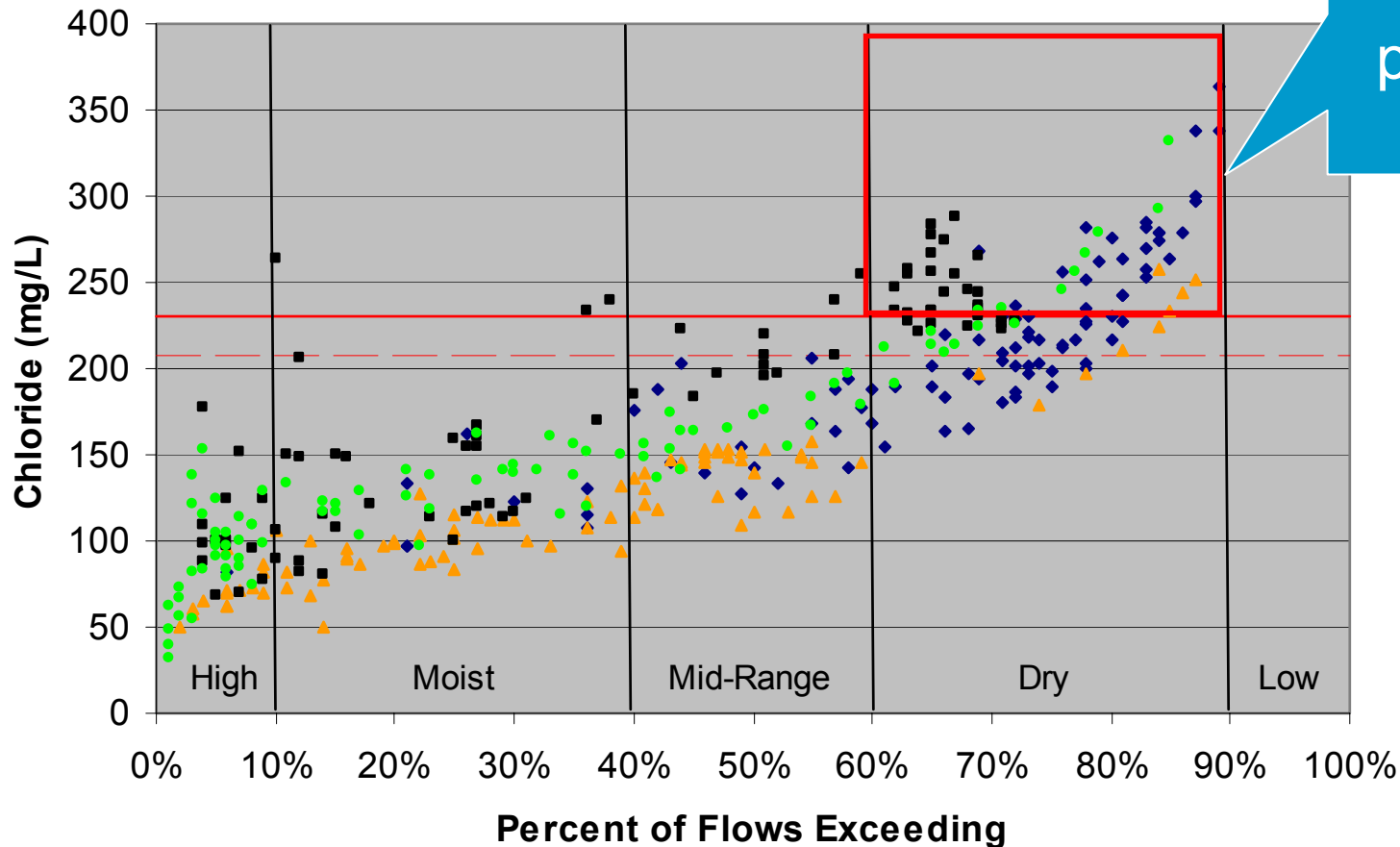
Total Cl exported = 1,563 tons/yr

Total salt exported = 2,576 tons/yr



Water Quality Data from FY07

Daily Average Chloride Concentrations



Key Fact
WQS violations occur during periods of low stream flow

- ◆ SUMMER
- ▲ FALL
- WINTER
- SPRING
- WQ Stds
- - - 90% of WQS

Source Characterization

- Chloride in the form of salt is imported to the study watersheds from several major sources:
 - Roadway deicing (state, municipal, private)
 - Parking lot deicing
 - Salt pile runoff
 - Water softeners
 - Food waste
 - Atmospheric deposition

Source Characterization

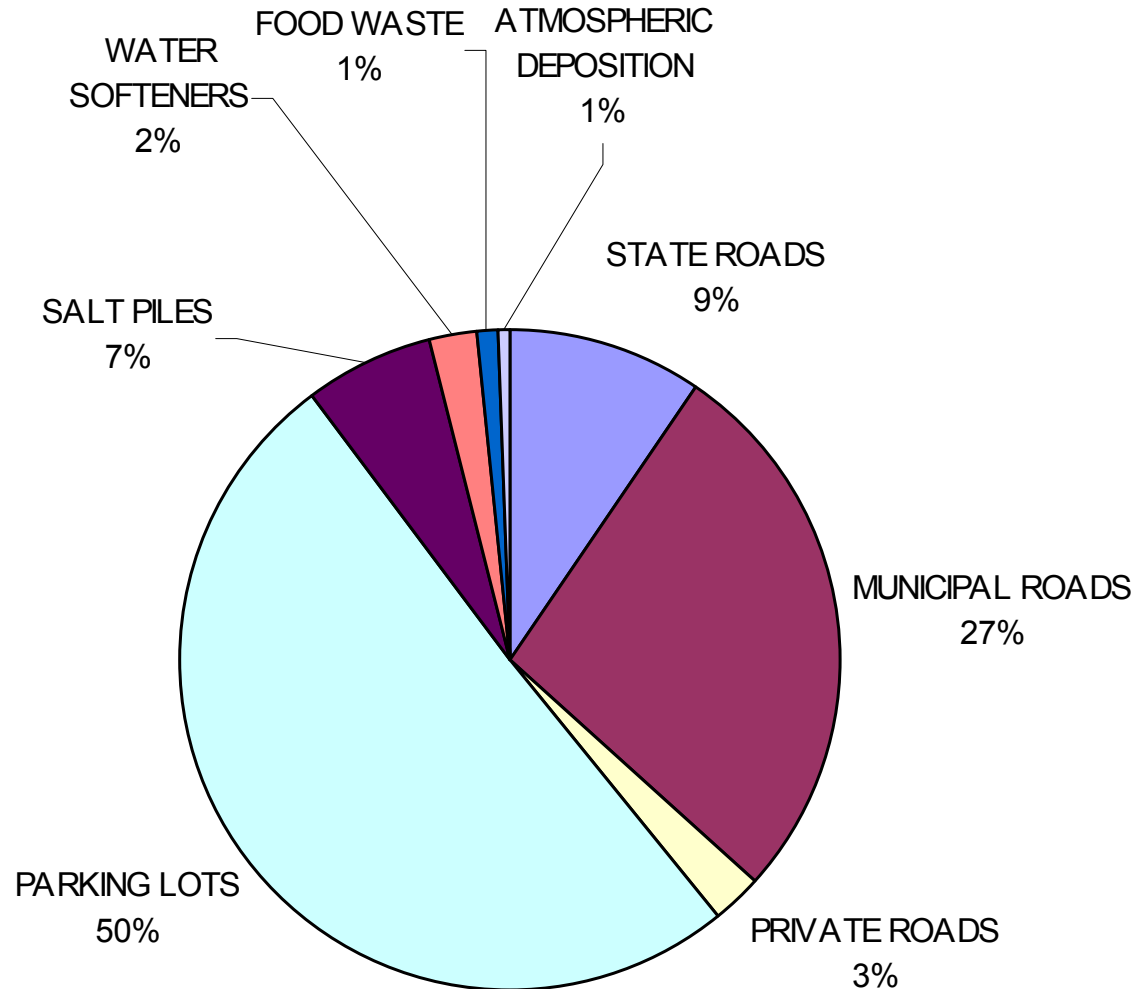
Key Facts

Total imports:
4,814 tons/yr

Imports divided by
drainage area:
473 tons/sq.mi.

Deicing accounts
for 89% of total

Salt piles account
for 7% of total



TMDL Definition and Requirements

- The TMDL is the maximum daily load of a pollutant which a waterbody can assimilate without violating WQS.
- The TMDL must be set at a level so that WQS are met for all conditions including seasonal variations.
- The TMDL must have a margin of safety (MOS) which takes into account scientific uncertainty.

TMDL Definition and Requirements (cont.)

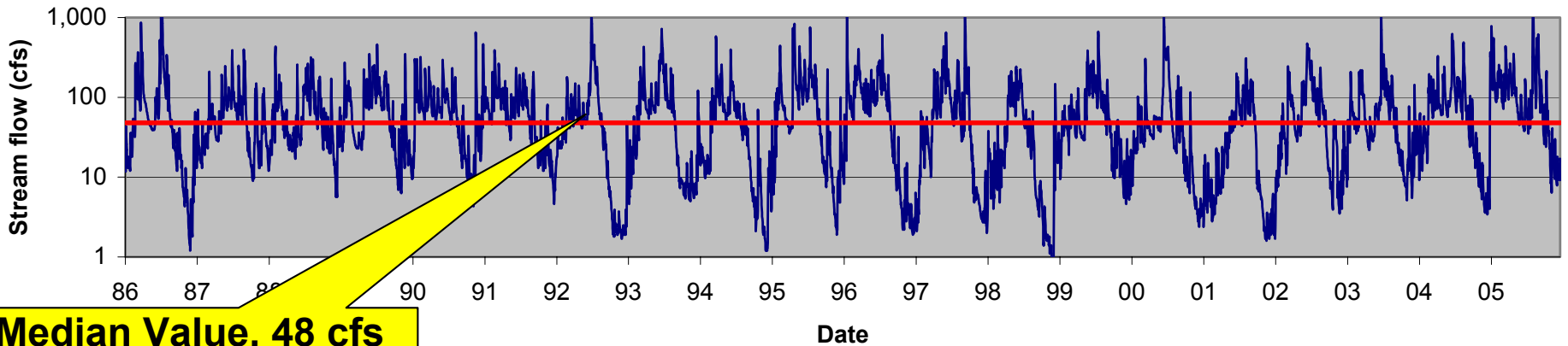
- The TMDL is divided into loads from point sources (i.e., waste load allocations or WLAs), and load allocations (LAs) from nonpoint sources (including natural background conditions).
- In equation form, a TMDL may be expressed as follows:

$$TMDL = WLA + LA + MOS$$

- The TMDL for this watershed will be expressed as a load duration curve.

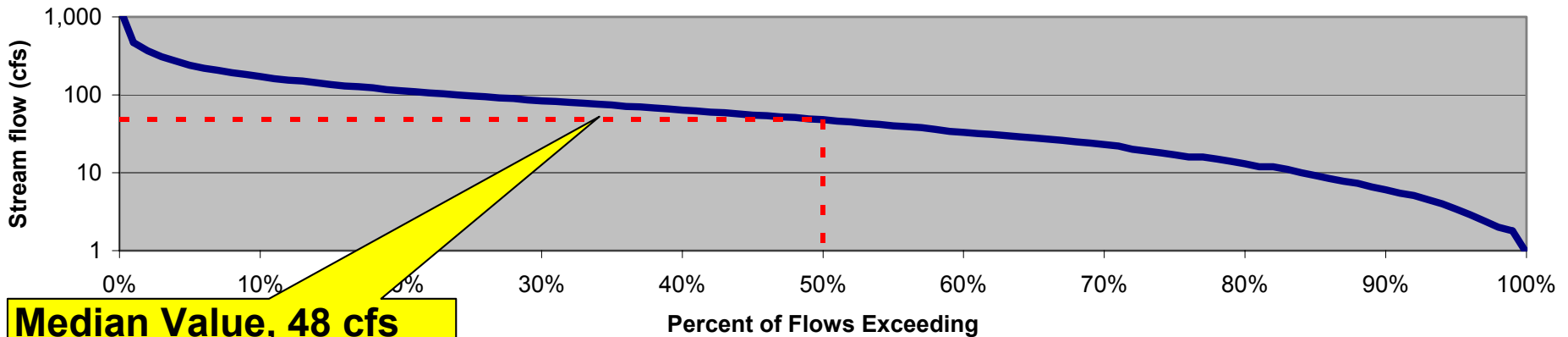
Flow Duration Curve Primer

Daily Average Flow



Median Value, 48 cfs

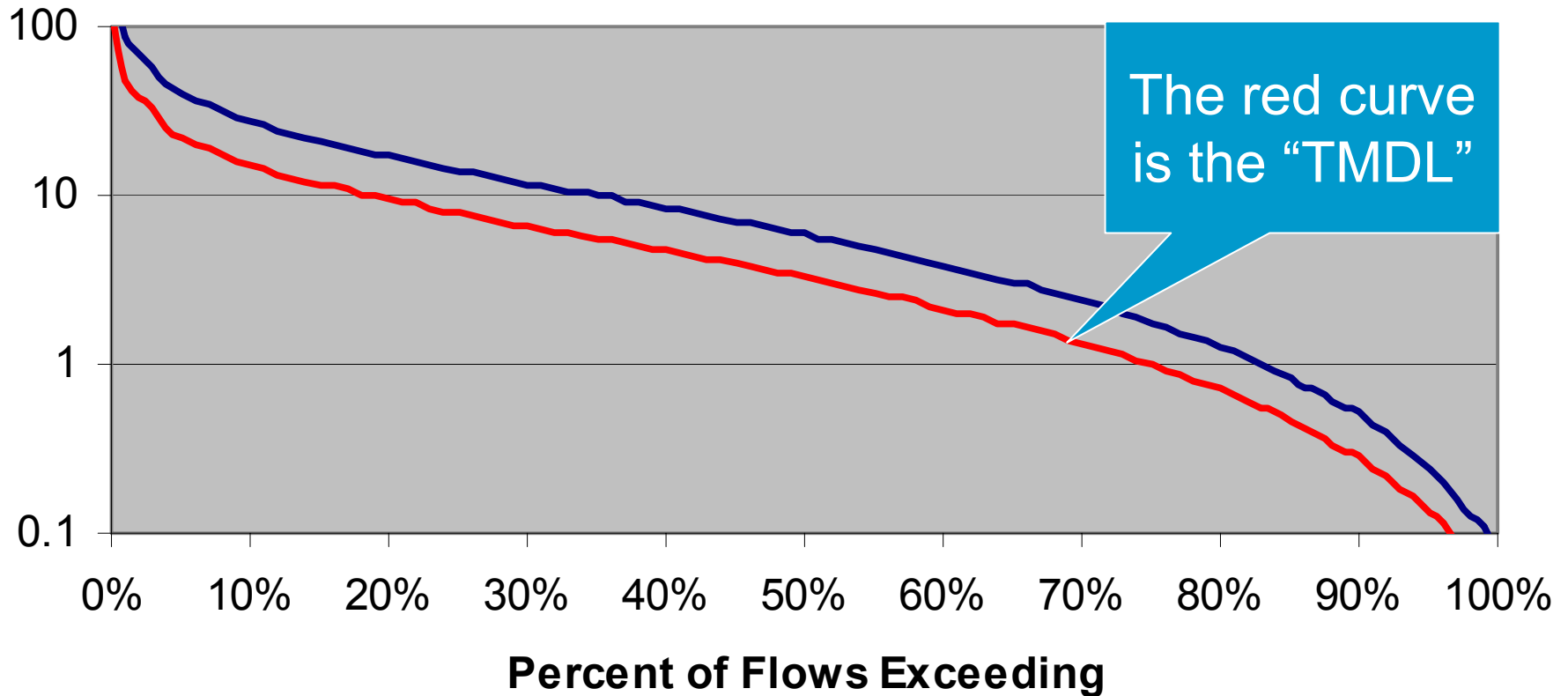
Daily Average Flow Duration Curve



Median Value, 48 cfs

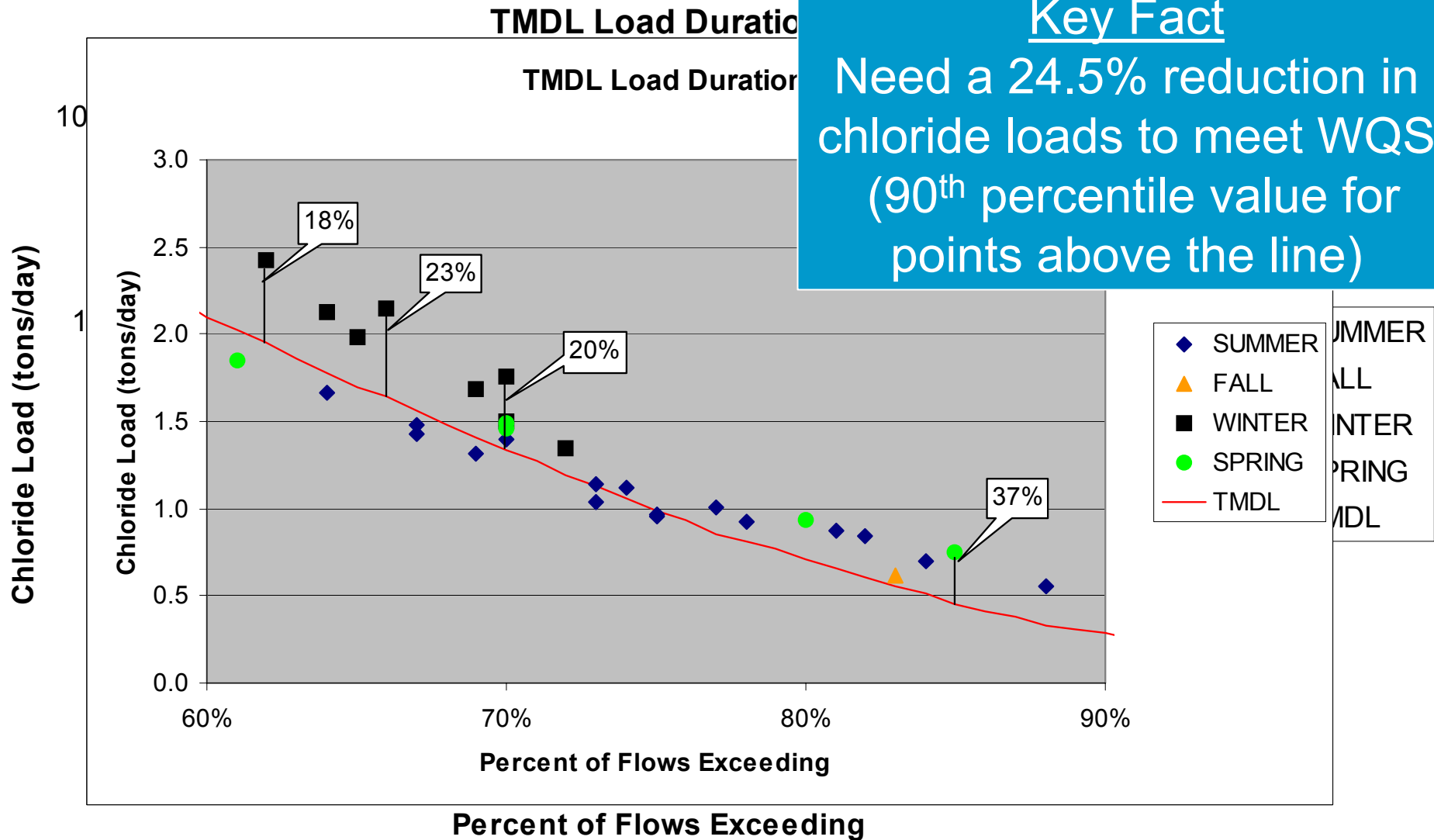
TMDL Load Duration Curve

Policy-Porcupine Brook



— Flow Duration Curve (cfs) — TMDL Load Duration Curve (tons Cl/day)

Percent Reduction Calculation



Allocation of Loads

- Combine salt imports with percent reduction goal to estimate total allocation
- Calculate DRAFT allocations by sector

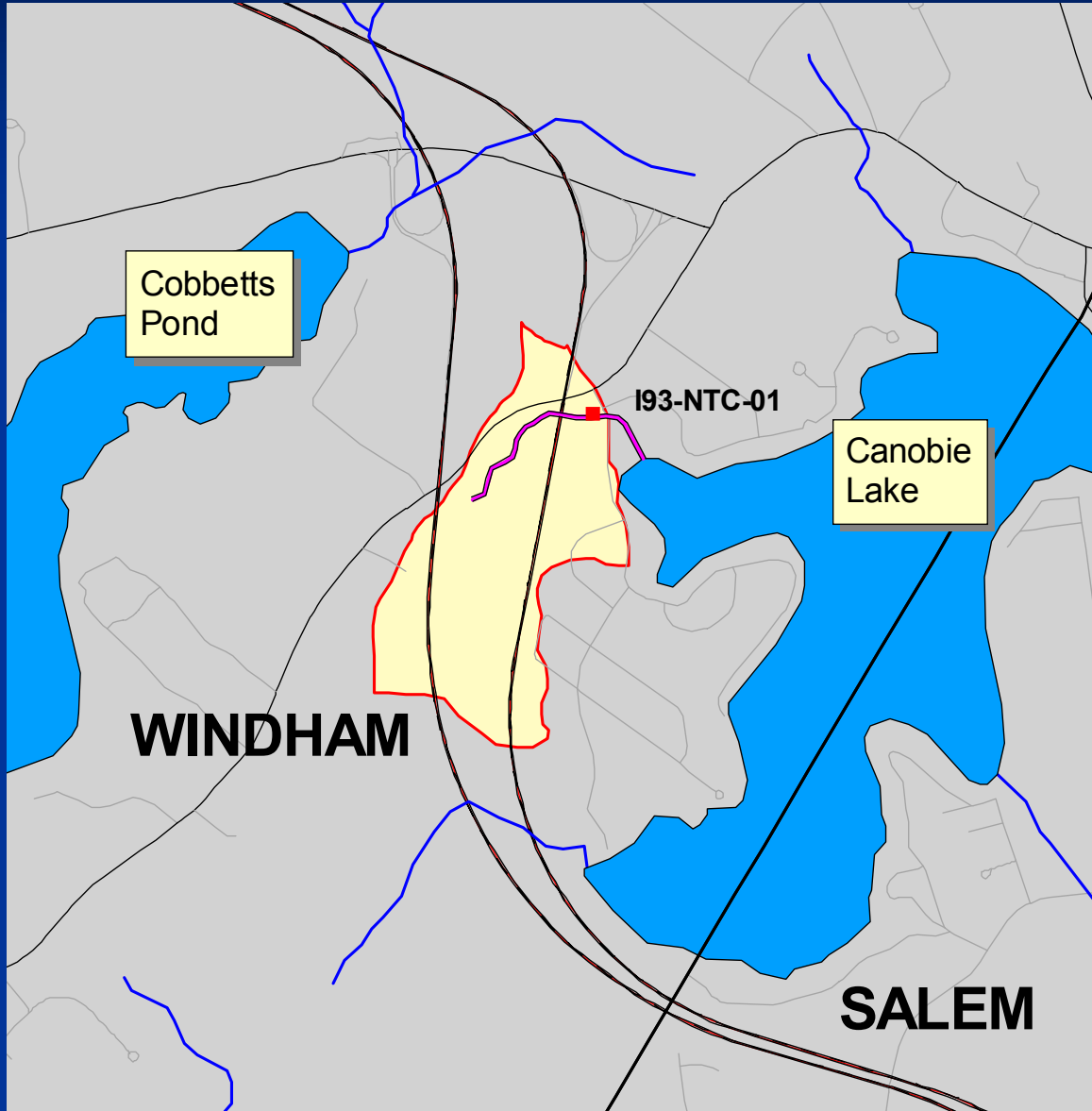
Source	FY07 Salt Imports (tons salt/yr)	Allocation of Loads (tons salt/yr)	Percent Reduction
State Roads	456.1	364.7 (10.9 tons/lm/yr)	20.0%
Municipal Roads	1,305.7	1,044.1 (9.0 tons/lm/yr)	20.0%
Private Roads	124.9	99.9 (6.6 tons/lm/yr)	20.0%
Parking Lots	2,426.4	1,940.3 (5.1 tons/ac/yr)	20.0%
Salt Piles	315.2	0	100%
Water Softeners	101.8	101.8	0%
Food Waste	52.3	52.3	0%
Atmospheric Deposition	31.9	31.9	0%
Total	4,814.3	3,635.0	24.5%

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**North Tributary to Canobie Lake
in Windham, NH**



Waterbody Description



Key Facts

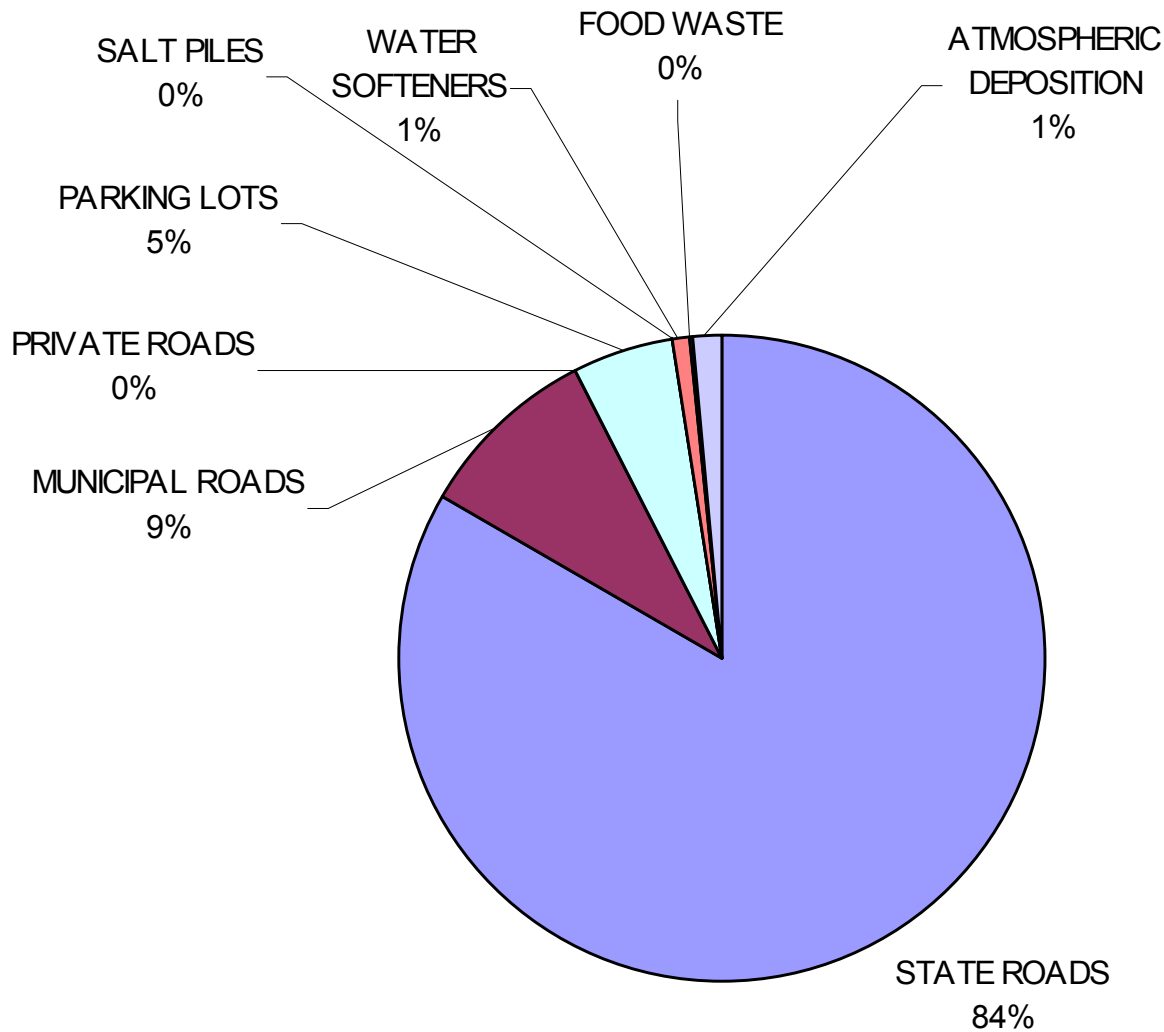
Drainage area:
0.20 sq.mi.

Population:
38

23% developed

100% urbanized
area classification

Source Characterization



Allocation of Loads

- TMDL and allocations for NTC calculated using the same method as for Policy Bk

Source	FY07 Salt Imports (tons salt/yr)	Allocation of Loads (tons salt/yr)	Percent Reduction
State Roads	38.8	23.0 (8.2 tons/lm/yr)	40.6%
Municipal Roads	4.2	2.5 (2.4 tons/lm/yr)	40.6%
Private Roads	0.0	0.0 (0.0 tons/lm/yr)	0%
Parking Lots	2.3	1.4 (3.8 tons/ac/yr)	40.6%
Salt Piles	0.0	0.0	0%
Water Softeners	0.4	0.4	0%
Food Waste	0.2	0.2	0%
Atmospheric Deposition	0.6	0.6	0%
Total	46.5	28.1	39.6%

Next Steps

- Public comment period on the Policy Brook and North Tributary to Canobie Lake TMDLs until 12/31/07
- Dinsmore Brook and Beaver Brook TMDLs prepared by 12/31/07
- Draft Implementation Plan by 3/31/08
- Final Implementation Plan by 6/30/08

Questions?

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