Chloride in Vermont Surface Waters and Sunnyside Brook Chloride TMDL

A Presentation for

Senate Committee on Natural Resources and Energy

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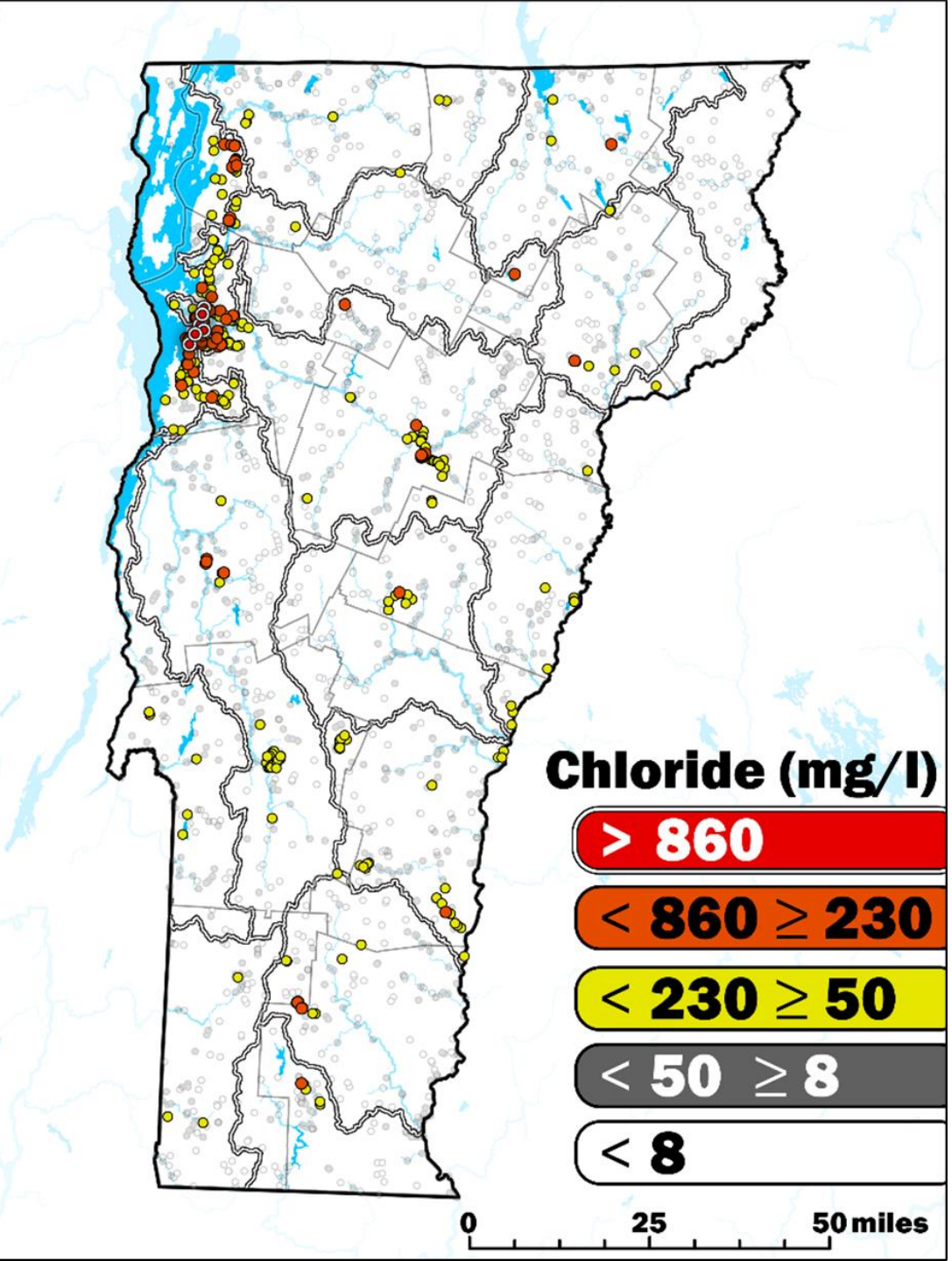
Tim Clear, VTDEC, Watershed Management Division

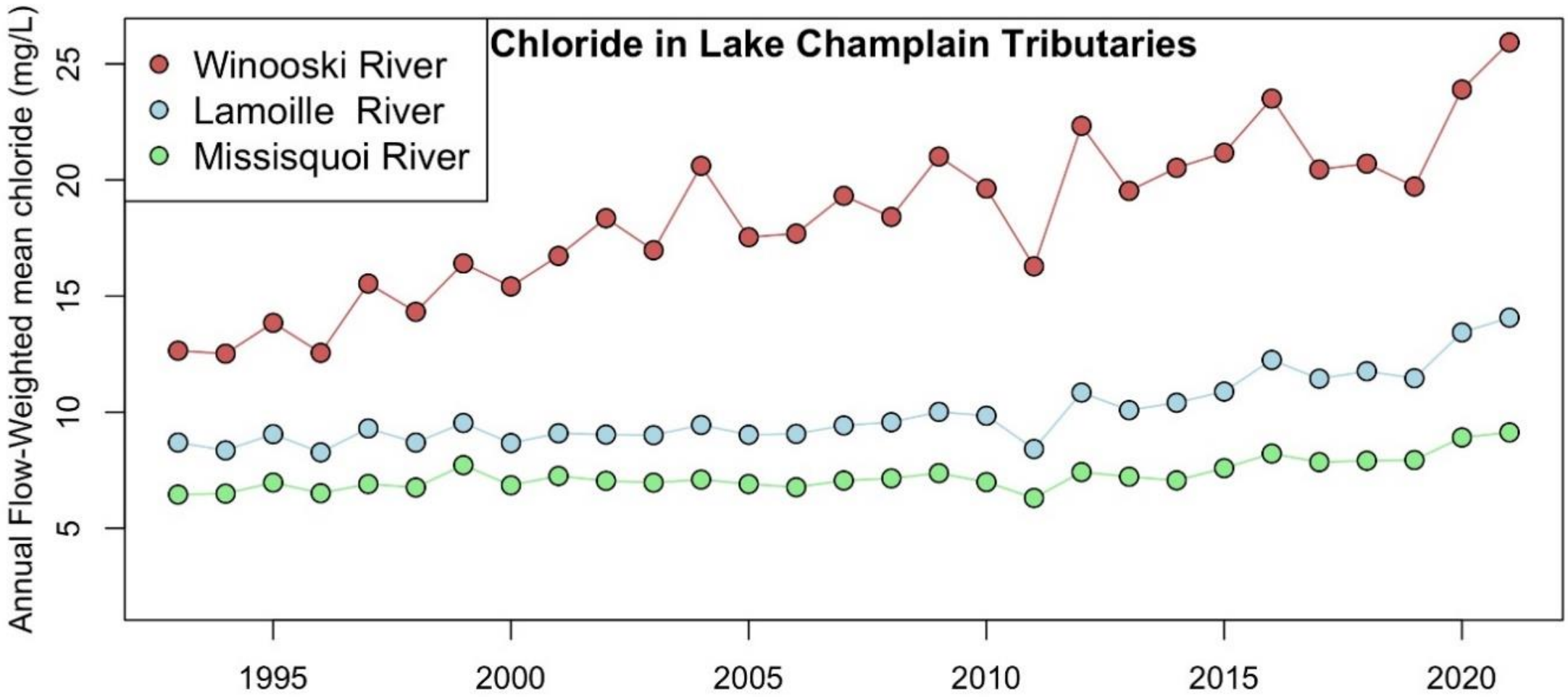
Why is chloride a problem

- Toxic to aquatic life in excess
- Chloride properties - conservative
  - Doesn’t react in soils – can’t be sequestered
  - Not taken up by biota – can’t be harvested
  - Soluble – can’t be filtered
- Source reduction (less salt) most practical management
- Currently most cost-effective winter safety tool
- Balance between water quality and winter safety

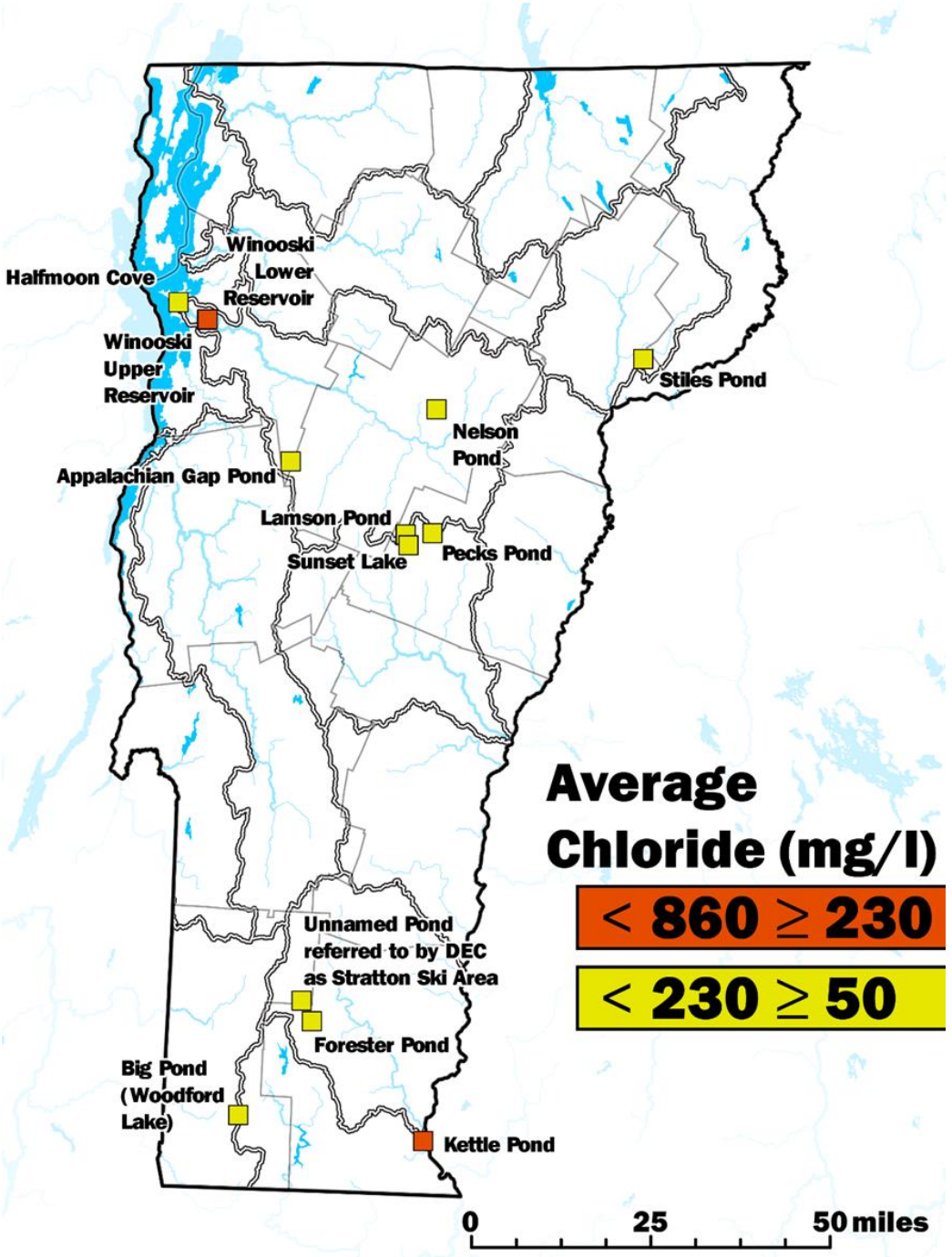


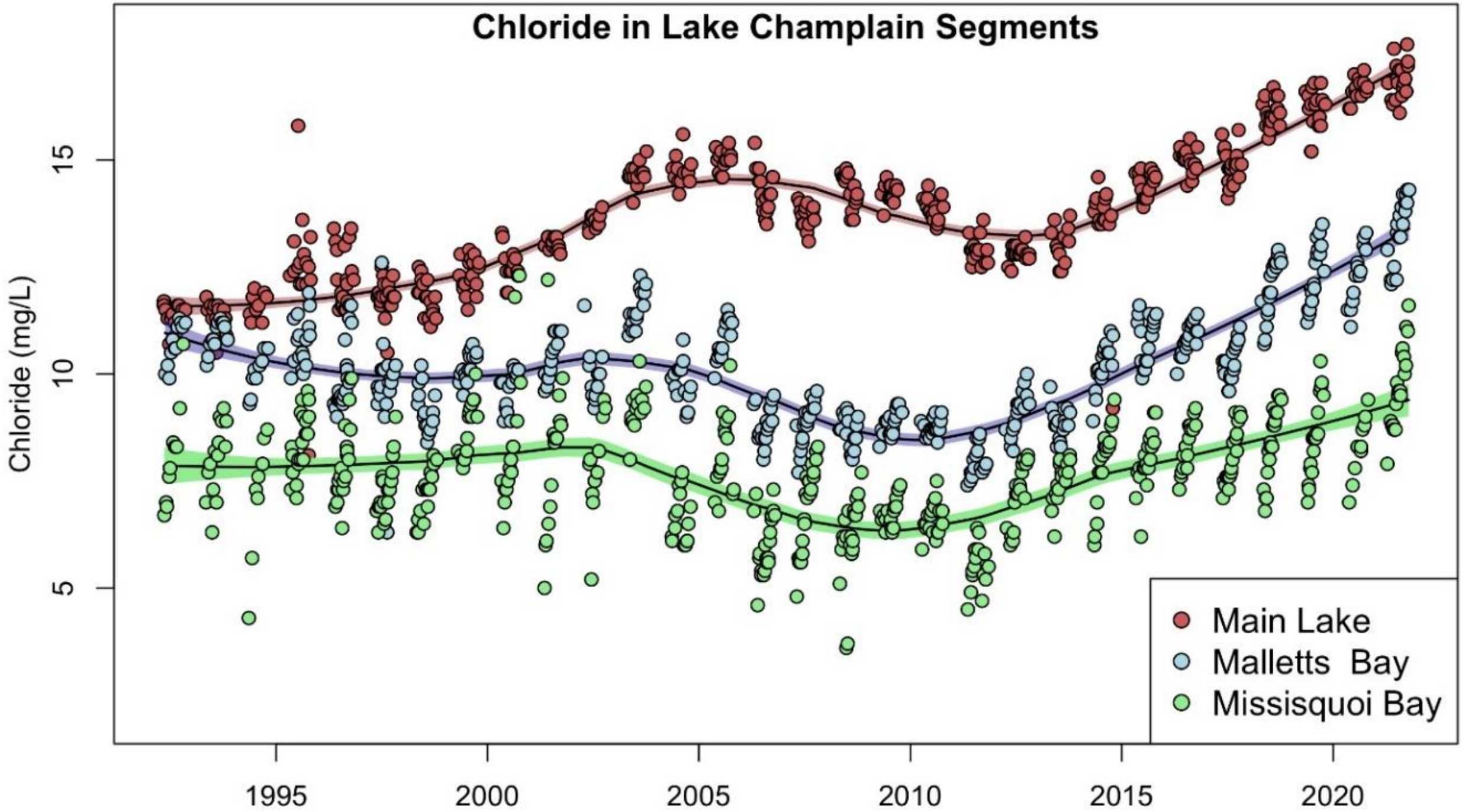
Chloride in streams

- VT Water Quality Standards to protect aquatic biota
  - Chronic 230 mg/l – 4 day average
  - Acute 860 mg/l – 1 hour


Chloride in Lake Champlain Tributaries
Winooski River
Lamoille River
Missisquoi River
Annual Flow-Weighted mean chloride (mg/L)
5
10
15
20
25
1995
2000
2005
2010
2015
2020

Chloride in lakes




Chloride in Lake Champlain Segments
Chloride (mg/L)
5
10
15
1995
2000
2005
2010
2015
2020
Main Lake
Malletts Bay
Missisquoi Bay

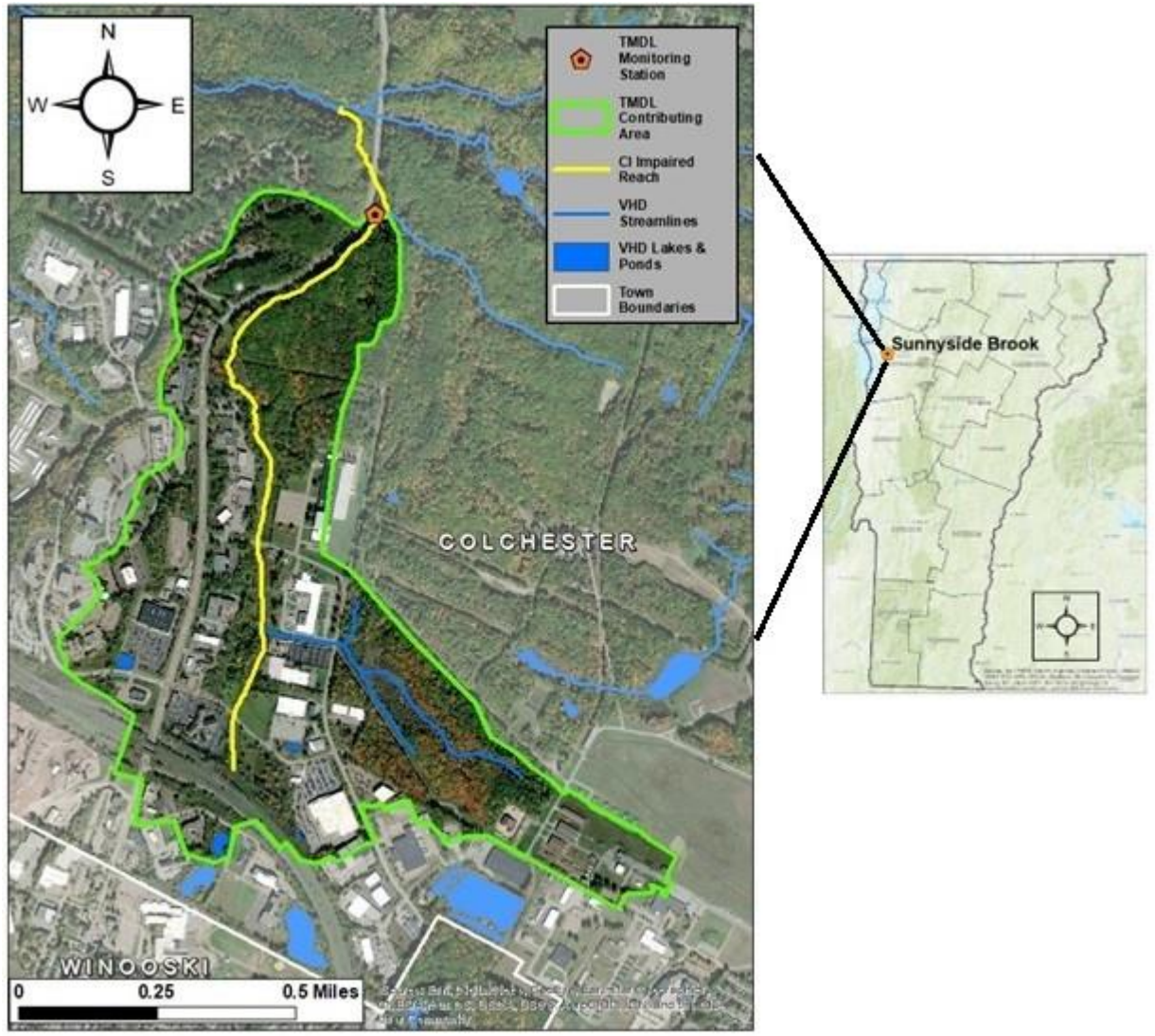
Chloride impaired streams

Watershed	Watershed area (ac)	Towns	State roads (%)	Municipal roads (%)	Private roads (%)	Other paved (%)
Bartlett Bk.	776	Shelburne S. Burlington	5	25	5	65
Centennial Bk.	866	Burlington S. Burlington	7	18	6	69
Englesby Bk.	598	Burlington	0	24	3	70
Morehouse Bk.	165	Colchester Winooski	0	24	3	73
Muddy Bk., trib #4	1216	Williston	10	11	5	74
Munroe Bk.	3461	Shelburne S. Burlington	6	25	7	62
Potash Bk.	4575	S. Burlington	8	23	2	67
Sunnyside Bk.	366	Colchester	13	7	4	76

Sunnyside Brook Watershed: Colchester, VT

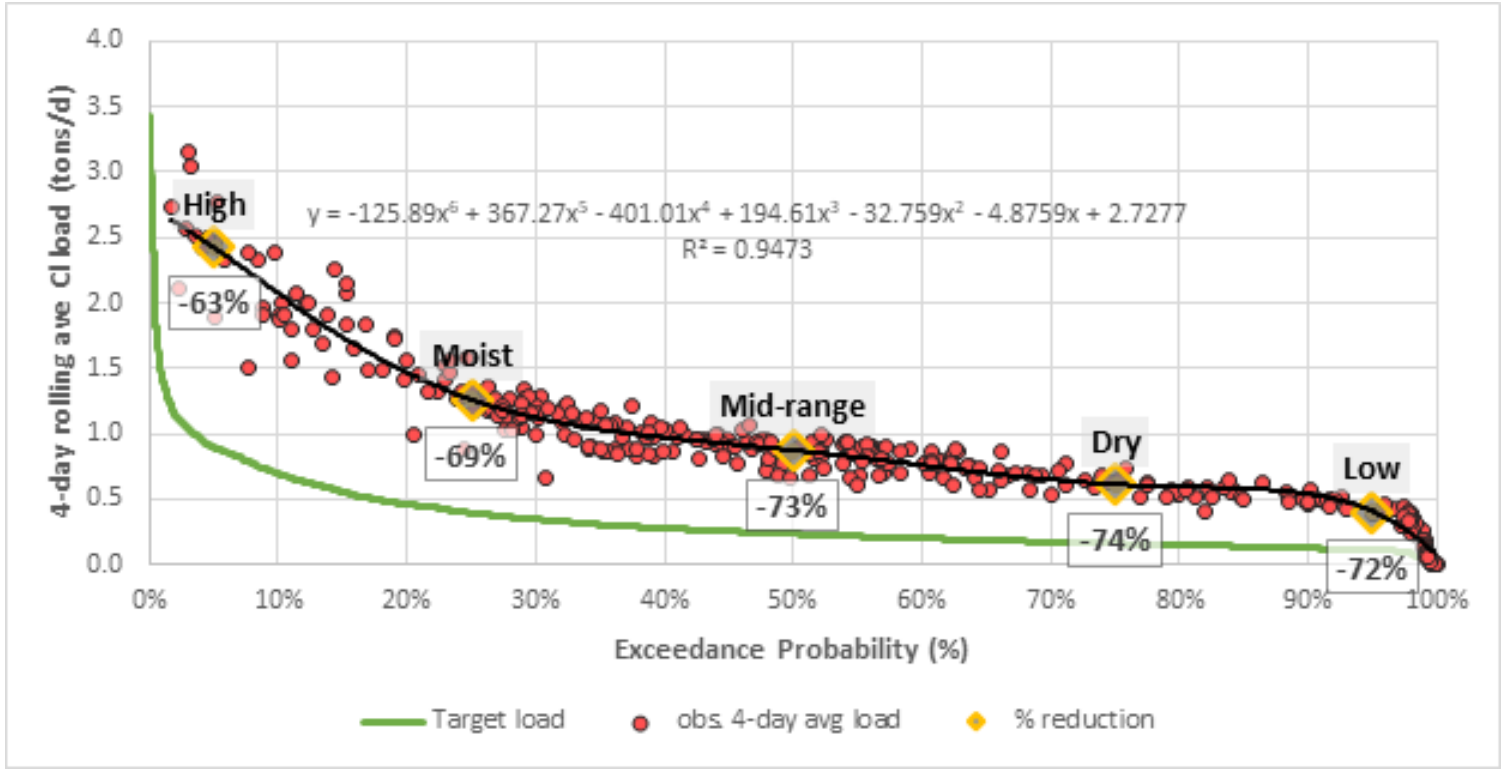
- 0.57 sq. mi.
- 27% wetland & forest
- 73% developed
  - 31% impervious
  - De-icing acres: 89 acres (24%)
  - 12 acres state roads
  - 6 acres municipal roads
  - 3 acres private/Fed roads

- I-89 and exits
- VT Rt. 7
- hotels, supermarkets, office parks
- a portion of Camp Johnson military base

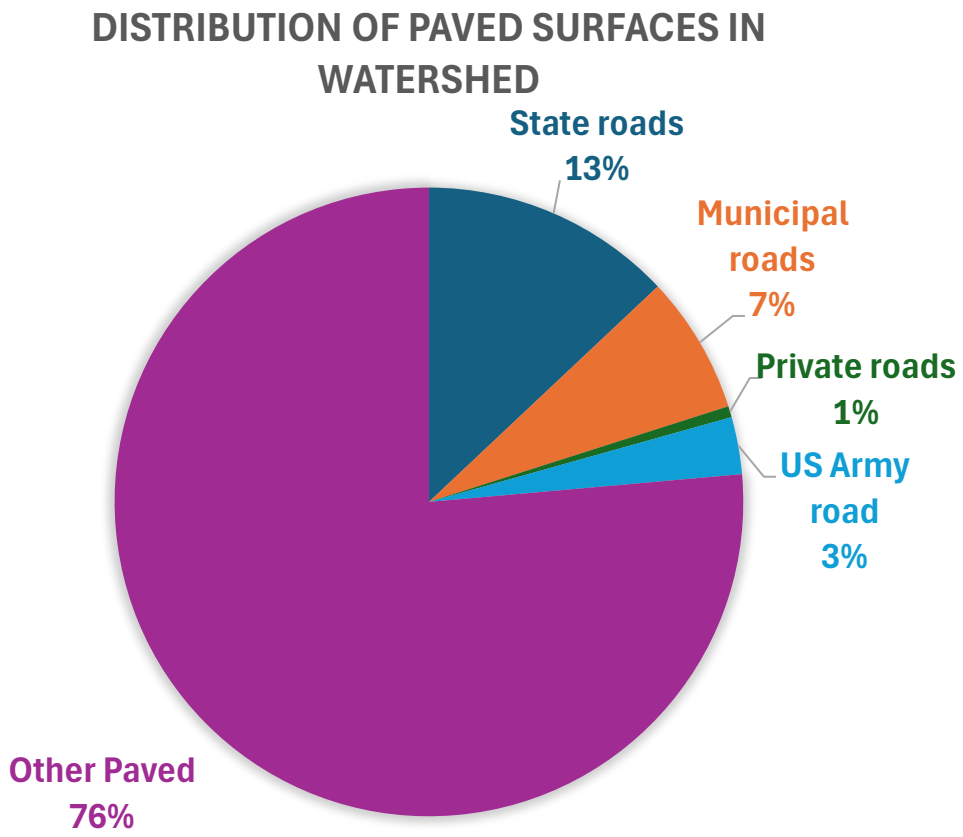


Task 5: Establish a target “load duration curve”.

- For each day of the 9-year dataset, multiple flow by the 90% of the VT Water Quality Standard chloride concentration limit of 230 mg/L (90% provides a conservative margin of safety)
- Derive a “load duration curve” as the percent of time a daily chloride load (tons) is equaled or exceeded.
- Each daily chloride load has a a concentration < VT WQS.



Composition of watershed



- 122-ton allocation is lumped for entire watershed
- Road salt primary source
  - No industrial/municipal discharges
  - No agriculture
- Future management could consider various distribution scenarios
  - Equal
  - Prioritized
  - Multiple