

Salinization of Adirondack Waters by Road Salt

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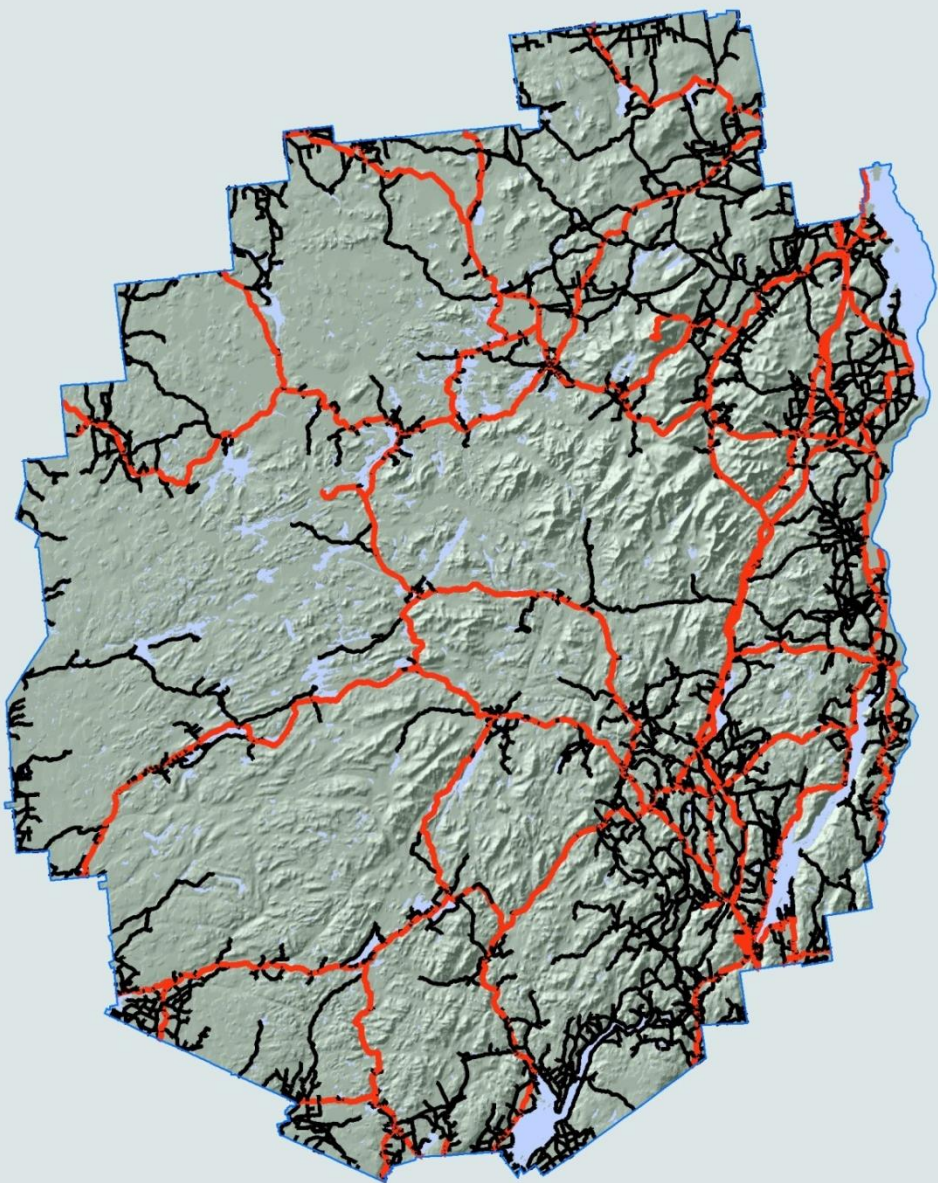
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Take Home Messages

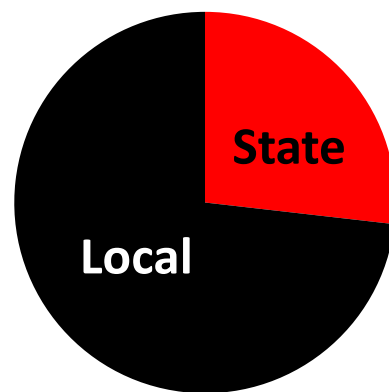
- We use a lot of salt
- Resulted in:
 - Regional salinization of surface & groundwater
 - Impacts to ecosystems, human health, & property values
- If we care we need to act



Road Salt (NaCl) Use in the Adirondacks

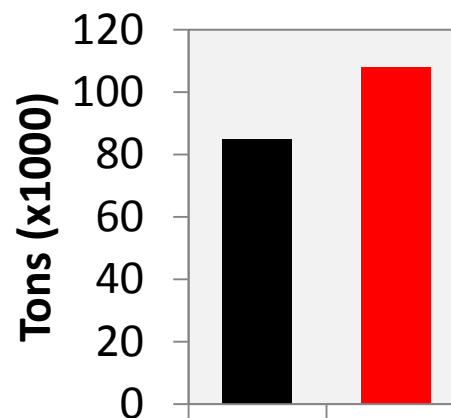


10,555 lane-miles of paved roads

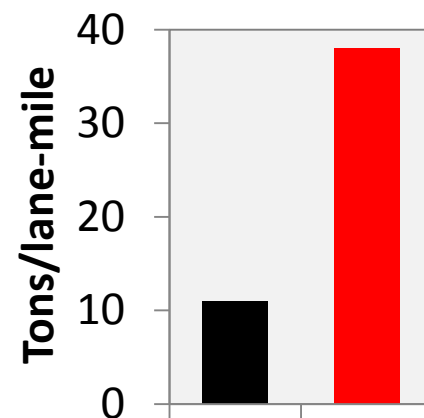


- 2,830 lane-mile
State & US highways
Interstate 87
- 7,725 lane-miles
County, Town, &
Local Roads

Annual Salt Use (192,700 tons)



Local State



Local State

- State uses 2.5× more salt per lane-mile

Salinization Begins with Runoff

State Route 30

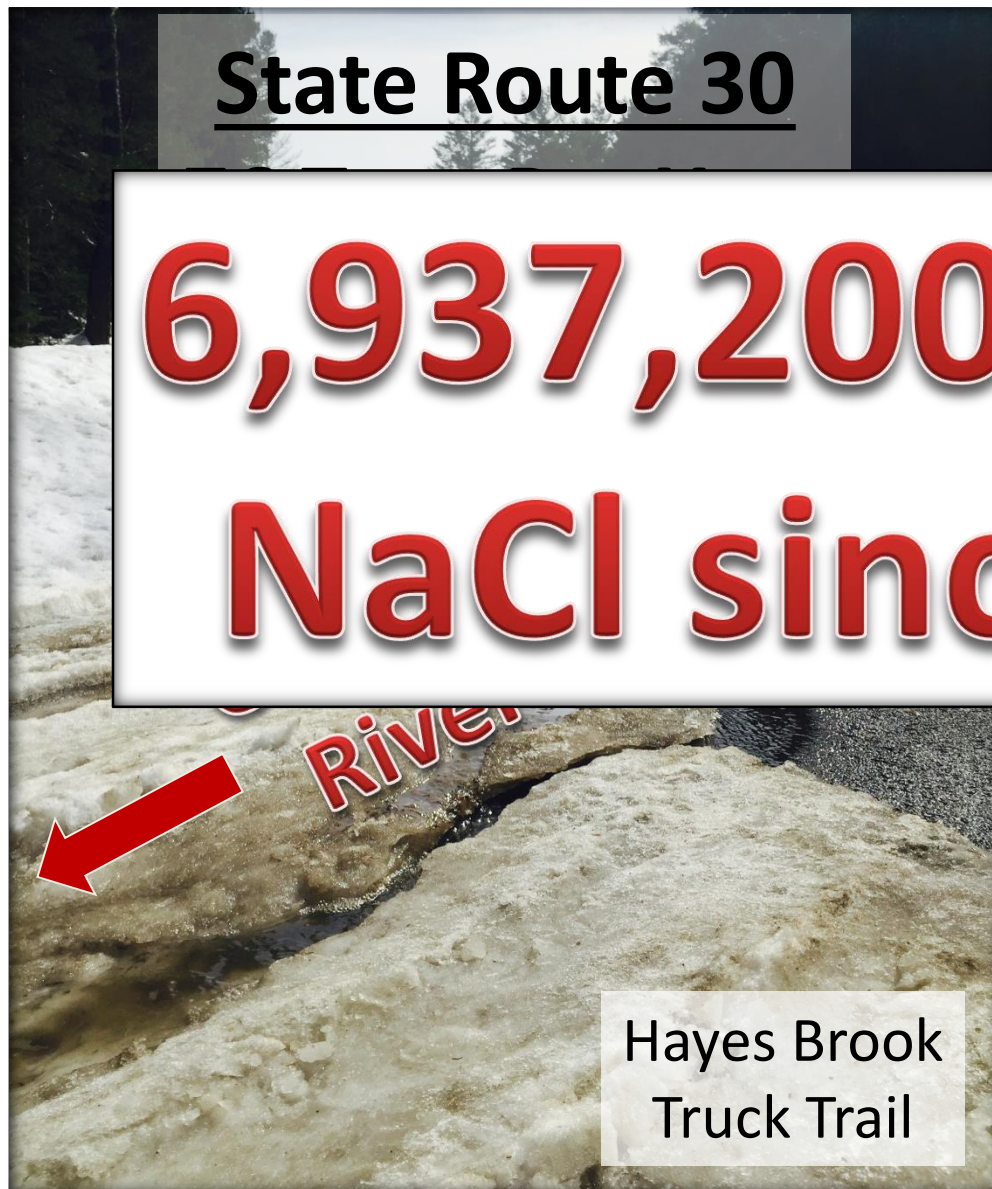
Runoff Event

**6,937,200 Tons of
NaCl since 1980**

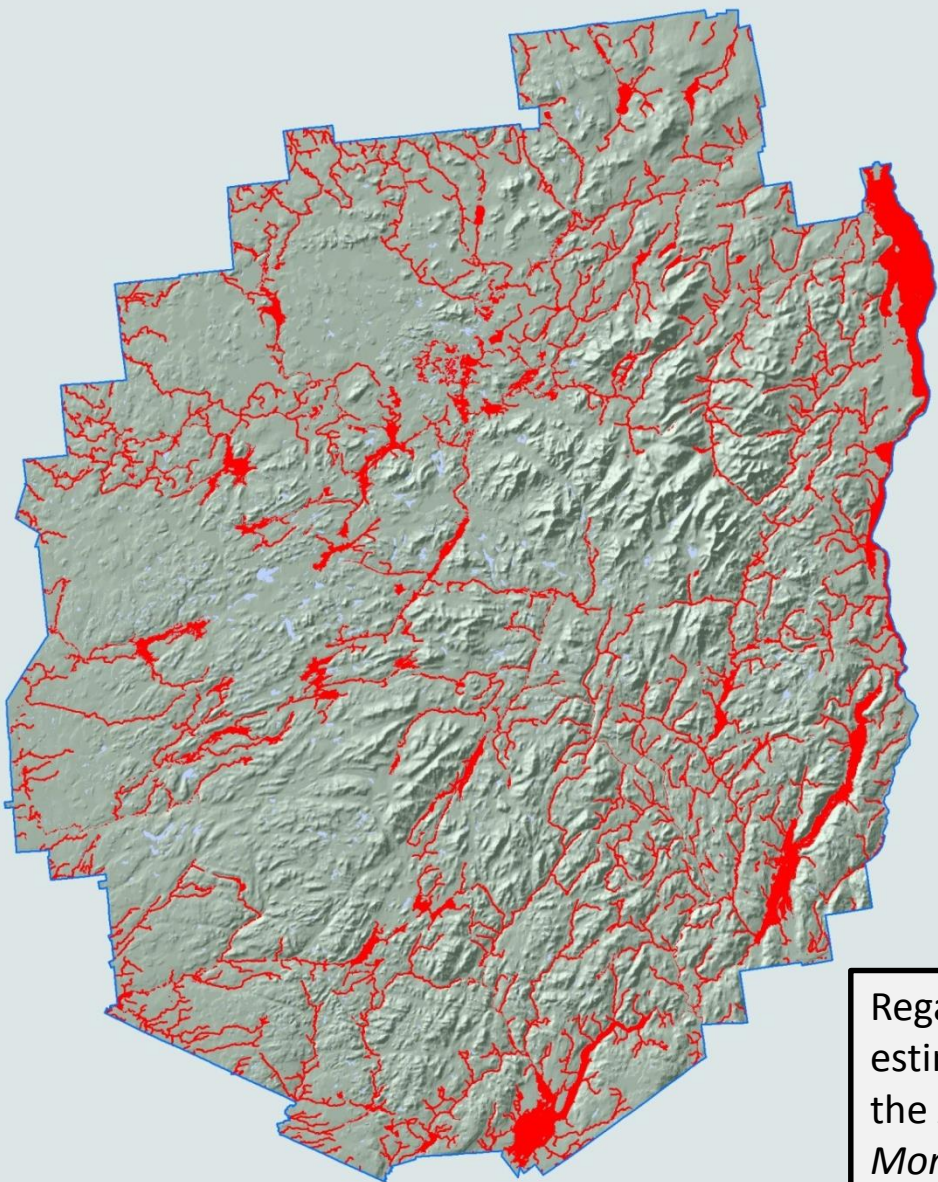
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Parkwide:

**192,700 Tons of
NaCl Runoff
per Year**



Streams & Lakes Impacted

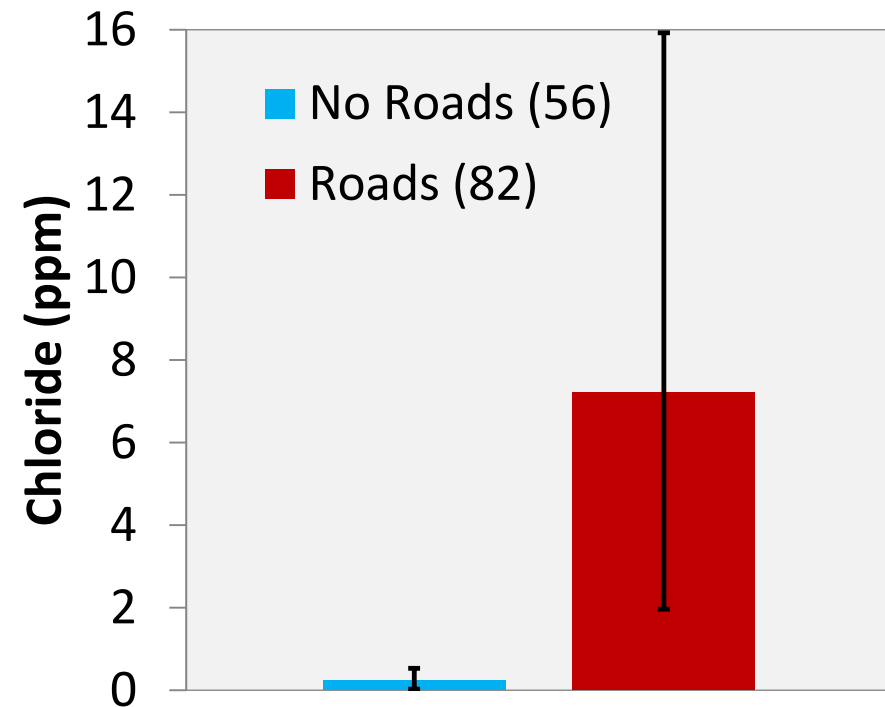
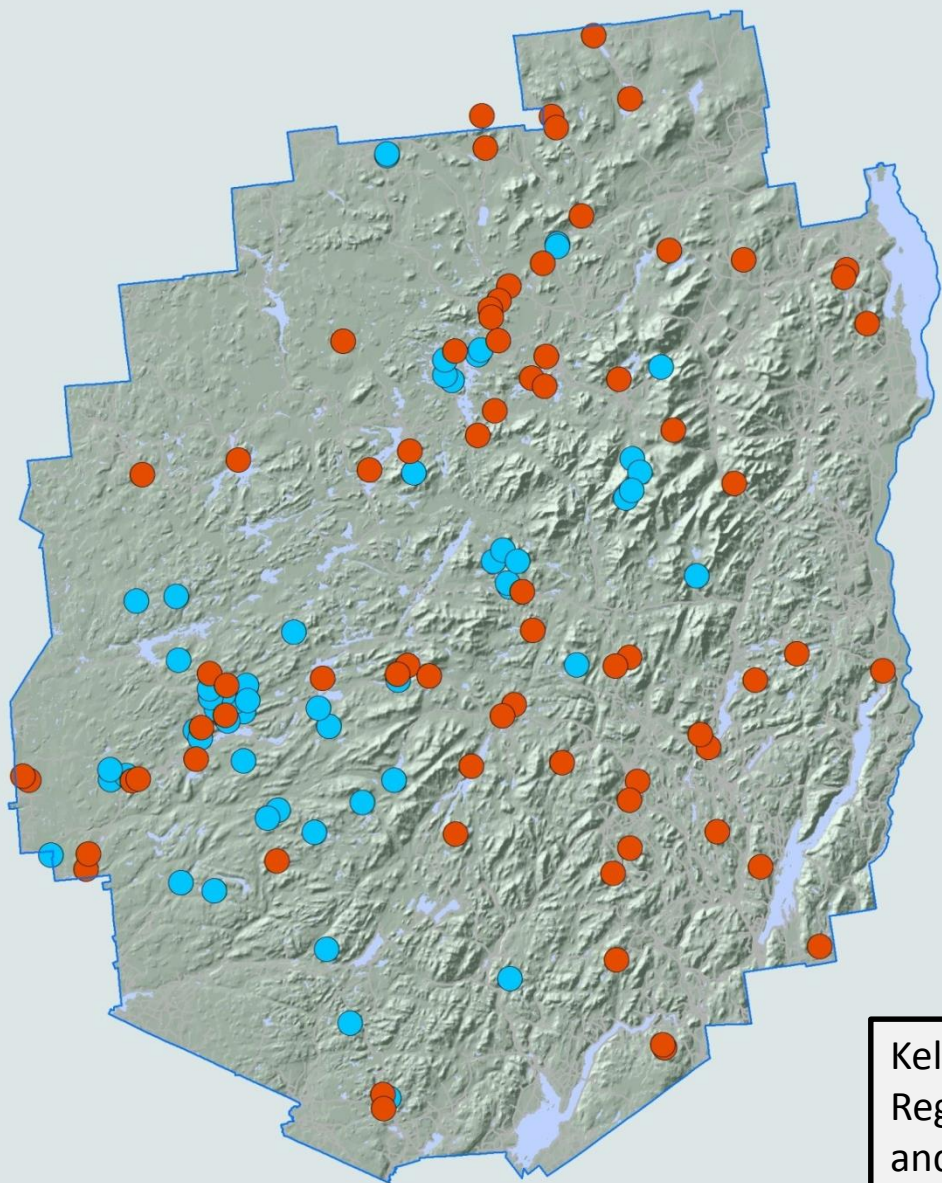


- GIS-based road runoff model using topography
- 6,000 miles of **streams**
 - 52% of total length
- 195,000 acres of **lakes**
 - 77% of total acres
 - 820 waterbodies

Potential Regional Salinization

Regalado, S. A., & Kelting, D. L. (2015). Landscape level estimate of lands and waters impacted by road runoff in the Adirondack Park of New York State. *Environmental Monitoring and Assessment*, 187(8), 1-15.

Median Lake Chloride



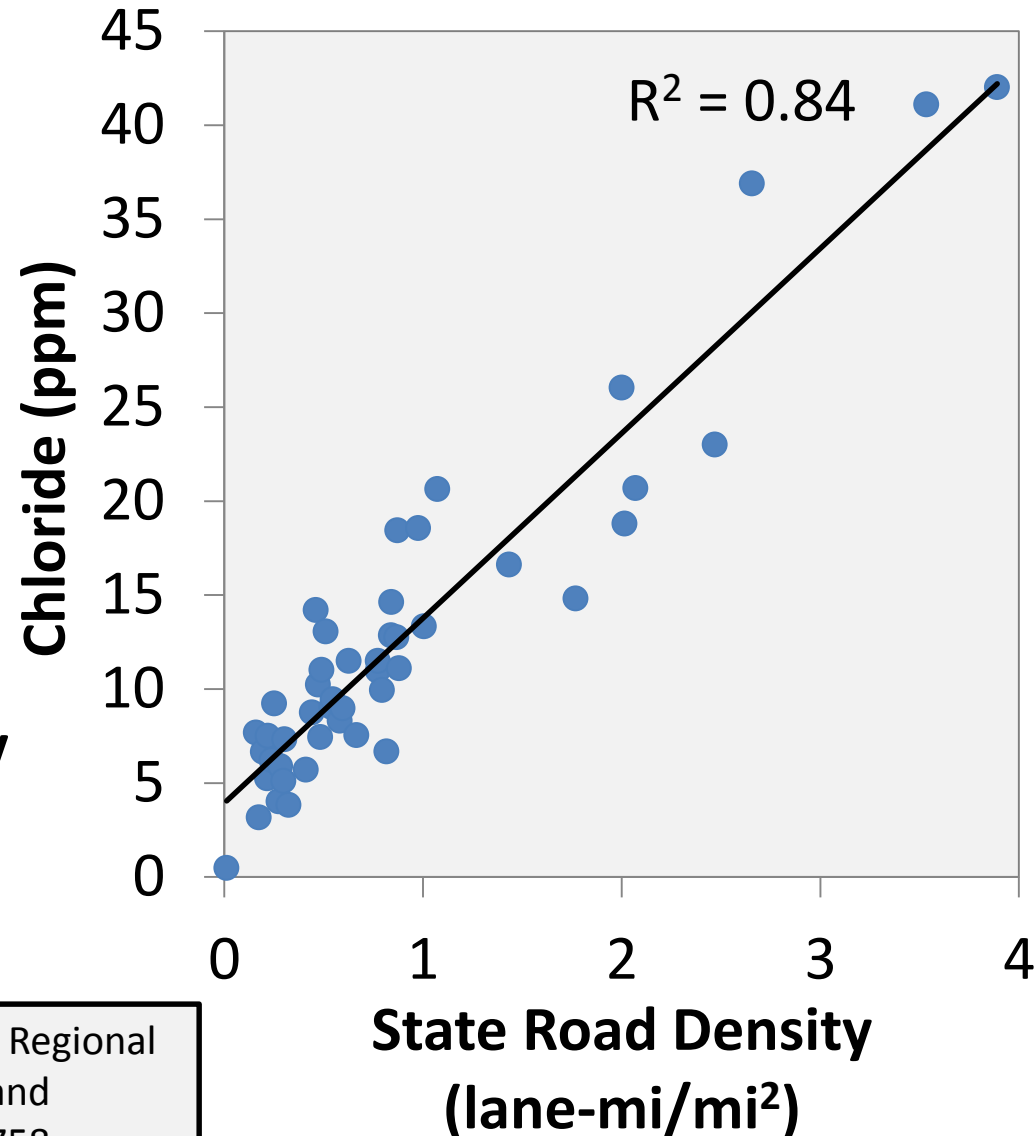
- <0.5ppm w/**no roads**
- 14× higher w/**roads**

Regional Salinization

Kelting, D. L., Laxson, C. L., & Yerger, E. C. (2012). Regional analysis of the effect of paved roads on sodium and chloride in lakes. *Water Research*, 46(8), 2749-2758.

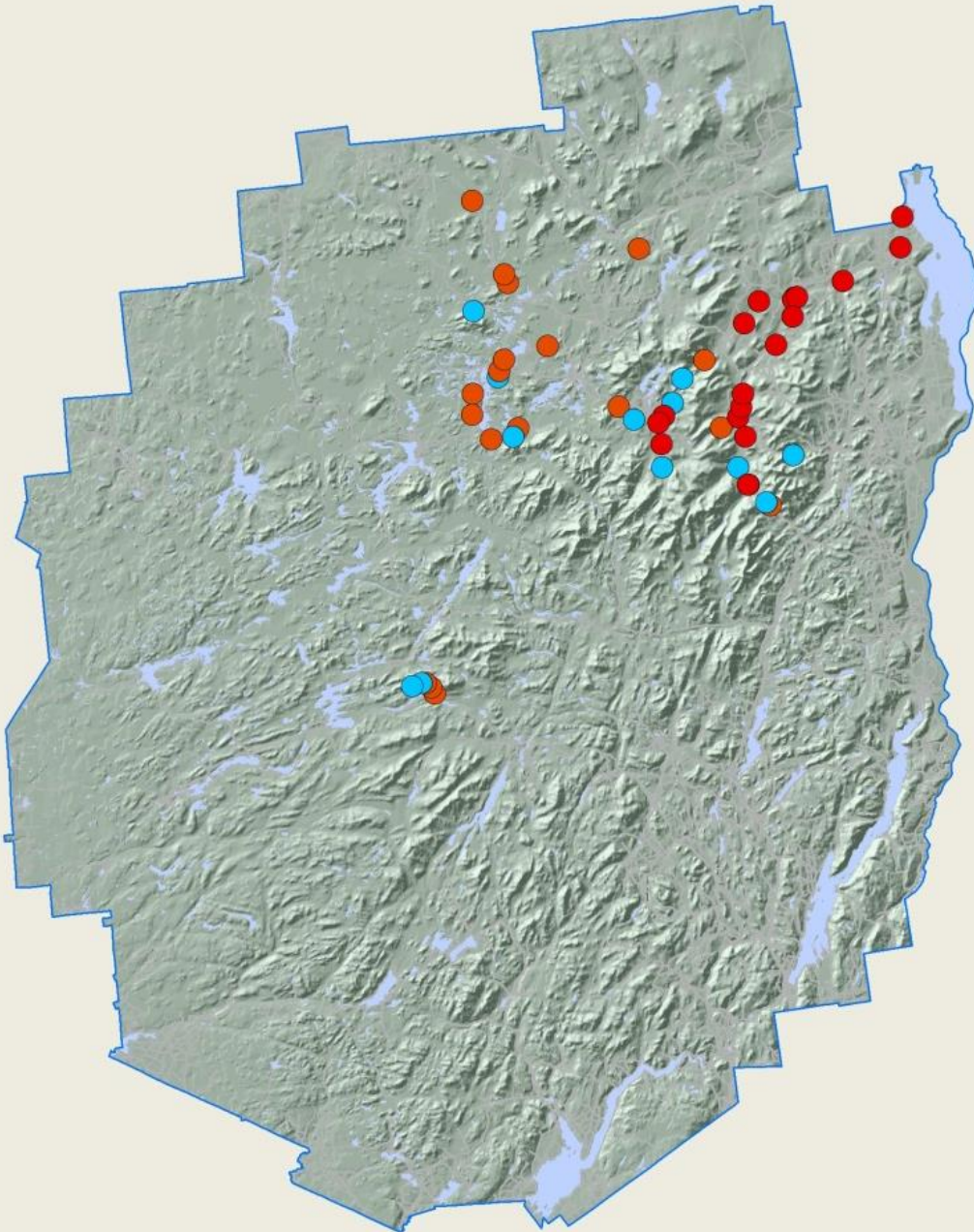
Lake Chloride and State Road Density

- State road density explained 84% of the variation in Cl
- Higher state road density equals higher salt load
- No relationship between local road density and Cl
- **Regional salinization is largely from state roads (NYS DOT)**



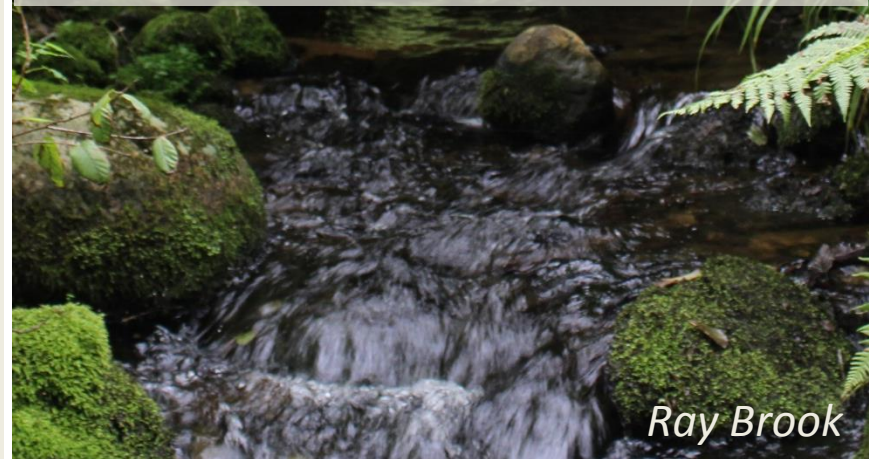
Kelting, D. L., Laxson, C. L., & Yerger, E. C. (2012). Regional analysis of the effect of paved roads on sodium and chloride in lakes. *Water Research*, 46(8), 2749-2758.

What About Streams?



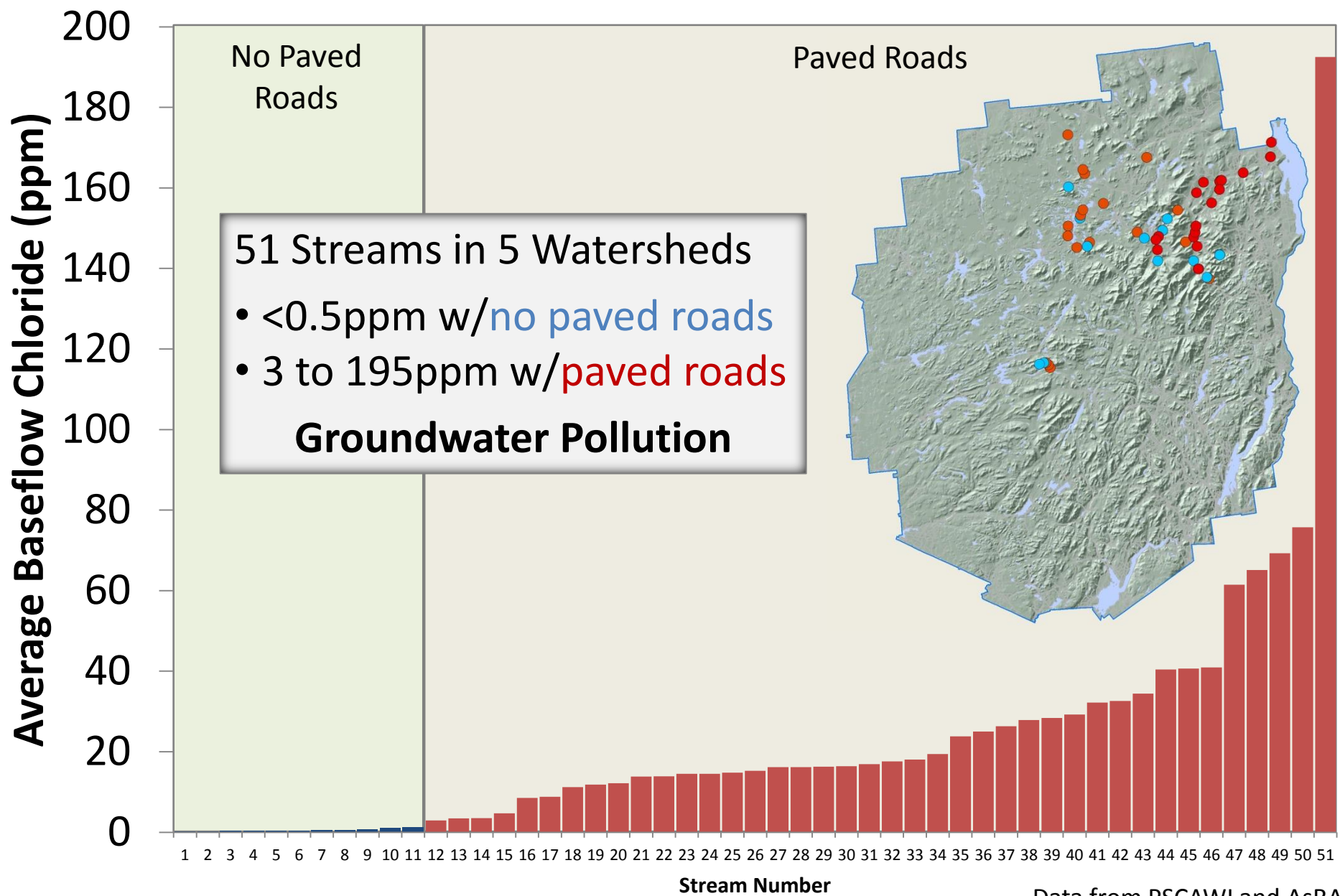
51 Streams

- 11 no paved roads
- 40 paved roads



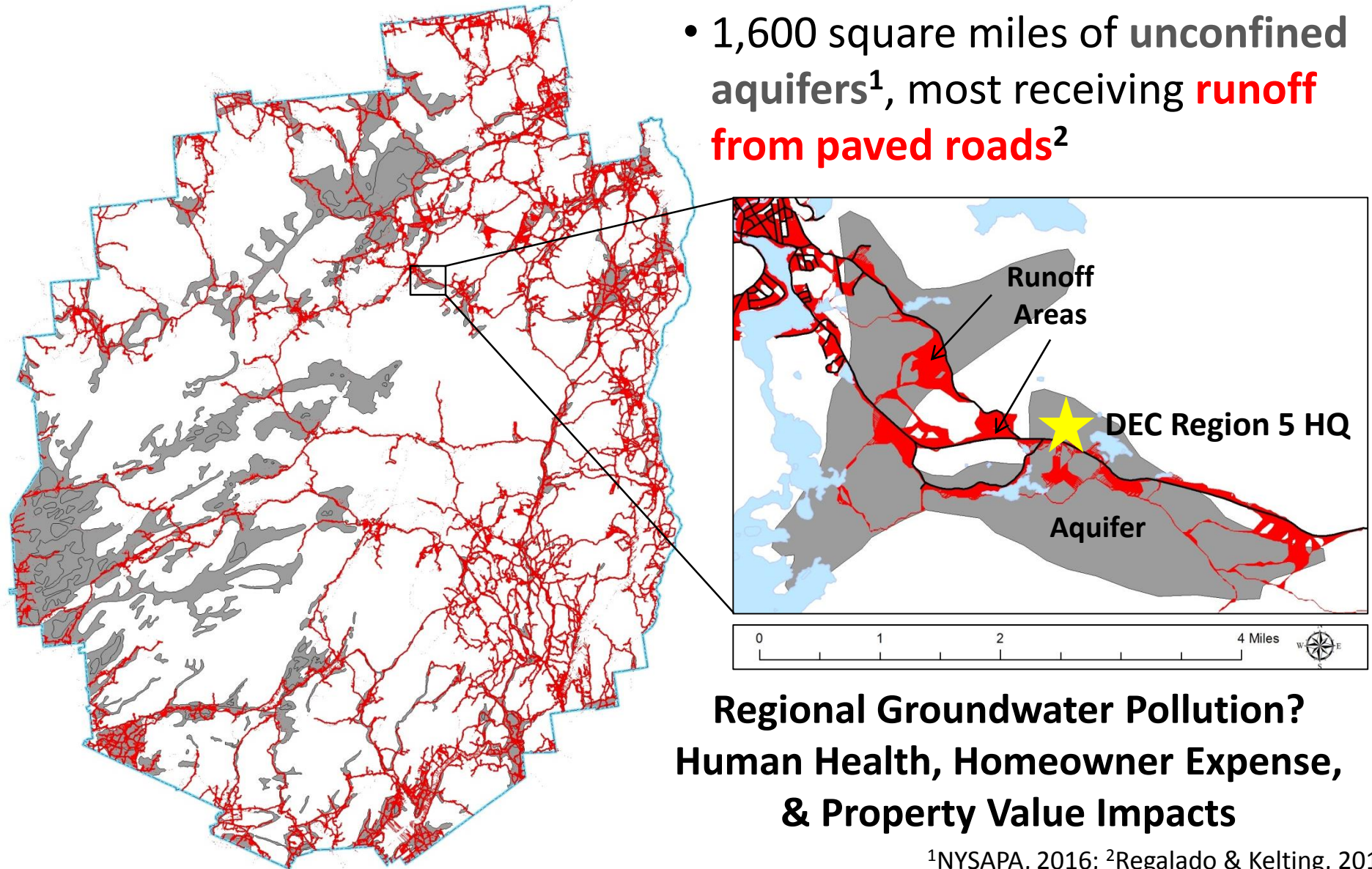
Ray Brook

Stream Baseflow Chloride



What About Groundwater?

- 1,600 square miles of **unconfined aquifers**¹, most receiving **runoff from paved roads**²

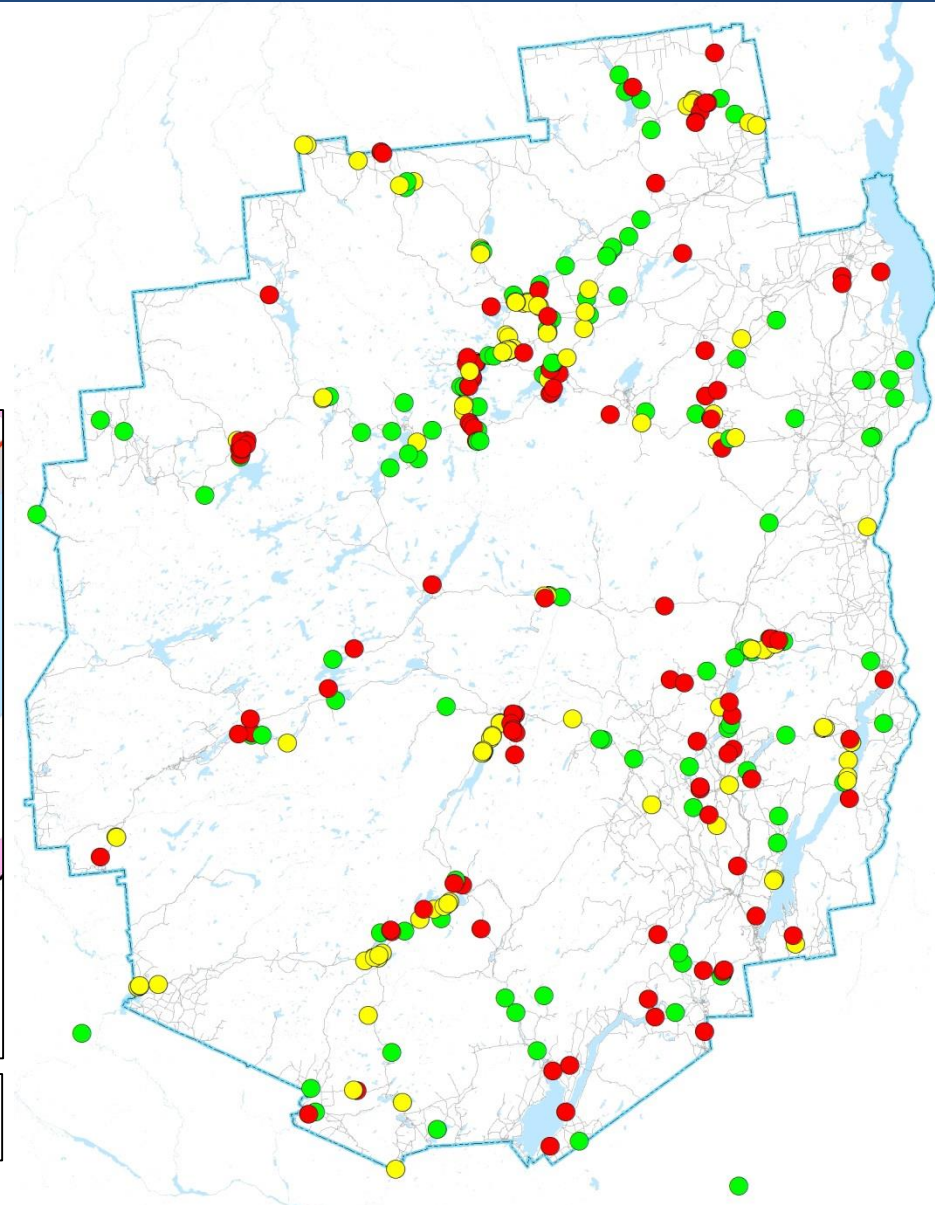
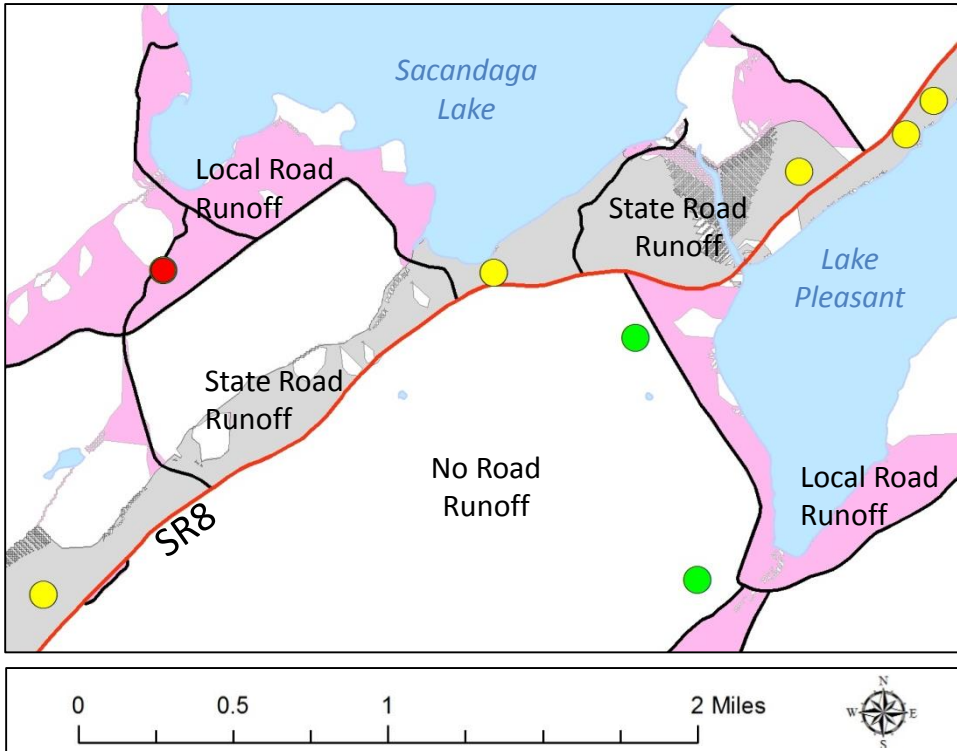


¹NYSAPA, 2016; ²Regalado & Kelting, 2015

Private Well Study

358 private wells

- 132 no road runoff = None
- 112 local road runoff = Local
- 114 state road runoff = State



Sodium & Chloride by Runoff Type

Sodium

Parameter	None	Local	State
Median (ppm)	3	6	26
Maximum (ppm)	17	403	748
Exceed Guidance ¹	0%	10%	55%

Chloride

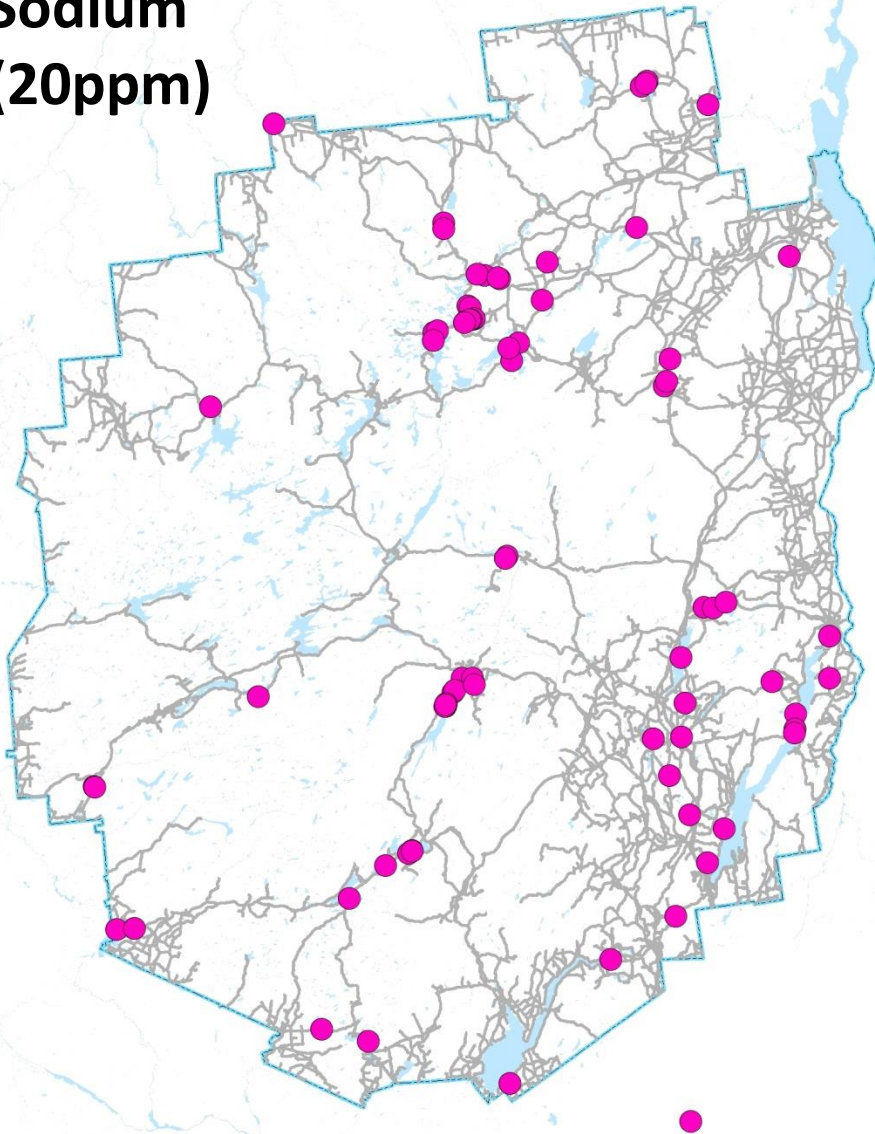
Parameter	None	Local	State
Median (ppm)	<1	7	78
Maximum (ppm)	57	204	1,327
Exceed Guidance ²	0%	0%	25%

¹20ppm

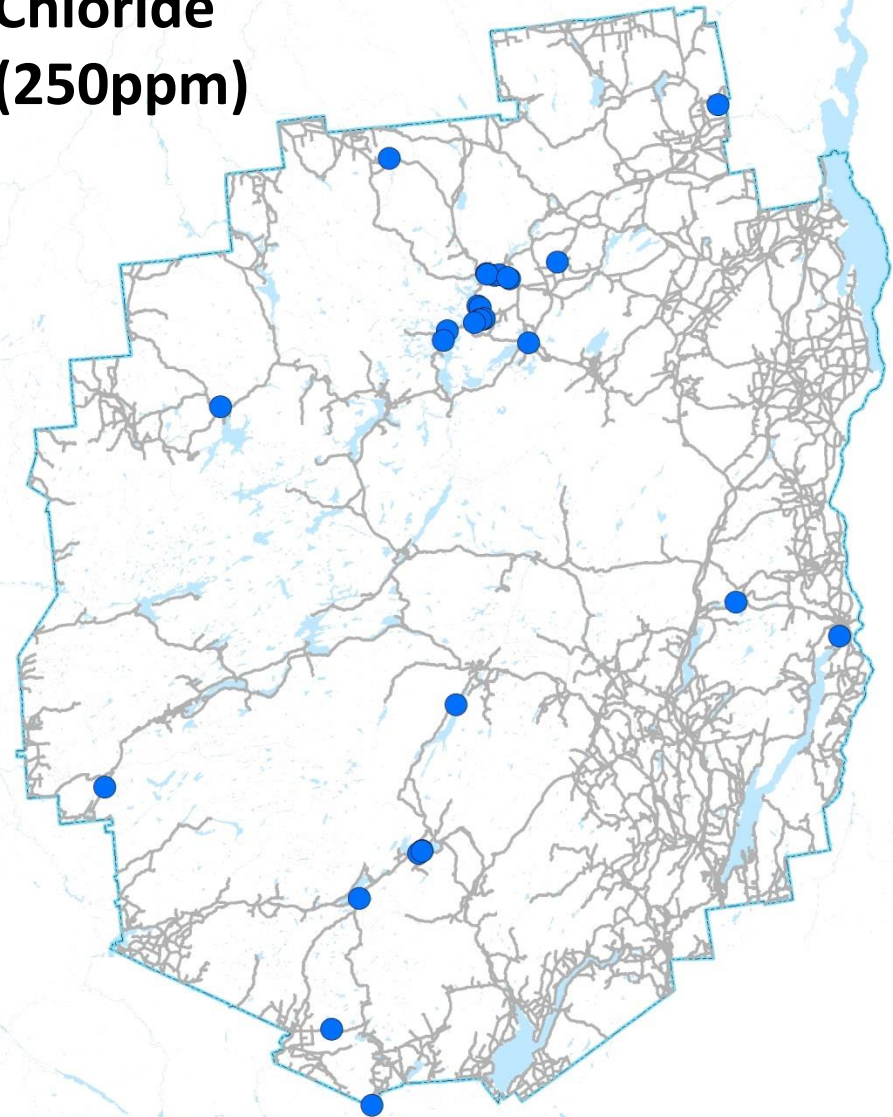
²250ppm

Distribution of Wells Exceeding Guidance

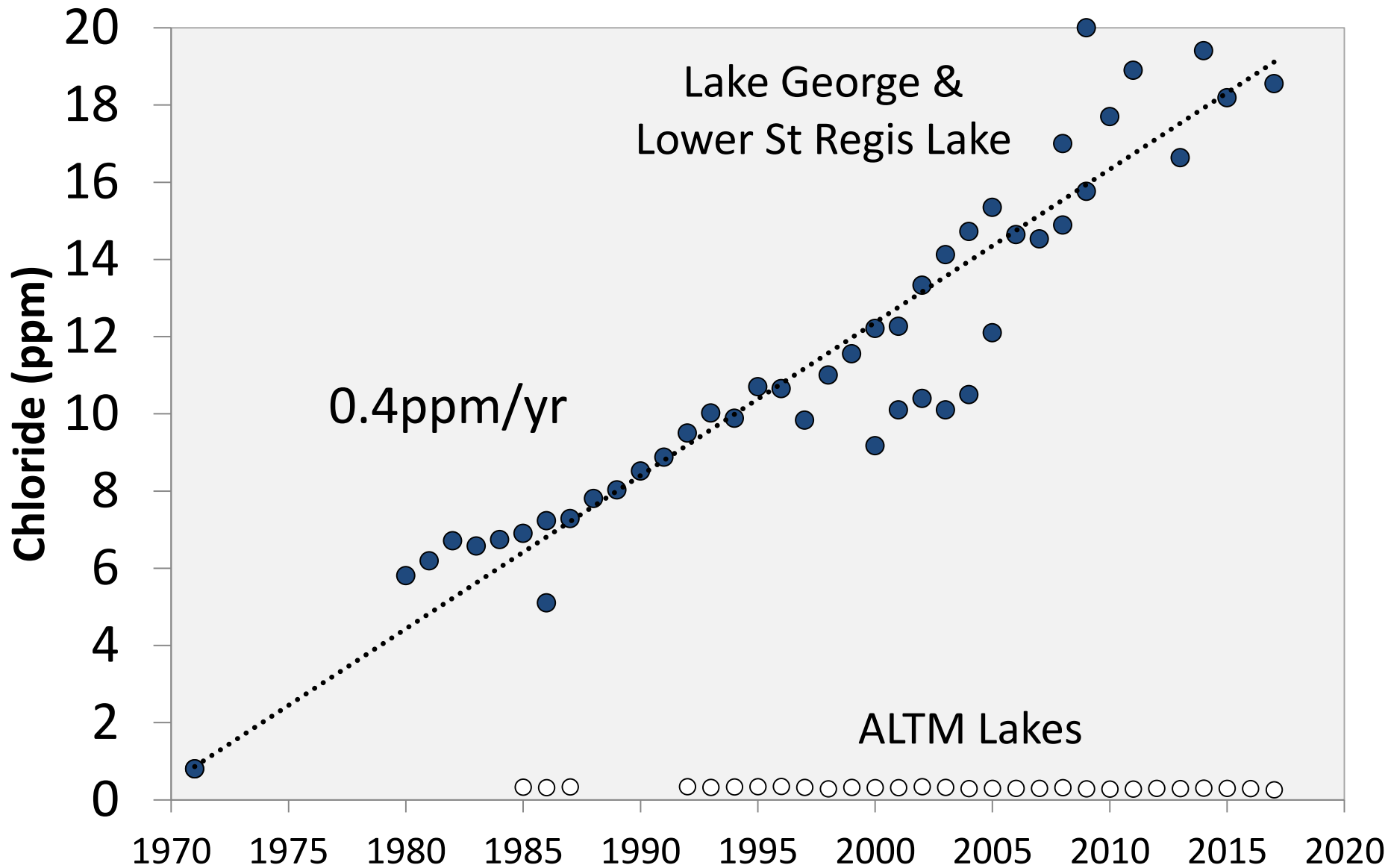
**Sodium
(20ppm)**



**Chloride
(250ppm)**



Status Quo = More Contamination



Take Home Messages

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