Road Salt Pollution of Surface and Groundwater Resources in the Adirondacks

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What investment is needed to address environmental concerns in the region?

1) Inter-municipal cooperation for planning

2) Need better capacity to serve on boards

3) Improved road salting process and education
We use too much salt

Resulted in:

- Regional salinization of surface & groundwater
- Impacts to ecosystems, human health, & property values

If we care we need to act
Salinization - What Is Road Salt?

- Mineral = Halite
- Chemical = Sodium Chloride (NaCl)

“Cheap” and “Effective” + Ice/Snow = Na\(^+\) + Cl\(^-\) + Water
Road Salt (NaCl) Use in the Adirondacks

- 10,555 lane-miles of paved roads
- State uses 2.5× more salt per lane-mile
- Annual Salt Use (192,700 tons)

State & US highways
- Interstate 87
- 2,830 lane-mile

County, Town, & Local Roads
- 7,725 lane-miles

• State uses 2.5× more salt per lane-mile
**Salinization Begins with Runoff**

**Runoff Event**

- March 12, 2015
- 5,000 ppm Chloride
- 1/4 th of sea water!

**Hayes Brook**

**Truck Trail**

**State Route 30**

- 70 Tons Per Year

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

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

**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

What About Lakes?

Regional Salinization

- <0.5 ppm w/o roads
- 14× higher w/roads

Median Lake Chloride
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)

Chloride in BR Watershed Lakes

Chloride (mg/L)
- < 1
- 1 to 5
- 6 to 10
- 11 to 20
- > 20

Chloride (mg/L)

No Roads      Roads
0            10
5            15
10
15
20
25
What About Streams?

51 Streams
- 11 no paved roads
- 40 paved roads
Stream Chloride Loadings

Upper Saranac Lake Watershed

Blue Mountain Lake Watershed
Upper Saranac Lake

• May to Oct 2015/16
• Black Brook (no roads)
  • 1 lb Cl per acre
• Cranberry Brook (SR 3)
  • 44 lbs Cl per acre

Blue Mountain Lake

• May to Oct 2015/16
• Beaver Brook (*no roads*)
  • <1 lb Cl per acre
• Museum Brook (*SR 28N*)
  • 22 lbs Cl per acre

51 Streams in 5 Watersheds

- <0.5ppm w/no paved roads
- 3 to 195ppm w/paved roads

Groundwater Pollution
What About Groundwater?

Regional Groundwater Pollution?

Impacts:
• Human Health
• Homeowner Expenses
• Property Values

• 1,600 square miles of unconfined aquifers\(^1\), most receiving runoff from paved roads\(^2\)

\(^1\)NYSAPA, 2016; \(^2\)Regalado & Kelting, 2015
489 private wells

- 206 no road runoff = None
- 126 local road runoff = Local
- 157 state road runoff = State
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<th>Parameter</th>
<th>Sodium</th>
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<th>Chloride</th>
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<td>Median (ppm)</td>
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<td>Maximum (ppm)</td>
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<td>Exceed Guidance¹</td>
<td>0%</td>
<td>20%</td>
<td>64%</td>
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<td>Maximum (ppm)</td>
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<td>Exceed Guidance²</td>
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<td>3%</td>
<td>29%</td>
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</table>

¹20ppm ²250ppm
Sodium & Chloride (ppm) by Runoff Type

**Sodium**
- None: Low
- Local: 2X
- State: 11X

**Chloride**
- None: Low
- Local: 8X
- State: 100X
Distribution of Wells Exceeding Guidance

**Sodium (20ppm)**
- 25 Local (20%)
- 99 State (64%)

**Chloride (250ppm)**
- 3 Local (3%)
- 46 State (29%)
Well sodium (ppm) in Black River Watershed

- 2 State Runoff
  - 42 – 336 ppm
  - 2/2 exceeded

- 3 Local Runoff
  - 6 – 8 ppm
  - None exceeded

- 1 No Runoff
  - 2 ppm
Multiple Stressors
• We use too much salt

• Resulted in:
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• If we care we need to act
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