

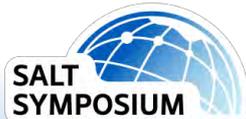


Melissa Wilson

University of Minnesota

Morning Speaker August 1

Chlorides in Animal Waste



Chlorides in Animal Manure

Dr. Melissa Wilson

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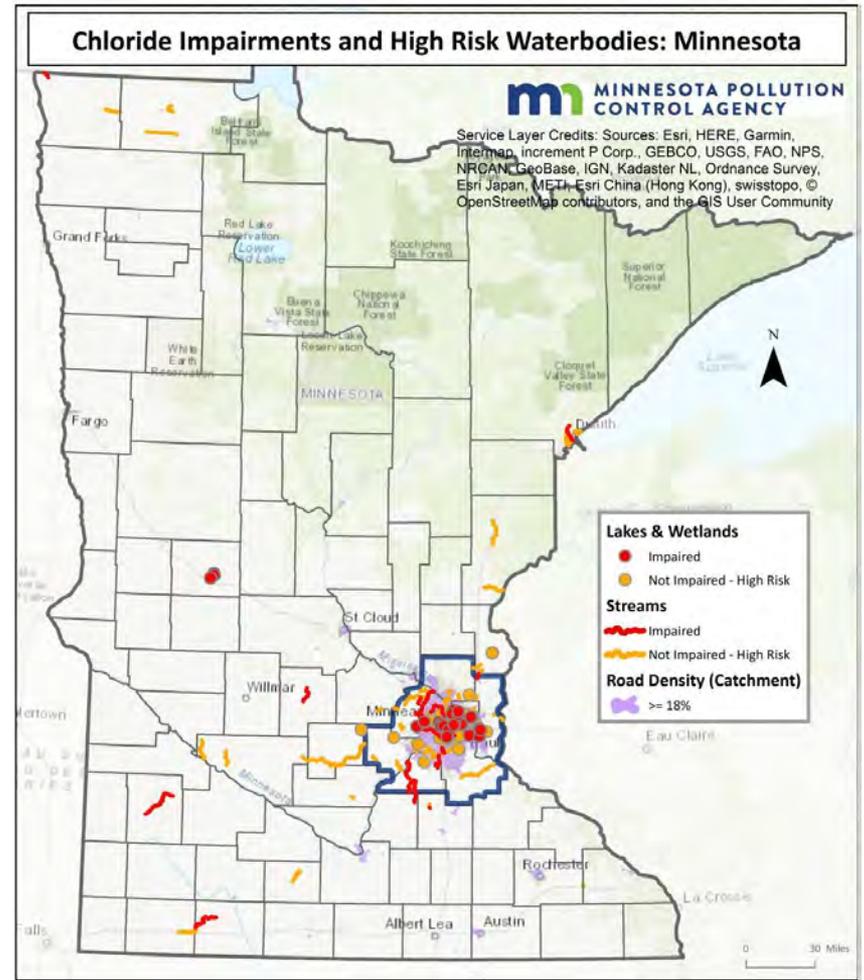


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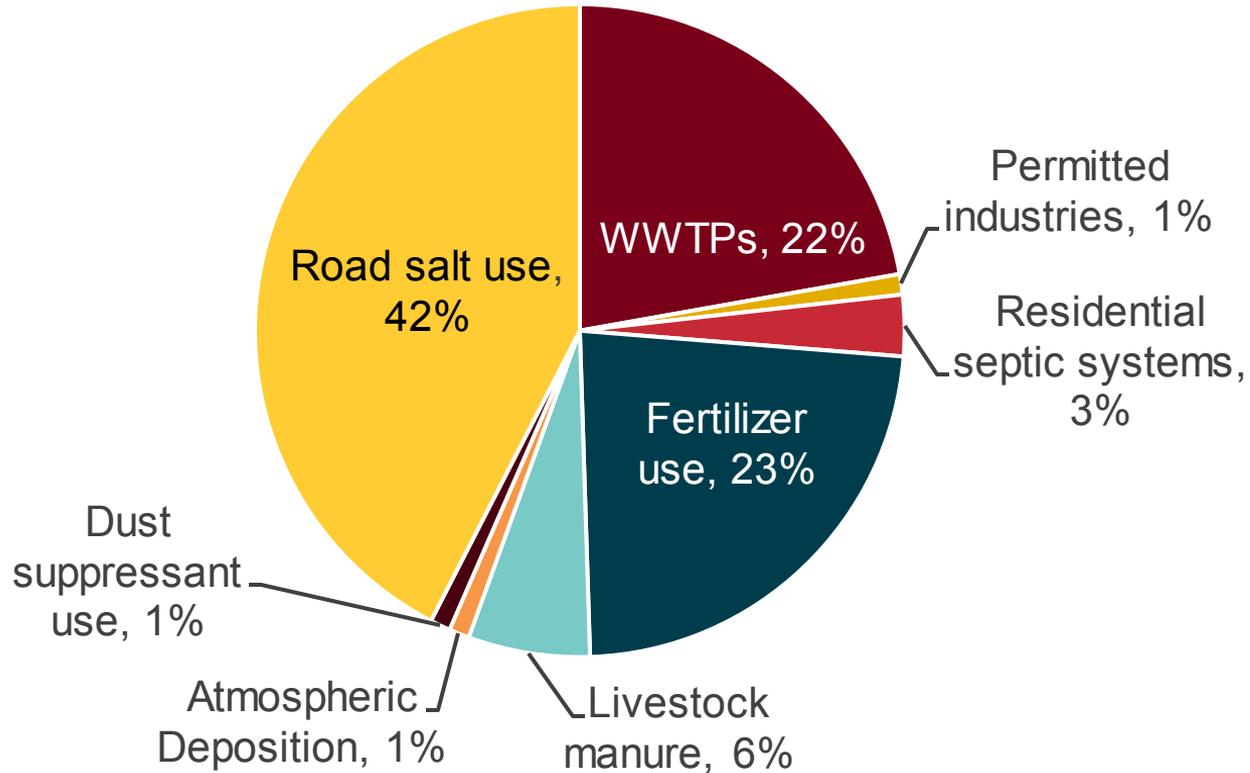
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Chloride impairments in surface water

- Impairment (above 230 mg/L) as of 2020:
 - 221 miles of river
 - 55 acres of wetland
 - 1,400 acres of lake



Where does the chloride come from?



Chloride in manure

- Models estimate that 6% of chloride comes from livestock waste
- However, chloride is not routinely tested in manure
 - Does it vary by livestock species?
 - Report from AZ found dairy and beef feedlot manure had 50,000 to 100,000 ppm of chloride!
 - Does it release from manure just as quickly as it does from fertilizer?



Preliminary Research

Thanks to funding from the Watershed Innovation Grant Program through UMN Water Resources Center:



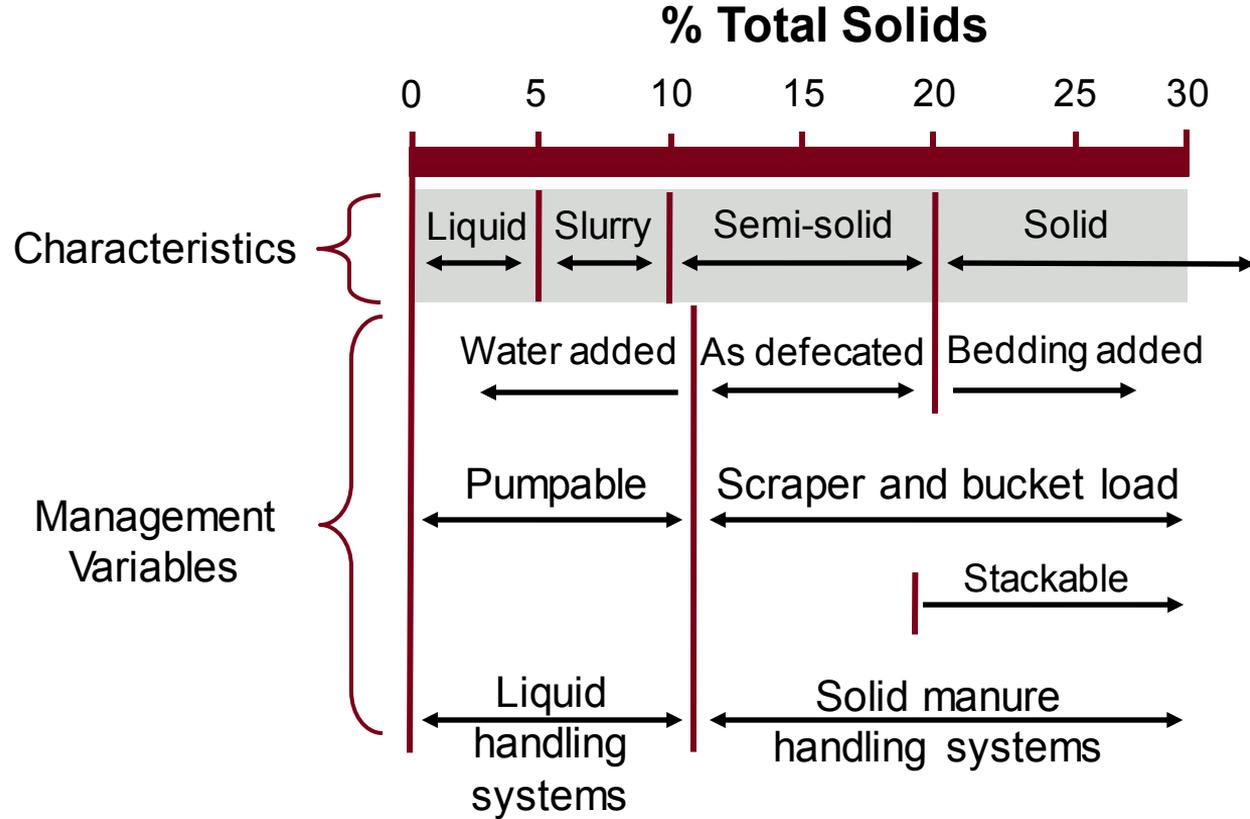
Worked with a lab to analyze chloride in manure



Conducted a leaching study with different manure types

A primer on manure

Manure is typically handled based on type and consistency

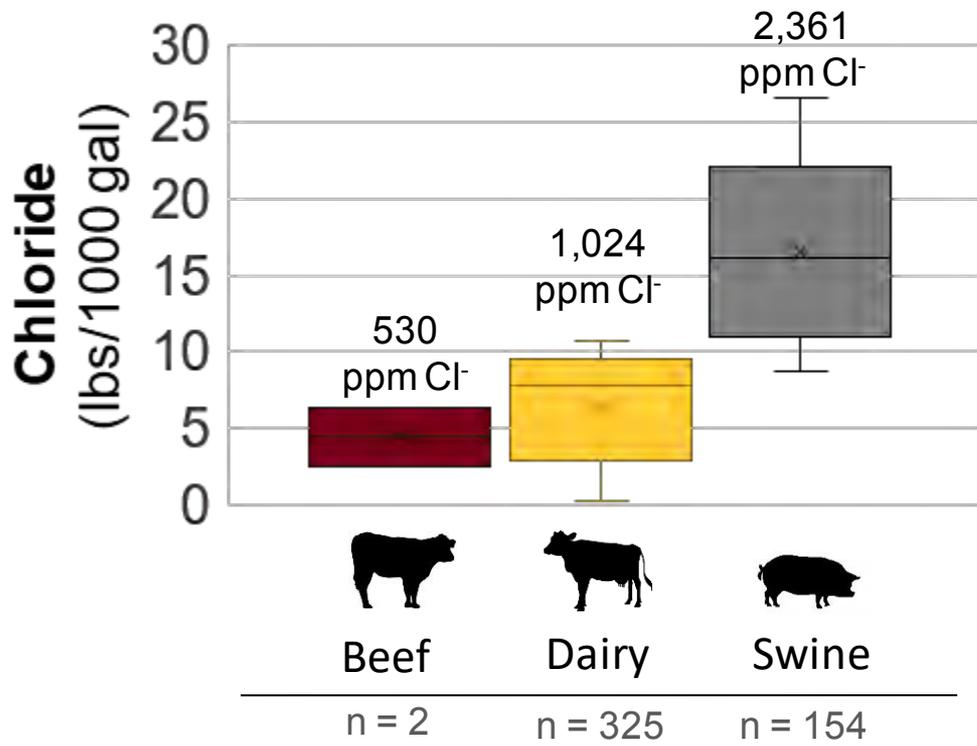


Updated chloride data for manure

- Collaborated with a local lab
 - They added chloride analyses to manure samples sent into their lab
 - Sent us the data along with species type, total solids, etc.
 - No identifying information was given regarding farms where samples came from



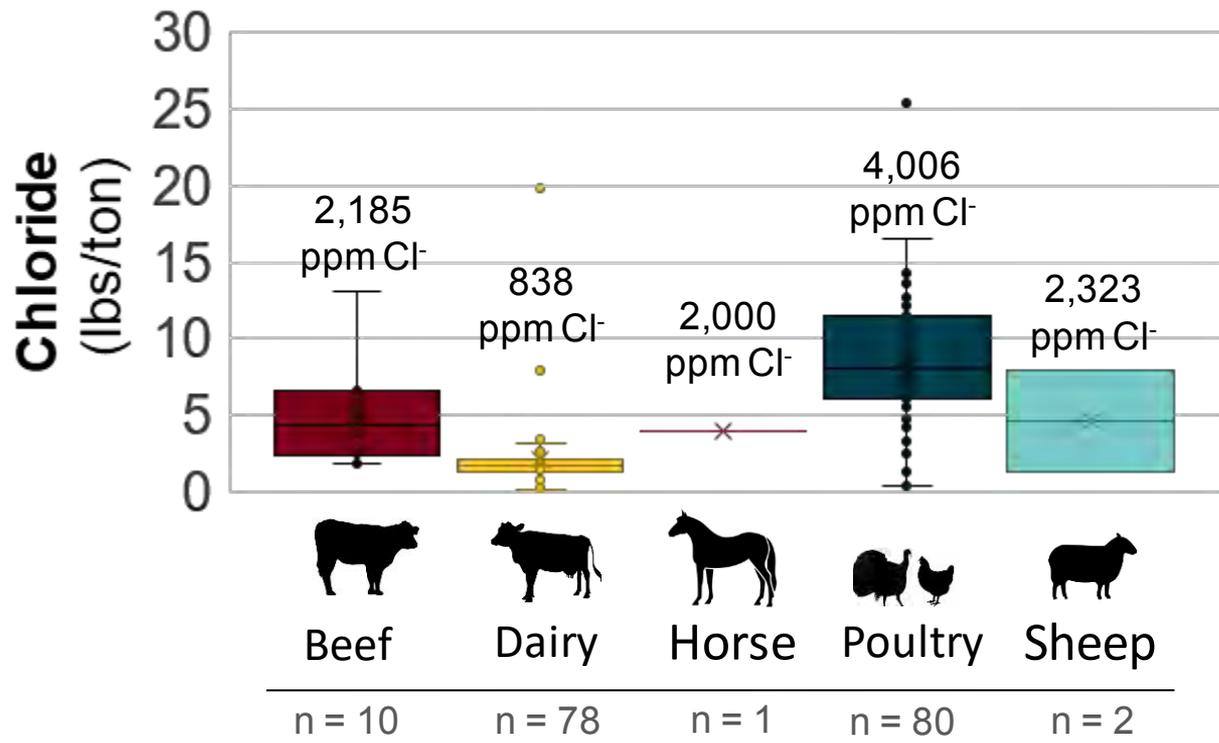
Liquid manure (less than ~10% solids)



- Swine had highest median and mean Cl⁻ concentration



Solid manure (greater than ~10% solids)

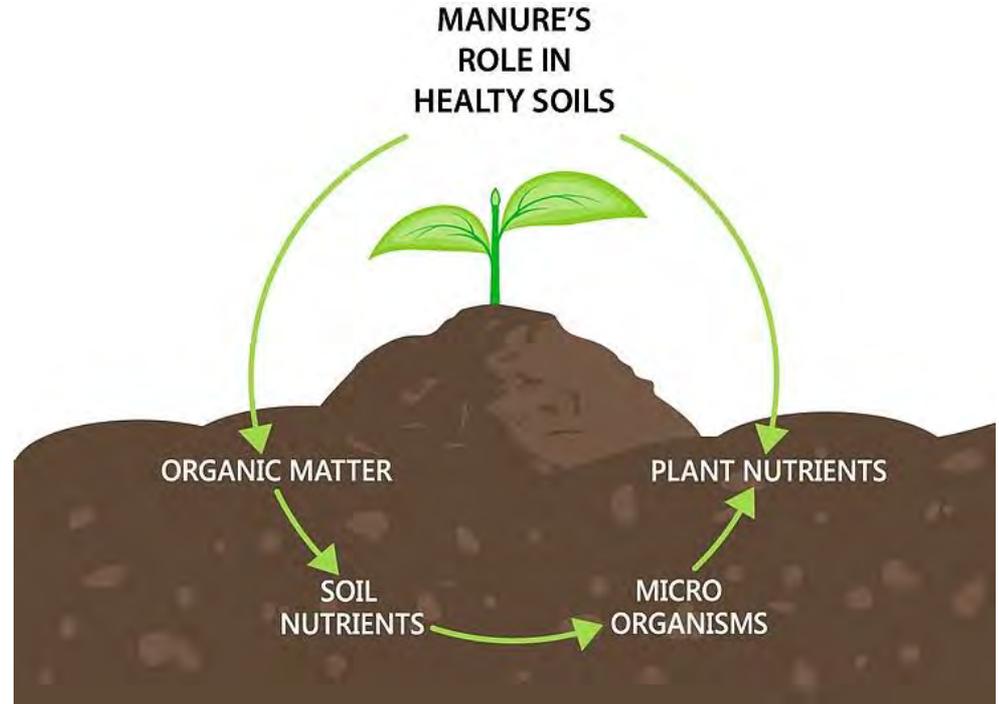


- Poultry had highest median and mean Cl⁻ concentration



Manure land application

- Manure is a “recycled” nutrient source
 - Has all nutrients needed for crop production
 - Includes food for microbes – carbon!
- Enough manure is generated in MN to apply ~28-40% of crop N needs annually



Does chloride leach from manure?



- If it's like other nutrients, it depends on:



Soil type



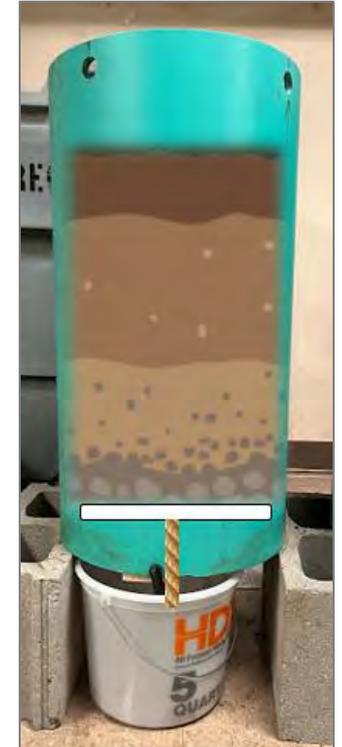
Manure characteristics



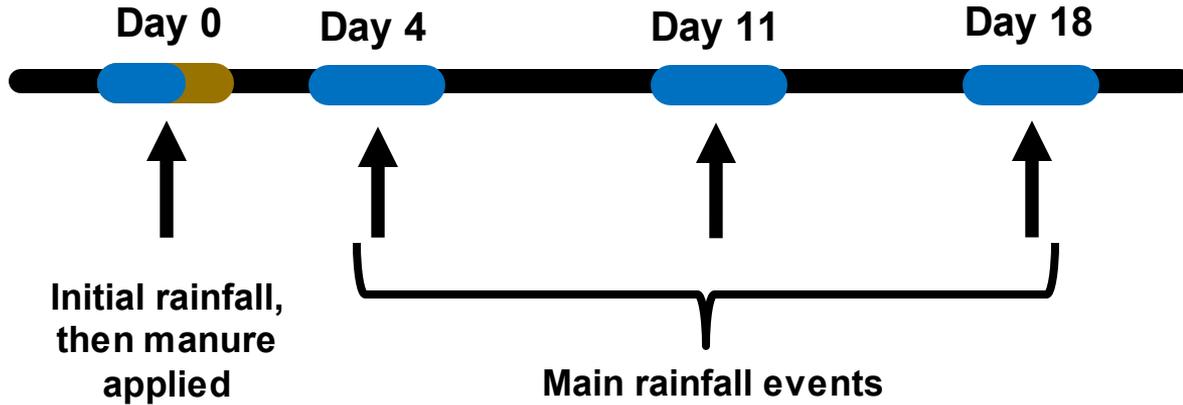
Time since application

Experimental design

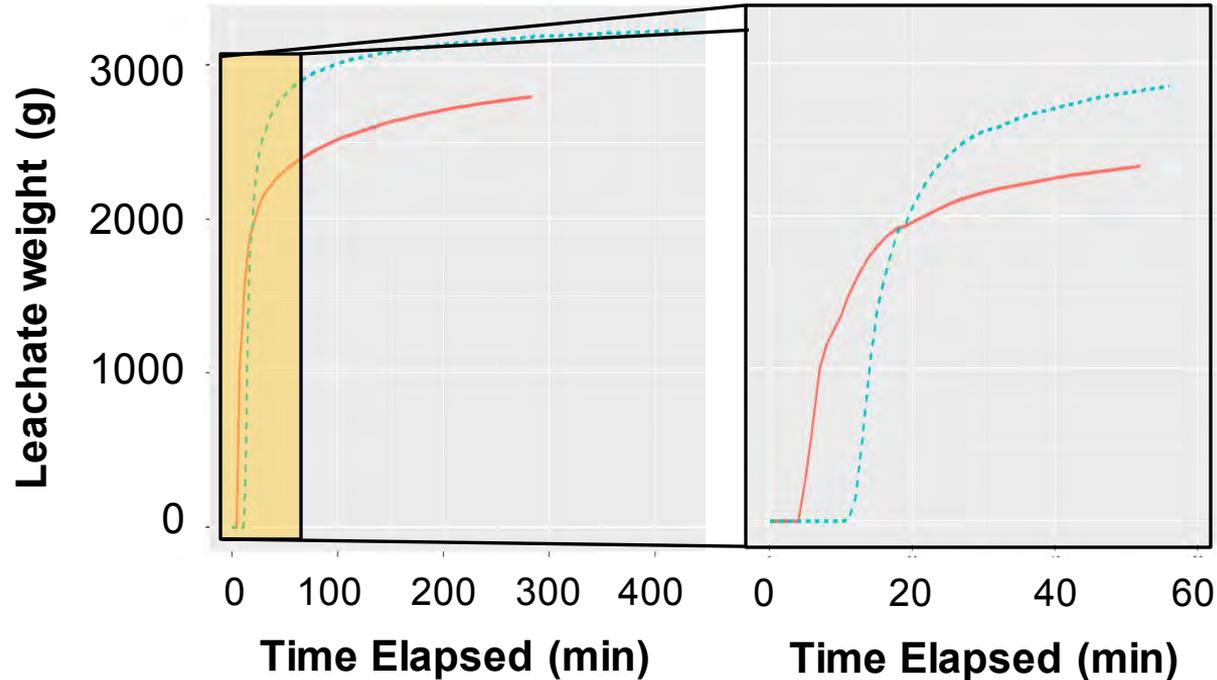
- Collected in-tact soil cores from agricultural fields with different soil textures
- Surface applied manure treatments
- Simulated 3 rain events (5-cm)
- Collected leachate and soil samples for analysis



“Rainfall” timeline



Drainage rates



Soil Type

— Sandy L

- - Silty Clay L

Soil Type

Average Drainage Rate (g min⁻¹)

Sandy L

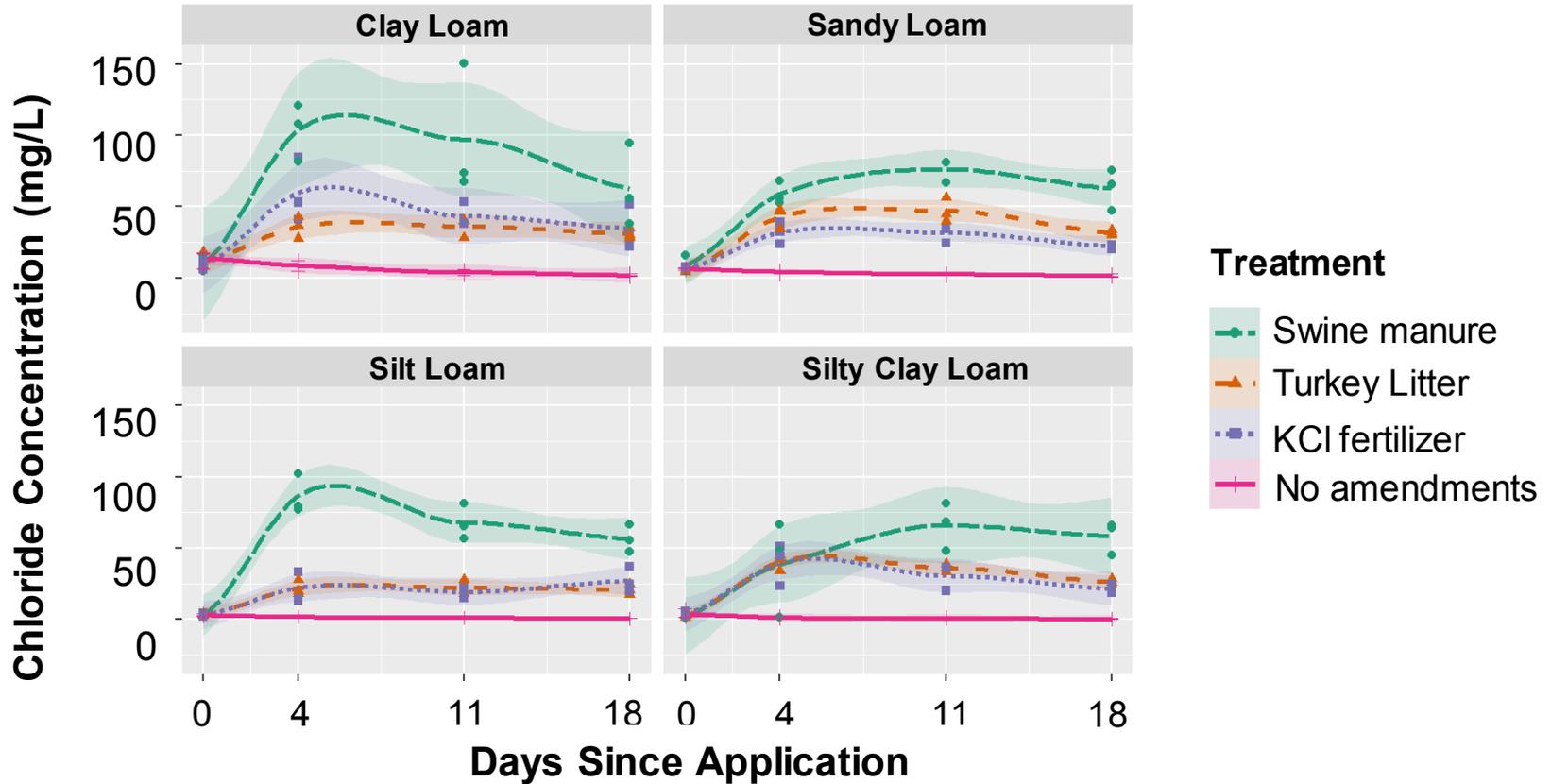
9.85

Silty Clay L

7.53



Cl⁻ concentration in leachate



Cl⁻ concentration ~ soil type * treatment * days ($P < 0.0001$)



Take home messages



Thank you!

Funding: Watershed Innovation Grant Program at the UMN Water Resources Center

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