Chippewa County Nitrate Occurrence and Source Investigation

Chippewa County
"Stewardship for Sustainability"
Land Conservation and Forest Management

CHIPPEWA COUNTY
Public Health
Prevent. Promote. Protect.

Center for Watershed Science and Education
College of Natural Resources
University of Wisconsin-Stevens Point

Extension
UNIVERSITY OF WISCONSIN-MADISON

Nitrate / Chloride

- Useful for understanding land-use impacts on groundwater

Conductivity

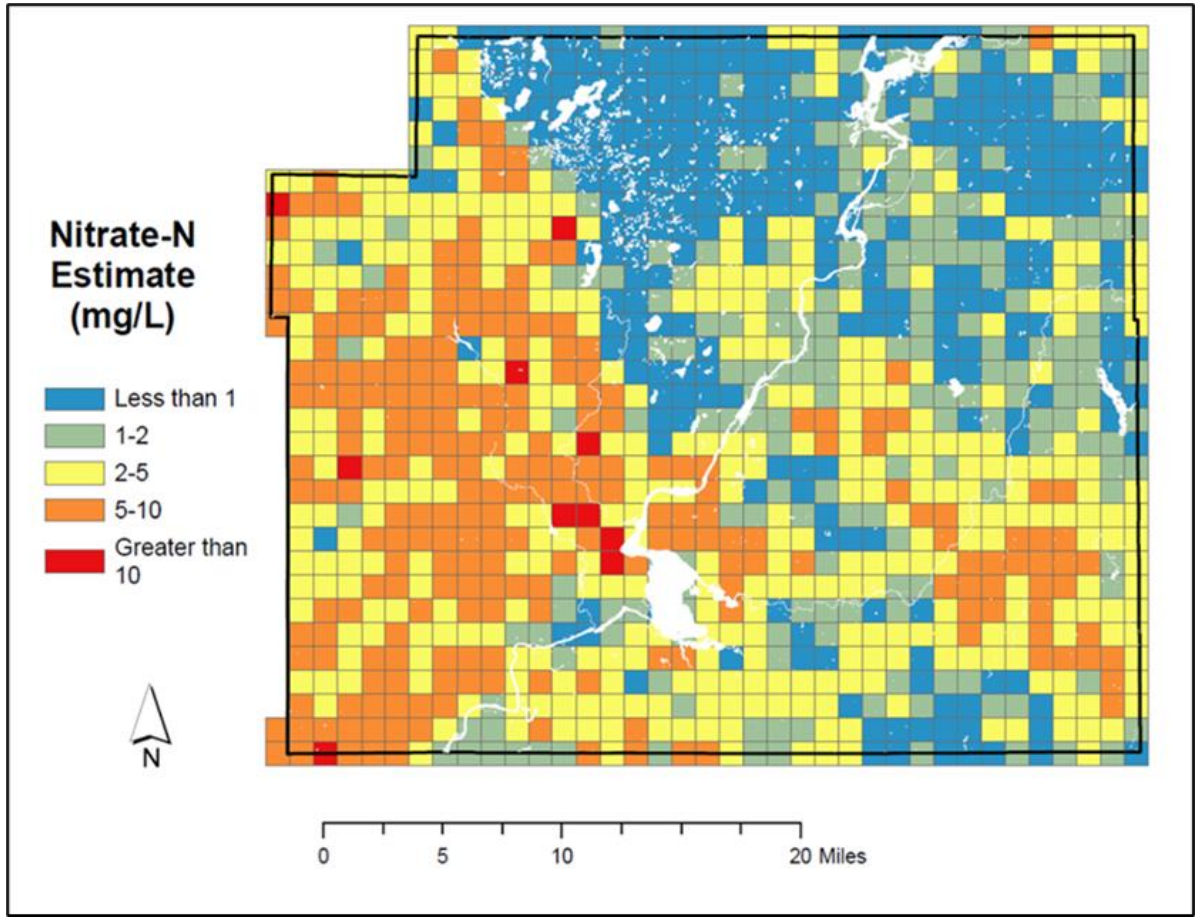
- Overall water quality, combination of both land-use, rocks, and soils

Total Hardness / Alkalinity / pH

- Help us understand how rocks and soils impact groundwater

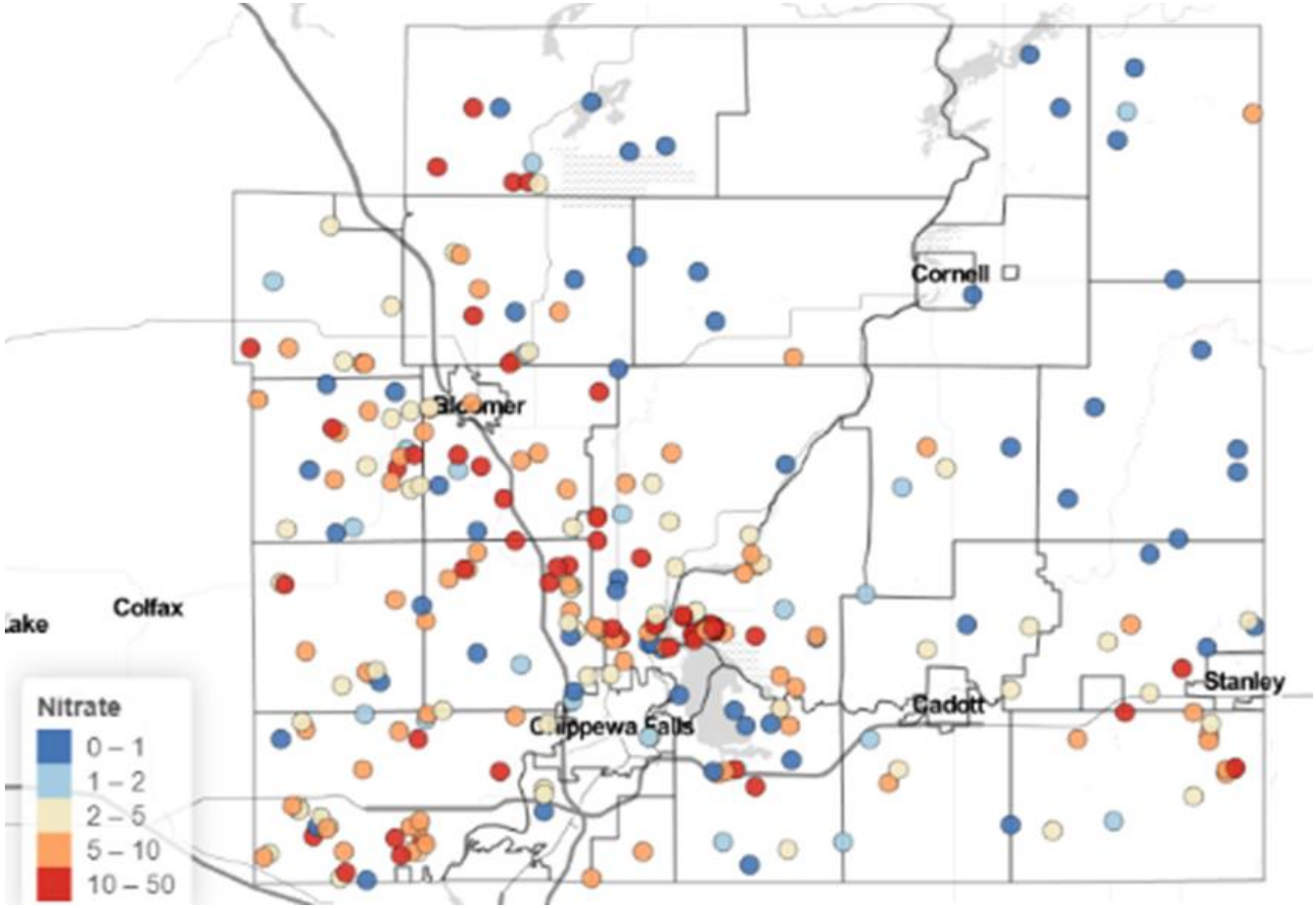
Well Selection

- County Trend Monitoring
  - Well owners that have submitted samples annually since 2019
  - 152 wells
- Nitrate Source Investigation
  - Additional wells selected from grid cells with a nitrate-N estimate greater than 5 mg/L
  - 141 wells



Chippewa County 2022 – Nitrate-Nitrogen

Nitrate-Nitrogen (mg/L)	Number of Samples	Percent
Less than 0.1	29	10%
0.1 – 2.0	52	18%
2.1 – 5.0	65	22%
5.1 – 10.0	78	27%
10.1 – 20.0	64	22%
Greater than 20.0	2	<1%



Annual Sampling (CTM) versus Nitrate Areas (NSI)

		Nitrate-Nitrogen			
	Samples	Mean Concentration	Greater than 2 mg/L	Greater than 5 mg/L	Greater than 10 mg/L
	n	mg/L	----------%----------		
CTM	151	4.7(4.4)	62	40	12
NSI	142	7.6(5.5)	82	59	34

Overall, gridded predictive model did a better job of identifying areas of elevated nitrate than random sampling would have.

Nitrate Source Tracers

Parameter	Samples	Limit of Detection	Samples with detections		Health value*	Min	Median	Mean	Max
	n	ug/L	n	%	ug/L or parts per billion				
Alachlor OA[1]	24	0.08	0	0		NA	NA	NA	NA
Alachlor ESA[1]	24	0.08	10	42		0.13	0.49	0.53	1.28
Metolachlor OA[1]	24	0.08	2	8		0.12	0.17	0.17	0.22
Metolachlor ESA[1]	24	0.08	21	88		0.12	0.61	0.95	6.01
	n	ng/L	n	%	ng/L or parts per trillion				
Acesulfame[2]	24	5	10	42		5.6	10.8	1,500	13,100
Sucralose[2]	24	25	11	46		27	43	1934	16,100
Caffeine[2]	24	12	3	13		12	12.3	14	18.7
Paraxanthine[2]	24	5	0	0		NA	NA	NA	NA
Carbamazepine[2]	24	2	1	4		7.6	7.6	7.6	7.6
Sulfamethoxazole[2]	24	5	2	8		64	117.5	117.5	171
Acetamiprid[3]	24	1.7	0	0		NA	NA	NA	NA
Clothianidin[3]	24	1.5	4	17	1,000,000	2.5	18.1	18.2	34.1
Dinotefuran[3]	24	0.7	0	0		NA	NA	NA	NA
Imidacloprid[3]	24	2.4	1	4	200	18.7	18.7	18.7	18.7
Thiamethoxam[3]	24	1.5	1	4	1,200,000	47.9	47.9	47.9	47.9

[1]Common pesticides

[2]Pharmaceuticals and personal care products (PPCPs)

[3]Neonicotinoid compounds

*If this column is absent it means that there is no recommended health value available due to low risk or lack of health/toxicity research on those compounds.

		Nitrate-Nitrogen	Chloride
	n	mg/L	
Agricultural Tracers	21	9.8(5.1)	20.4(13.8)
PPCPs	17	8.8(5.4)	35.8(60.1)
Only Agricultural Tracers	6	10.0(5.2)	19.2(14.9)
Only PPCP	3	4.7(5.2)	105(137)

Take aways:

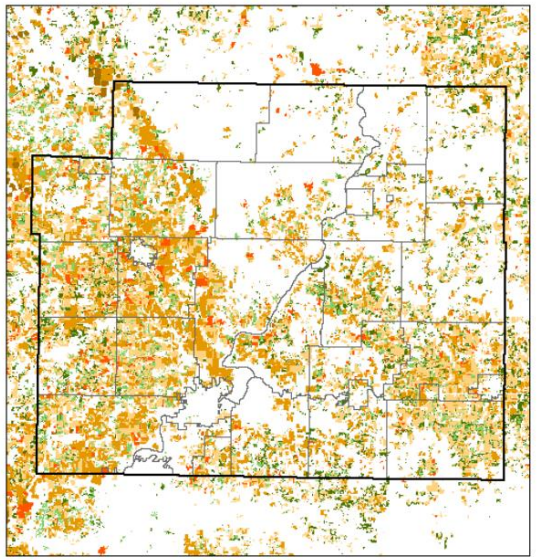
- Agriculture has greater influence on nitrate concentrations
- Developed areas have greater influence on chloride concentrations

Perfluoroalkyl and Polyfluoroalkyl Substances

Parameter	Samples	Limit of Detection	Samples with detections		Health value*	Min	Median	Mean	Max
	n	ng/L	n	%	ng/L	ng/L or parts per trillion			
PFOA	**24**	**0.107**	**3**	**13**	**20**	**2.94**	**3.19**	**8.78**	**20.20**
PFOS	24	0.141	2	8	20	0.17	0.61	0.61	1.04
FOSA	24	0.153	0	0		NA	NA	NA	NA
N-EtFOSA	24	0.686	0	0		NA	NA	NA	NA
N-EtFOSE	24	0.21	0	0		NA	NA	NA	NA
N-EtFOSAA	24	0.21	0	0		NA	NA	NA	NA
Total of 6 above					20				
PFNA	24	0.146	1	4	30	0.19	0.19	0.19	0.19
PFHxS	24	0.14	3	13	40	0.19	1.22	3.21	8.23
HFPO-DA	24	0.19	0	0	300	NA	NA	NA	NA
PFDA	24	0.161	1	4	300	0.149	0.149	0.149	0.149
PFDoA	24	0.268	0	0	500	NA	NA	NA	NA
DONA	24	0.127	0	0	3,000	NA	NA	NA	NA
PFUnA	24	0.219	0	0	3,000	NA	NA	NA	NA
PFBA	24	0.342	4	17	10,000	1.23	6.35	15.31	47.30
PFTeDA	24	0.173	0	0	10,000	NA	NA	NA	NA
PFHxA	24	0.202	3	13	150,000	0.67	0.91	1.05	1.57
PFBS	24	0.228	3	13	450,000	0.26	2.05	4.77	12.00
PFPeA	24	0.148	3	13		0.26	0.80	0.76	1.22
PFHpA	24	0.148	2	8		0.36	3.42	3.42	6.49
PFPrS	24	0.255	1	4		0.46	0.46	0.46	0.46
PFPeS	24	0.134	2	8		0.39	1.41	1.41	2.43
FHpPA	24	0.435	1	4		1.11	1.11	1.11	1.11
PFBSA	24	0.427	1	4		1.23	1.23	1.23	1.23

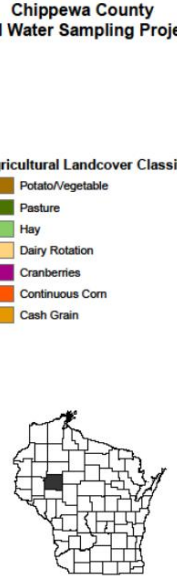
The one PFAS detected above the health standard for PFOA only contained PPCPs, no agricultural tracers

Landcover + Soil Drainage = Nitrate-N



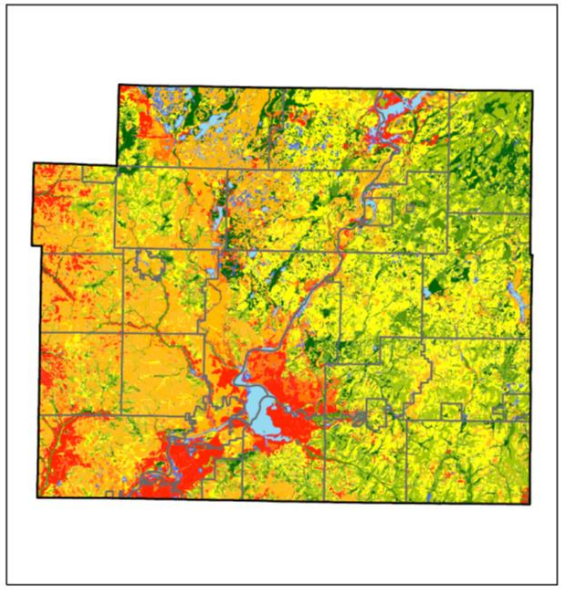
Chippewa County
Well Water Sampling Project

Agricultural Landcover Classification
- Potato/Vegetable
- Pasture
- Hay
- Dairy Rotation
- Cranberries
- Continuous Corn
- Cash Grain



Source: Wisland 2.0

Created: Elizabeth Belmont. February 28, 2022



Chippewa County
Well Water Sampling Project

Drainage Classification
- Excessively drained
- Somewhat excessively drained
- Well drained
- Moderately well drained
- Somewhat poorly drained
- Poorly drained
- Very poorly drained
- Water

Source: Soil Survey Staff, Natural Resources Conservation Service, United States Department of Agriculture. Soil Survey Geographic (SSURGO) Database

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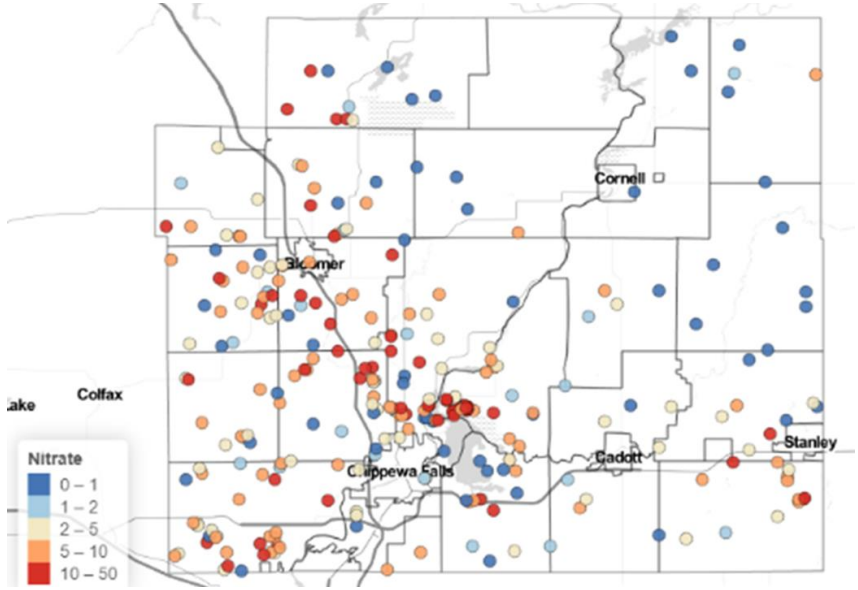
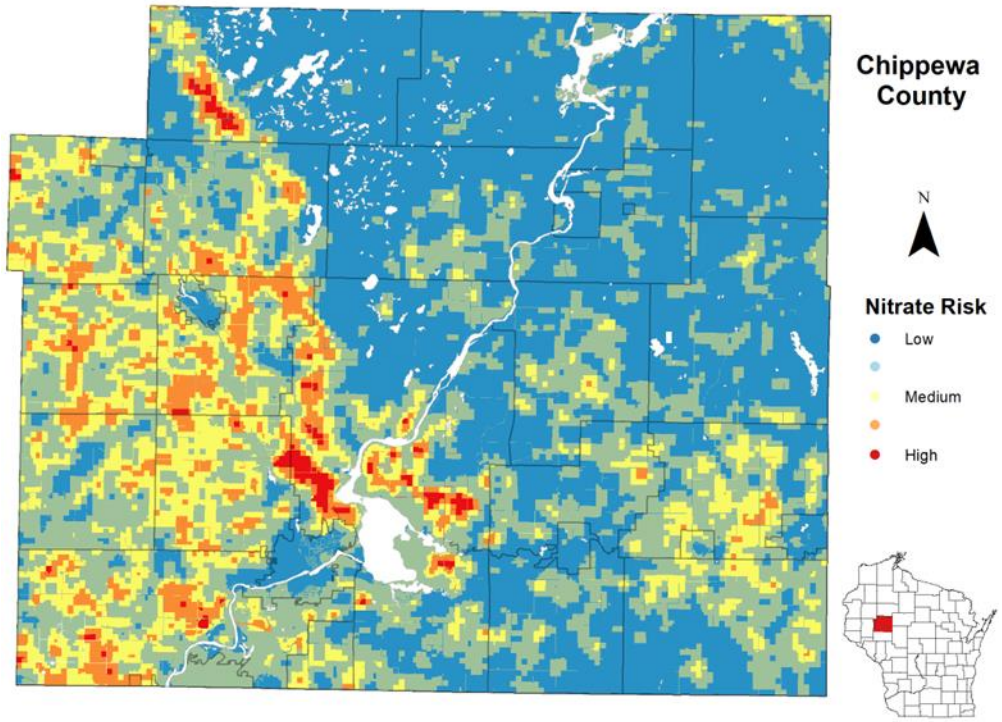
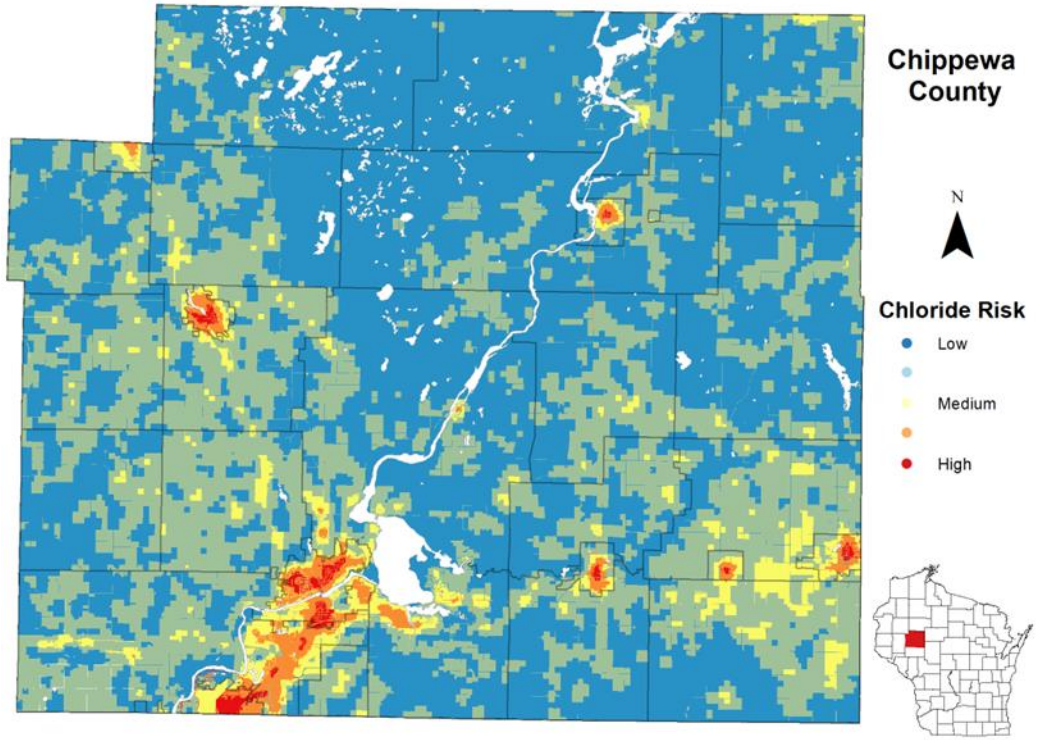


2022

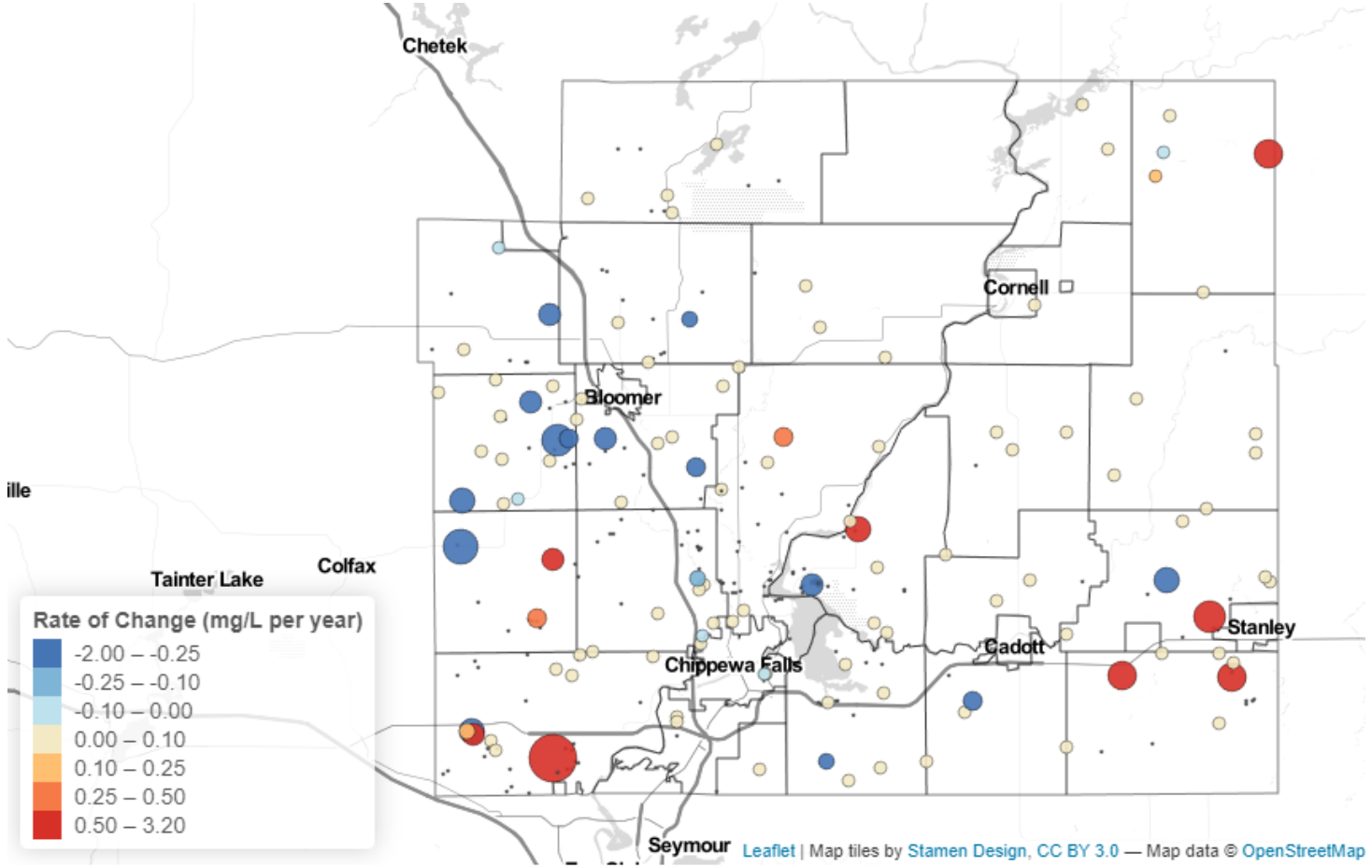
Nitrate Risk Model



Chloride Risk Models



Preliminary Data - Chippewa County Trends



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