Lower Farmington River and Salmon Brook Watershed

Spring & Summer 2022 Chloride Monitoring

Farmington River Watershed Association

With funding from the Lower Farmington River and Salmon Brook Wild & Scenic Committee

Chloride concentrations have been increasing exponentially in waterways, yet it has only recently become a topic of concern. While road salts keep roads safe for travel in winter months, they also get washed into surrounding waterways. The Connecticut Department of Energy and Environmental Protection (CT DEEP) recently expressed interest in chloride monitoring throughout spring and summer months, and are encouraging volunteer groups to collect data. It is pertinent to understand how these locations fare during times of the year in which no road salt is applied. Chronic increases in chloride concentrations can result in impaired food webs and reduced fitness of aquatic plants and wildlife during times of high production, such as the spring and summer months.

FRWA recently brought attention to road salts in the Farmington River Watershed through partnership with the Izaak Walton League of America (IWLA) on their Salt Watch program. The IWLA Salt Watch program has made chloride monitoring easily accessible to organizations and citizen scientists. FRWA monitored eleven sites in the Lower Farmington River watershed during winter of 2021-2022 by using the IWLA chloride kits. Eleven sites were monitored in spring, May 2022, and fifteen sites from June to August 2022. These sites were selected based on their potential to have high chloride or to monitor tributaries going to the Farmington River. Two sites on the Farmington River in Simsbury and Windsor were included.

Figure 1: Izaak Walton League of America Salt Watch Kit

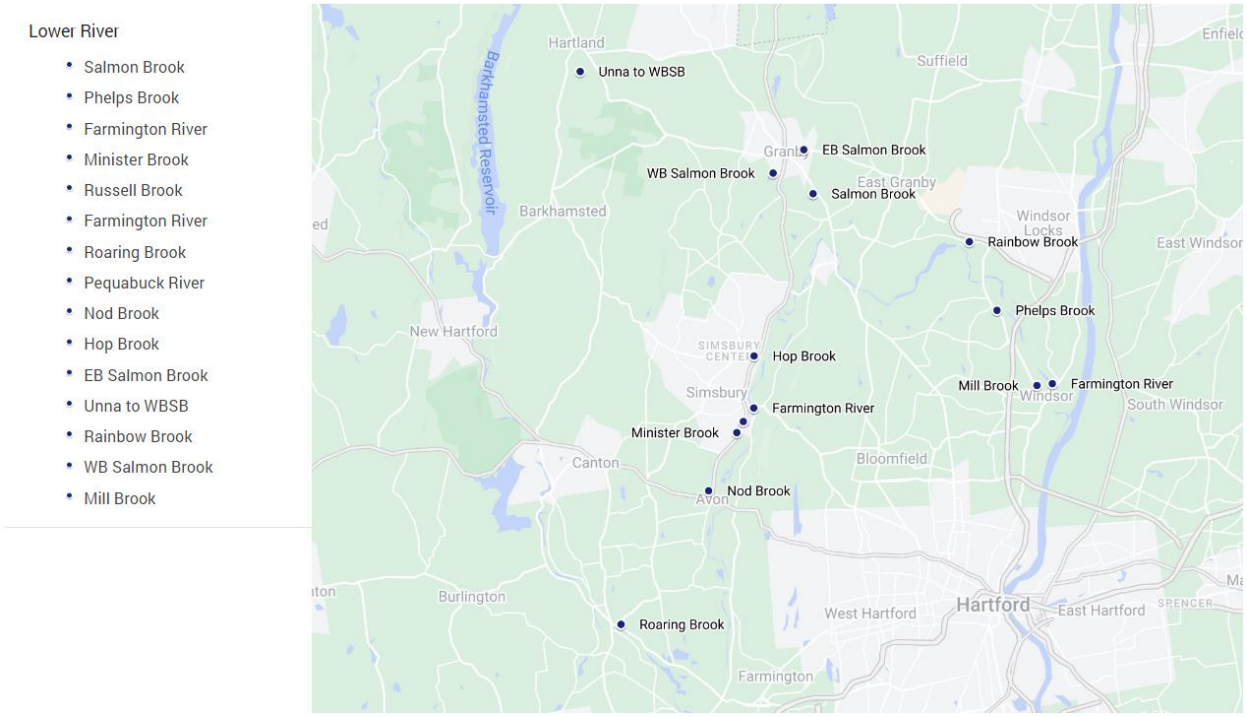
Three FRWA interns were trained by FRWA staff and participated in the spring and summer chloride monitoring. FRWA has mentored many college interns in our water quality monitoring program that have then gone on to get professional positions in the environmental field including USGS, Connecticut Water Company, UTC, CT DEEP, Massachusetts DEP, clean energy, and environmental consulting.

FRWA Chloride Monitoring Sites spring and summer 2022

Lower Farmington River Watershed

Site ID	Waterbody Name	Location	Municipality
RO-F1	Roaring Brook	Cottage St. bridge	Farmington
PR-F1	Pequabuck River	Meadow Rd.	Farmington
NB-1770	Nod Brook	Ensign Dr.	Avon
MS-S1	Minister Brook	Across Latimer Ln.	Simsbury
RB-S1	Russell Brook	Weatogue Park	Simsbury
FR-S1	Farmington River	Pinchot Sycamore	Simsbury
HB-S2	Hop Brook	Rt. 10 bridge	Simsbury
SB-2	Salmon Brook	Granbrook Park	Granby
EBSB-5430	East Branch Salmon Brook	Bryan's Landing	Granby
SB-WB3	West Branch Salmon Brook	Salmon Brook Park	Granby
Unna-822	Unnamed Tributary to WBSB	Rengerman Hill Rd.	Hartland
RB-W1	Rainbow Brook	High St. / Cat Connection	Windsor
PB-W1	Phelps Brook	Rt 75 MDC	Windsor
ML-W1	Mill Brook	East St. bridge	Windsor
FR-W2	Farmington River	Boat launch	Windsor

LFSWS Spring and Summer Chloride Monitoring Sites



Methods

Sites in the Lower Farmington River Watershed were selected based on their potential to have high chloride or to monitor tributaries and the Farmington River. Two sites were on the main stem of the Farmington River and the remainder were on tributaries that flow into the Farmington River. Eleven sites were monitored in spring of May 2022, and fifteen sites from June to August 2022. Data was collected using IWLA Salt Watch kits, and FRWA's YSI ProDSS meter. The IWLA Salt Watch kits included strips for determining chloride and salt concentrations, and all sites were supported with the use of FRWA's YSI ProDSS meter measuring chloride, temperature, dissolved oxygen, turbidity and conductivity. These measurements were used to understand the water quality of the sites in more depth in relation to chloride.

Figure 2: Meter and Salt Watch water sample.

Figure 3: Salt Watch water sample.

Figure 4: Chloride strip in water sample.

Results

The purpose of chloride monitoring in spring and summer months was to identify potentially impaired locations, to determine how locations fare during high-production times for aquatic plants and wildlife, and to collect data for future long-term monitoring. While most sites had low concentrations of chloride during May through August, some sites remained higher in chloride.

The EPA's chronic concentration criteria (CCC) of chloride for aquatic life is 230 mg/L. CCC is an estimate of the highest concentration of a material in ambient water to which an aquatic community can be exposed indefinitely without resulting in an unacceptable adverse effect. Values above 230 mg/L for chloride can result in impaired food webs and reduced fitness of aquatic plants and wildlife during times of high production. Comparing chronic concentration criteria with results provides insight into how the stream's environment is affecting aquatic life. The EPA's criterion maximum concentration (CMC) of chloride for aquatic life is 860 mg/L. CMC is an estimate of the highest concentration of a material in ambient water to which an aquatic community can be exposed briefly without resulting in an unacceptable adverse effect. Results showed that most sites remained lower than 230 mg/L over spring and summer months, and some sites were higher in chloride than expected. For perspective, most sites during winter months when road salts were being applied remained low in chloride with the exception of a couple sites, including Nod Brook which spiked at 331 mg/L in chloride. The highest result from spring and summer monitoring was 170 mg/L at Rainbow Brook, and other sites Pequabuck River, and Mill Brook remained high in chloride but did not reach 230 mg/L. All other sites remained below 100 mg/L, except Roaring Brook which reached 131 mg/L in August during drought. All sites by town are included in the appendix.

Sites on the Farmington River have consistently had low chloride levels, even during winter when road salts are being applied. Any tributaries high in chloride have been diluted when entering the Farmington River due to the volume of water in the river. The highest value recorded on the Farmington River in the winter was 57 mg/L, which is far below the chronic criteria of 230 mg/L. Due to these findings in the winter sampling season, FRWA reduced the number of river sites for Salt Watch, and focused more on tributaries in the watershed. The Farmington River sites at the Pinchot Sycamore in Simsbury, and at the boat launch in Windsor will continue to be monitored for future long-term trends.

Pequabuck River – Meadow Road, Farmington

The Pequabuck River was monitored at the confluence with the Farmington River. It was monitored for winter, spring, and summer months. Chloride levels during spring and summer months, especially in August, increased due to drought conditions when no dilution was occurring (figure 5). In August, the Pequabuck River reached 131 mg/L during drought (figure 6).

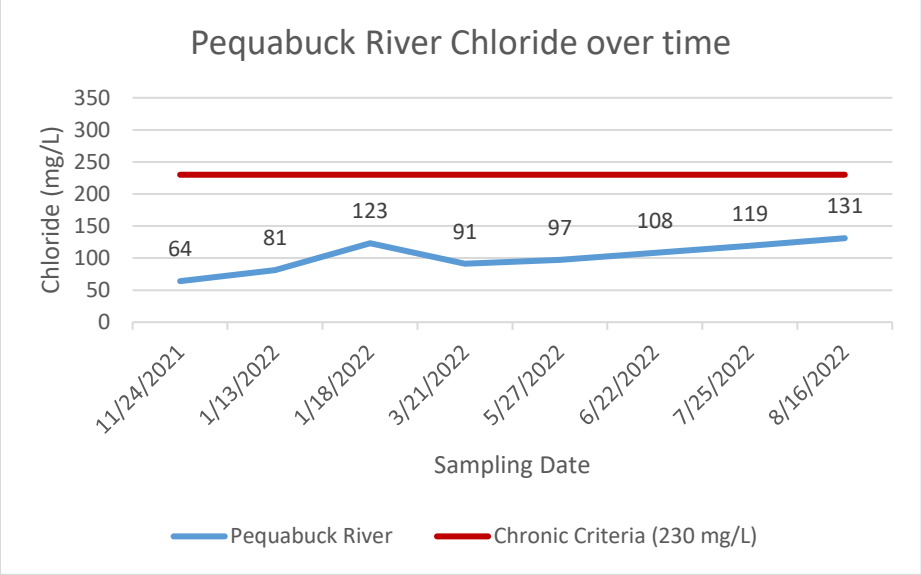


Figure 5: Pequabuck River chloride over time

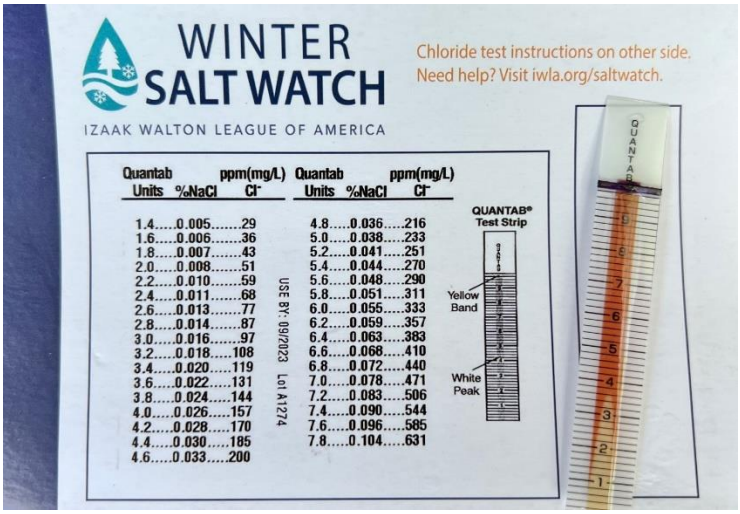


Figure 6: Pequabuck River chloride results from IWLA Salt Watch kit

Nod Brook – Ensign Drive, Avon

Nod Brook was monitored on Ensign Dr. in Avon (figure 7). It was monitored for spring, and summer months. It reached 331 mg/L on January 18th 2022; this sampling date was after a snowstorm where road salts were applied (figure 8). This spike in chloride at Nod Brook exceeded the CCC of 230 mg/L, but was not a chronic condition as it decreased to 111 mg/L in March (figure 9). Nod Brook exhibits higher than normal chloride concentrations throughout all seasons, consistently remaining over 100 mg/L.

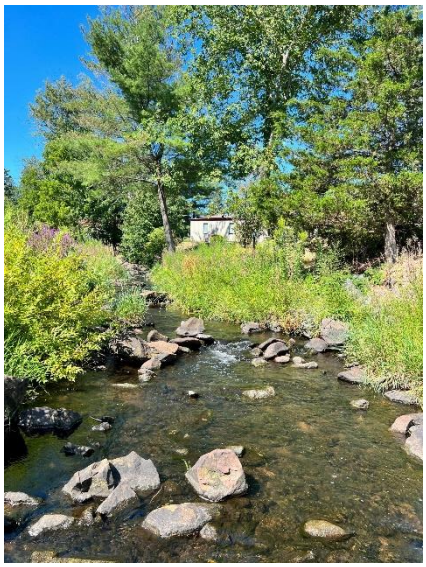


Figure 7: Nod Brook at Ensign Dr., Avon

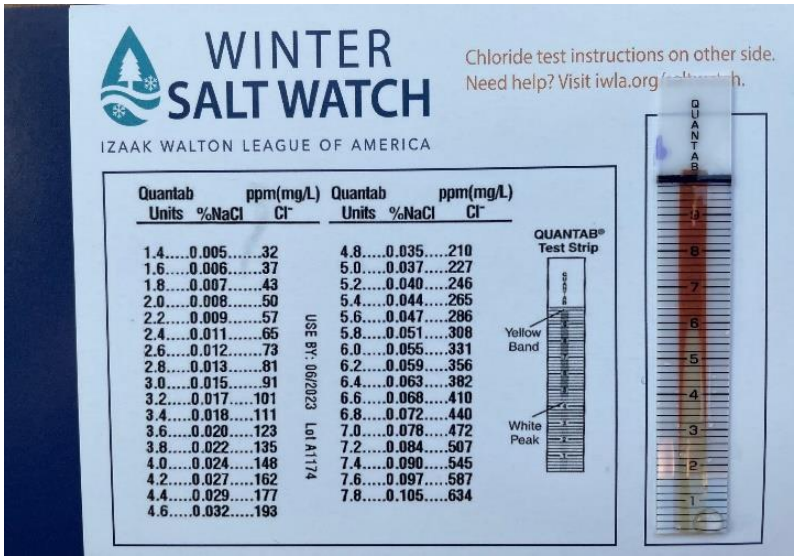


Figure 8: Nod Brook chloride results from IWLA Salt Watch kit

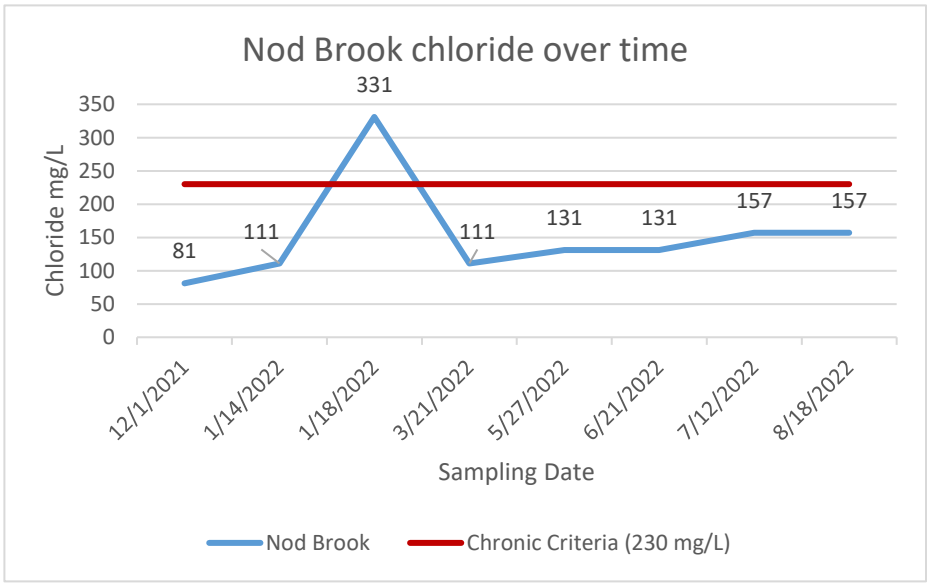


Figure 9: Nod Brook chloride over time

Rainbow Brook – High Street, Windsor

Rainbow Brook's headwaters start at Bradley International Airport (BDL) in Windsor and travel south to the Farmington River just below the Rainbow Reservoir dam. Rainbow Brook was monitored upstream of the culvert on Rainbow Rd. across from the Connecticut Cat Connection, and downstream from the highway. This site was added in June as an additional site to be monitored. Rainbow Brook instantly became a priority site upon first visit with high chloride values (figure 10), and by its cloudy visual appearance (figure 11). Rainbow Brook has remained between 157 and 170 mg/L from June through August 2022 (figure 12). Rainbow Brook's potential for winter chloride levels above 230 mg/L are high due to summer findings and will remain a priority site for chloride monitoring.

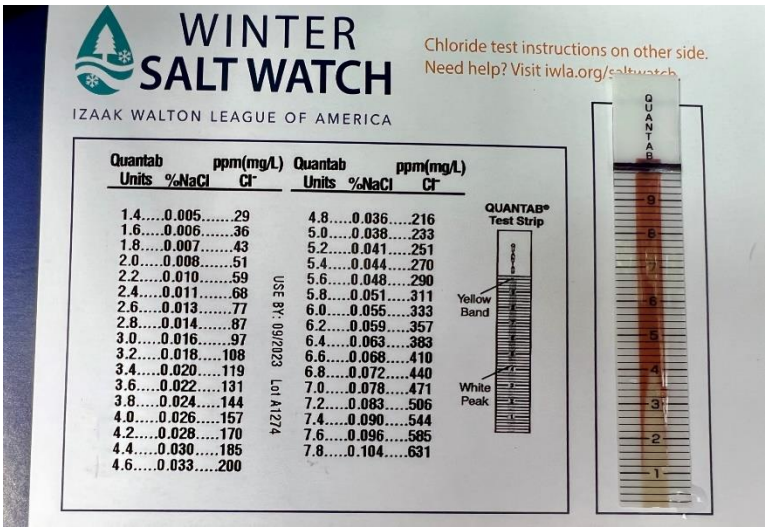


Figure 10: Rainbow Brook chloride results from IWLA Salt Watch kit

Figure 11: Rainbow Brook cloudy visual appearance

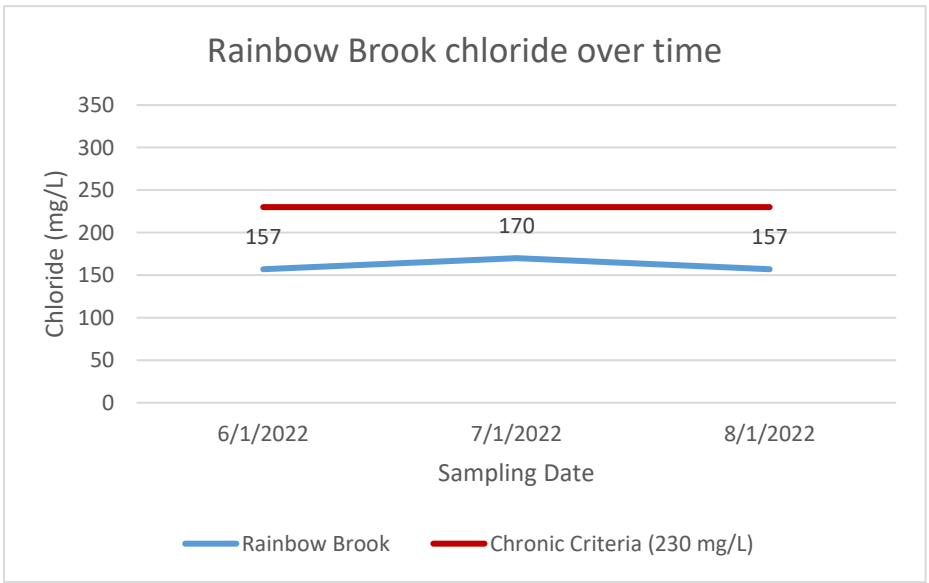


Figure 12: Rainbow Brook chloride over time

Mill Brook – East Street, Windsor

Mill Brook is located downstream of the East St. bridge. This site was added in June as an additional site to be monitored due to it being in an urban area of Windsor. All chloride values have remained over 100 mg/L for spring and summer months (figure 13), with the highest value in June 2022 of 131 mg/L (figure 14). Mill Brook was not monitored in winter months but has potential to have chloride levels above 230 mg/L in winter months when road salts are being applied.

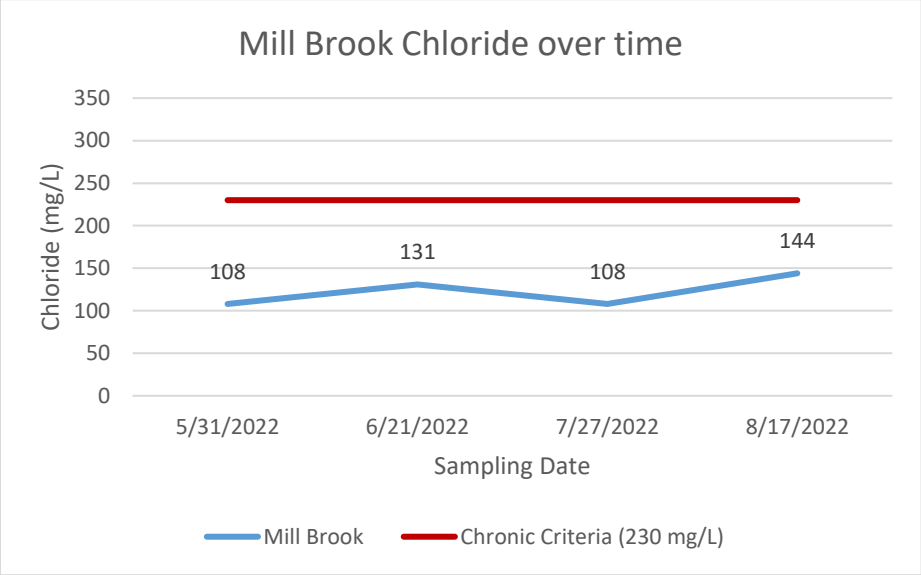


Figure 13: Mill Brook chloride over time

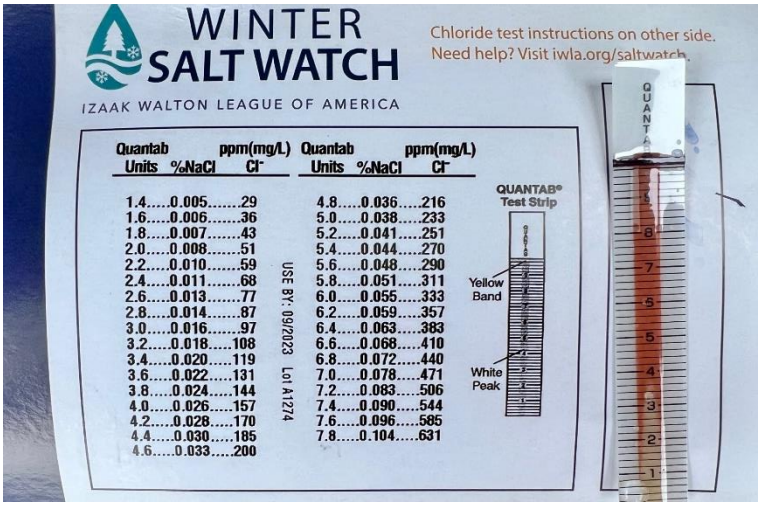


Figure 14: Mill Brook chloride results from IWLA Salt Watch kit

Conclusion

Chloride is increasing gradually over time in the Farmington River Watershed. The Upper Farmington River Watershed was monitored for several parameters, including chloride, from 2004 to 2019. All sites monitored from 2004 to 2019 show steady increases in chloride (figures A-11, A-12). While most sites in the Lower Farmington River Watershed had low concentrations of chloride during May-August, some sites remained higher in chloride. Tributaries in the watershed are more susceptible to higher chloride values than the main stem Farmington River due to lower water volume. Tributaries in urban areas or near plazas and parking lots have potential to have higher chloride values, especially in winter or drought. In winter the contributing factor is application of road salts, which get washed down into surrounding streams or make their way into groundwater. For spring and summer months, values that are higher are the result of drought, and can be from lingering chloride levels from winter or contaminated groundwater. For locations with private wells, salt can percolate into groundwater and contaminate drinking water. Four priority sites were determined from spring and summer chloride monitoring. These sites include the Pequabuck River in Farmington, Nod Brook in Avon, Rainbow Brook in Windsor, and Mill Brook in Windsor.

All chloride sites in the lower Farmington River watershed should continue to be monitored as long-term sites year-round to monitor future changes in chloride values. Year-round monitoring of chloride provides information on how tributaries and the Farmington River fare in winter during road salt applications, in spring when rain and snowmelt result in road salt run-off, in summer when aquatic plants and wildlife are most active and when drought can be present. In the future we plan to work with municipalities and other environmental organizations to address these sources through best management practices and public education. The Green SnowPro training by the T2 Center of UConn was provided to municipalities and funded by the Lower Farmington River and Salmon Brook Wild & Scenic Committee in winter 2022. Green Snow Pro training should be continued for municipalities and private companies in the future. All chloride data is shared with the CT DEEP and IWLA.

Appendix

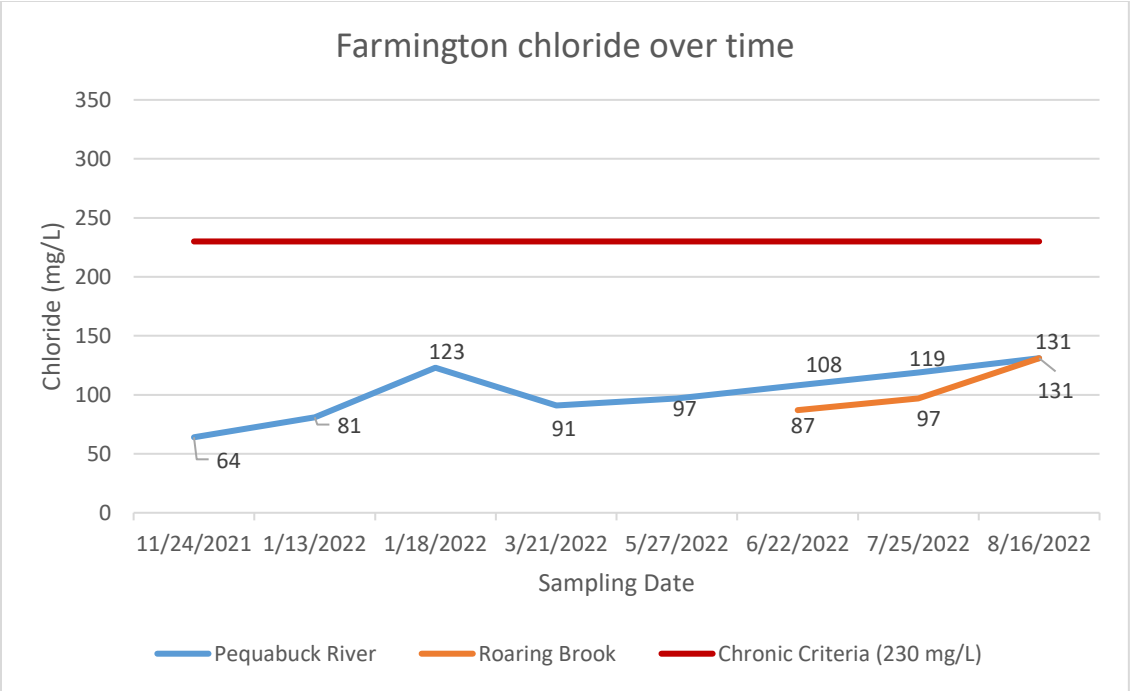


Figure A- 1: Town of Farmington: Pequabuck River and Roaring Brook chloride over time

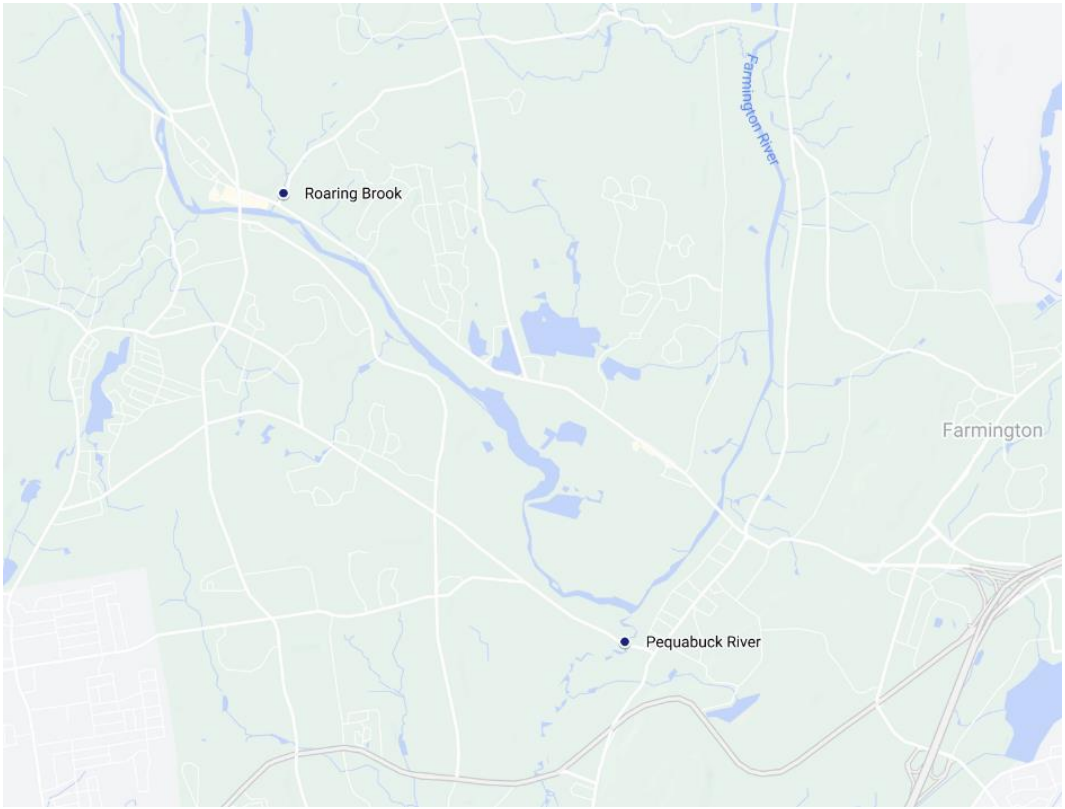


Figure A- 2: Town of Farmington sites: Pequabuck River and Roaring Brook

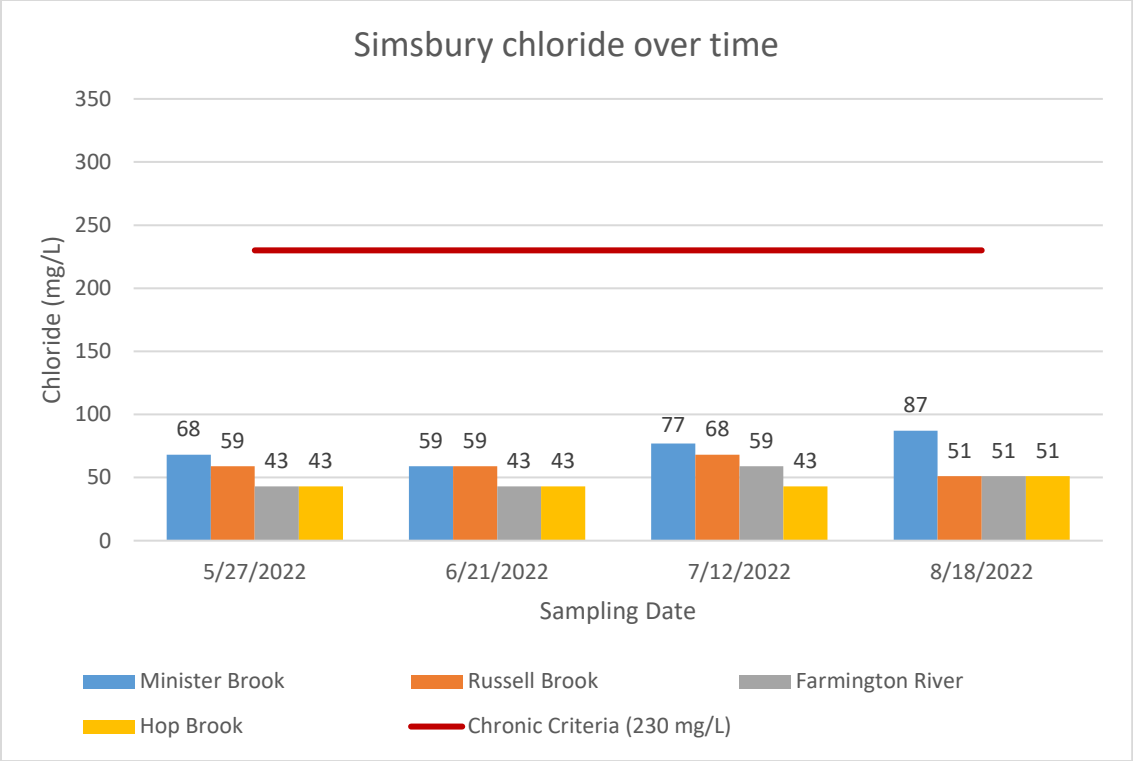


Figure A- 3: Town of Simsbury: Minister Brook, Russell Brook, Farmington River, and Hop Brook chloride over time

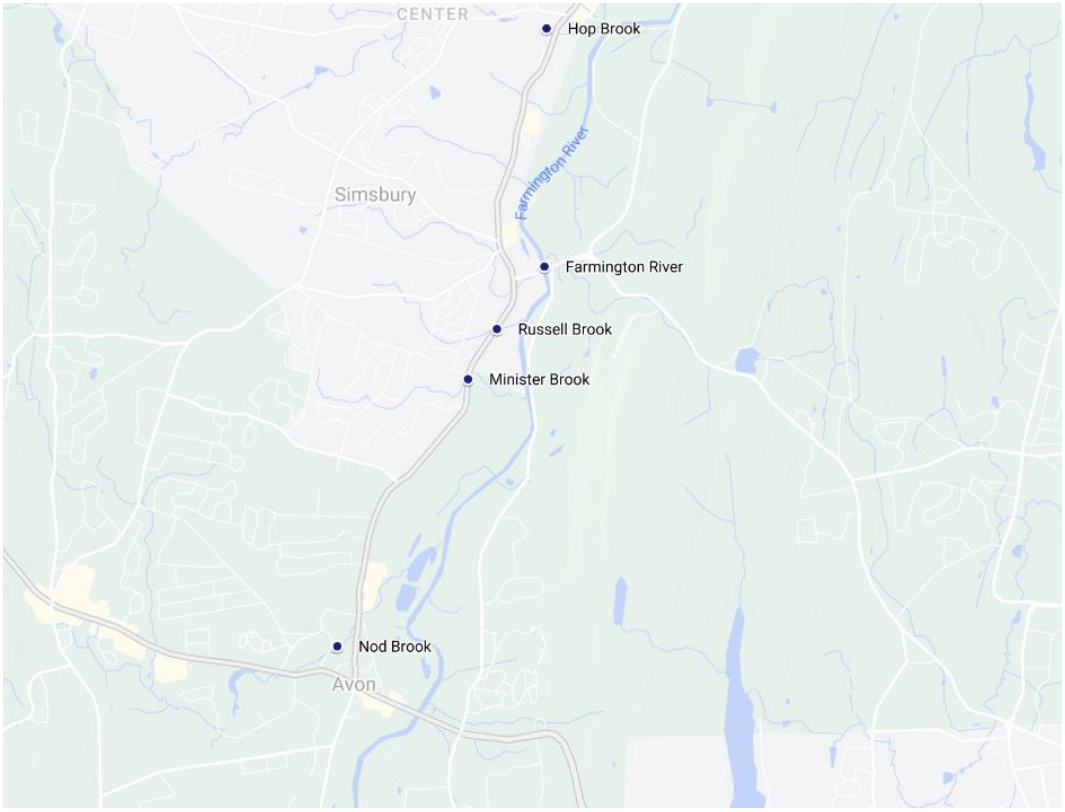


Figure A- 4: Town of Avon and Simsbury sites: Nod Brook, Minister Brook, Russell Brook, Farmington River, and Hop Brook

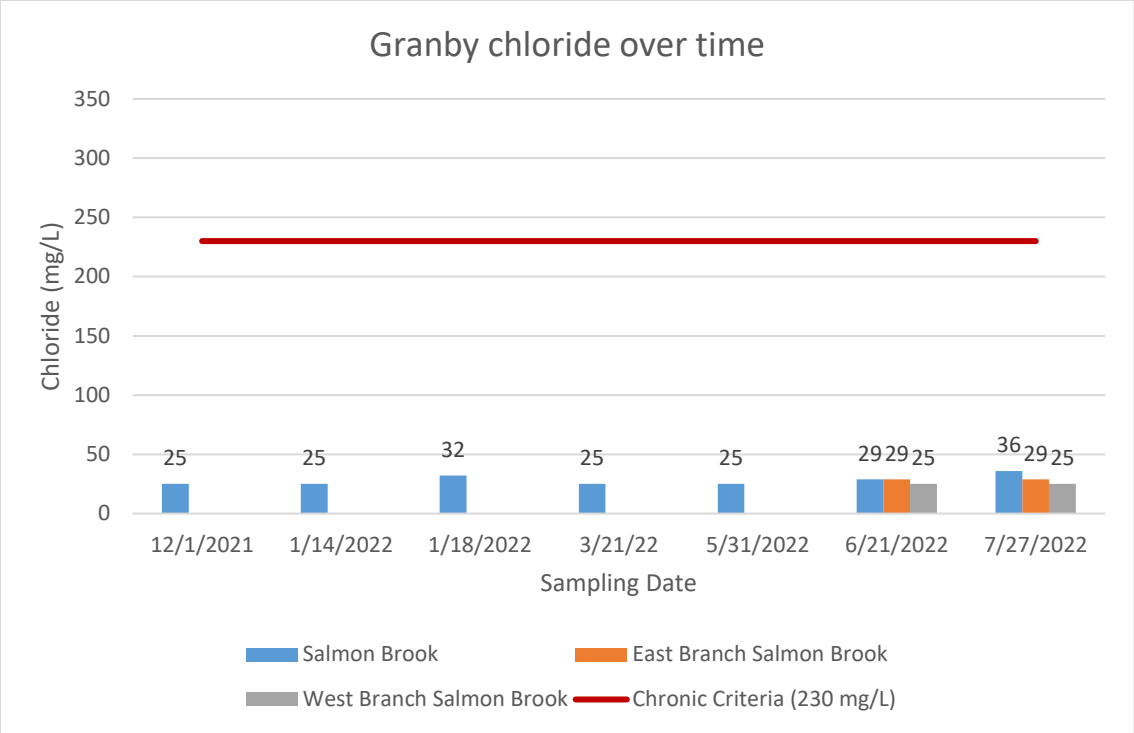


Figure A- 5: Town of Granby: Salmon Brook, West Branch Salmon Brook, and East Branch Salmon Brook chloride over time

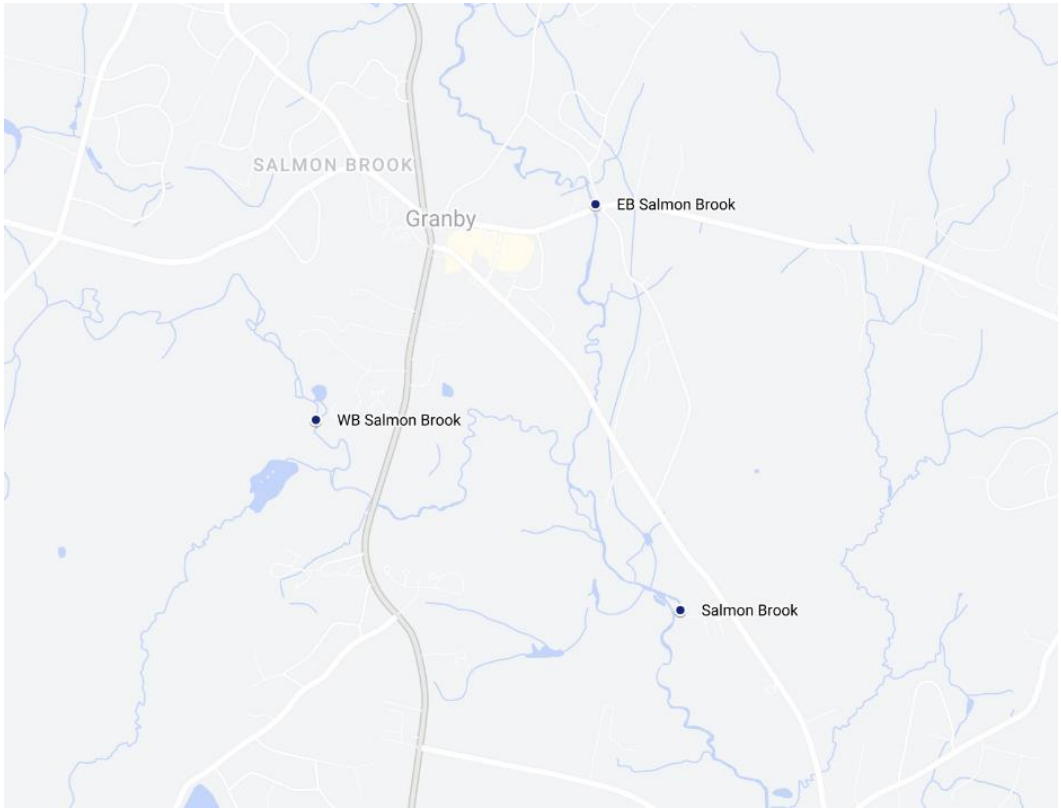


Figure A- 6: Town of Granby sites: Salmon Brook, West Branch Salmon Brook (WB Salmon Brook), and East Branch Salmon Brook (EB Salmon Brook)

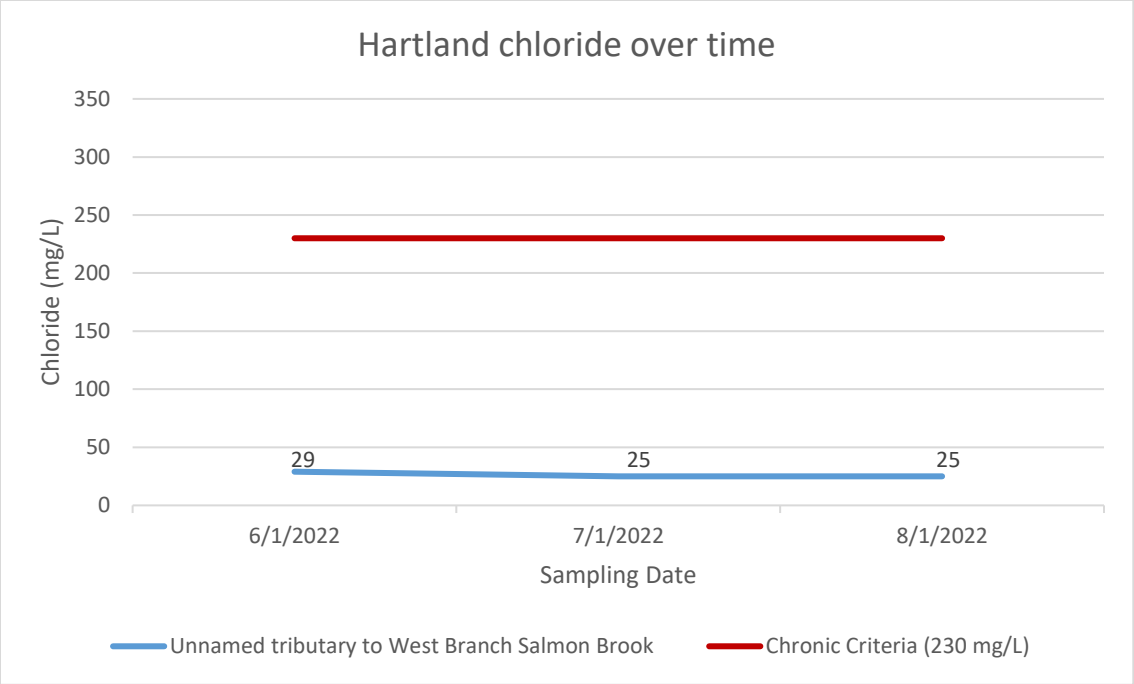


Figure A- 7: Town of Hartland: Unnamed Tributary to West Branch Salmon Brook chloride over time

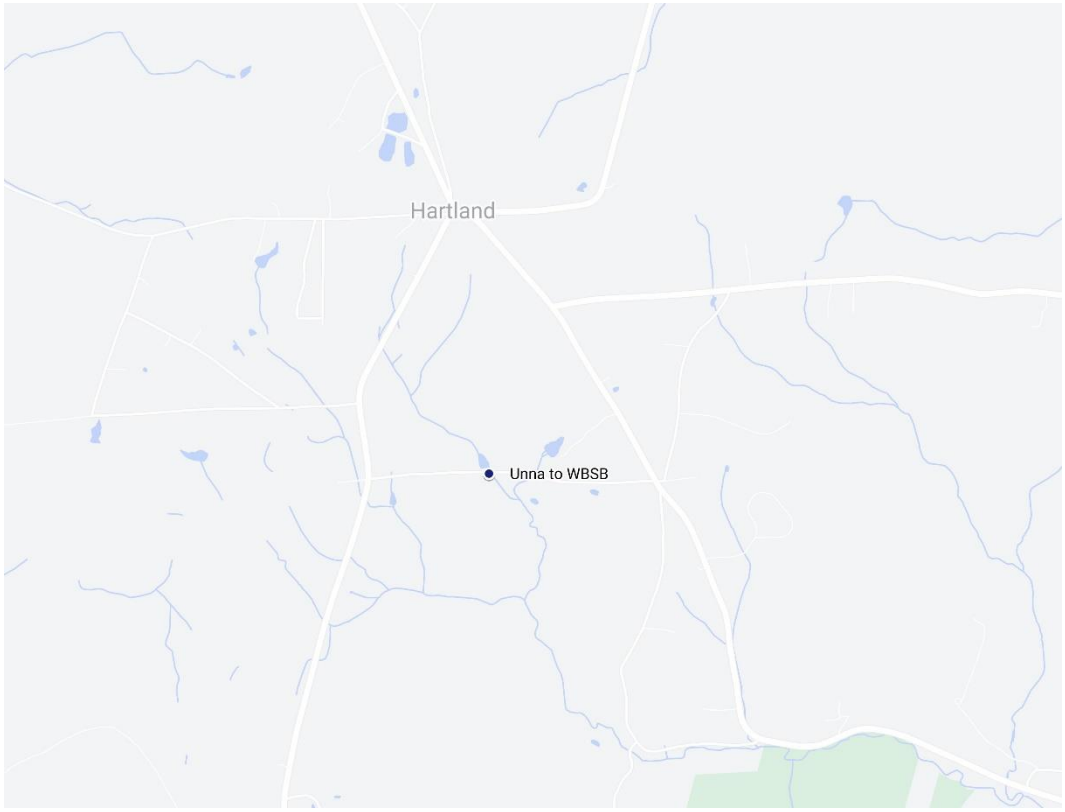


Figure A- 8: Town of Hartland site: Unnamed tributary to West Branch Salmon Brook (Unna to WBSB)

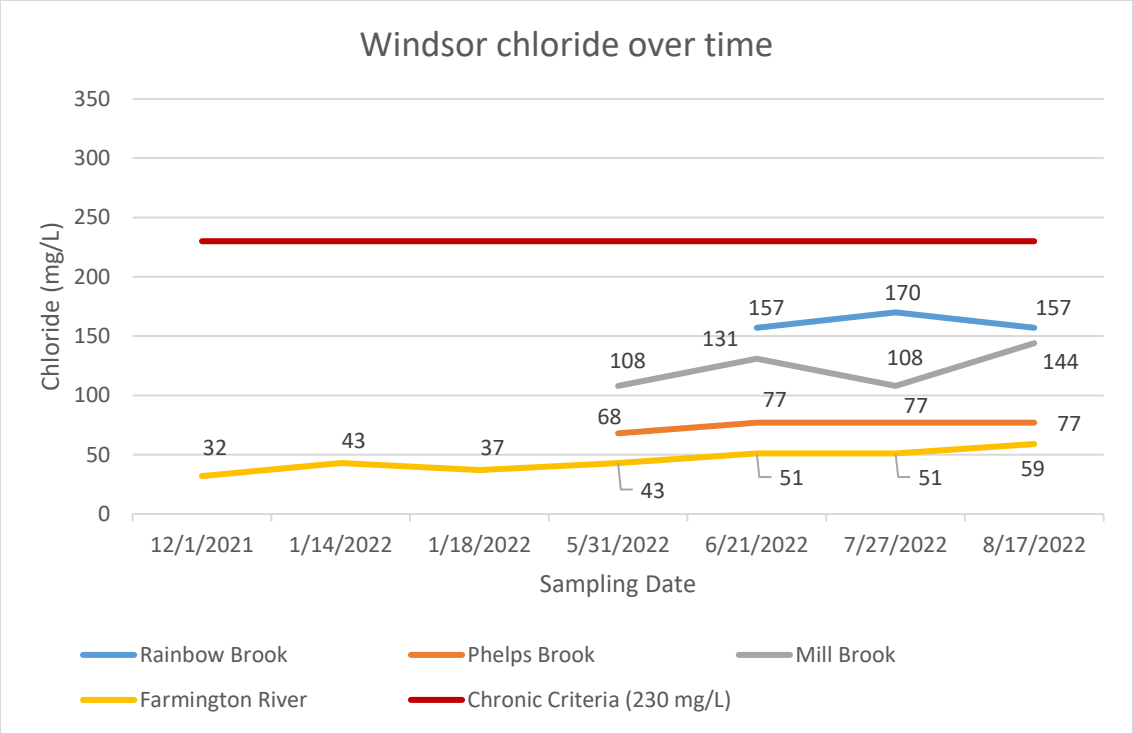


Figure A- 9: Town of Windsor: Rainbow Brook, Phelps Brook, Mill Brook, and Farmington River chloride over time

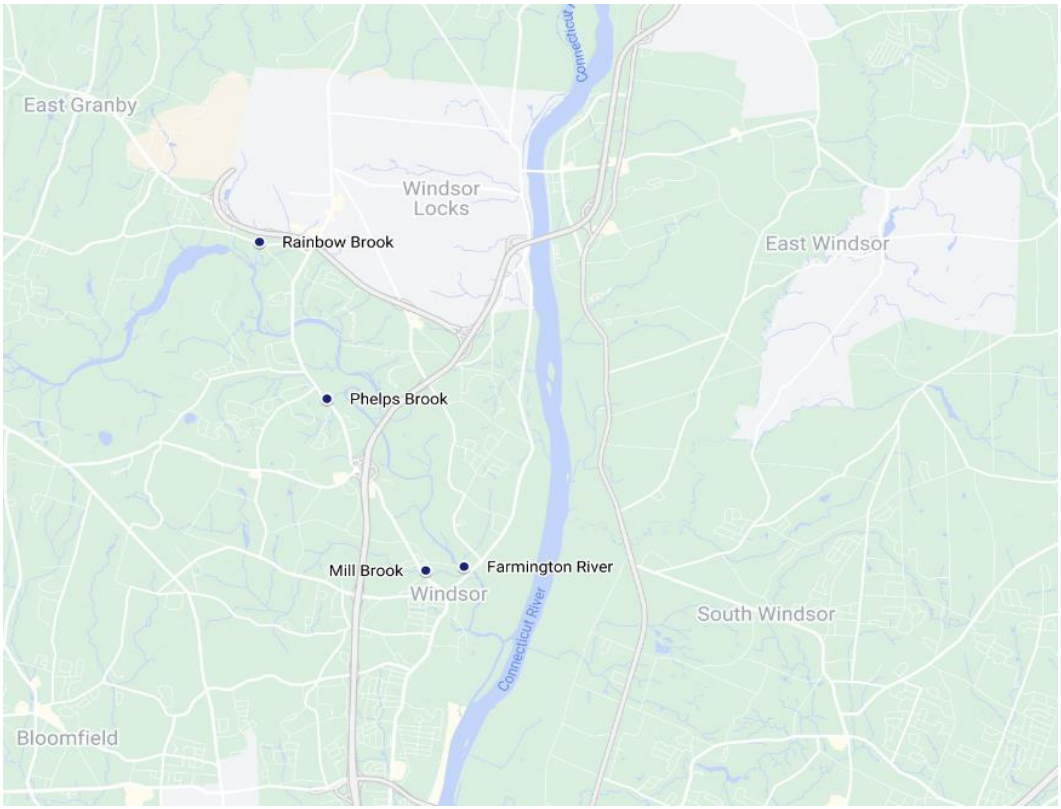


Figure A- 10: Town of Windsor sites: Rainbow Brook, Phelps Brook, Mill Brook, and Farmington River

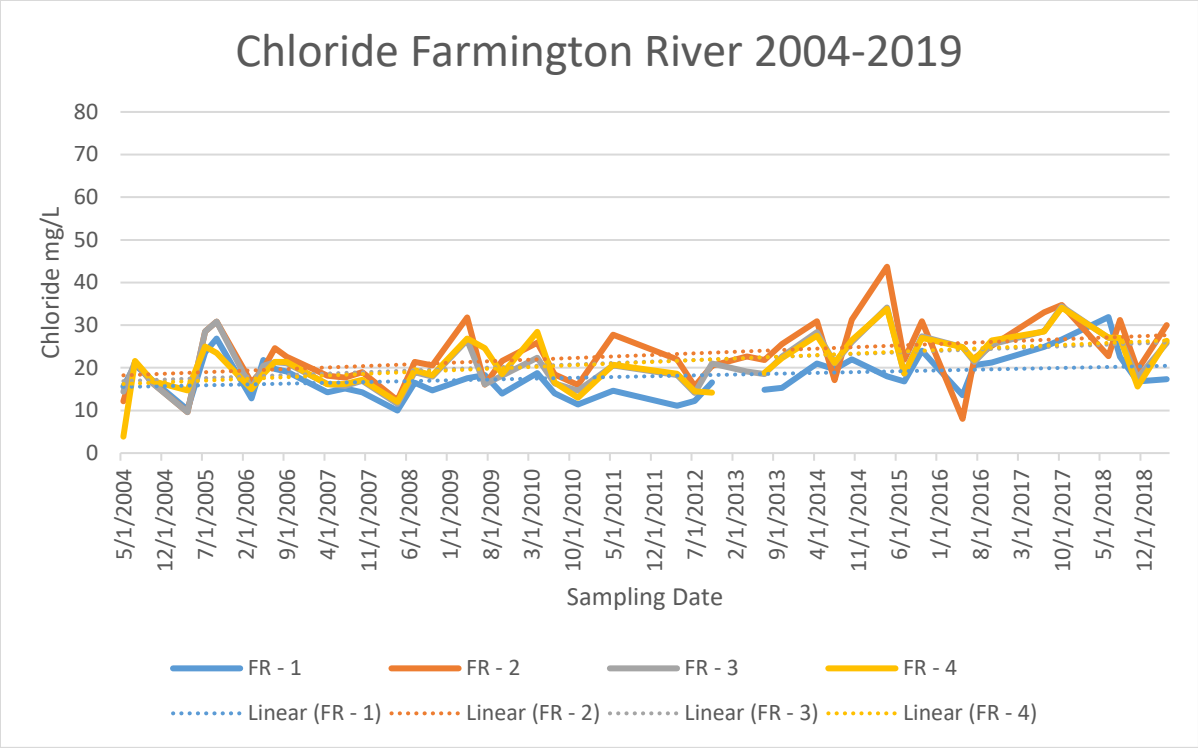


Figure A- 11: The Farmington River in the Upper Farmington River Watershed chloride over time with trend lines

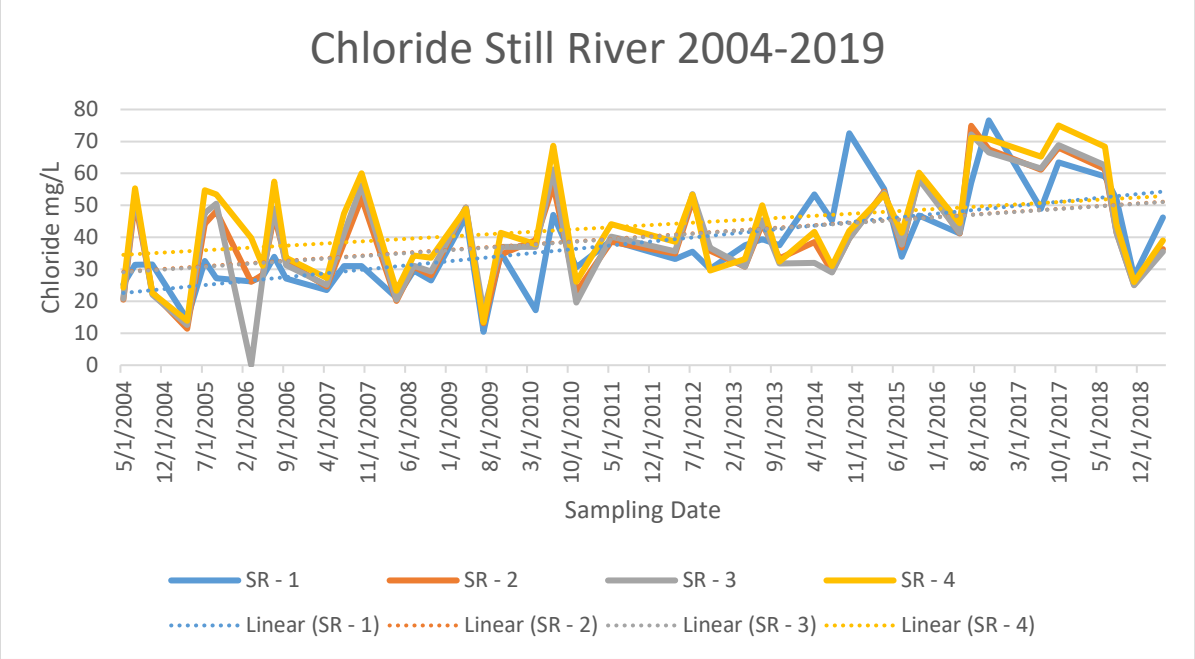


Figure A- 12: The Still River, a tributary to the Farmington River, in the Upper Farmington River Watershed chloride over time with trend lines

References

US EPA. n.d. a. National Recommended Water Quality Criteria Aquatic Life Criteria Table. US EPA. [https://www.epa.gov/wqc/national-recommended-water-quality-criteria-aquatic-life-criteria-table] (Date accessed: 22 August 2022)

US EPA. 1988. b. Chloride Aquatic Life Criteria. US EPA. [https://www.epa.gov/sites/default/files/2018-08/documents/chloride-aquatic-life-criteria-1988.pdf] (Date accessed: 22 August 2022)

US EPA. 1988. c. Supplemental Module Aquatic Life Criteria. US EPA. [https://www.epa.gov/wqs-tech/supplemental-module-aquatic-life-criteria] (Date accessed: 22 August 2022)