

Background

For highway safety, road salting is very common during the winter months, especially in urban parts of New Jersey. However, road salts can be harmful to the ecosystem and are related to chloride concentration rising in watersheds. This study focuses on the Manasquan River in Monmouth county, NJ.

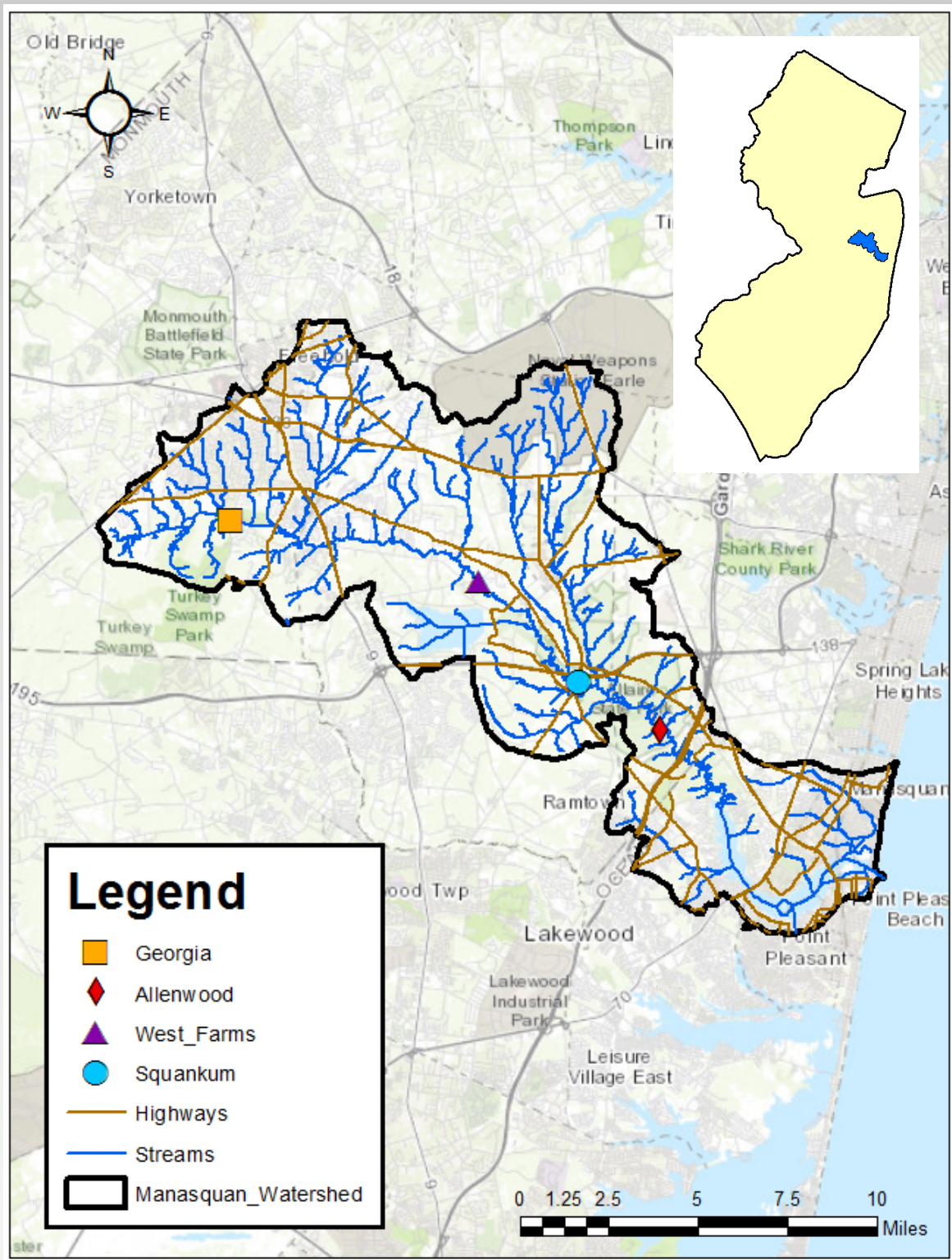


Figure 1. Map of watershed with streams, highways and stream gages. Inset map shows location of watershed in NJ.

METHODS

- State road salt information was retrieved from New Jersey Transportation website (NJDOT) and precipitation data were from Rutgers Climate website
- Specific conductance and chloride data was downloaded from the National Water Quality Monitoring Council and USGS
- Linear trendline was applied to gage data calculate chloride
- Salt applied to watershed was calculated based on winter of 2014-2015 and lane miles proportions in NJ
- Maps were created using ArcMap

DIAGRAMS

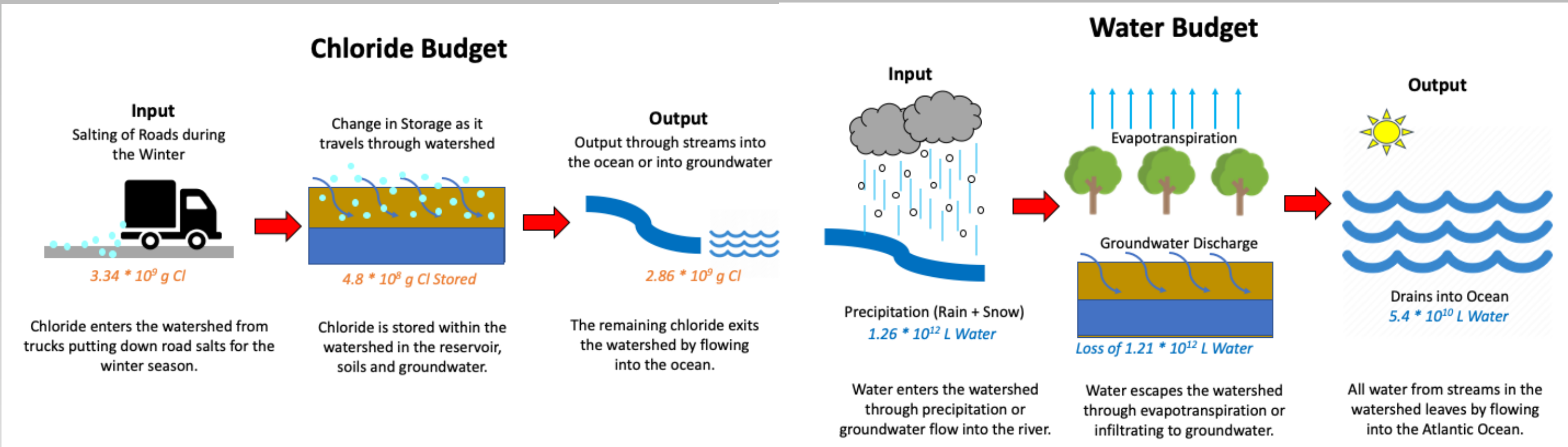


Figure 2. Mass balances of chloride and water in the Manasquan watershed.

RESULTS

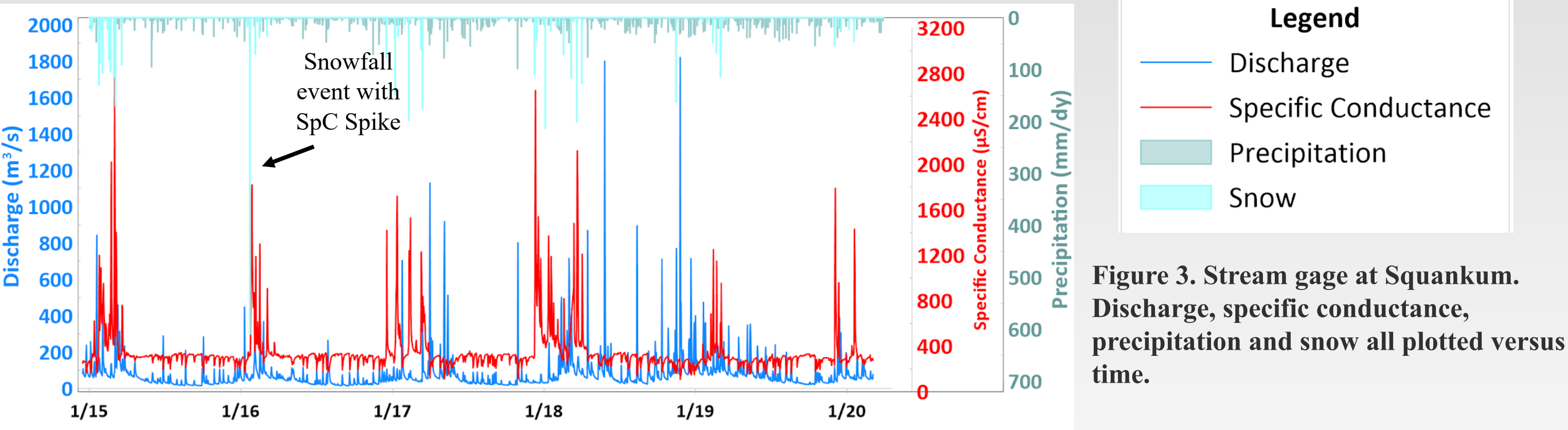


Figure 3. Stream gage at Squankum. Discharge, specific conductance, precipitation and snow all plotted versus time.

- In Manasquan watershed, spikes in specific conductance (SpC) appear to be correlated with precipitation events (Figure 3)
- Specific conductance is mainly controlled by chloride (Figure 4)
- Chloride input calculations (Table 1) was about 3.34×10^9 g
- Used stream gage data from downstream site Allenwood to calculate chloride output to be 2.86×10^9 g
- 4.8×10^8 g Cl is stored within the watershed
- Water input of the system from precipitation is 1.26×10^{12} L and calculated output of water was 5.4×10^{10} L

Figure 4. Scatterplot data from three stream gages of chloride and specific conductance data with trendline.

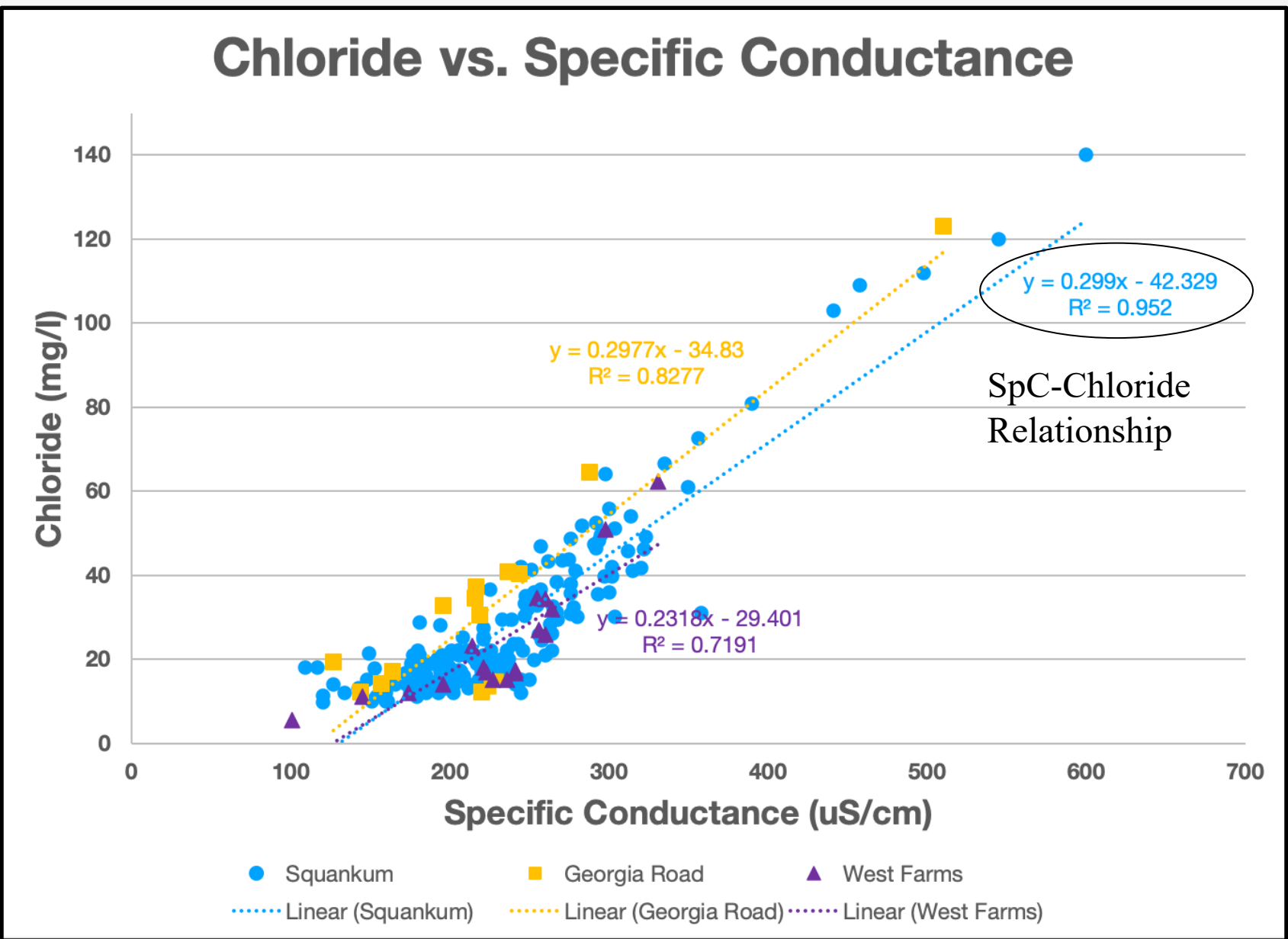


Table 1. Chloride budget calculations

Type of Salt Used	Salt Amount (g)	Percent Solution (%)	Chloride Ratio	Cl Concentration in Salt (g)
Rock Salt (NaCl)	4.30E+11	100	0.60661	2.60E+11
NaCl Brine	9.80E+08	23	0.60661	5.90E+08
CaCl Brine	2.20E+09	29.8	0.319	6.90E+05
Sum of Cl for Entire State (g)	2.60E+11	New Jersey	11,493	
Sum of Cl for Watershed (g)	3.30E+09	Watershed	147	

CONCLUSIONS

Chloride staying within the watershed can be toxic to aquatic life, impacting vegetation and wildlife. Chloride is a chemical that cannot be broken down, metabolized, taken up or removed from the environment naturally. Even low levels of chloride concentration can affect freshwater sources. This becomes an issue for the Manasquan River since the drinking water for the surrounding county is drawn from the Manasquan Reservoir. Therefore, any chloride that is stored within the watershed has a chance of infiltrating the drinking water.

ACKNOWLEDGEMENTS

