# Fluoride Contamination Expectancy in Natural Waters throughout Texas

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GIS in Water Resources – 10/29/2013

**Datasets**

This project aims to better understand geography, population, and fluoride contamination. Each of these topics requires its own dataset so that they that can be integrated together through mapping or conventional data analysis techniques. The necessary data sets to complete this project and their sources were (or will be) obtained from government databases or basemap layer files provided by ESRI.

**EPA STORET/Fluoride Data**

Data concerning fluoride concentrations in ground and surface waters across the state of Texas was obtained using the Environmental Protection Agency's (EPA) STORET Data Warehouse. STORET is an online repository containing water quality monitoring data. Federal, state, and local water resource management groups submit their data to the STORET database through a water exchange service which automatically formats the data and makes it publically accessible for downloads and analyses. The data available contains specific results for the water quality parameter of interest along with a substantial amount of metadata such as site location, sample time, analytical method used, medium, and organization. Latitude and longitude based on the NAD1983 datum for each sampling site is also contained in the metadata which is important for the implementation of this project.

A request was submitted using the STORET website to collect fluoride data for this project. Specific parameters of the request are contained in Table 1. Two datasets were obtained from the request. The first dataset contained information on the sampling sites, indicating where fluoride data was available (1,451 stations). The second dataset contained measurement results for fluoride concentrations in the ground or surface water being monitored from the period of January 1, 2000 to October 1, 2013 (9,751 samples). These datasets were downloaded and then integrated together using computer programming to organize the sites by identification numbers and subsequently pair each site with measurement results for fluoride. This allowed the fluoride measurement results to be associated with a specific geographic coordinate. ArcMap was then used to project and manipulate the data.

**Population Dataset**

Data has not yet been obtained concerning the population distribution of the state of Texas. However, it is expected that this can either be obtained through a state or federal website such as the United States Census Bureau using their TIGER/LINE files. This will be investigated in the near future.
Potential Website Links for Population Data:
http://www.census.gov/geo/maps-data/data/tiger.html
http://txsdc.utsa.edu/Data/Tiger/2010/Index.aspx

**Geographic Dataset**

ArcMap has the capability of downloading basemaps from their online website. Basemaps of Texas aquifers and geology are available and have been obtained through this service. The difficulty with this data is figuring out how to download it so that they appear as physical files on your computer. Each of these basemaps depicting Texas aquifers or geology has an attribute table with information I would like to have access to and manipulate. However, I am unsure how to export this data into an Excel or csv. File. This is because the basemaps are coming from online and are hot physically on my computer. Insight concerning how to extract these basemaps from online with their data would be appreciated.

**Mapping**

Fluoride concentrations in ground and surface waters across the state of Texas were mapped using ArcMap (Figure 1). Data obtained from the STORET water quality database was projected using the display x,y coordinates function. The Thiessen Polygons tool in the Spatial Analyst toolset was used to generate a spatial representation of fluoride concentrations for areas of Texas where there was not a specific monitoring station. Each Thiessen polygon encompasses an area of influence about a sample point so that all locations in the polygon are closer to that sample point than any others. From current results, it appears that the West and Northwest regions of Texas has the greatest fluoride contamination. Eastern regions of Texas have fluoride in their water, but generally these concentrations are under 2-4mg/L which meet current EPA regulations.

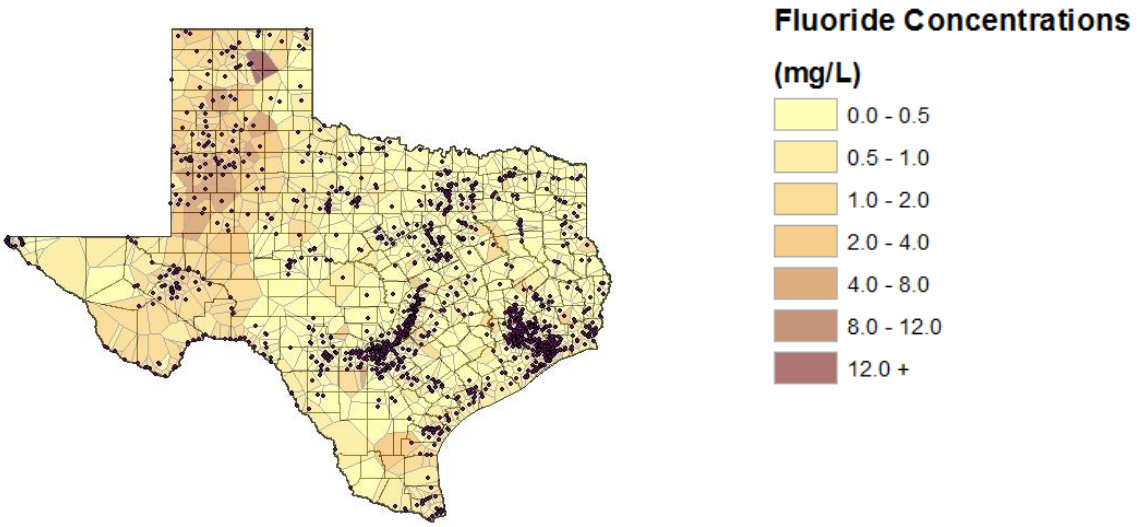


Figure 1 – Fluoride contamination in ground and surface waters across the state of Texas.

**Future Work**

In the near future, data associated with population distributions across Texas will be obtained to investigate the number of people potentially impacted by fluoride contamination. Preliminary investigations as to obtaining this data look promising. Incorporation of aquifer and geologic records may also be used to provide a better prediction of areas with fluoride contaminated water. Otherwise, these records may serve to better understand connections such as why the West and Northwest regions of Texas are more likely to experience contamination compared to the Eastern regions.

Additional work to separate sample and station results could provide independent maps depicting surface and ground water predictions of fluoride contamination, instead of combined results that are undifferentiated. These maps could be used to calculate a fluoride contamination index which identifies communities/counties at risk based on degree of contamination, population, water source (ground or surface water). Another possible aspect of this project could involve gathering fluoride data from previous years when monitoring began and comparing those results/maps to current results/maps. This would provide interesting insight concerning any fluxes or changes in fluoride contamination throughout time in Texas.