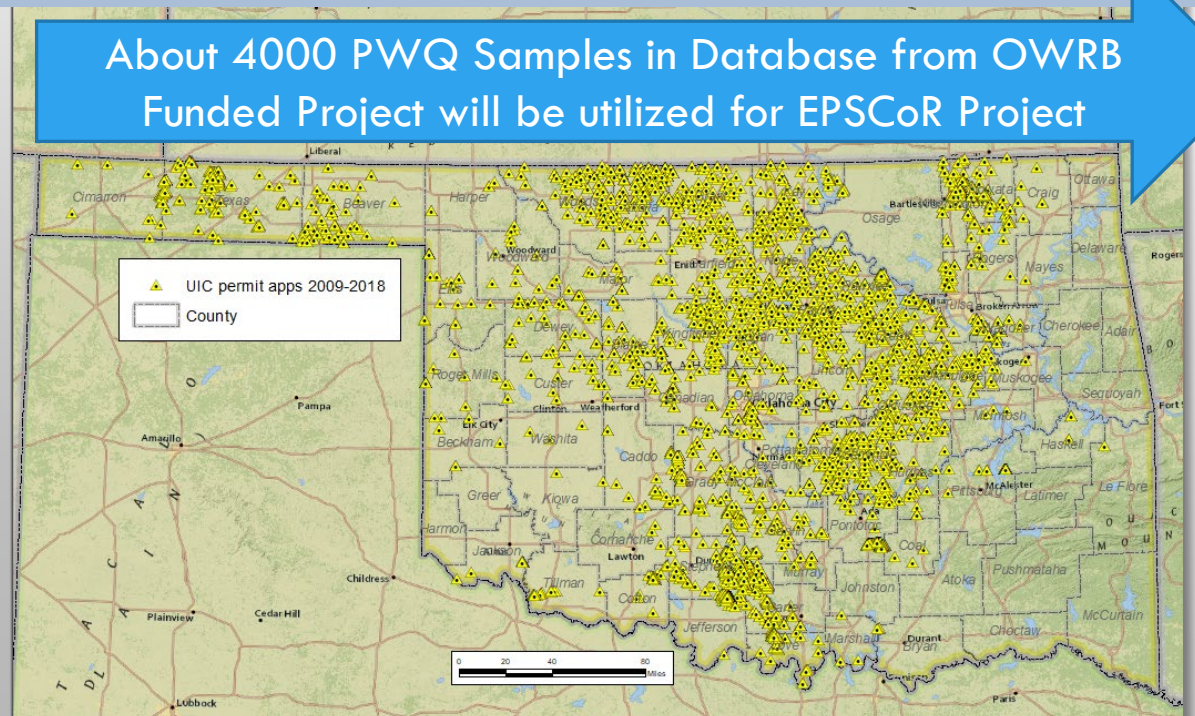
Database Compilation and GeoSpatial Analysis of Produced Water Quality in Oklahoma

Kyle E. Murray, Ph.D.
Oklahoma Geological Survey, University of Oklahoma

Applications Include:

- Understand chemical and corresponding physical characteristics of produced water disposed into UIC wells in Oklahoma;
- Strategize for potential produced water recycling and reuse projects in Oklahoma;
- Evaluate resource (e.g., rare earth metals such as Lithium or Zinc) recovery options that are current, geolocated, and linked to a producing formation.

About 4000 PWQ Samples in Database from OWRB Funded Project will be utilized for EPSCoR Project



EPSCoR Variable & Marginal Water Quality (V-MWQ) Produced H_2O Tasks

- Task V-MQW 1.3a Determine the distribution and microbial ecology of produced waters (Fathepure, Murray, Aichele, Kim)
- Task V-MQW 1.3b Study microbial pretreatment of select produced water using halophilic hydrocarbon degraders (Fathepure)
- Task V-MQW 1.3c Apply bioremediation of produced waters into the field (Fathepure, Krzmarzick, Aichele, Kim)
- Task V-MQW1.3d Active treatment of hydrocarbons and dissolved solids from produced water (Murray, Fathepure, Aichele, Kim)

Water Pretreatment & Desalination Technologies

Key

- Fresh H_2O
- Salt H_2O
- Treated H_2O
- Approach

Well Drilling and Hydraulic Fracturing

Flowback and Produced H_2O

Pre-treatment (aka treat to clean brine)

Treat & Desalinate

- EOR Injection H_2O
- Makeup H_2O for HF
- Non-Food Crop Irrigation
- Food Crop Irrigation
- Other Uses

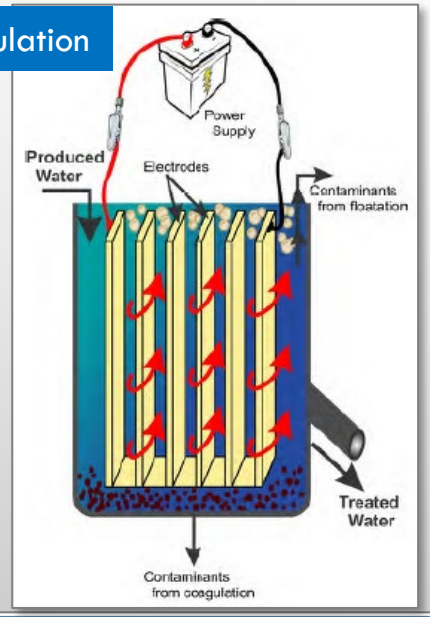
Pretreatments Include:

Bag Filter
Settling Pond
Gravity Separation Tank
Micro/Ultra Filtration
Electrocoagulation
Hydrocyclone
Dissolved Air Flotation
Nanotechnology
Bioreactors
Biocide

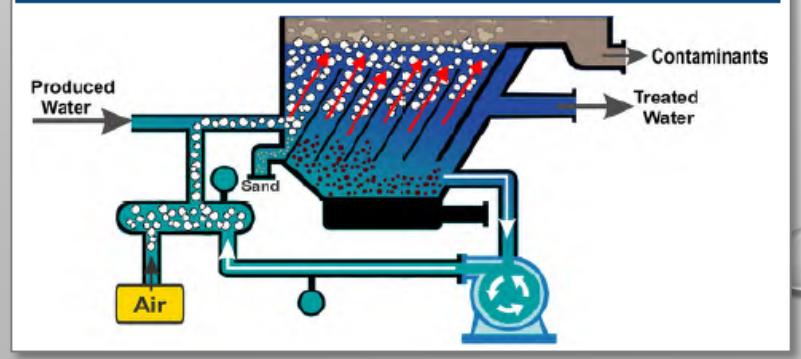
Desalination Systems Include:

Evaporation
Reverse/**Forward Osmosis**
Ion Exchange
Membrane Distillation
Multi-Effect Distillation
Multi-Stage Flash Distillation
Mechanical Vapor Compression

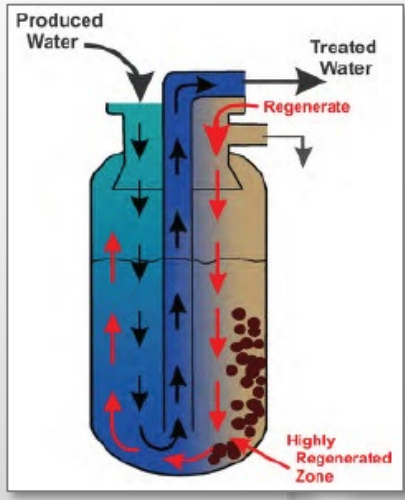
Electrocoagulation



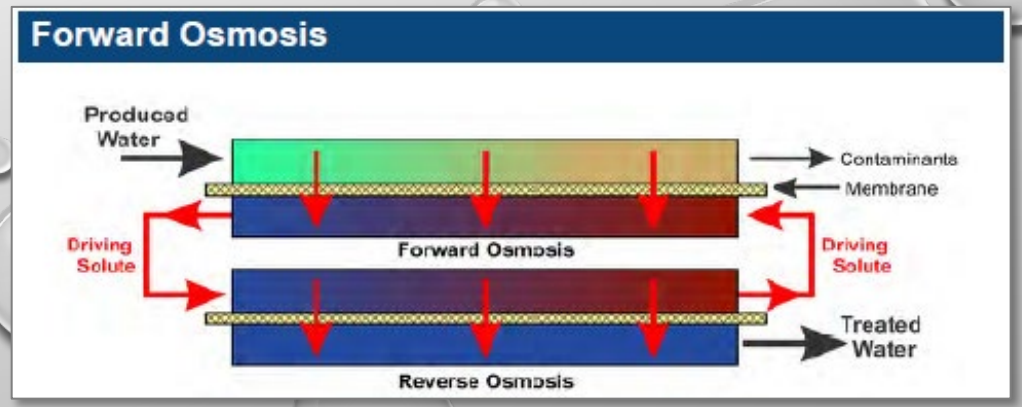
Dissolved Air Flotation



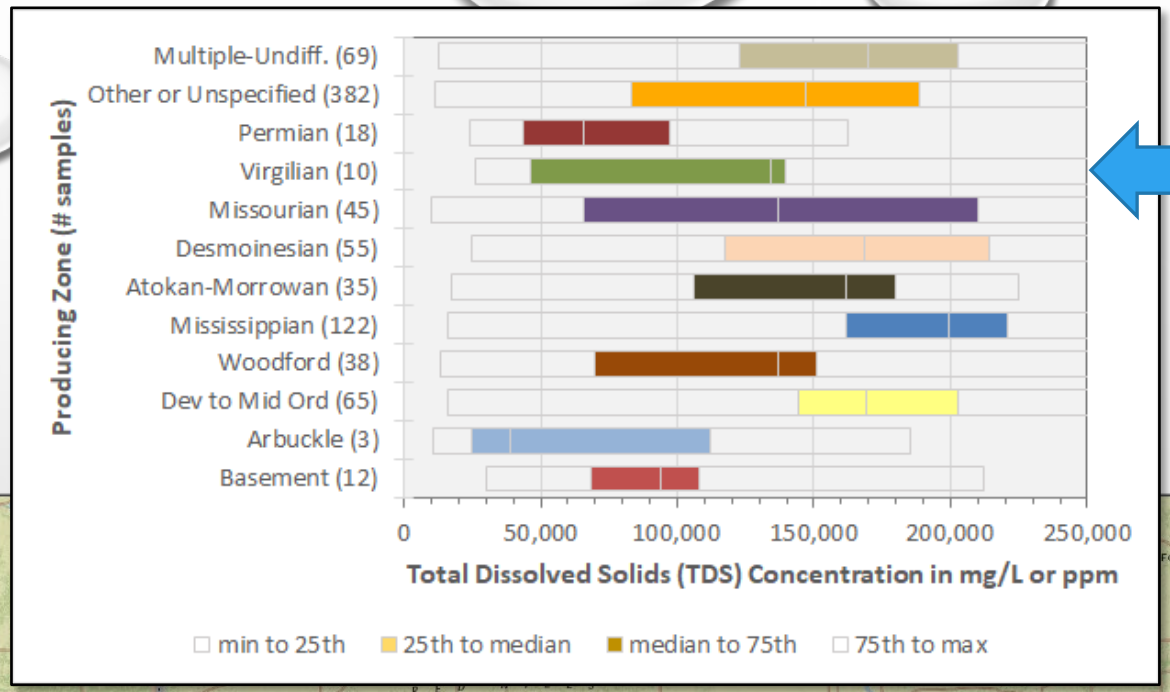
Ion Exchange

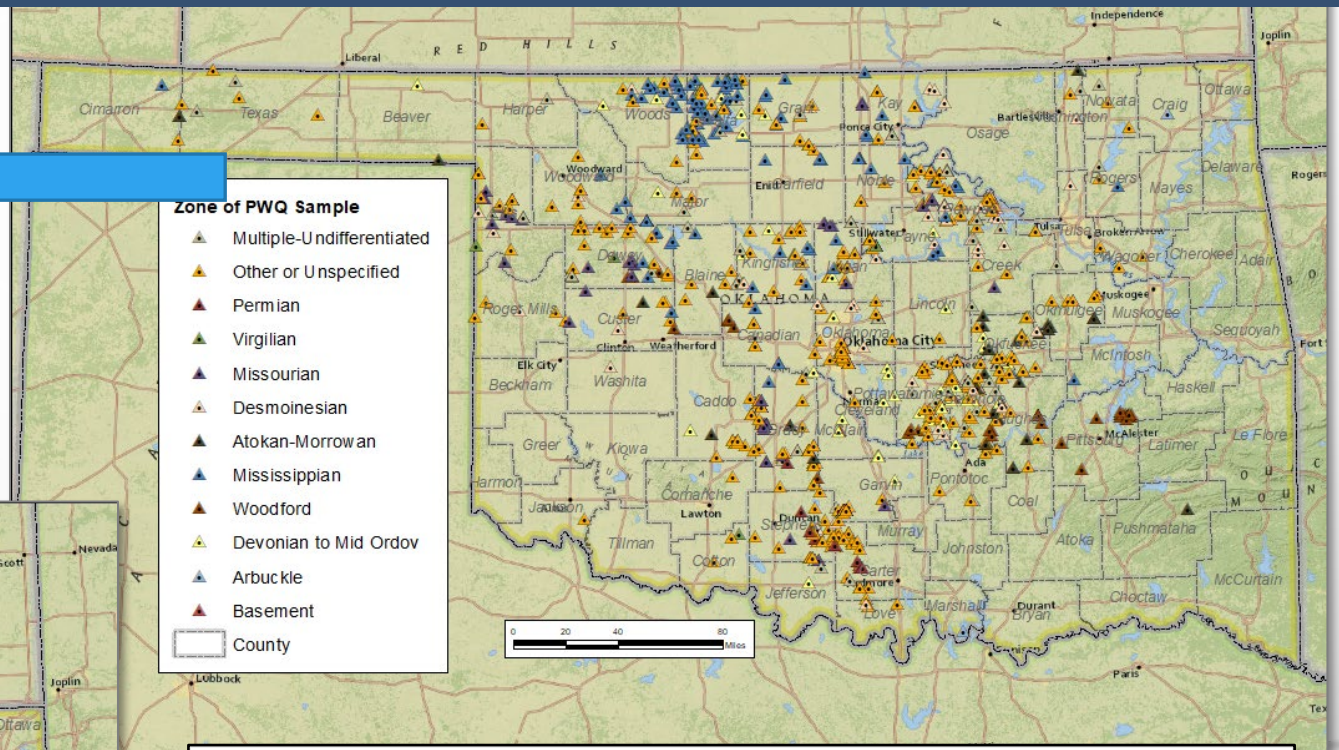


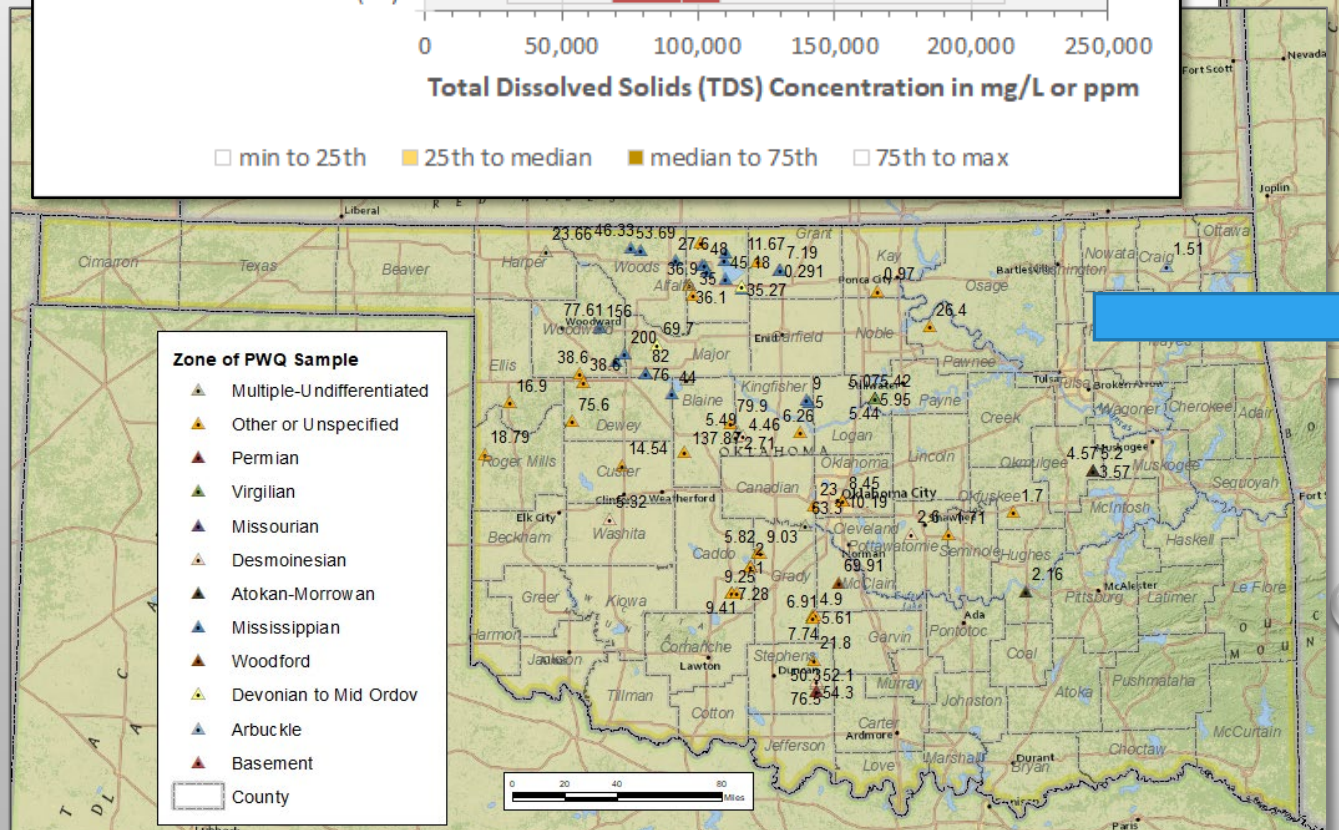
Forward Osmosis

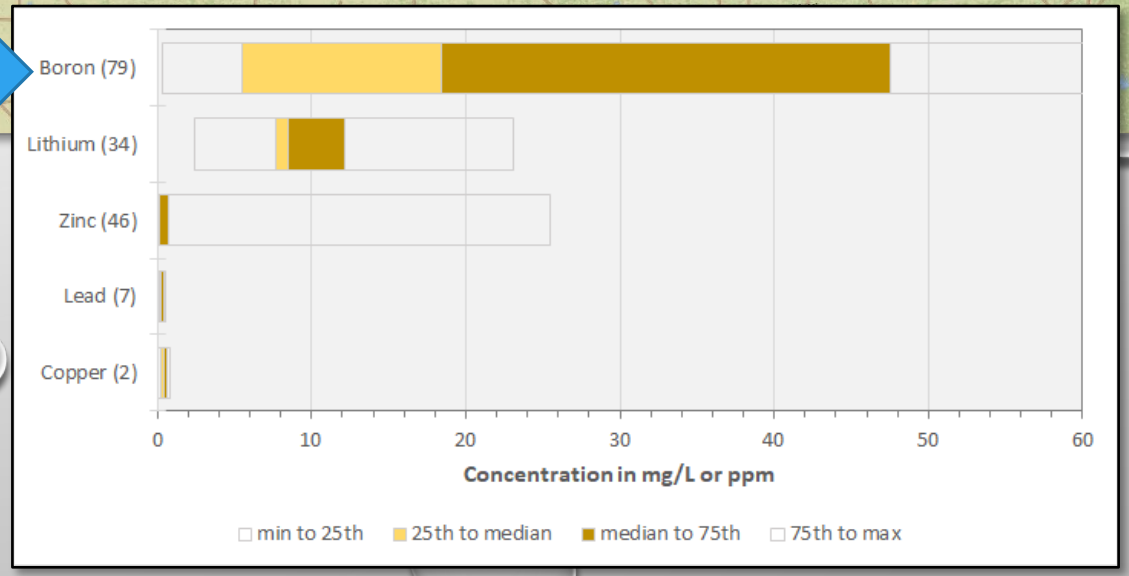


Analytical Results for about 875 PWQ Samples Compiled to Date

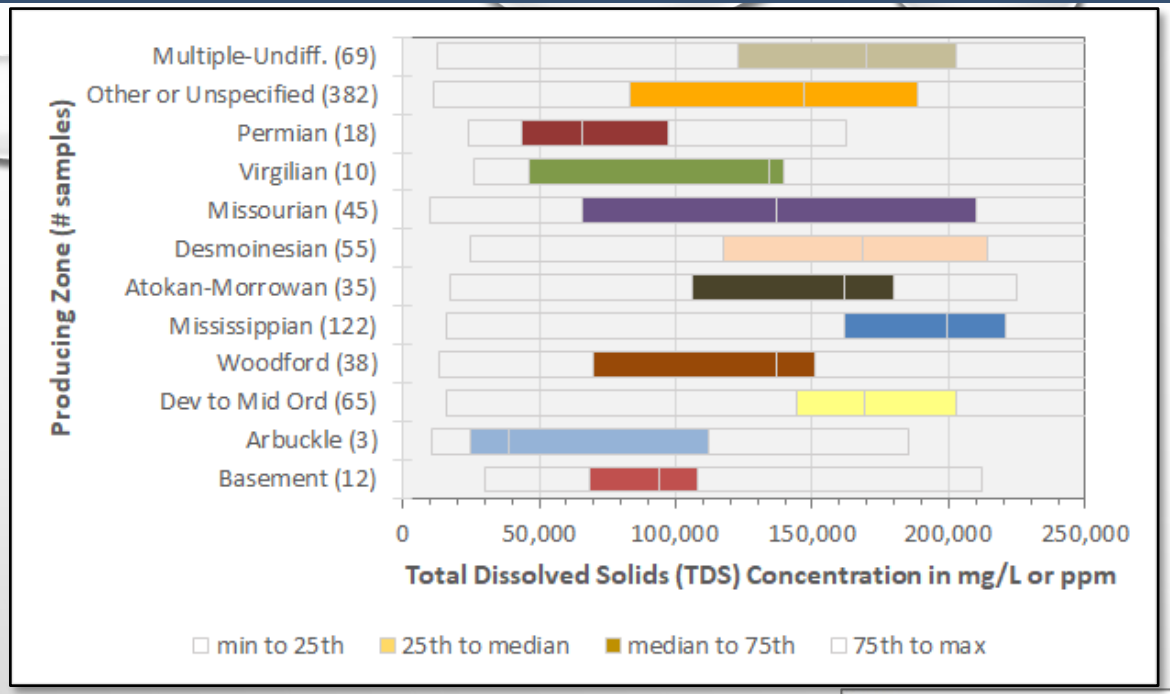


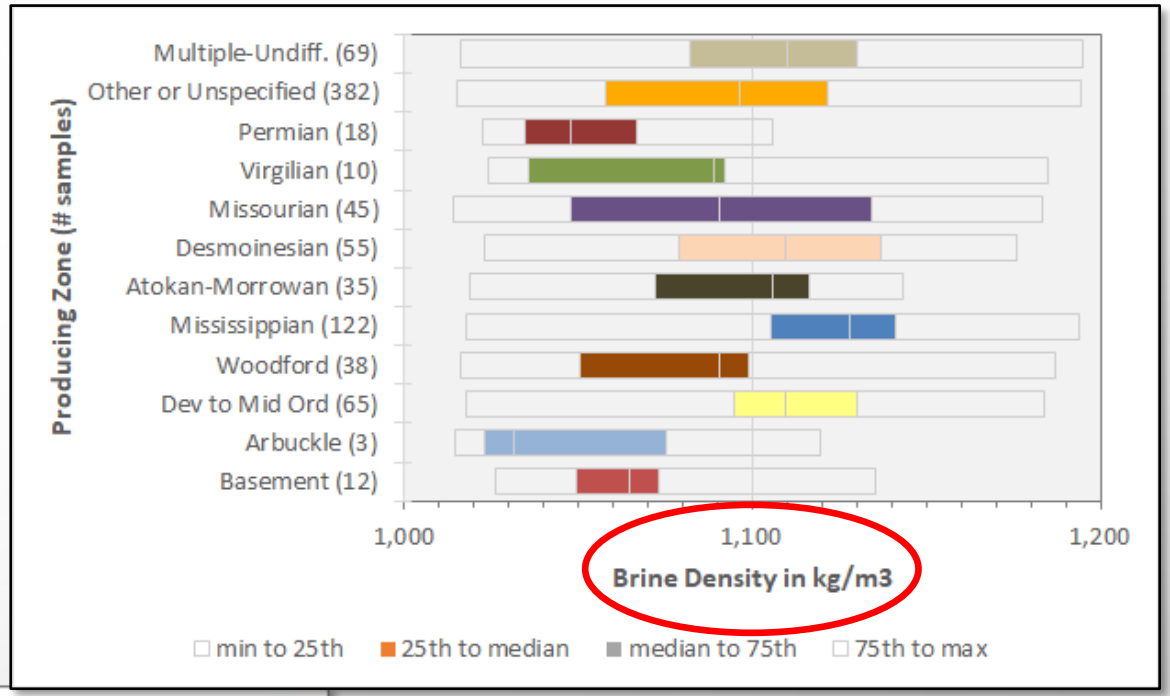


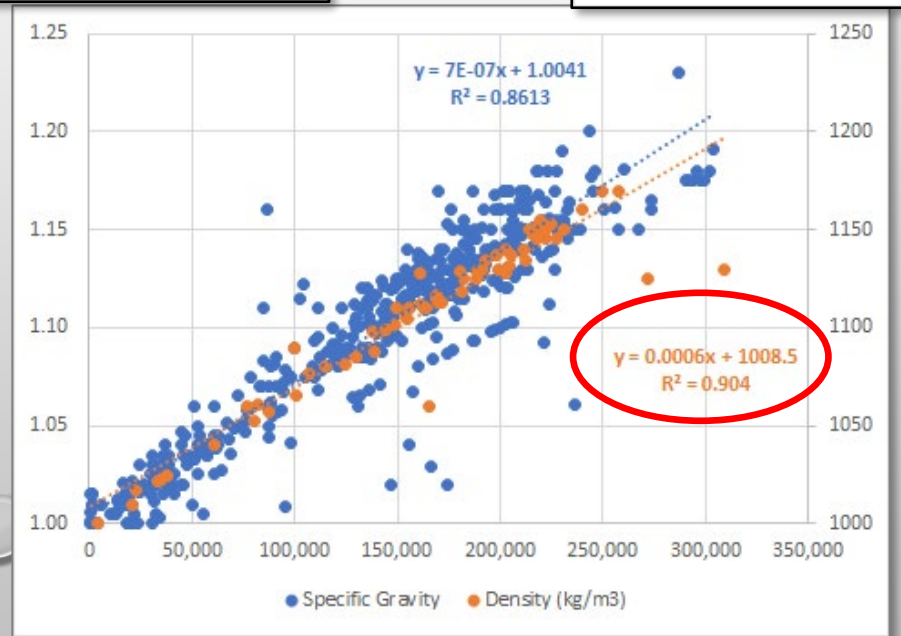
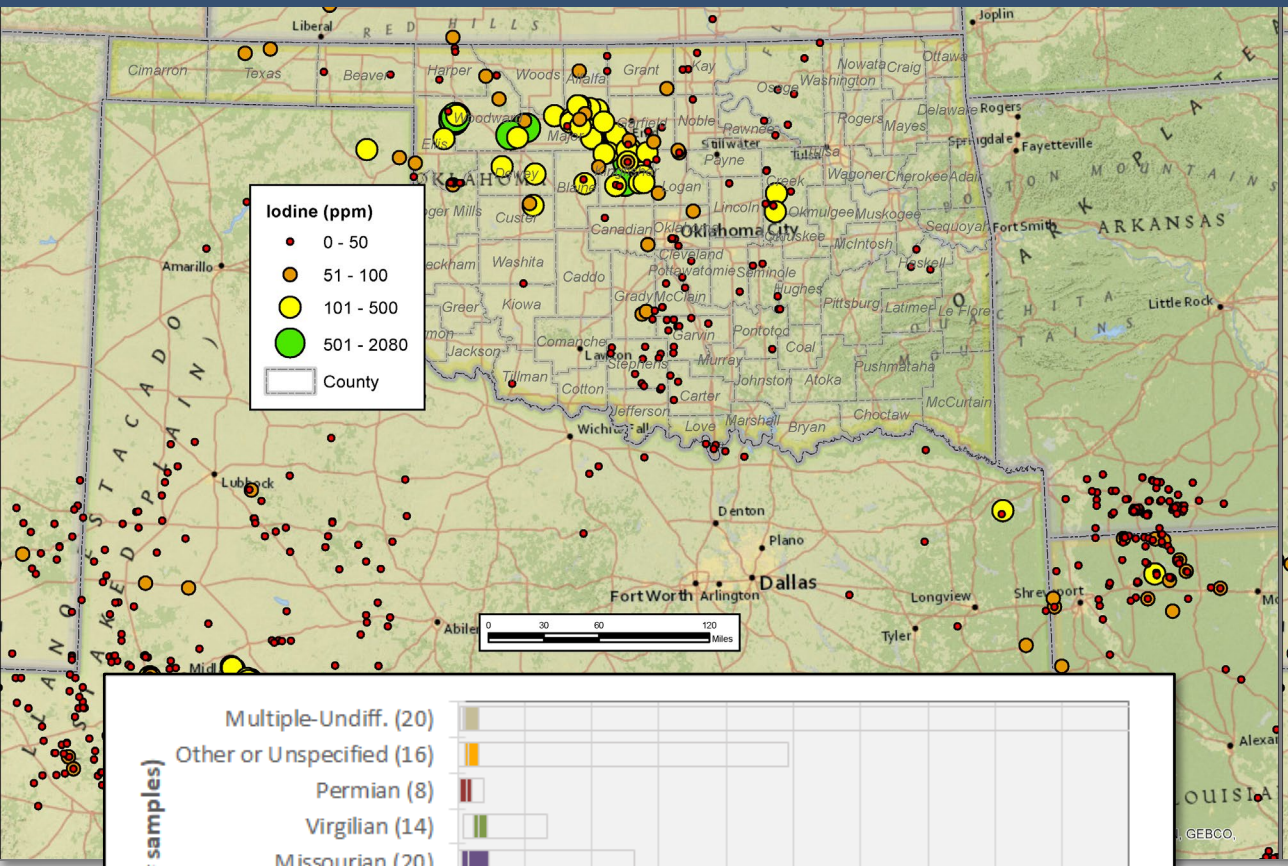
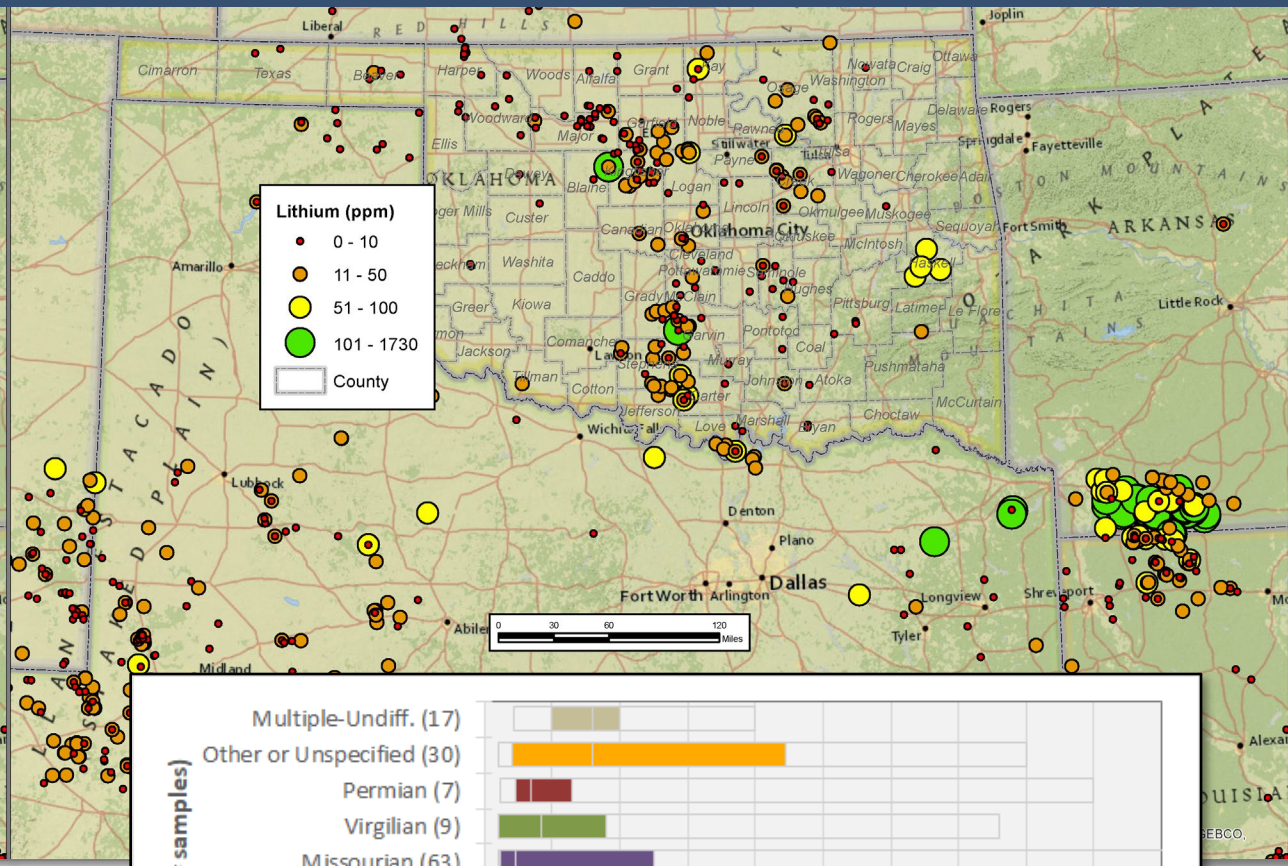
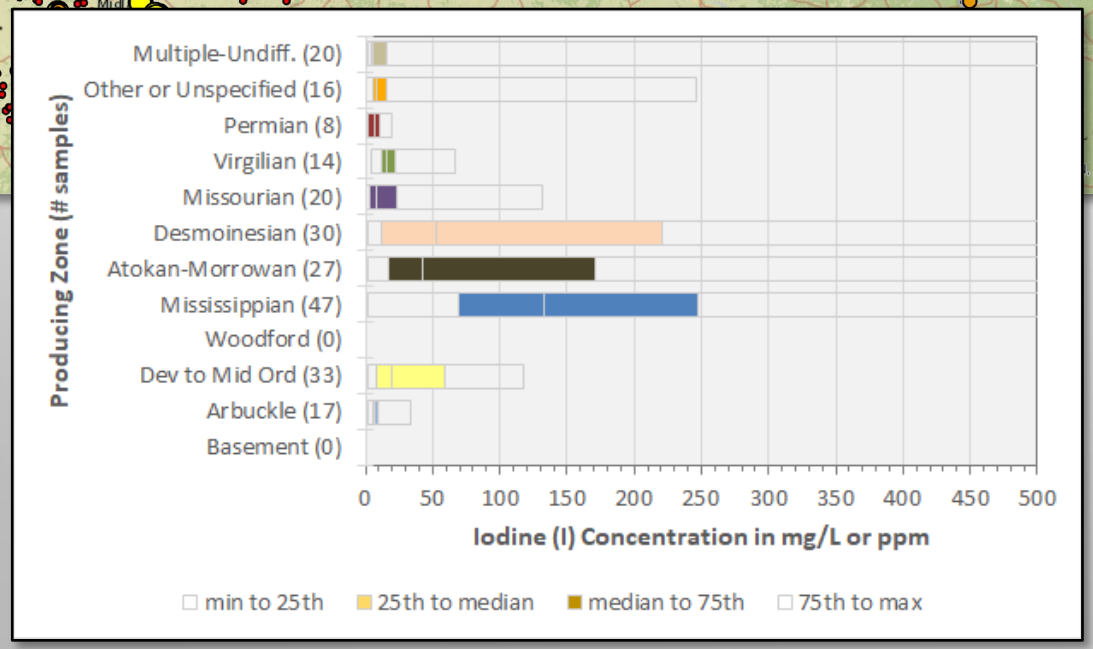
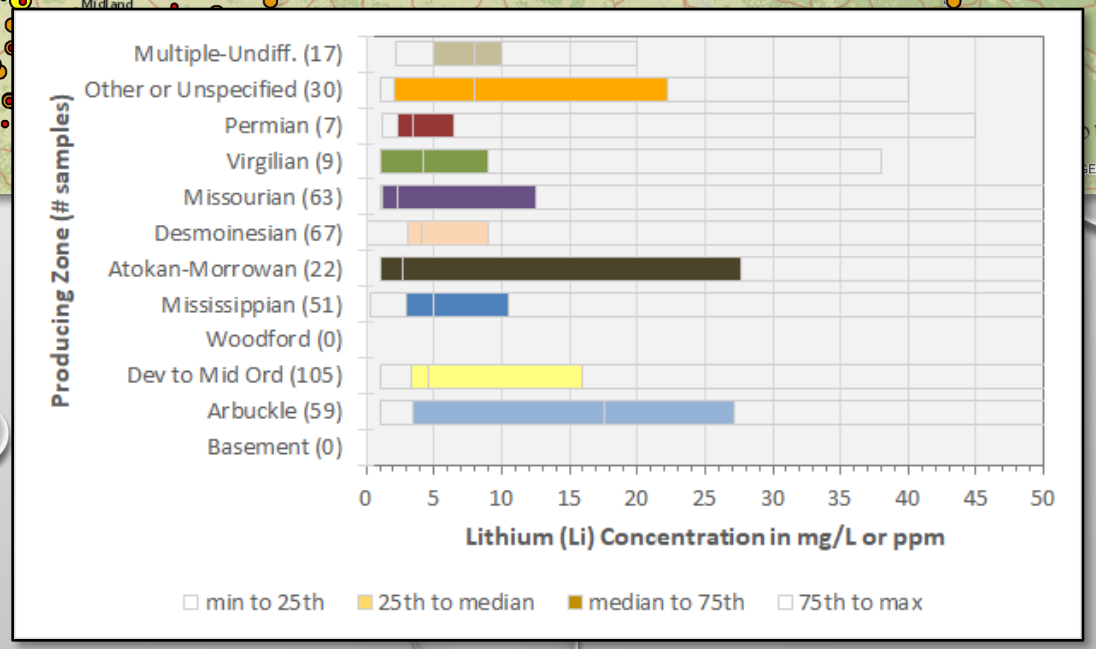




Property Ranges for Injection, Treatment, & Reuse Projects







Resource Recovery? of Rare Earth Elements, conc. from USGS