Water Filters: Recommendations based on Contaminant Levels

Client: California State Water Resources Control Board
Project by: Kat Hanner

California Open Data and Targeted Segment

- Dataset:
  - From the California Department of Water Resources (DWR), lab and field results for drinking water quality are considered.
    - Over 300 contaminants recorded from 1903 – 2020
  - Comparison of maximum contaminant levels (MCLs) for Regulated Contaminants in Drinking Water
    - 56 contaminants monitored by the State of California are contained in the dataset

- Targeted Segment: environmental education organizations
  - Gives a recommendation of water filter
    - may help extract contaminates and increase the water quality

CDC Recommendations and WHO Guidelines

- The Centers for Disease Control and Prevention (CDC) has outlined water filters and treatment devices to help the public understand which type of water filter will help improve the quality of water having specific contaminants or qualities.
    - Activated Carbon Filter
    - Ion Exchange Unit
    - Reverse Osmosis
    - Distillation

- The World Health Organization (WHO) states that Turbidity at 4 NTU and above is visibly contaminated. They recommend that large municipal water suppliers achieve a Turbidity sample result of 0.5 NTU before disinfection and ideally average a result of 0.2 NTU or less.

California Regional Data

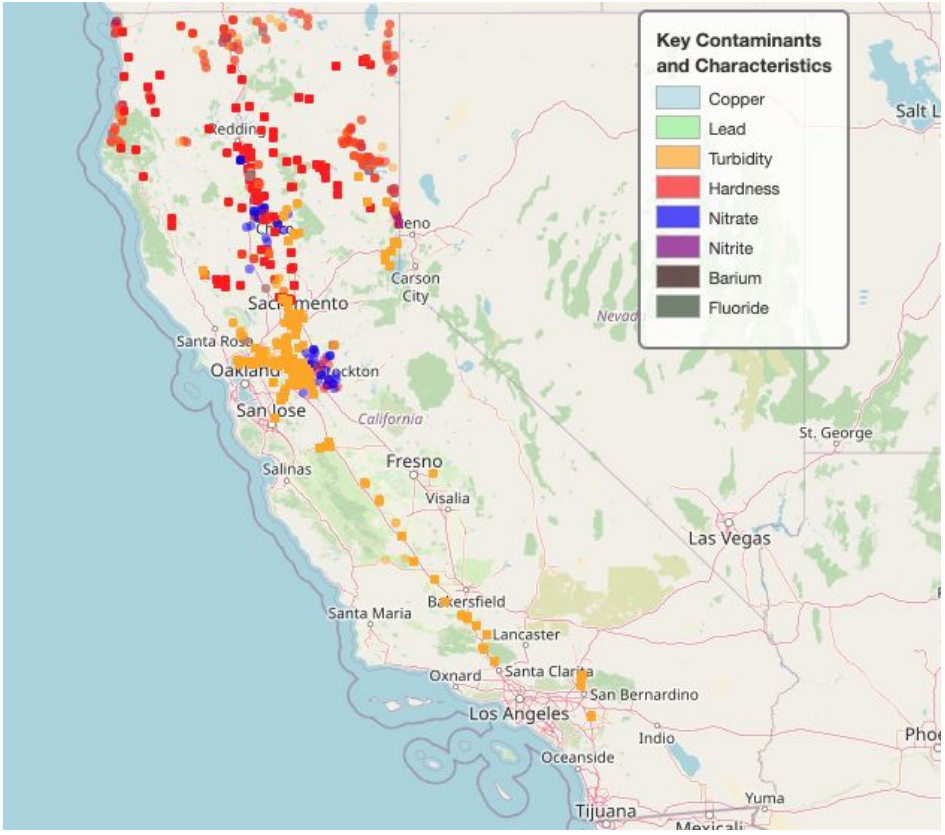
- Considering records from 2010 to 2020 only, Orange County and San Diego did not have any regulated contaminate data. So, this dataset focuses on the following regions:
  - Superior California
  - North Coast
  - San Francisco
  - Northern San Joaquin Valley
  - Central Coast
  - Southern San Joaquin Valley
  - Inland Empire
  - Los Angeles

Exploring the Dataset

After reviewing the CDC's water filter recommendations, eight key contaminants and characteristics for selecting a type of water filter are identified.

<u>The Key Contaminants and Characteristics</u>

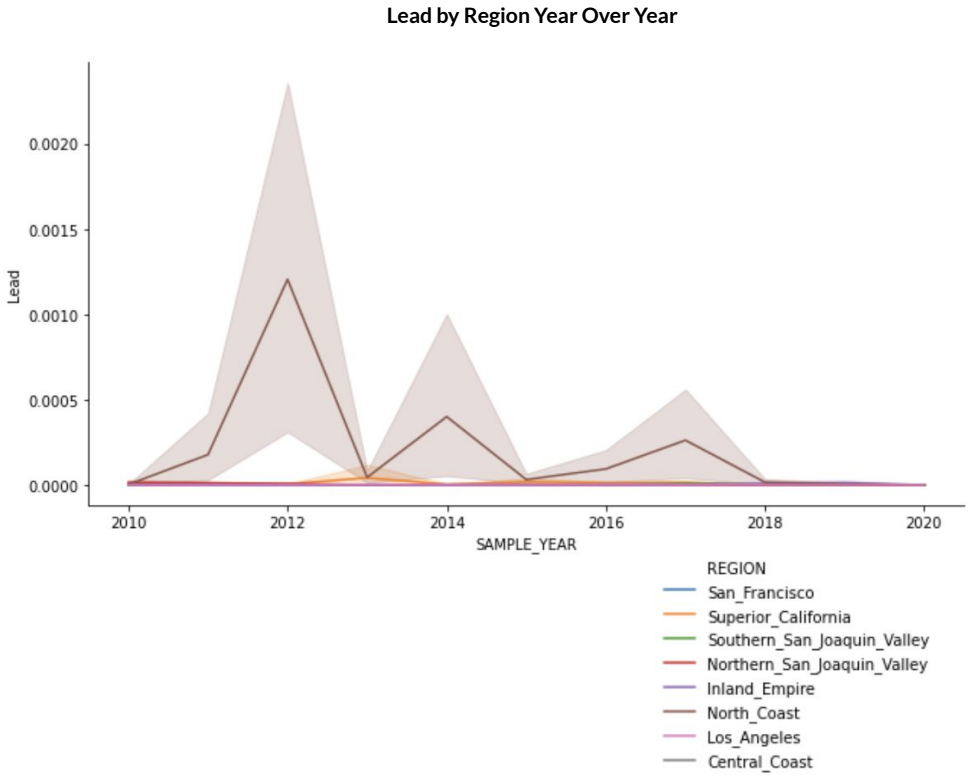
- Turbidity
- Hardness
- Copper
- Lead
- Nitrates and Nitrites
- Barium
- Fluoride



Exploring the Dataset

Lead and Copper

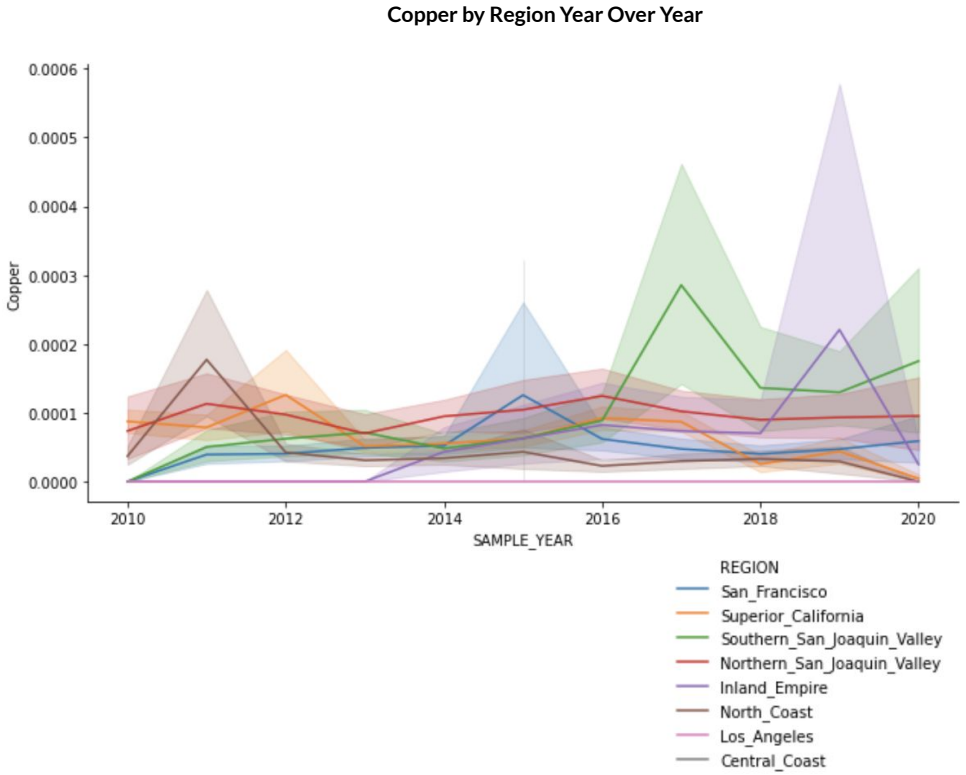
- While the contaminant levels of Lead and Copper are below the California MCL, there are still recorded levels in the drinking water.
- Year over year, the amount of Lead in drinking water has decreased.



Exploring the Dataset

Lead and Copper

- While the contaminant levels of Lead and Copper are below the California MCL, there are still recorded levels in the drinking water.
- Year over year, the amount of Lead in drinking water has decreased.
- There is still room for improvement regarding Copper.
- An Activated Carbon Filter will help improve the quality of water containing Lead and Copper

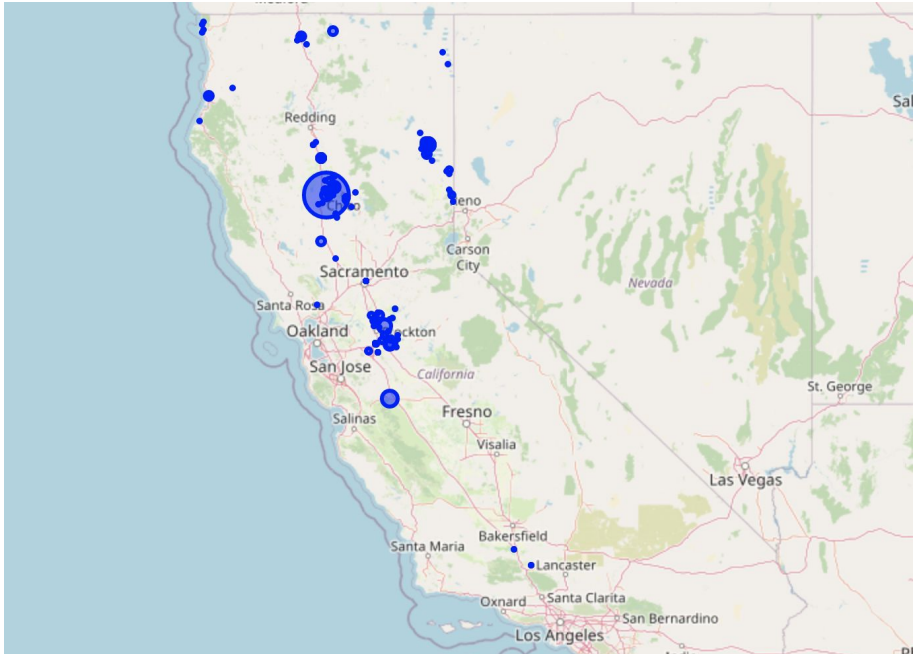


Exploring the Dataset

Nitrites and Nitrates

- Nitrates are on the rise in most regions and are over the MCL in four regions primarily in the Northern part of the state.
- Reverse Osmosis can help remove these contaminants.

Location of Nitrates Exceeding MCL



Water Filter Recommendations

Based on the regulated contaminant levels, the classification model is able to recommend one of the following four water filters by California region:

- Activated Carbon Filter
  - Helps with Lead and Copper levels
- Ion Exchange Unit
  - Reduces Hardness and helps with Barium and Fluoride levels
- Reverse Osmosis
  - Reduces Turbidity, Nitrates and Nitrites
- Distillation
  - useful for water with sample results over the MCL

Future Exploration

Gather more data for the San Diego and Orange County areas

Focus on locality features

- Future iterations could recommend a water filter at the county or city level
- Agricultural water resources for specific types of crops

Include all the regulated contaminants in the model rather than just the key parameters

Compare specific filtration devices

Thank you

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