Drought in Rhode Island

Environmental Data Science

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Introduction

Rhode Island is a state in the United States situated on the north-east coast. It is in New England and known for sandy shores and seaside Colonial towns. It would probably come to most people around the nation as a surprise, that despite of its coastal location, Rhode Island has been experiencing a rather harsh drought in the past few months. This project aims to investigate the shortage of water in this state, which is not commonly covered by national news media, and explore factors such as time, place, and residents affected.

Problem Statement

The ultimate question that I seek to answer is: Looking at relevant data in recent years, has the drought in Rhode Island been "expected" in terms of timing and magnitude?

Data and Methodology

Original Data

The data used in this project is retrieved from *The U.S. Drought Monitor* hosted by The National Drought Mitigation Center at University of Nebraska-Lincoln. The data are weekly collections of categorical scales of drought values, based on percentage of areas and populations affected. A sample of the selected columns of the first 5 rows from the raw data can be seen here:

StateAbbreviation	None	D0	D1	D2	D3	D4	ValidStart	ValidEnd
RI	0	0	55.86	44.14	0.00	0	2020-11-17	2020-11-23
RI	0	0	55.86	44.14	0.00	0	2020-11-10	2020-11-16
RI	0	0	55.86	44.14	0.00	0	2020-11-03	2020-11-09
RI	0	0	0.00	55.61	44.39	0	2020-10-27	2020-11-02
RI	0	0	0.00	55.61	44.39	0	2020-10-20	2020-10-26
RI	0	0	0.00	0.98	99.02	0	2020-10-13	2020-10-19

It shows that the percent of areas under different drought categories -
None for normal, **D0** for abnormally dry, **D1** for moderate drought, **D2** for severe drought, **D3** for extreme drought, and **D4** for exceptional drought.
For more detailed classification parameters, please refer to *this webpage*.
One note: each level of drought automatically covers the previous one, for example, for the week of 2020-11-17 in RI, although the numerical values is 0 under **D0**, it is assumed that 100% of the area there has to be "abnormally dry" before being considered "moderate drought" or "severe drought" in **D1** and **D2**. Similarly, although only 55.86% is under **D1**, in fact the rest of 44.14% under **D2** has to be qualified in **D1** before getting a more severe rating.

In addition to the comprehensive data shown, some GIS data will be introduced to visualize the drought on a map.

Data Cleaning and Merging

The first step to make a data set usable is to clean it, and here I will be removing irrelevant columns in both the population and area data sets, such as $StateAbbreviation. After that, for the easy of accessing the data, I will merge the two data set based on respective weeks. The categories are simply labeled as "Dx" in both sets, so to avoid confusion, I will rename columns prior to the merging.

Research Methods

First, I will investigate the duration of drought in each year and their patterns, focusing on the overall week counts. Then, the severity of the drought throughout the years will be checked under statistically analysis on proportion of the areas under different level of drought in each season. Moreover, I will introduce an index that weights all the factors can combine 5 categories into one single representative number. Lastly, the population and areas will be compared and contrasted to see if the drought has changed its patterns, and it will be aided with some map images.

Analysis