Visualizing Precipitation and Droughts

Team 1: The Water Tables
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We are "The Water Tables Team". Our mission is to provide intelligence on water data .
We enable our stakeholders to save lives, property and agriculture loss due to water related disasters.

The water tables team members are Marque, Ryan, Sarah and myself.

Today we will walk you through interactive visualization we have built on precipitation and drought data.

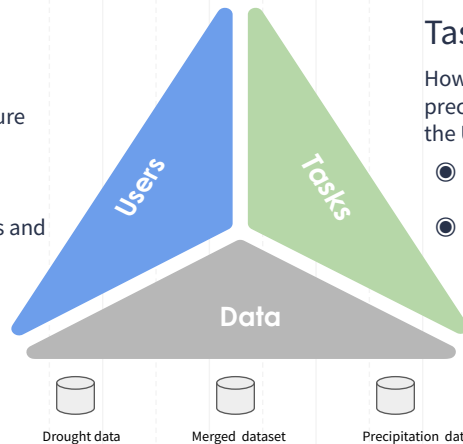Emergency response teams, Govt agencies, farmers and communities are dependent on insight from water and moisture data.
These are users of our tool.
They need this data to determine how climate change is impacting various parts of country.
They need to know which years are at risk during.

To do these analysis we will use drought data, precipitation data made available by govt agencies. We have merged these data together for ebay analysis.

To do such analysis Govt has already made few dataset available. We are using data set related to drought
Dataset
- Precipitation data, Granular precipitation dataset
- Drought data,
- Merged dataset - Precipitation and Drought.

Terminology

SPI (Standardized Precipitation Index):

An index of the amount of precipitation in a region compared to historical average.

Drought Severity:

A calculated scale of how intense a drought condition is in a region.

0 = No Drought

1 = 100% of region is in the most severe drought condition

FIPS (Federal Information Processing Standards):

The unique identification number for a county in the US.

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Tool - Tableau

- ◉ Deliver insights quickly thru interactive visualizations
- ◉ Ability to integrate changes and test impact on the fly
- ◉ Built in functionality for complex visualization e.g. county , map
- ◉ Quick syncing between graphics e.g. Crossfiltering
- ◉ Highly intuitive, extensible for non-developers
- ◉ Industry Standard Tool

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We have selected Tableau as we need to provide complex relationship in intuitive manner.
We need to test and deliver insight quickly
We want to try new things and determine impact on the fy.
Tableau out of box functionality has many features suitable for map, county level details.
Its cross filtering functionality allow syncing between multiple graphics related to SPI and drought.
It is industry standard tool

We have selected Tableau as we need to provide complex relationship in intuitive manner. We also want our users to do adhoc analysis by extending /modifying the visualization we have built .
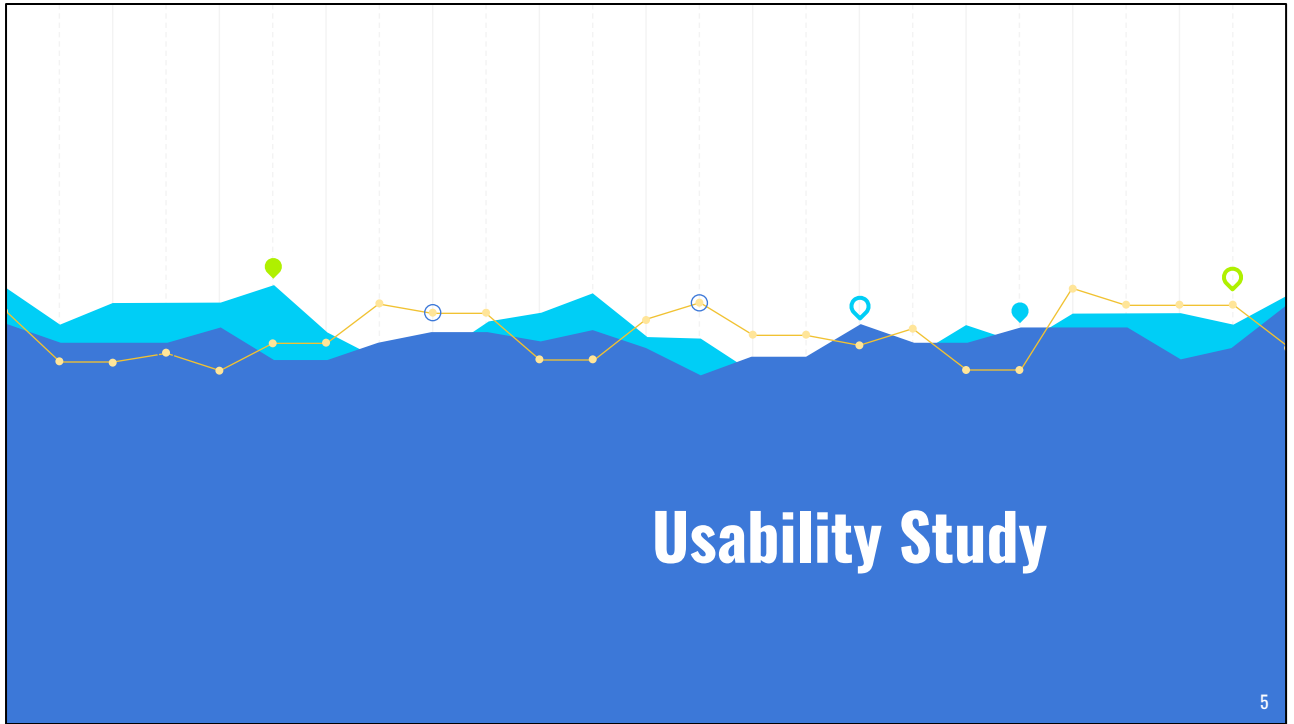
Tableau enable non developer to deliver insight quickly. It has out of box interactive visualization e.g filtering, animation.
We can try changes and test on the fly.
Built in functionality for county, map enabled us
Our users are non-developers and there is need to extend visualzations and adhoc analysis.
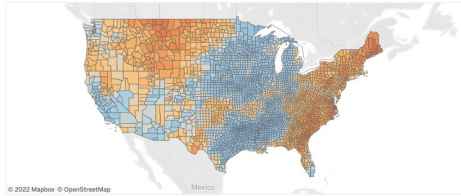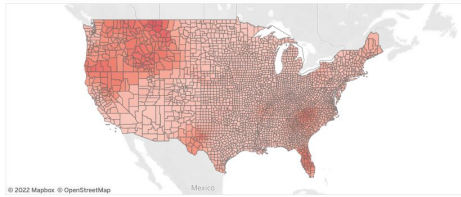We selected a tool that our user base can

Usability Study

Sarah

Previous Design

SPI_Timeline - 2001

Avg. Spi
-1.285   1.299

Avg. Severity
0.000   1.000

Year of Date
< 2001 ▾ >

□ Show history

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Severity_Timeline - 2001

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◉ Individual maps for SPI and Severity

◉ Animation to visualize change over years

◉ Ability to filter to a specific year

◉ Hover functionality to see the county FIP and the average SPI or severity for that year

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Sarah

Usability Outcomes
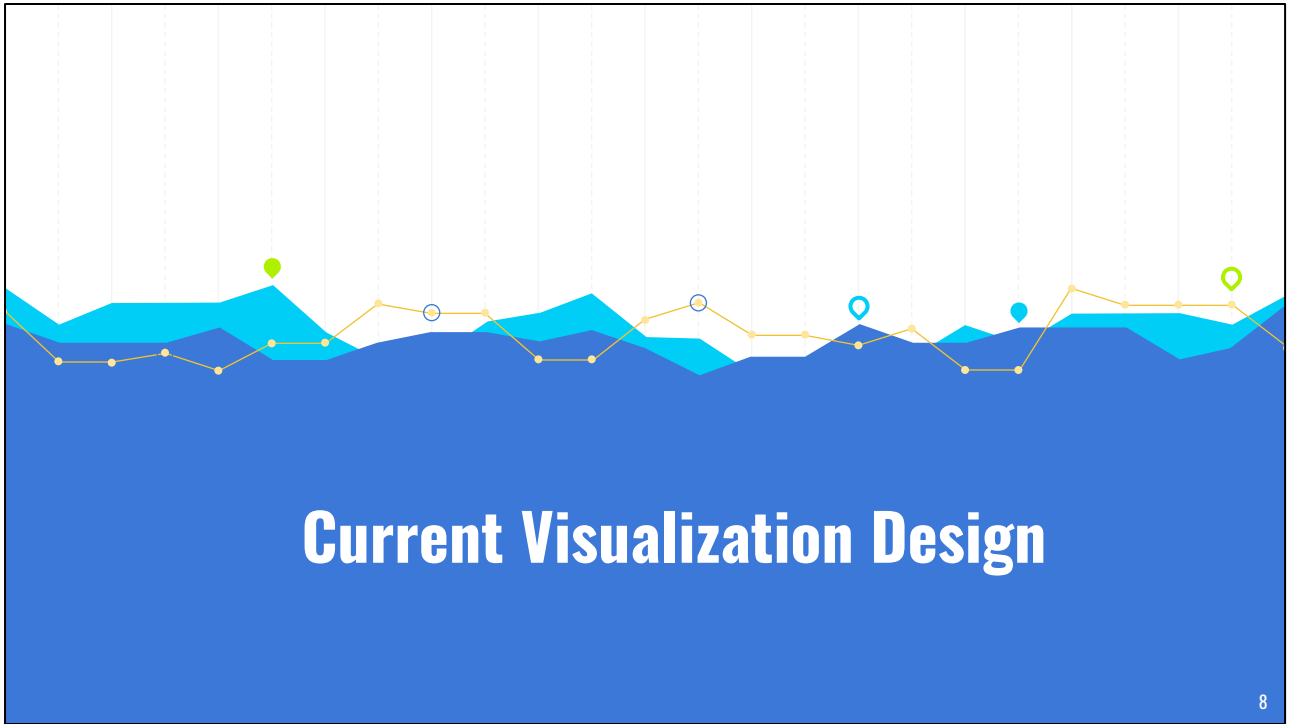
Difficulties discovered
- Reading SPI values
- Reading drought severity
- Comparing years

New features considered
- Filters
- Keep graphs in sync
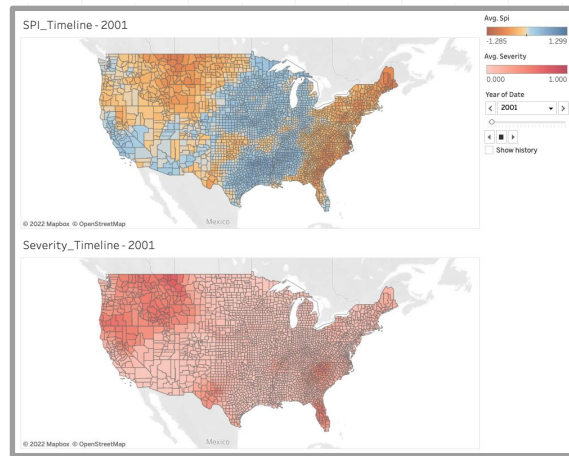- FIPs → County Names

Sarah

Current Visualization Design

Ryan

With our usability testing results, set to work immediately to incorporate the feedback that we received. Through much experimentation and collaboration, we were able to create the current version of our data visualization's design.

The feedback we collected really opened our eyes to how limited our original prototype was, but it also gave us hints into what the final viz would need to be. We each had different ideas for what could be done, and we embraced those diverse ideas. Each of us created our own experiments on the prototype, independently testing and discovering ways it could be improved. Eventually, we came together and incorporated the most effective experimental changes into our final version, always keeping the testing feedback in mind.
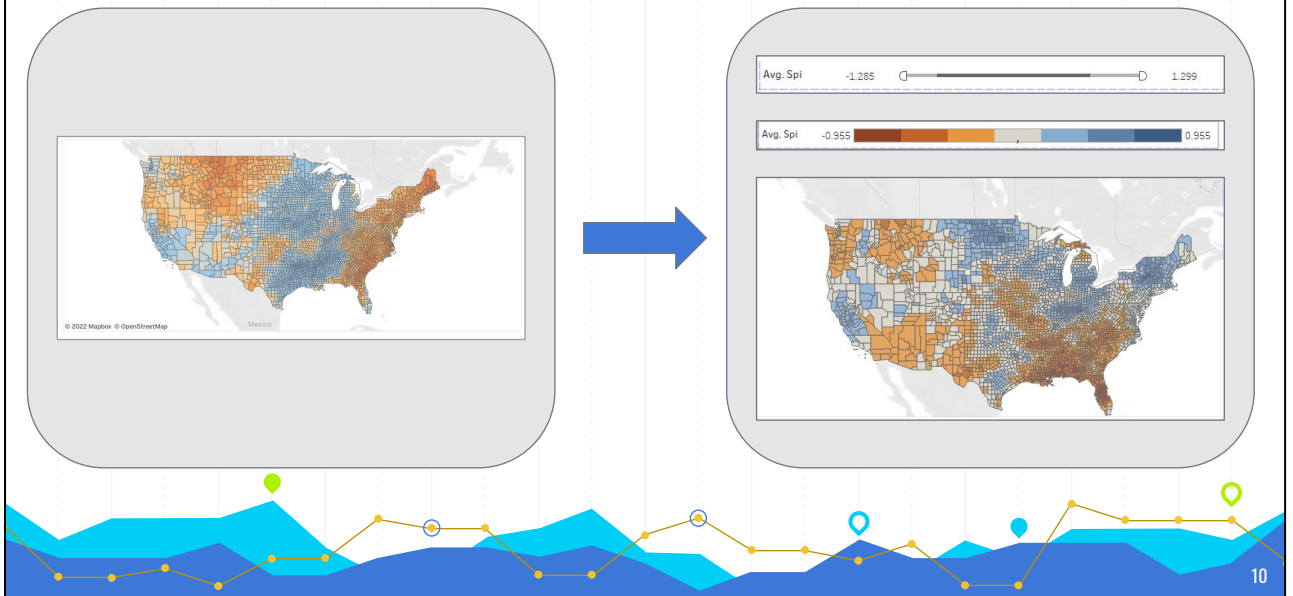
Were the SPI values too difficult to read due to the color gradient? We introduced a filter for the SPI value and a more distinctive 7 step color scheme for greater control and readability.
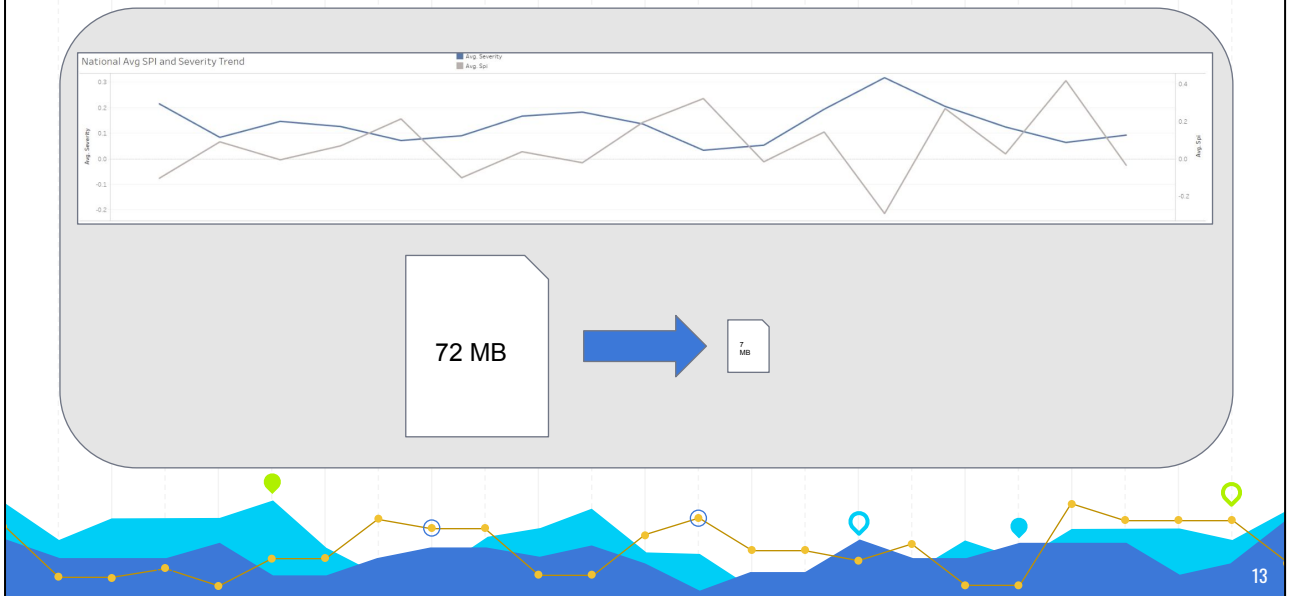
"Difficult to Read Drought Severity"
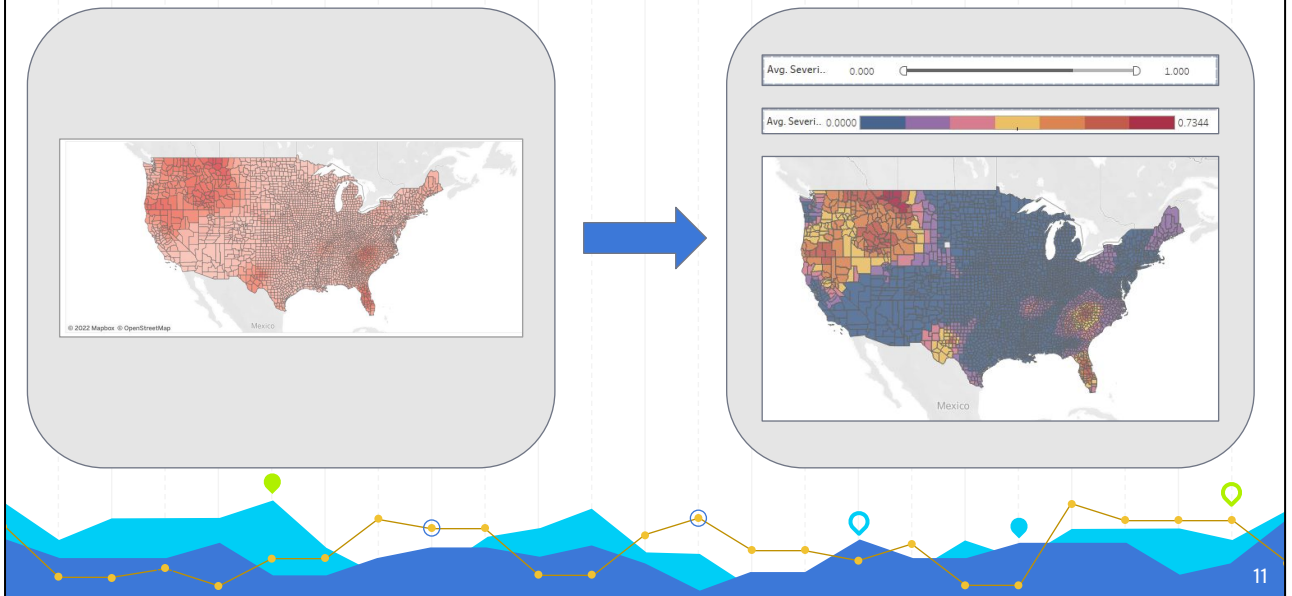
Were the Drought Severity values too gradual and difficult to read, especially for those who are red colorblind? We introduced a filter for the drought severity value and a much more varied and distinctive 7 step color scheme for greater control and readability.

"Difficult to Compare SPI, Drought Severity"
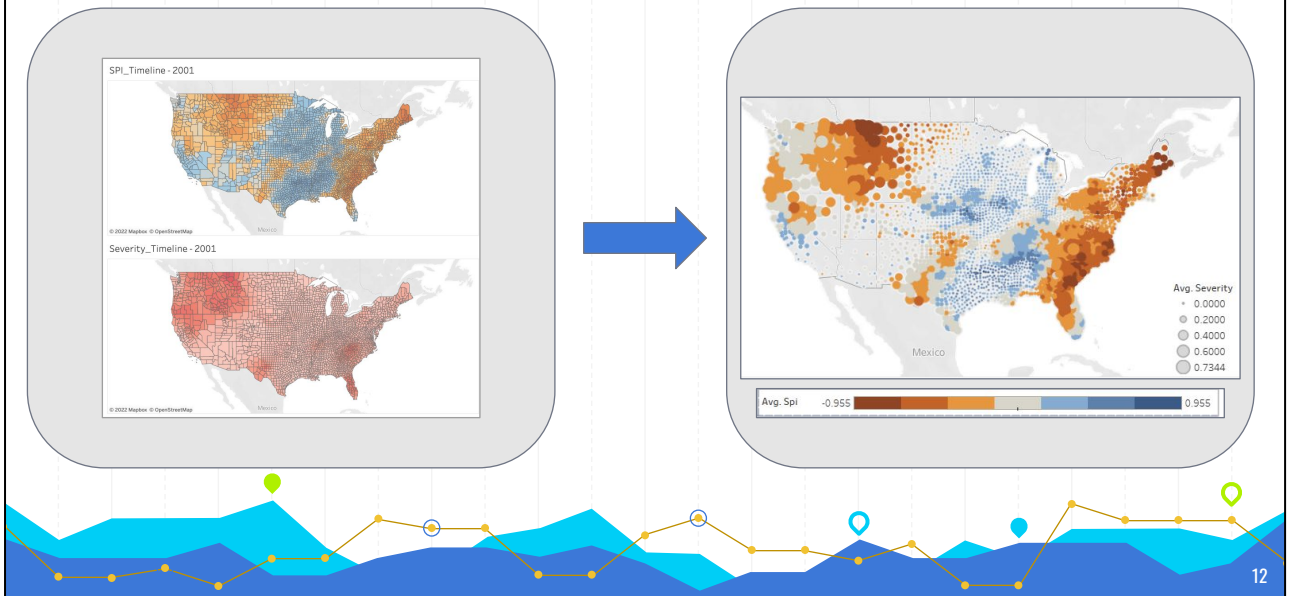
Was it too difficult to compare SPI and Drought Severity on separate maps? We introduced a brand new map that combined the SPI and drought severity data, encoding SPI through color and drought severity through icon size. This enabled users to easily distinguish both features at the same time on the same map.

The difficulty of comparing data over the years was a bit trickier to overcome, but we introduced a line chart that compares the national average for SPI and drought severity over time. Furthermore, we optimized our data set ten-fold, thereby enabling Tableau to load a year's map data in to less than a second.
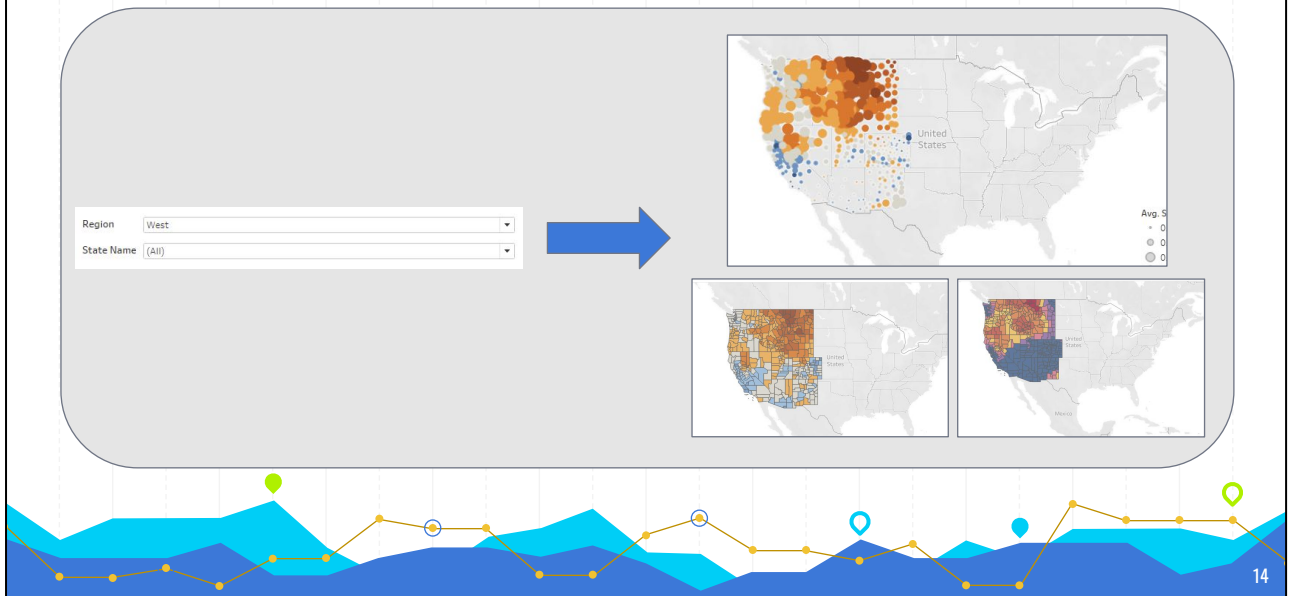
And finally, we introduced the ability to filter between regions of the US, individual states, or user-highlighted areas. As shown here, when you filter by any state, region, or highlighted area, the results are filtered across all maps to show only the region of interest. And, of course, everything is properly labelled with the county name and FIPS number.
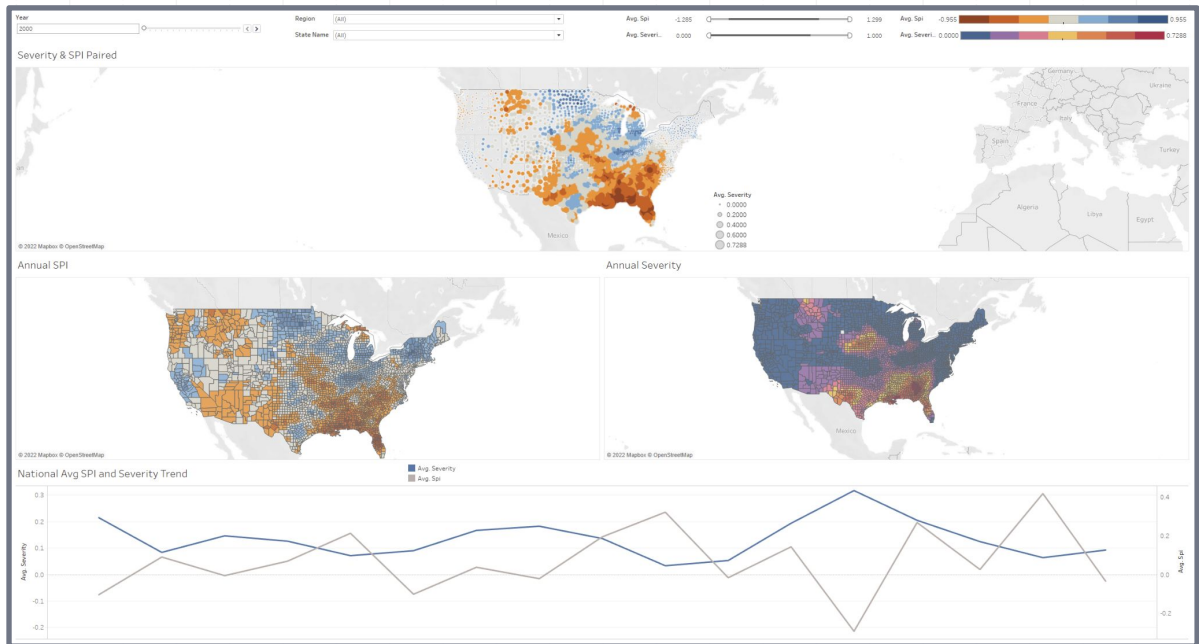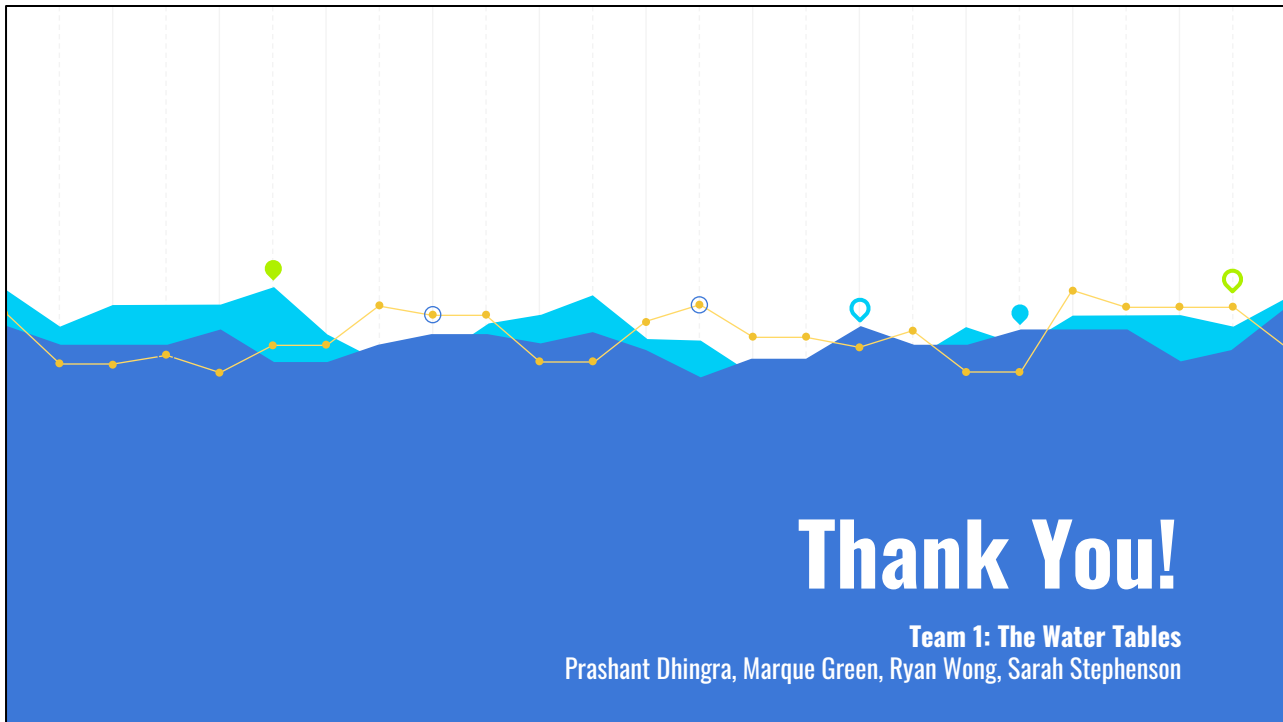
With all of those changes and features combined, this is a snapshot of our final data visualization, which Marque will demonstrate for us.
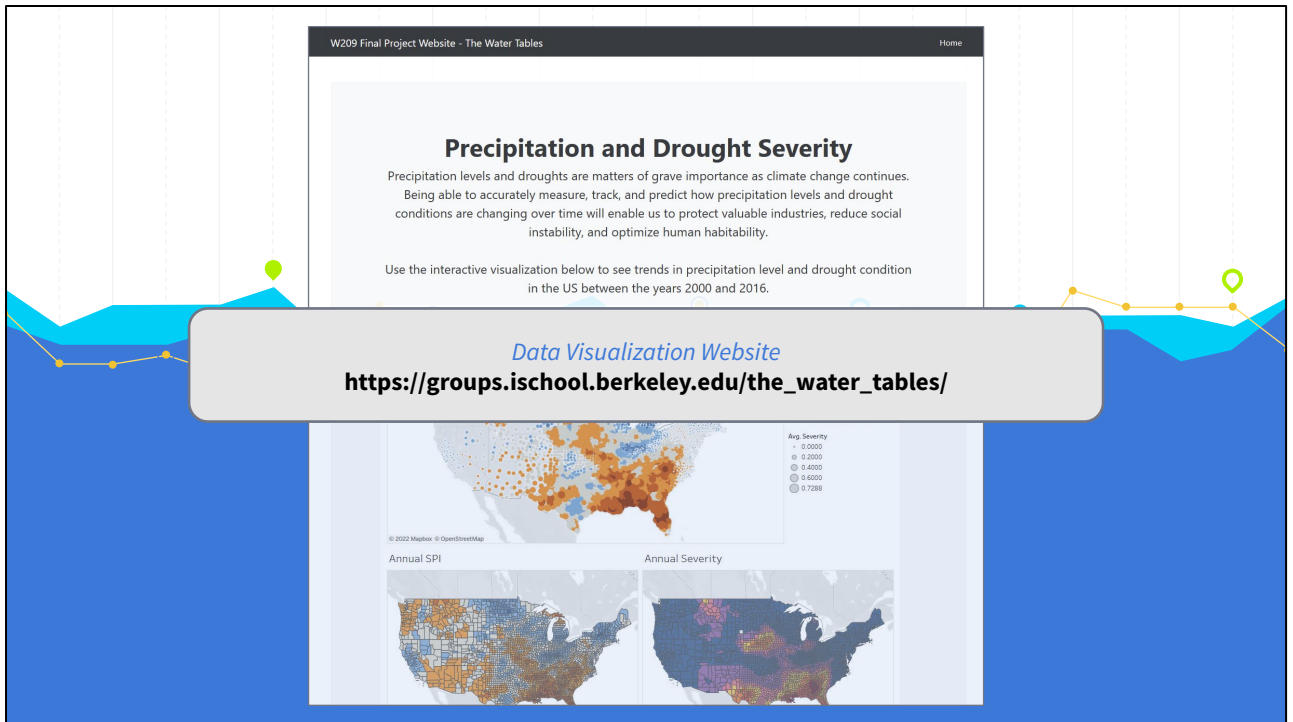
Our data visualization is also publicly available on our website, which is available at the URL shown here.

DEMO

Thank You!

Team 1: The Water Tables

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Terminology

- **Drought Condition Designations: D0-D4**
- **Standard Precipitation Index: SPI**

D0	Abnormally Dry	Going into Drought , Coming out of Drought
D1	Moderate Drought	Some damage to crops , Water shortage developing
D2	Severe Drought	Crops damage likely, Water shortage, Water restriction imposed
D3	Extreme Drought	Major loss to crops, Widespread water shortage and restriction
D4	Exceptional Drought	Exceptional Crop loss, Shortage of water in wells and reservoirs