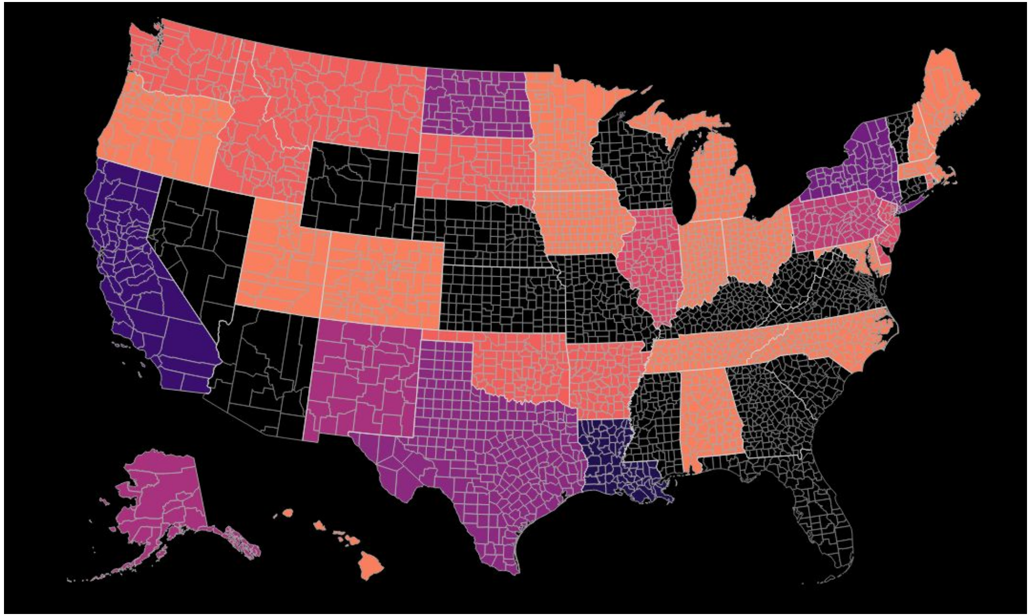
A History of Oil and Nuclear Accidents

Clayton Dembski, Mikayla Fischler

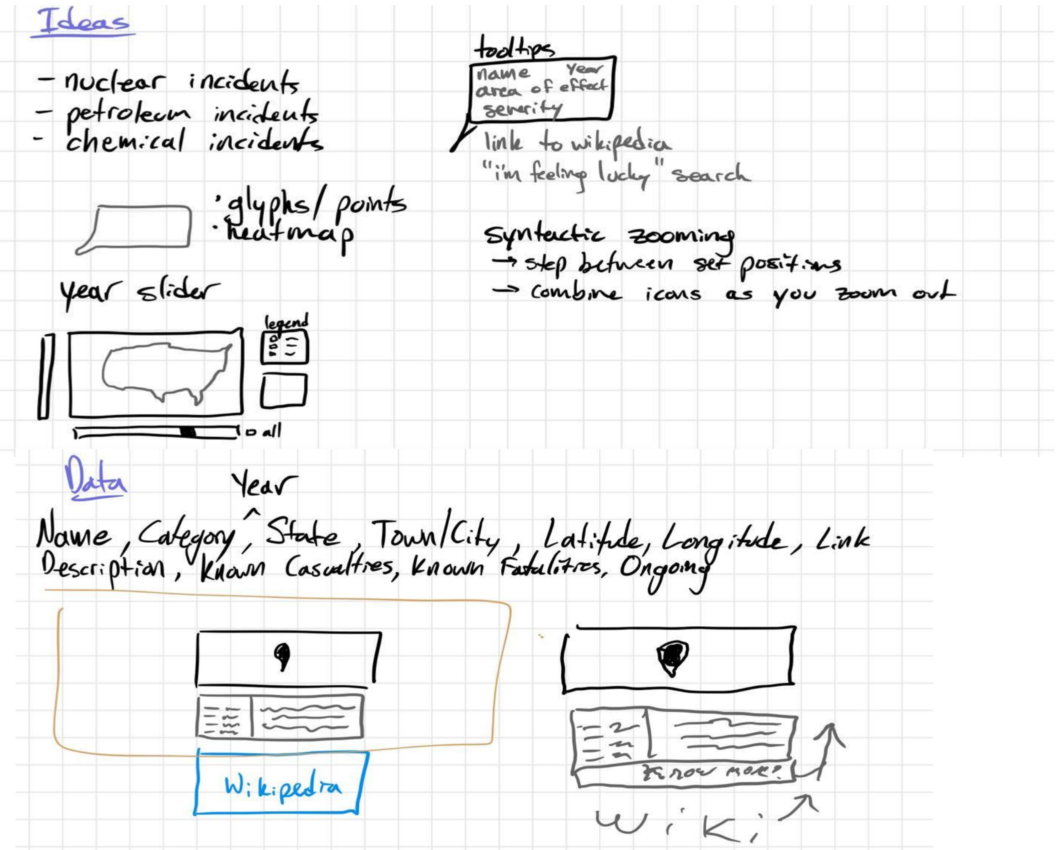
The Full Viz Can Be Found At

https://mikaylafischler.github.io/final/web/



Design Brainstorming

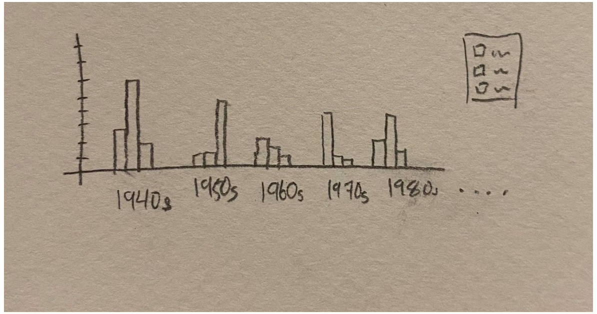
We started off with what we knew we wanted out main representation to be: A map with the specific locations of various nuclear, oil, and chemical incidents.
We decided that having a brief description of each event would encourage the user to keep reading and exploring the map. The user should be able to click to view the map closer, and the user should be able to get more info if necessary.

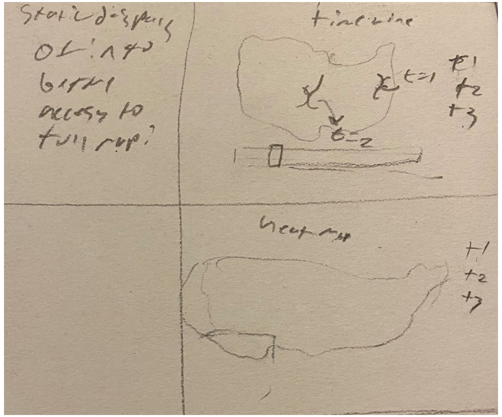


Design Process

We introduced the of grouping each dataset by decade, allowing the users to see what trends were happening in events (more common vs less common).

From this, we decided the map should have some sort of scrubber or timer system so that the user can directly see the events that show up.

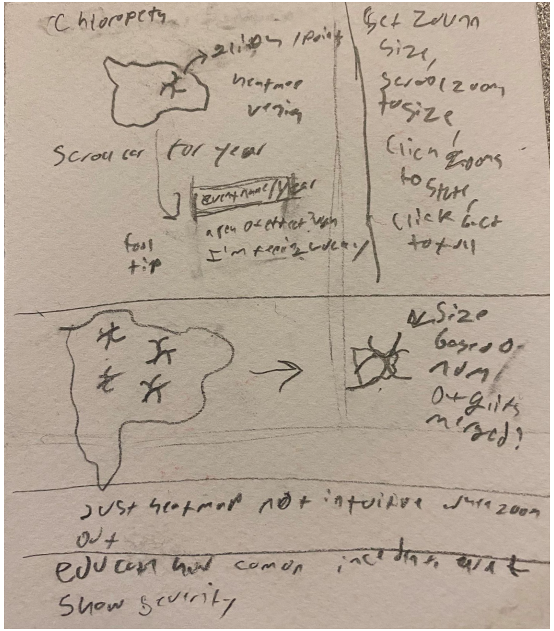




Design Process

Next, we decided that each marker type should have a unique symbol.

Each state should be a density chart which shows how many particular events are in at a time.



Prototyping

Knowing what direction we were heading in with the final project, we decided that we would utilize a4 as a way to prototype and understand the necessary functionality that we wished to use. Both projects should be considered a part of the process to finalize this project.
Following this slide will be a brief description as to which elements were prototyped in a4, however more info can be found at the full, individual project level.

Mikayla:

https://github.com/MikaylaFischler/04-Remix

https://mikaylafischler.github.io/04-Remix/web/

Clayton:

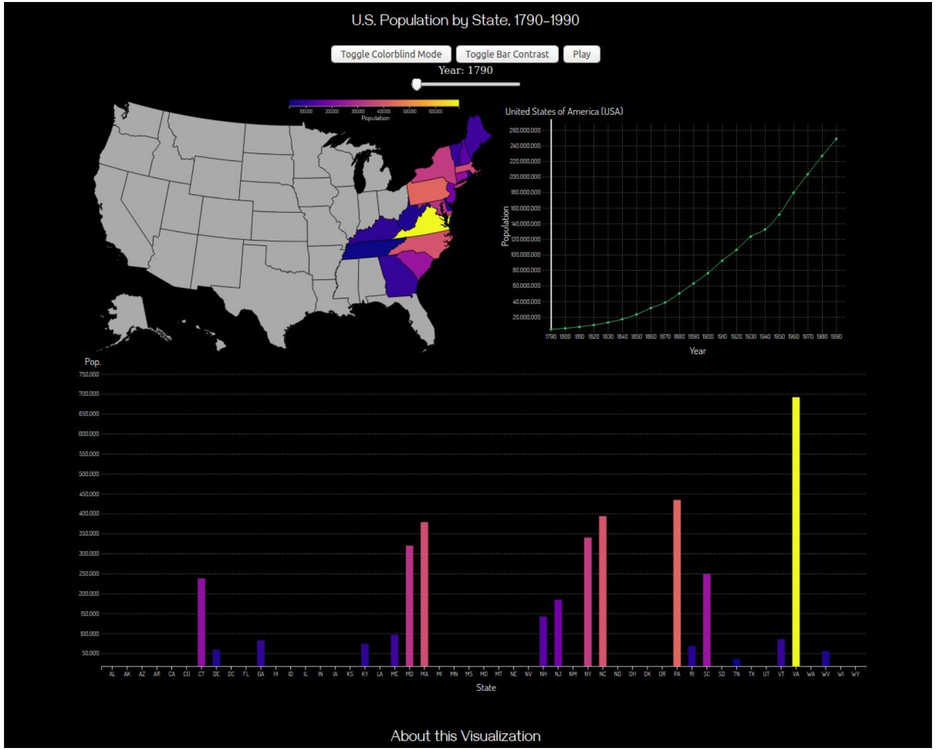
https://github.com/cabincabin/04-Remix

https://observablehq.com/@cabincabin/walmarts-growth-intermediate-infection-version/3

Prototyping: Mikayla

From Mikayla, we get the final colorscheme, a way to scrub through individual years, a density map, and a bar chart who’s data is specifically attached to the map data.

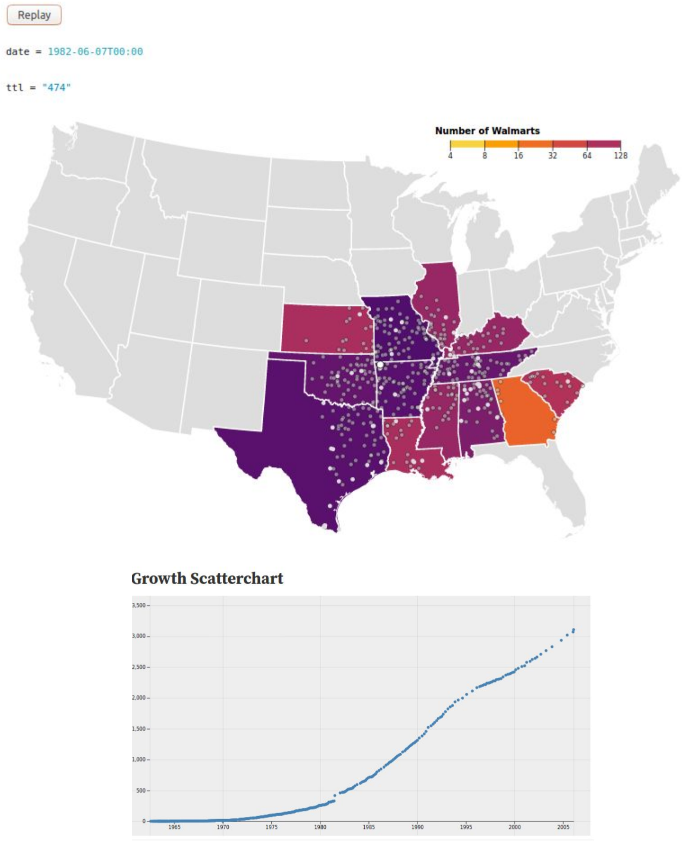
From both we get tooltips



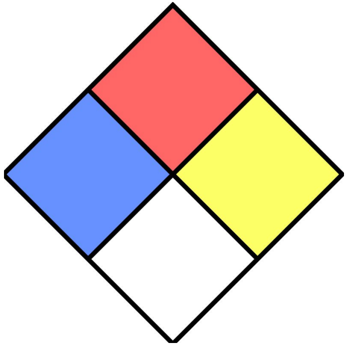
Prototyping: Clayton

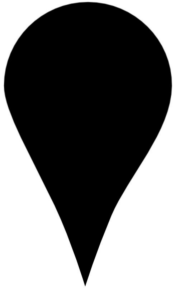
From Clayton, we also get animation based on time, and a density heatmap of data. We also get a directly linked scatterchart.

We specifically get a way to plot points on the map given a latitude and longitude, and a way to connect a point to a state, so that the access, or adding of a point on the map updates the density of the state element.



Graphic Generation





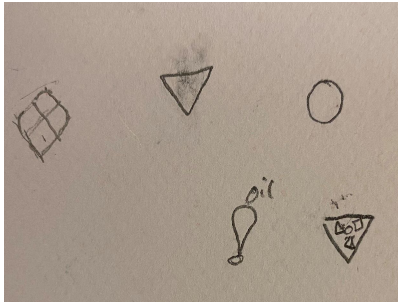
From quick, crude drawings, we realized two things about how to show the location of our data. First, we wanted each marker to represent the type of event that was happening:

Chemical: the NFPA Classification Diamond Roll Labels,

Oil: an oil droplet

Nuclear: the hazard symbol

Second, we realized that, as our markers would have to be large enough to be recognized, each should represent some sort of arrow pointing to the corresponding location. We briefly toyed with ways that we could represent the size of an event, and, as seen below oil, came up with a bubble chart representation



Data Collection

A large chunk of time for this project, at least a third, was just dedicated to data collection and manipulation. This was as we knew we wanted users to have access to full descriptions of each event, and accurately mark all events location and year. This required appending together multiple datasets from multiple sources, customizing each point

Oil

- 92 individual events
- 1940 to 2019
- Each description parsed from articles.
- Categories:

Name, Category, Cost ($), Year, Date, State, Town/City, Latitude, Longitude, Link, Description, Who, avgSize, Max Size, Min Size, fips

Nuclear

- 23 individual events
- 1940 to 2016
- Each description written by hand
- Categories:

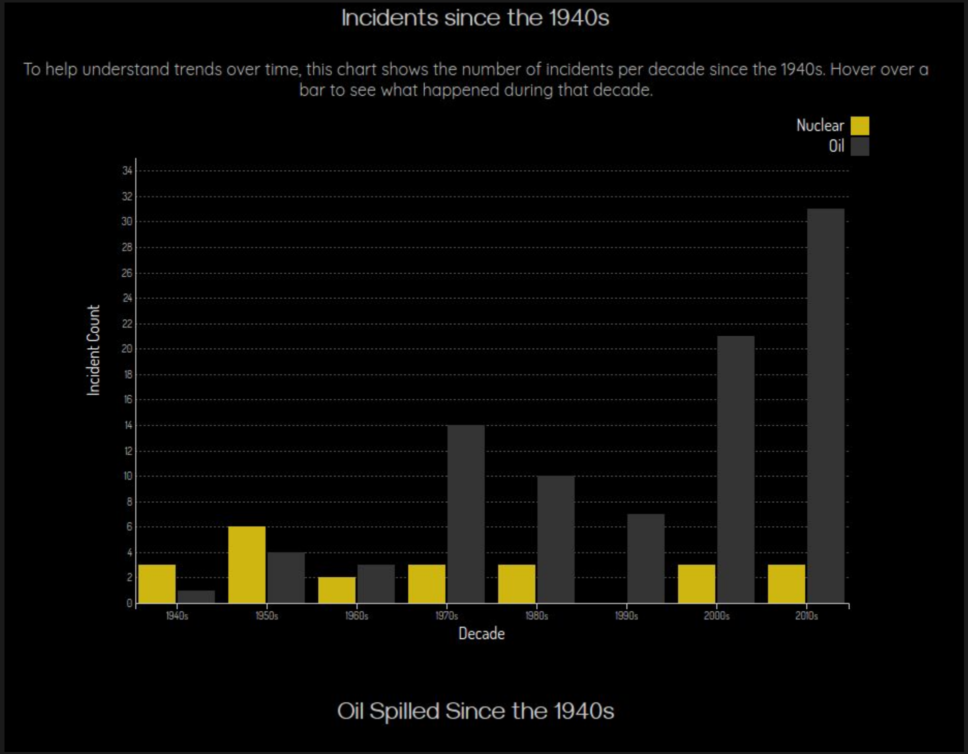
Name, Site, Category, Cost, Year, Date. State, Town/City, Latitude, Longitude, Link, Description, Injuries, Fatalities, Active, fips

Name	Category	Cost ($)	Year	Date	State	Town/City	Latitude	Longitude	Link	Description	Who	avgSize	Max Size	Min Size	fips
Keystone Pipeline 2019 spill	oil		2019	29 October 2019	United States, Walsh County, North Dakota		48.3778	-97.7529	https://en.wikipec	The Keystone oil	TransCanada Co	1240	1,240	1,240	38
Doon, Iowa derailment	oil		2018	22 June 2018	United States, Lyon County, Iowa		43.3954	-96.1527	https://www.desn	OON, Ia. — BNS	BNSF Railway	520	520	520	19
Keystone Pipeline 2017 spill	oil		2017	16 November 2017	United States, Marshall County, South Dakota		45.7271	-97.6046	https://en.wikipec	leaked around 4(	TransCanada Co	682	682	682	46
Delta House floating production platform spi	oil		2017	11 October 2017 – 12 Oct	United States, Gulf of Mexico, near Louisiana		27.8778	-97.2117	https://www.bloo	Authorities are in	LLOG Exploratio	1180	1,080	1,280	48
East River insulating oil spill	oil		2017	7 May 2017	United States, New York		40.7172	-73.9712	https://www.amn	More than 5,000	Con Edison	99	97	101	36
Belle Fourche pipeline leak	oil		2016	5 December 2016	United States, North Dakota, Billings County, Ash Coulee Cr		47.056	-103.3906	https://www.cnbc	A pipeline leak h	Belle Fourche Pi	571	571	571	38
2016 Colonial Pipeline Leak	oil		2016	12 September 2016	United States, Shelby County, Alabama		33.3039	-86.6611	https://en.wikipec	olonial Pipeline fi	Colonial Pipeline	1092	1,092	1,092	01
2016 Union Pacific oil train fire	oil		2016	3 June 2016	United States, Oregon, Mosier		45.684701	-121.403456	https://en.wikipec	Oregon officials s	Union Pacific Ra	152	152	152	53

Features

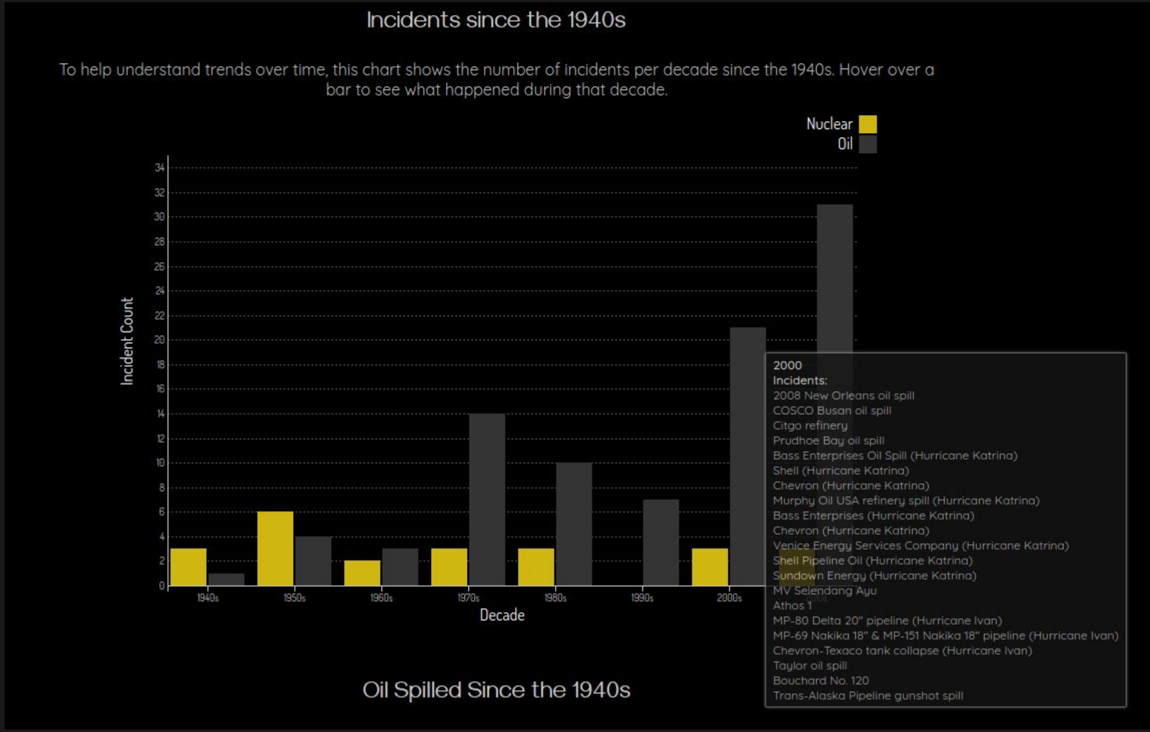
The first section, incidents since 1940, provides the users with a chart showing when each of our data points lay. This gives them an intuitive sense, when they are exposed to the full map, of when to explore, and lets them get a sense of the trend over time.

While we believe this is mostly accurate to the U.S., data further back in time tends to be less accessible and easier to miss.



Features

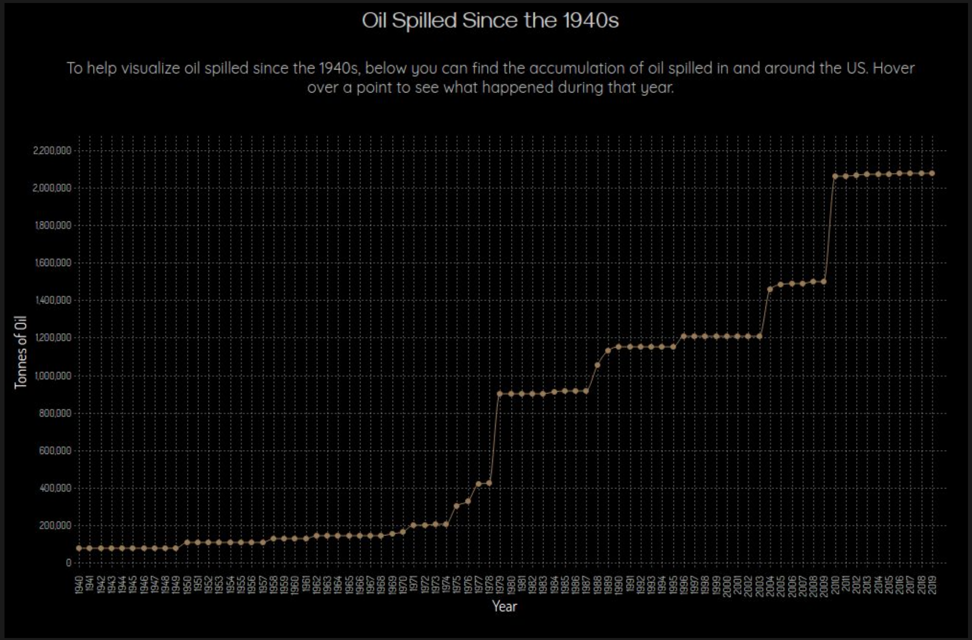
On hovering over a particular bar, either oil or nuclear, the user sees all events that happened for that period, allowing them to categorize what happened when.



Features

The second chart is a summation line chart for our oil data. It represents cumulatively the amount of oil spilled in the U.S. after 1940.

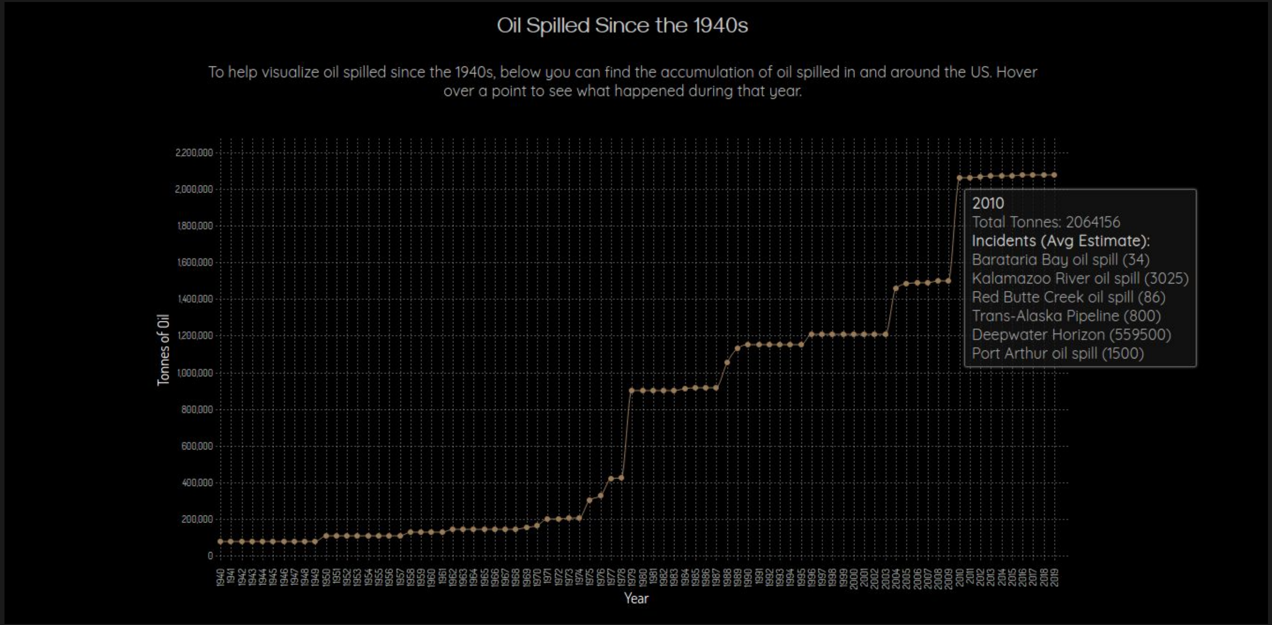
We can see that, in the latter half of the last 60 years, the sizes, or combination of sizes and number, of spills has increased, with a relitively major spill event every ~7 years



Features

On hover of the first element with a change in spillage, a tooltip with the year pops up.

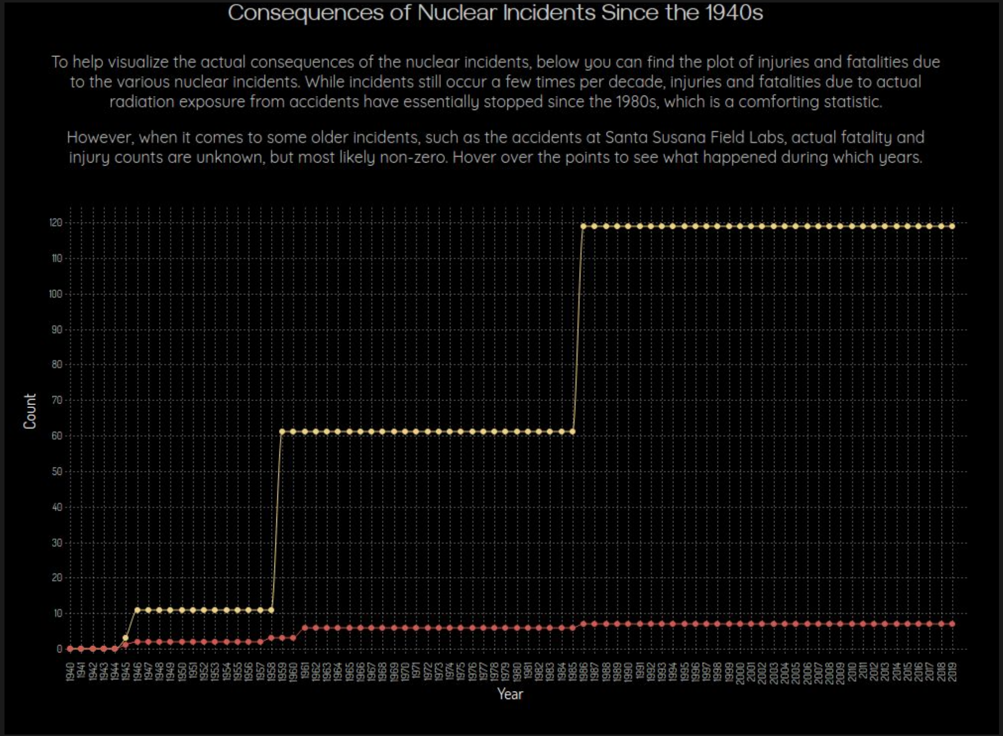
Contained in it is the name of the events that happened that year, and the spillage of each.



Features

The third chart is a summation line chart for our nuclear data. It represents cumulatively the amount of known people injured (in yellow) and the number of known people killed (in red) in the U.S. after 1940.

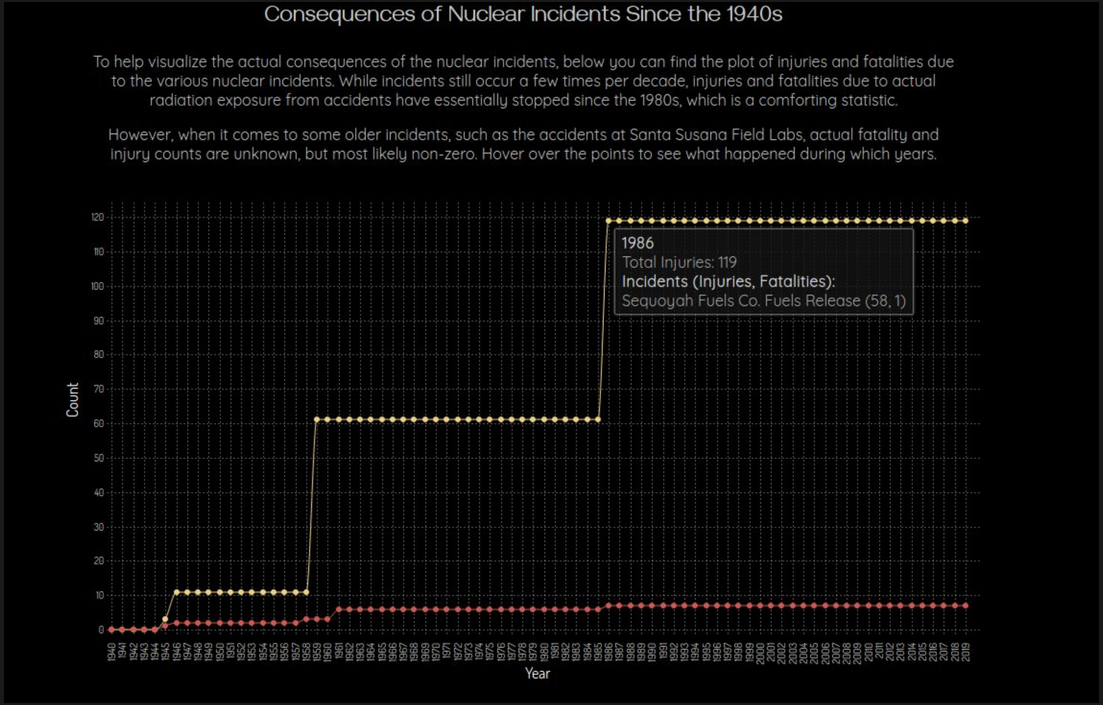
We see that, in general, the time between injuries from nuclear hazards tends to increase as we move up the decades, however, the total number injured also moves up.



Features

On hover of the first element with a change in injury or mortality, a tooltip with the year pops up.

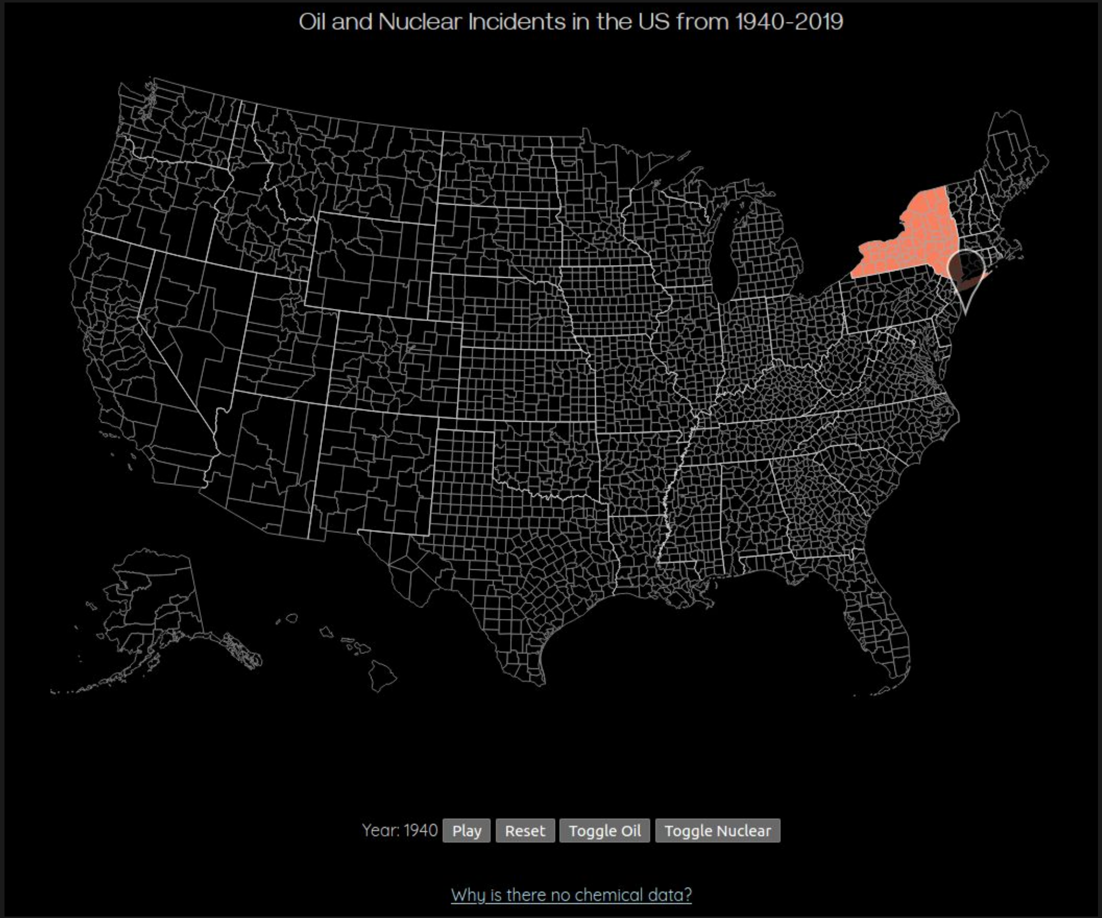
Contained in it is the name of the events that happened that year, the injuries, and the direct fatalities.



Features

The final section is called *Oil and Nuclear Incidents in the US from 1940-2019.*
 It is made up of Albers' equal-area conic projection, which includes all counties, a year, and 4 toggleable buttons.

The first datapoint, an oil spill from 1940, is preloaded. This is to get the user to investigate and passively move the mouse onto the map.

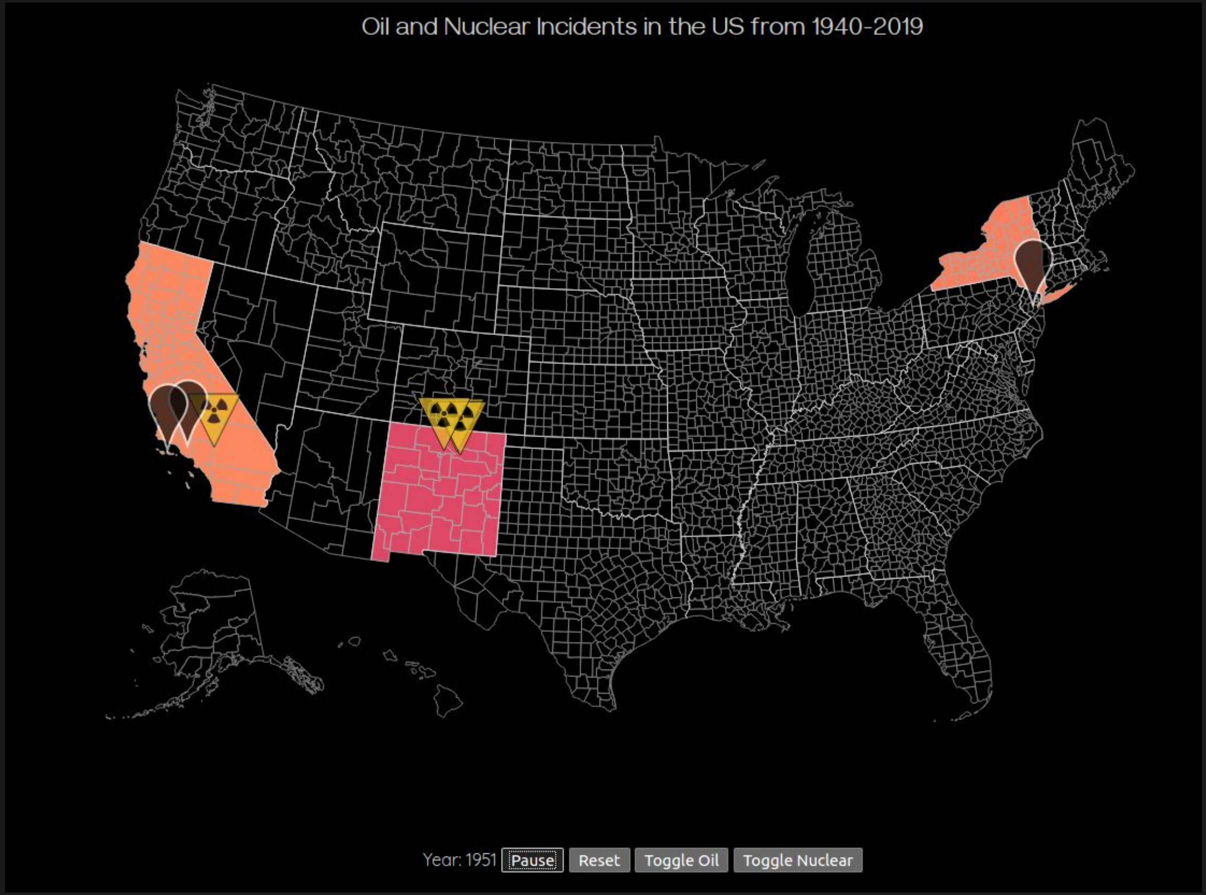


Features

When the play button is pressed, a timer starts, and the map starts to change. Every interval, the time, signified in the bottom left, increases. This can be paused by clicking again.

When the year corresponds to existing oil or nuclear data, the corresponding marker is spawned at the lat/long where the event took place.

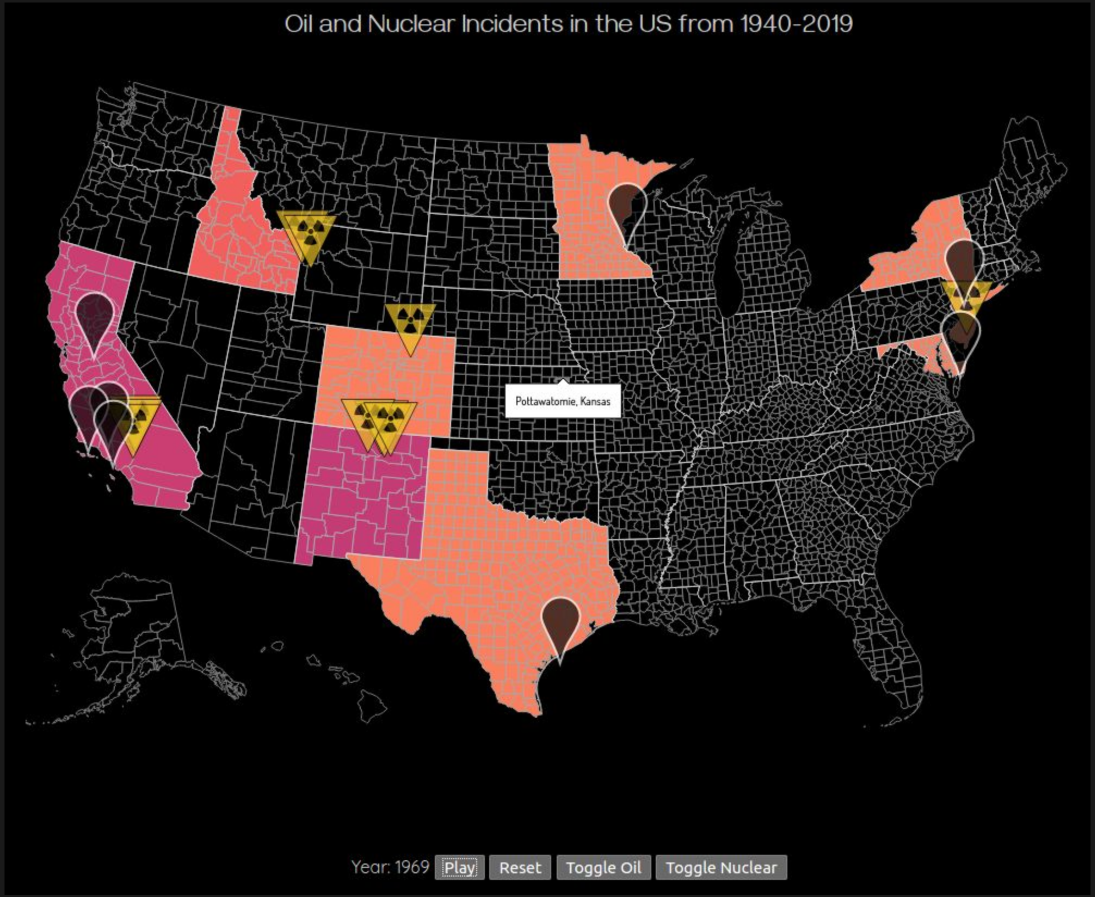
Each state is a heatmap, using the magma interpolation pattern, and the color corresponding to the number of events



Features

When the user hovers the mouse over any non-event point on the map, the particular county is highlighted

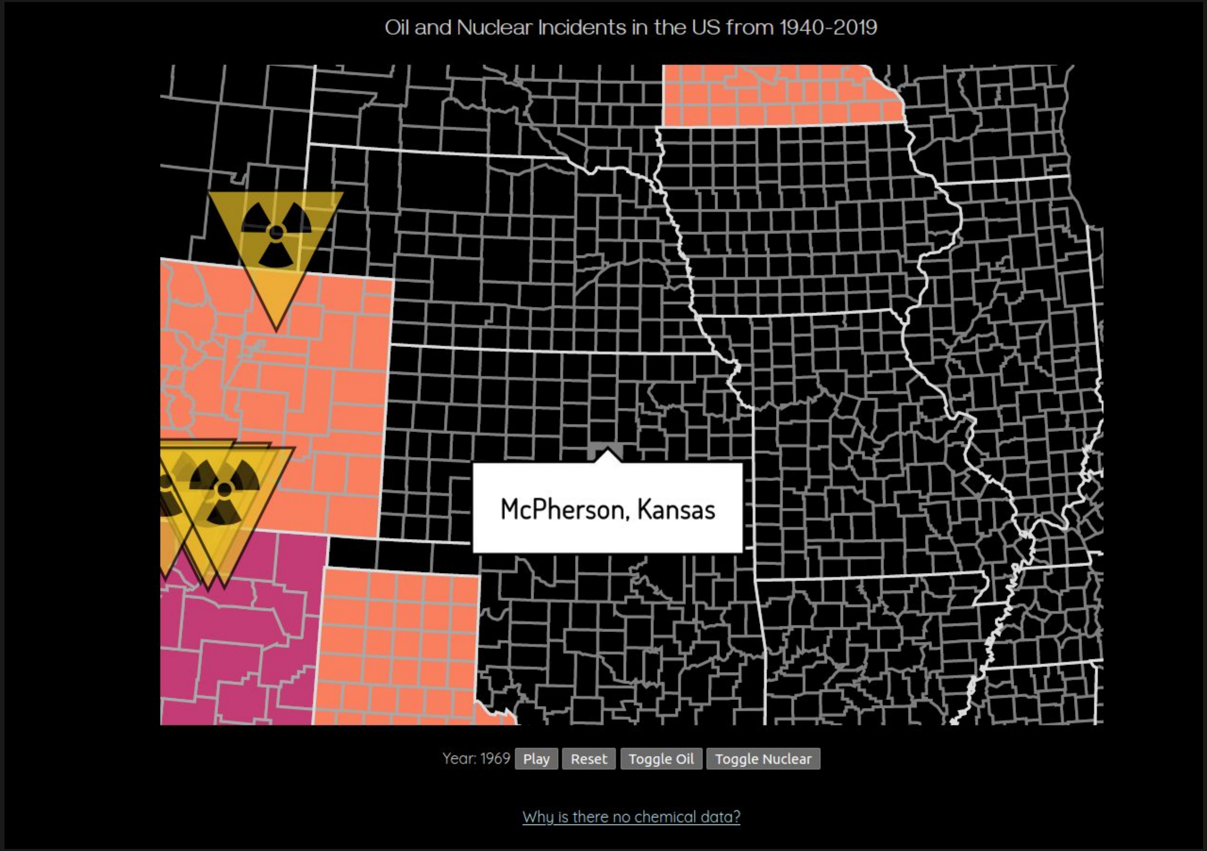
The user is told the county name and the corresponding state via a tool tip.



Features

When the user clicks one of these counties, the svg element zooms in, showing the map in greater detail.

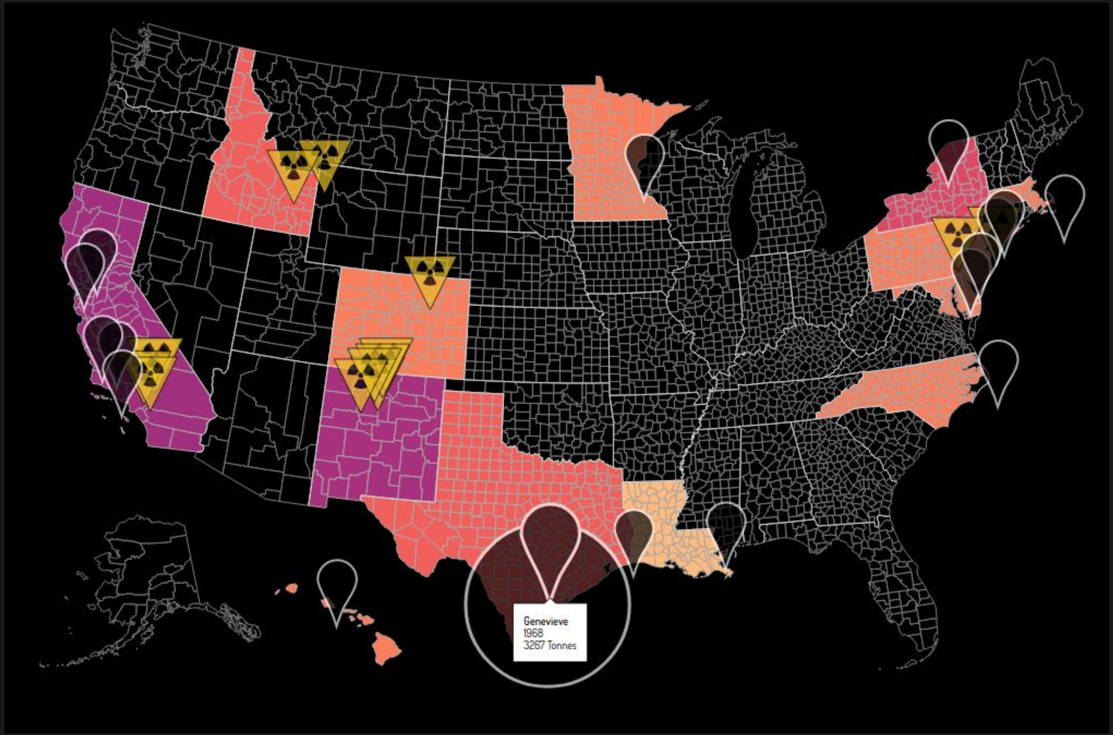
Clicking again will zoom back out the map to the standard size.



Features

When an oil event is hovered over, the oil market expands in size. In addition, an animation, starting from the location of the event, plays: an expanding circle. The circle's radius is logarithmically proportional to the amount spilled at a particular site.

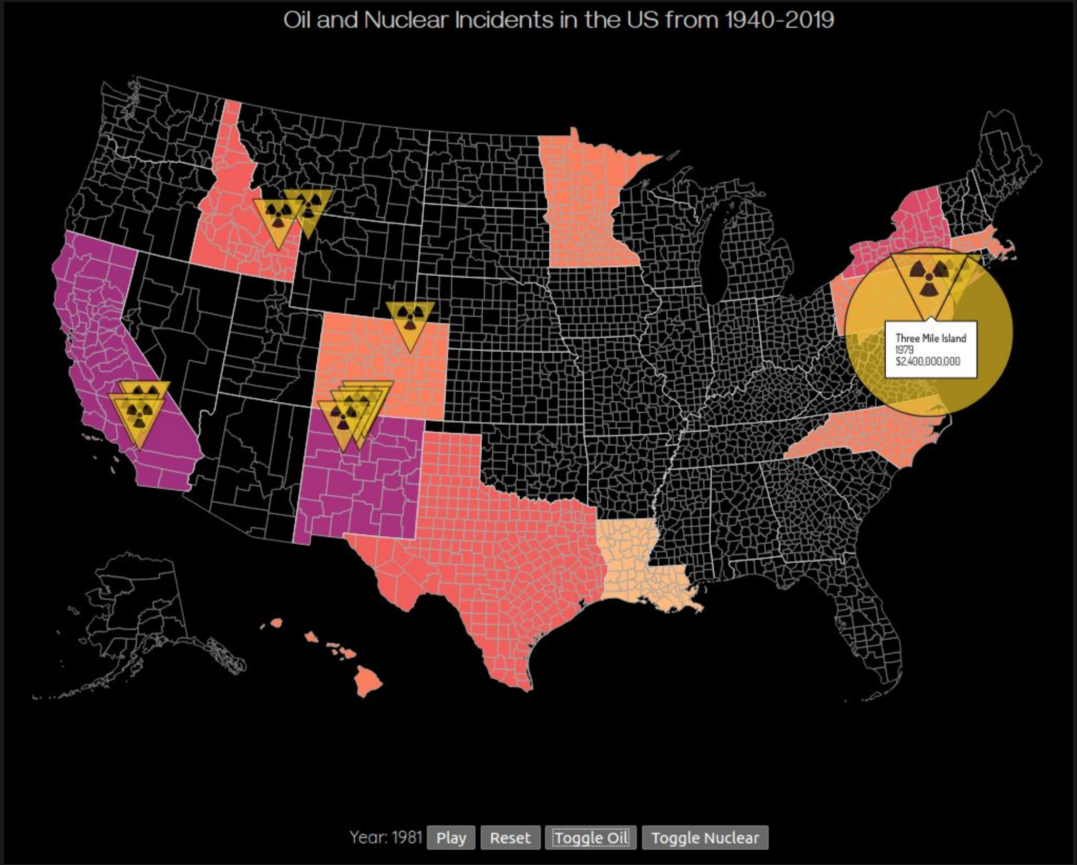
The tooltip shows the name, the year, and the total spillage in tonnes.



Features

Similarly, when a nuclear event is hovered over, the nuclear symbol increases in size to “highlight”, and an animation representing the *cost* of cleanup is displayed.

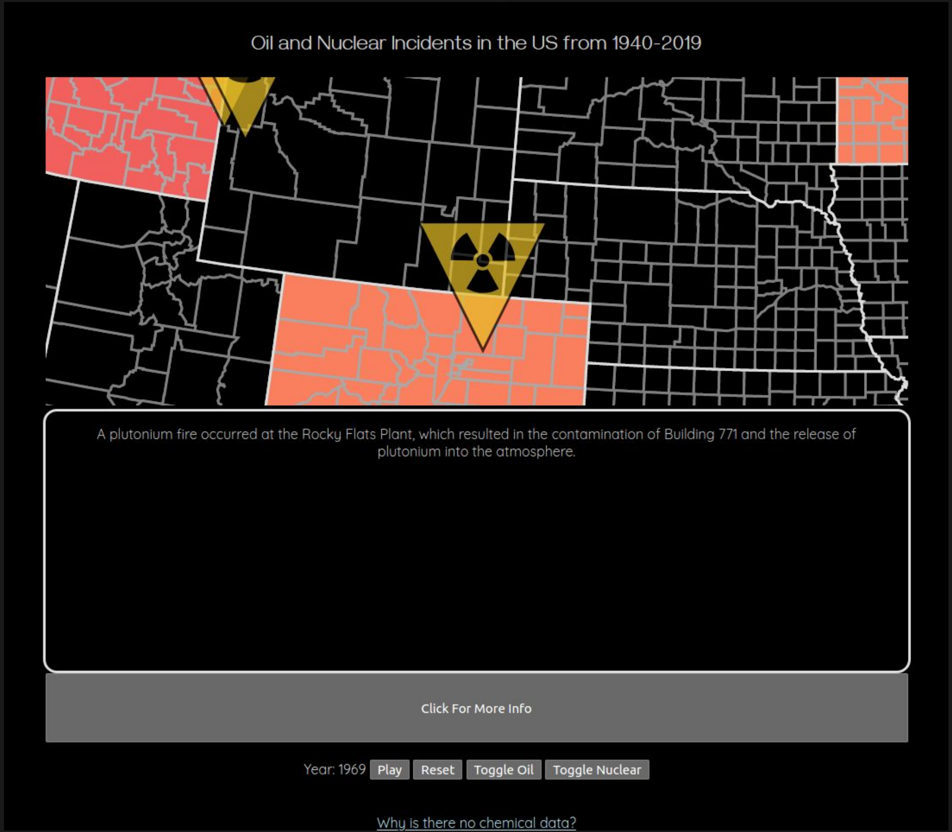
The tooltip shows the name, the year, and the total cost.



Features

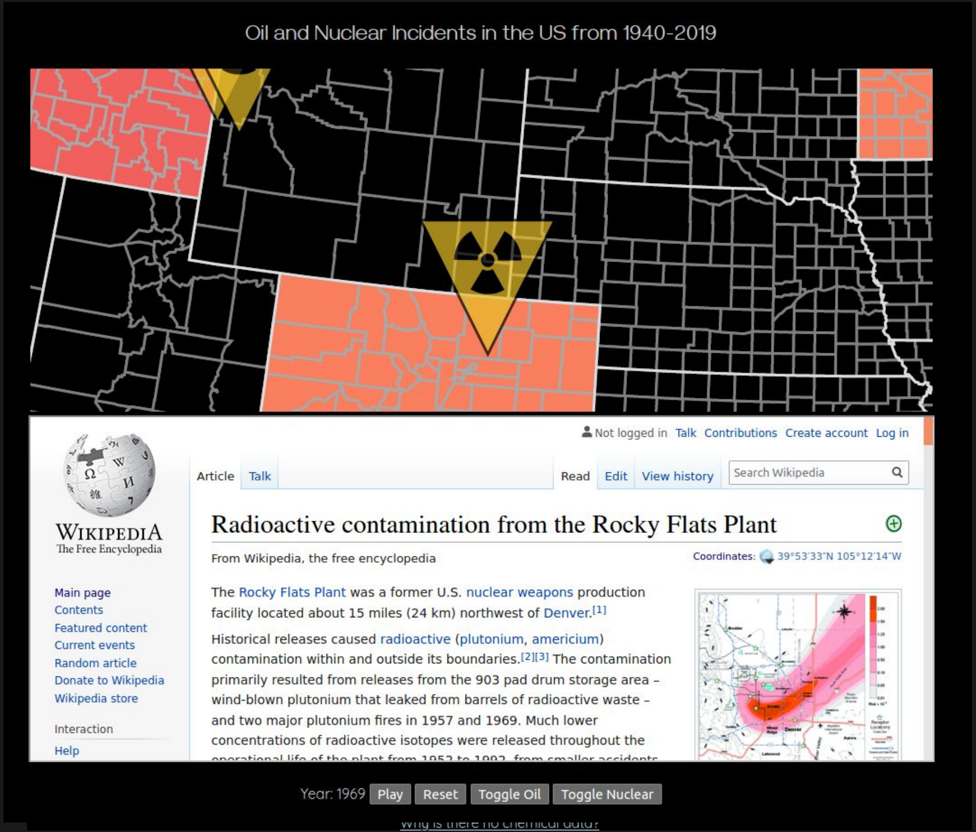
When a user clicks a marker, the user moves to an expanded view around the event.

A description of the event is provided, along with a button prompting the user to click for more info. If the user clicks the map again, the user goes back to the default view.



Features

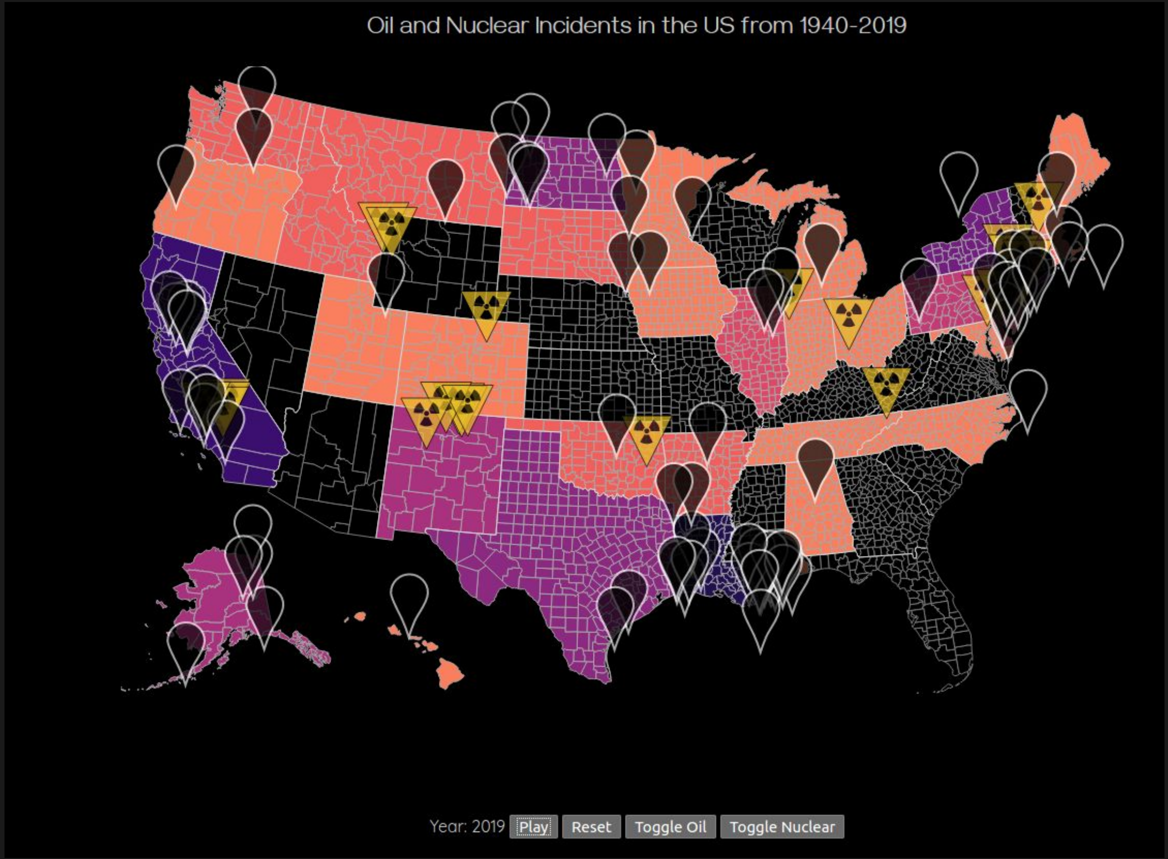
On clicking for more info, a relevant article, many from wikipedia, but also many from sites such as National Oceanic and Atmospheric Administration, pops up for the user to read in depth.



Features

This is the full, completed map when the time has scrubbed to 2019.

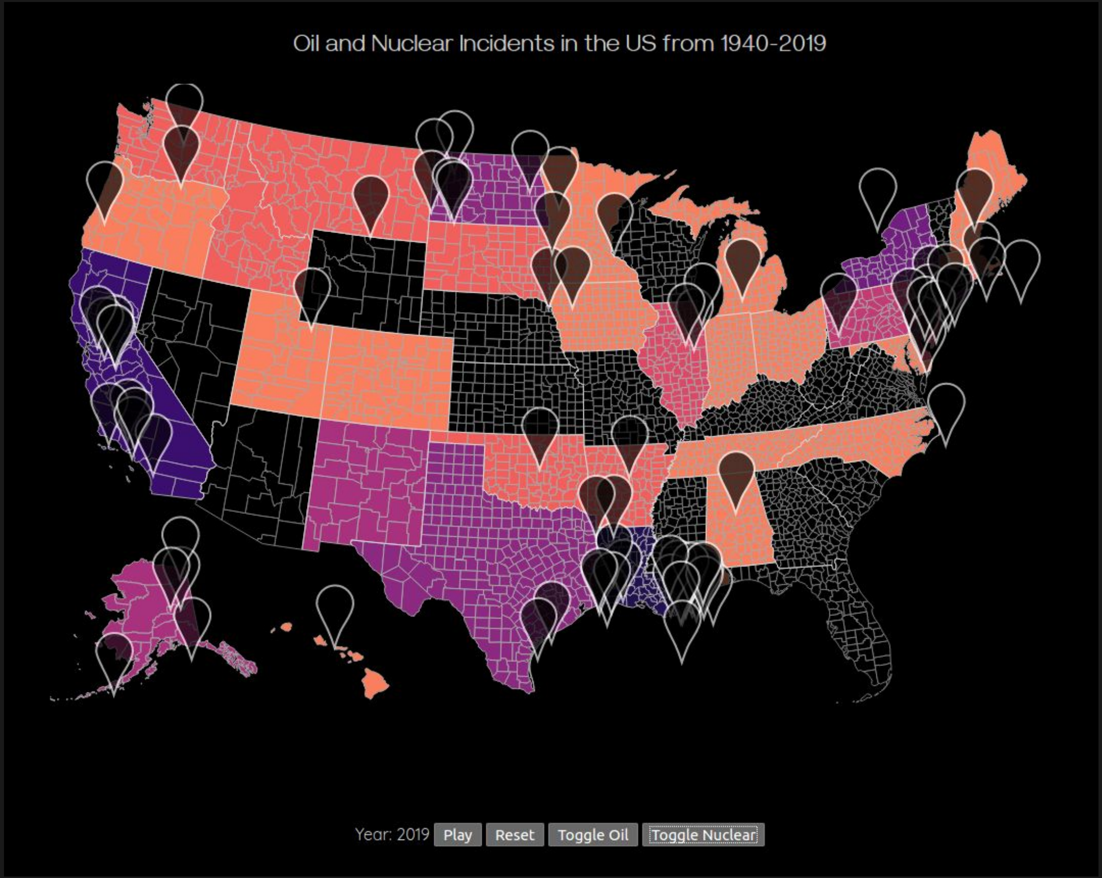
At any point, one may toggle the oil or nuclear markers



Features

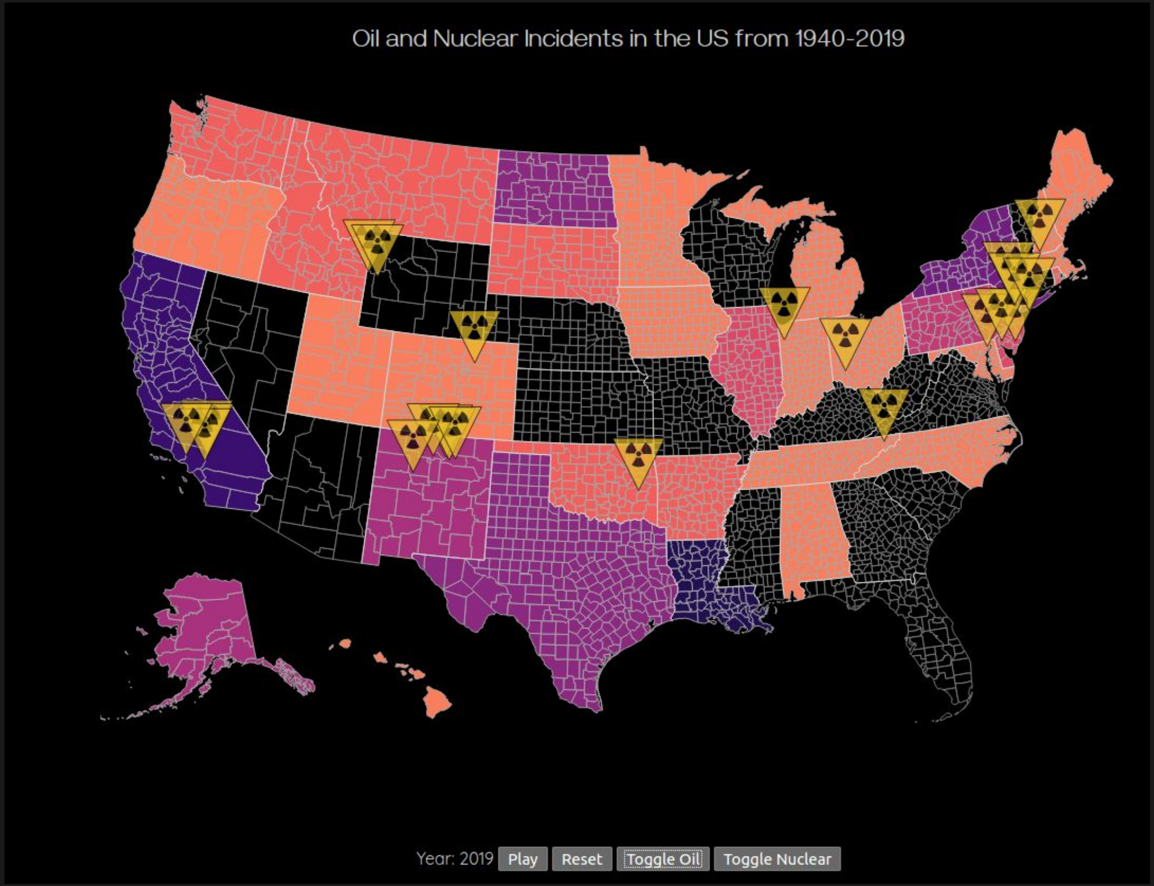
Temporarily removing the marker from view.

In this case, toggle nuclear has been pressed.



Features

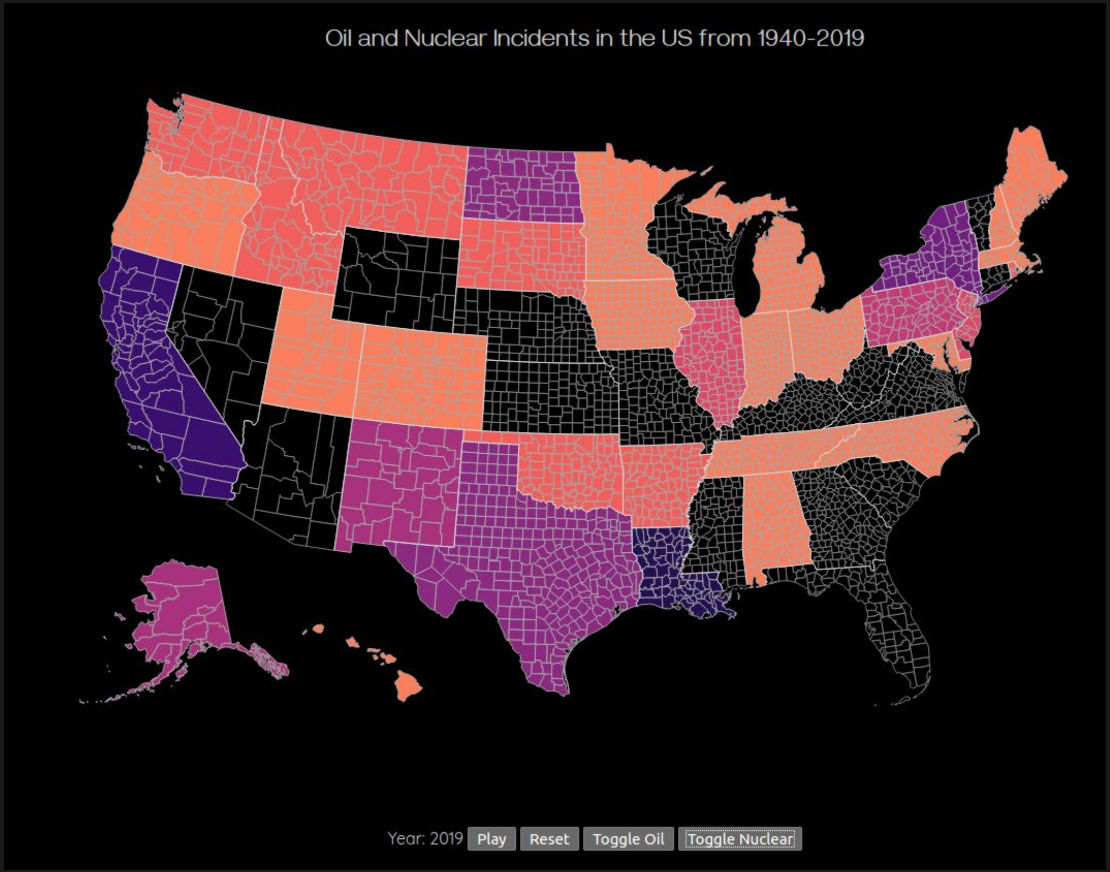
In this case, toggle oil has been pressed.



Features

Both may also be toggled, so that one may view just the density map.

This allows users to remove clutter that isn't relevant to them, allowing them to more easily explore just the oil or just the nuclear events.



Features

The final piece we see in this visualization is a hyperlinked text.

This text redirects to an article discussing the high inaccuracy rate of reportings of chemical spills, and the deliberate obfuscation of data by federal sources.

US not accurately tracking serious chemical accidents

BY REBECCA TRAGER | 2 SEPTEMBER 2013

Even America's best chemical incident data is only 10% accurate, a Dallas Morning News investigation has found

The US government lacks accurate information about the frequency of serious industrial chemical accidents in the country, according to an analysis by the *Dallas Morning News* published on 24 August. After examining more than 750,000 federal records, its reporters found that even the nation's best data on chemical accidents only has an accuracy rate of about 10%.

LM Otero/AP/Press Association Images

The devastation caused by the West explosion. An analysis suggests the US government lacks data on accident rates

The paper determined that it is extremely difficult to tease the number of severe chemical accidents out from the hundreds of thousands of records