Project Title:
Mapping Environmental Risk: Nutrient Pollution and Clean Water Access in Iowa Counties

Abstract:
This project will explore on understanding how nutrient pollution and clean water access affect different counties in Iowa—especially in terms of who's most vulnerable. I'm using R (with tidycensus), Leaflet, and Tableau to bring together demographic and environmental data like nitrate levels in drinking water, proximity to impaired waterways, and ACS indicators like poverty and race. The goal is to create a set of interactive maps and dashboards that show where the biggest risks are, and hopefully point to where planning and conservation efforts are most needed.

Overview:
In Iowa, nutrient pollution occured mainly from nitrogen and phosphorus runoff, continues to impact the water systems. Rural communities that relies on shallow wells or small water systems can be especially vulnerable to nitrate contamination, which is tied to serious health risks like cancer and birth defects. But the issue isn't just environmental—it's also social. Some counties may be more exposed due to overlapping factors like poverty, housing costs, or race.
This project is about putting those pieces together. I'm mapping out county-level risk using both environmental and demographic data. The idea is to highlight where these issues overlap so we can better understand where the biggest challenges are. I'll be making:

- An interactive Leaflet map to visualize nitrate exposure.
- Tableau dashboards for comparing counties.
- A possible "Clean Water Equity Score" to rank and prioritize high-risk areas.

Tools List:

- **RStudio** – for data wrangling, mapping, and pulling in ACS data
- **Tableau Public** – to build dashboards and make county comparisons
- **QGIS or ArcGIS Pro** – optional, for any deeper spatial overlays
- **HTML/CSS** – for pulling everything together in a clean, interactive poster layout

Main Data Sources:
From the Census through tidycensus:

- Poverty rate (B17001_002)
- Median household income (B19013_001)
- Percent of renters (B25003_003)
- Housing cost burden (B25070_007 to 010)
- Black or African American population (B02001_003)

Environmental & Water Data:

- **Iowa DNR** – nitrate levels in public water systems (by system, to be aggregated to county)
- **EPA SDWIS / ECHO** – Safe Drinking Water Act violations
- **Iowa DNR** – list of impaired waterways, watershed data
- **USGS SPARROW** – nutrient load modeling
- **TIGER/Line Shapefiles** – for county boundaries

Methods / Workflow:

1. Pull county-level ACS data and join it with shapefiles in R

2. Clean and standardize nitrate/nutrient exposure data by county
3. Combine social and environmental indicators into a composite "Pollution Risk Score" (probably using percentiles or z-scores)
4. Build a Leaflet map with toggles for individual indicators and the composite score
5. Use Tableau to compare counties on key variables and create simple visualizations
6. (Optional) Use Highcharts for a bar or radar chart that ranks counties on a "Clean Water Equity" scale
7. Put it all together into an interactive poster using HTML/CSS.

What Inspired This:

- Iowa Environmental Council's *Nitrate Watch*
- EPA's *EJScreen*
- Environmental Working Group's nitrate maps
- My own interest in environmental justice, clean water access, and spatial storytelling

Expected Challenges:

- Figuring out how to access and clean the nitrate data—some sources aren't super beginner-friendly and I'm still learning what to search for.
- Making sure the data from different sources can actually be compared (especially over time or different scales).
- Making the final visuals easy to understand while still showing all the important details.
- Making sure the spatial joins are accurate so counties align properly across datasets.

Timeline:

Week 1 (Apr 6–12):

- Start collecting ACS and nitrate data
- Begin joining spatial layers and doing basic calculations

Week 2 (Apr 13–19):

- Finalize the risk scoring method
- Make a draft version of the Leaflet map and Tableau dashboard

Week 3 (Apr 20–26):

- Improve visuals and explore adding a Highcharts graphic
- Begin sketching out HTML/CSS layout for the digital poster

Week 4 (Apr 27–May 3):

- Finalize the design, write descriptions for maps and charts
- Debug and test everything

Week 5 (May 4–9):

- Final polish, review, and submit the whole project