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Comparison of EPA AirToxScreen with Local Monitoring Stations and the Benefits for EJ Analyses

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RAMBOLL Bright ideas. Sustainable change.

Presentation Outline

1. Introduction to AirToxScreen through an Environmental Justice Lens
2. Salt Lake City Valley: Comparison of 2019 AirToxScreen to the 2017 NEI
3. Salt Lake City Valley: AirToxScreen Results and EJ Considerations
4. Contra Costa County: Comparison of AirToxScreen Results to EPA Benzene Monitors
5. Conclusion and Takeaways

2019 Air Toxics Screening Assessment (AirToxScreen or ATS)[1]

- Update 2017 NEI with 2019 data
- Estimate ambient concentration of air toxics:
  - CMAQ model
  - AERMOD model
- Estimate population exposure:
  - HAPEM7 model
- Characterize potential health risk from inhalation:
  - Cancer risk and noncancer hazard indices by pollutant

- US EPA's identified uses:
  - Prioritize pollutants and emission source types
  - Identify places of interest for further study
  - Focus community efforts
  - Inform monitoring programs

Acronyms

- NEI: National Emissions Inventory
- CMAQ: Community Multiscale Air Quality Modeling System
- AERMOD: American Meteorological Society/EPA Regulatory Model
- HAPEM: Hazardous Air Pollutant Exposure Model
- EPA: Environmental Protection Agency

Output → Reports and Maps

- Tables of emissions data
- Modelled concentrations, exposures & risks
- Mapping tool

Purpose

- Provide communities with information about health risks from air toxics
- Help agencies and public more easily identify existing and emerging air toxics issues

Limitations

- Data gaps
- Pollutant concentrations are not direct measurements (model simulations)
- Default assumptions
- Regional differences in emissions data completeness

1. https://www.epa.gov/AirToxScreen/airtoxscreen-overview

USEPA's Definition of Environmental Justice[1]

Environmental justice:

"The fair (just) treatment and meaningful involvement of all people regardless of race, color, national origin or income with respect to the development, implementation and enforcement of environmental laws, regulations and policies."

Fair (just) treatment requires that "no group of people should bear a disproportionate share of the negative environmental consequences resulting from industrial, governmental and commercial operations or policies."

Meaningful involvement is:

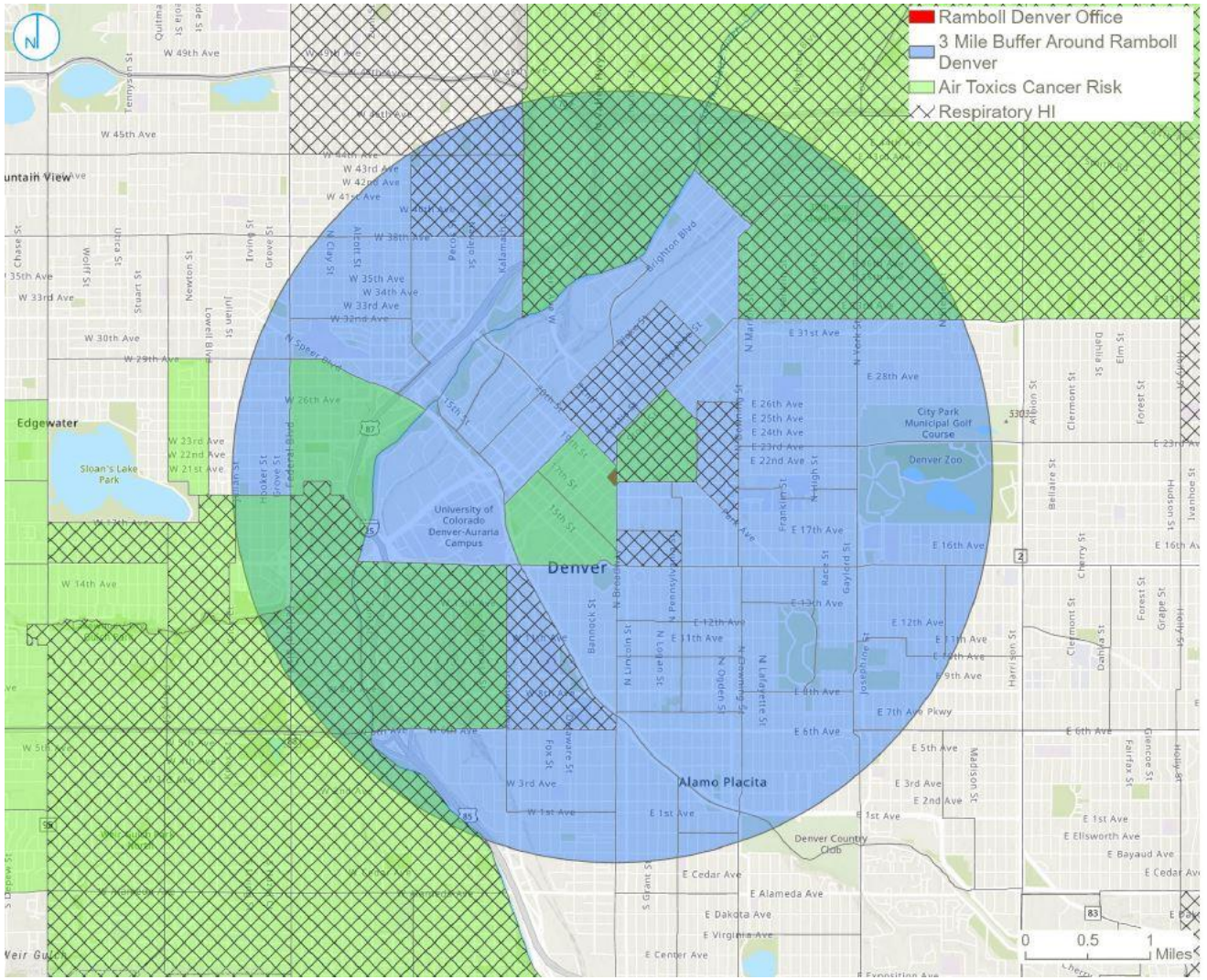
- People having an opportunity to participate in decisions about activities that may affect their environment and/or health
- Community concerns will be considered in the decision-making process
- The public's contribution can influence the regulatory agency's decision
- Decision-makers will seek out and facilitate the involvement of those potentially affected

1. https://www.epa.gov/AirToxScreen/airtoxscreen-overview

How ATS is used in EJ analyses

- Screening tools, such as EPA's EJ Screen, identify variables that warrant further research. Related to air toxics:
  - Air Toxics Cancer Risk
  - Respiratory Hazard Index (HI)
  - Combined with demographics

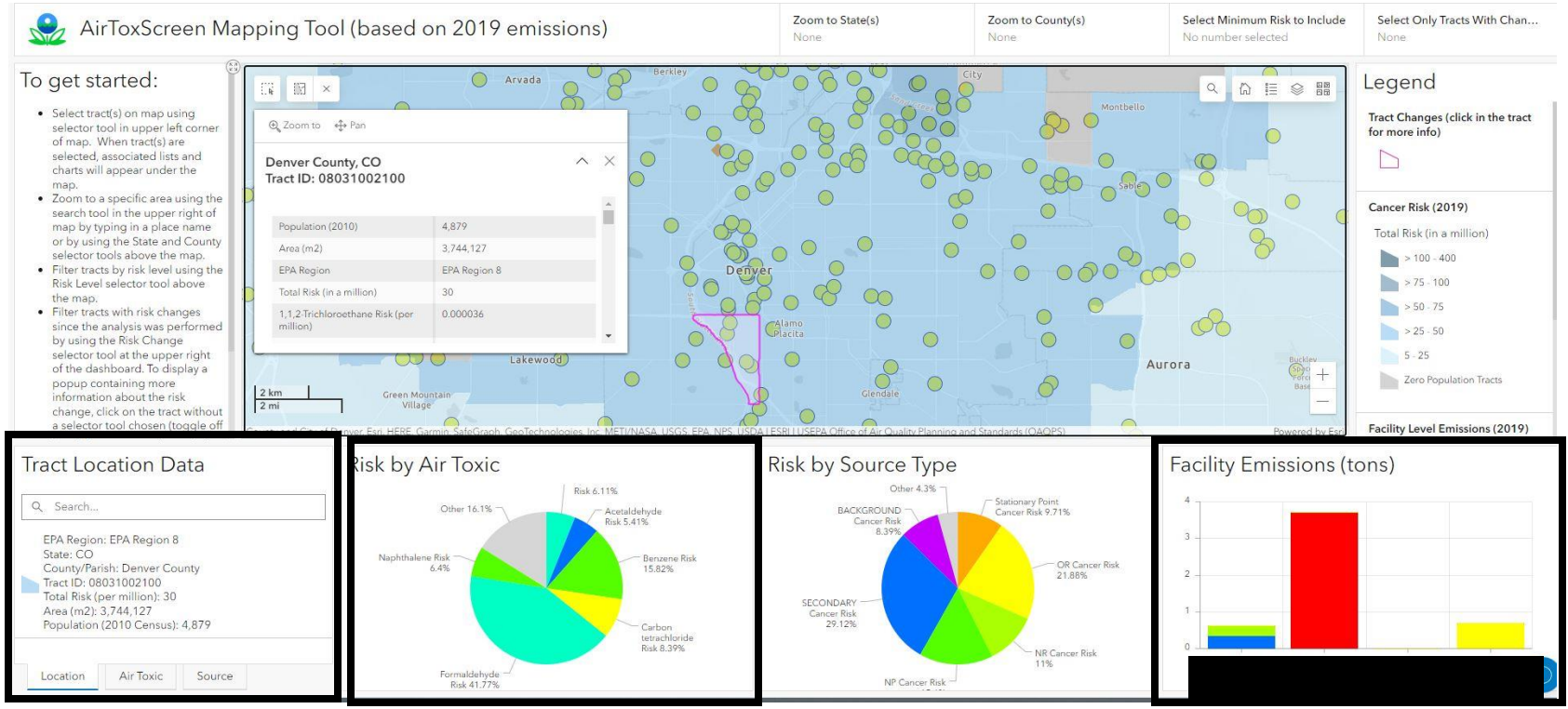
- **AirToxScreen** provides:
  - Chemicals that contribute to health risks
  - Source types that contribute to health risks
  - Facility-reported air toxic emissions



Expanding an EJ Analysis with AirToxScreen

- Mapping tool provides:
  - Chemicals contributing to cancer risk and respiratory HI
  - Tracts in a user defined area
  - Raw emissions from facilities (not weighted for risk)

- Does not provide:
  - Underlying raw data tables
  - Ability to import a shapefile
  - Ability to draw a buffer on an area (will include all information from intersecting tracts)
  - Risk-weighted facility contributions



Ramboll Method to Add Efficiency to AirToxScreen Analysis

Inputs

User Defined:
- Facility shapefile
- Buffer distance
- State(s)
- Directory paths

Stored in Code:
- 2019 ATS results:
  - Facilities
  - Risk
- CEJST census tracts

~ 1 hour for setup

Analysis Steps

1. Read in shapefile, buffer, and census tracts. Ensure consistent coordinate systems.

2. Read in ATS risk and facility data. Filter to only include facilities/tracts in the study area

3. Identify the key chemical contributors to both cancer and non-cancer risk

~ 5 min to run the code

Outputs

- Facilities and tracts in the buffer
- Facilities and tracts in the surrounding counties
- List of chemicals contributing to risk
- Filtered reports of cancer risk and hazard index for the study area

Part 1: Comparison of 2019 AirToxScreen Data to 2017 NEI in the Salt Lake Valley

Salt Lake Valley: Comparing 2019 ATS to 2017 NEI/ATS

- **Recall:** AirToxScreen (2017-2019) is based on 2017 NEI.
  - 2020 and 2021 AirToxScreen results are in progress and will be based on 2020 NEI
- 2019 updates based on **actual data**[2]:
  - Larger point sources: update with 2019 emissions
  - Fire and biogenic emissions: updated to 2019 models
- 2019 updates based on **projections**[2]:
  - Commercial airports: terminal airport forecasts
  - Fugitive dust: projected using vehicle miles
  - Onroad mobile emissions: federal highway annual data
  - Railyard emissions: projected activity

EPA Guidance on Comparing Assessments[1]

Over the years, EPA has improved its air toxics screening assessments in several ways:

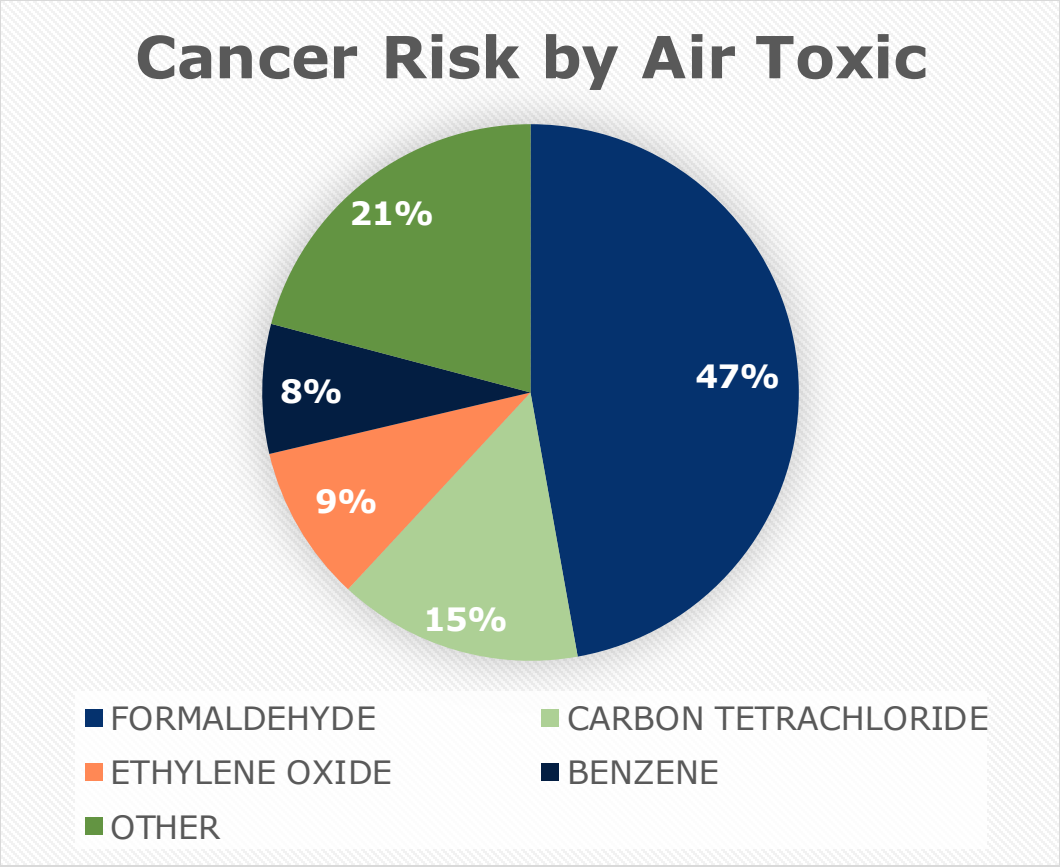
- Better source and emissions inventories
- Updates to models used
- Modelling more air toxics
- Latest science on how air toxics affect health

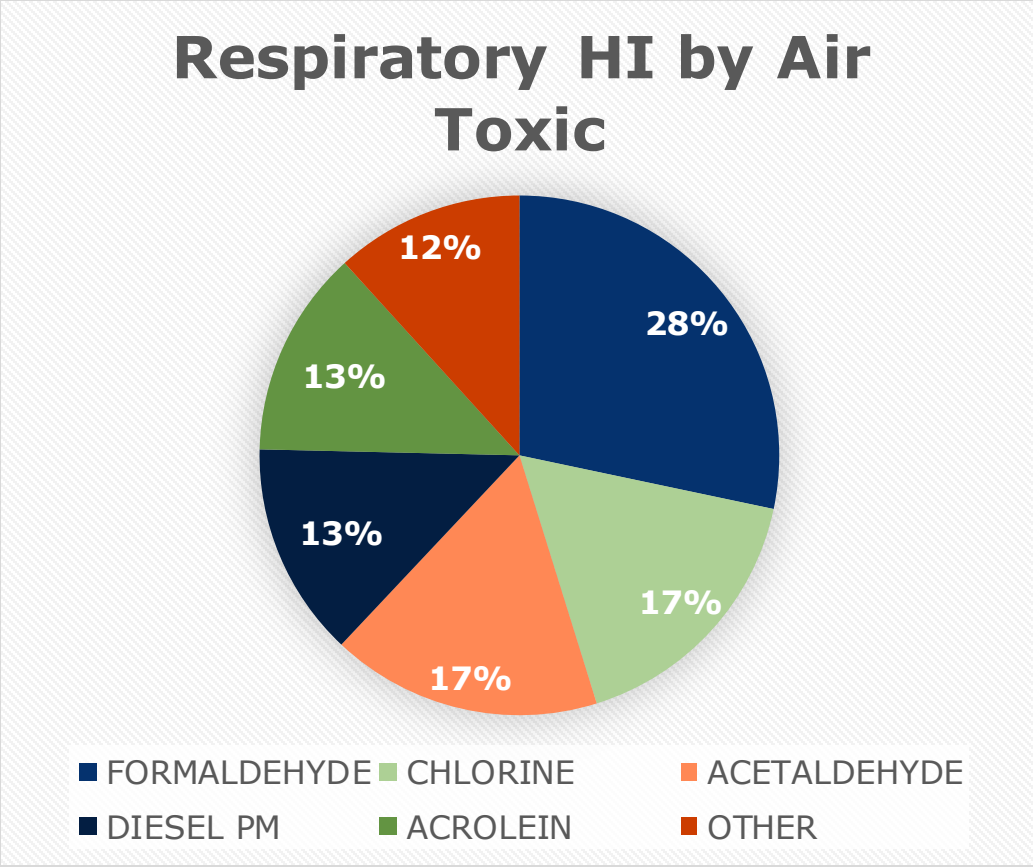
Use caution when comparing data from different years

1. https://www.epa.gov/AirToxScreen/airtoxscreen-overview
2. https://www.epa.gov/AirToxScreen/airtoxscreen-frequent-questions#emm16

2019 AirToxScreen: Chemicals Contributing to Cancer Risk and Respiratory HI in the Salt Lake Valley

- Will focus on the main chemicals contributing to cancer risk and respiratory HI
- Use facility data of these reported emissions





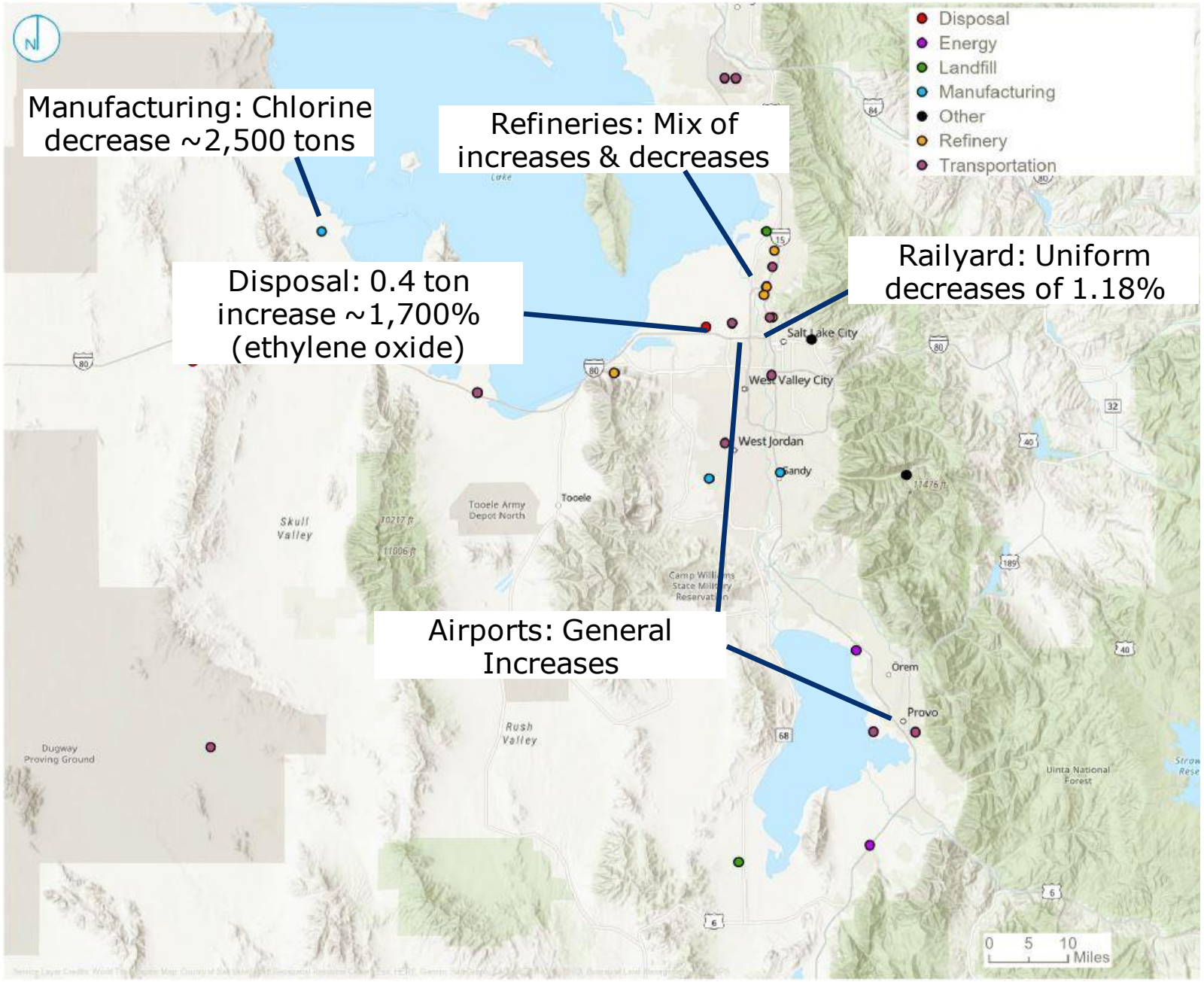
Notable Changes in Facilities 2017 to 2019

- **Railyards:** uniform decrease shows projections in action

- **Refineries are mixed:**
  - Benzene increases in 1 of 5 refineries

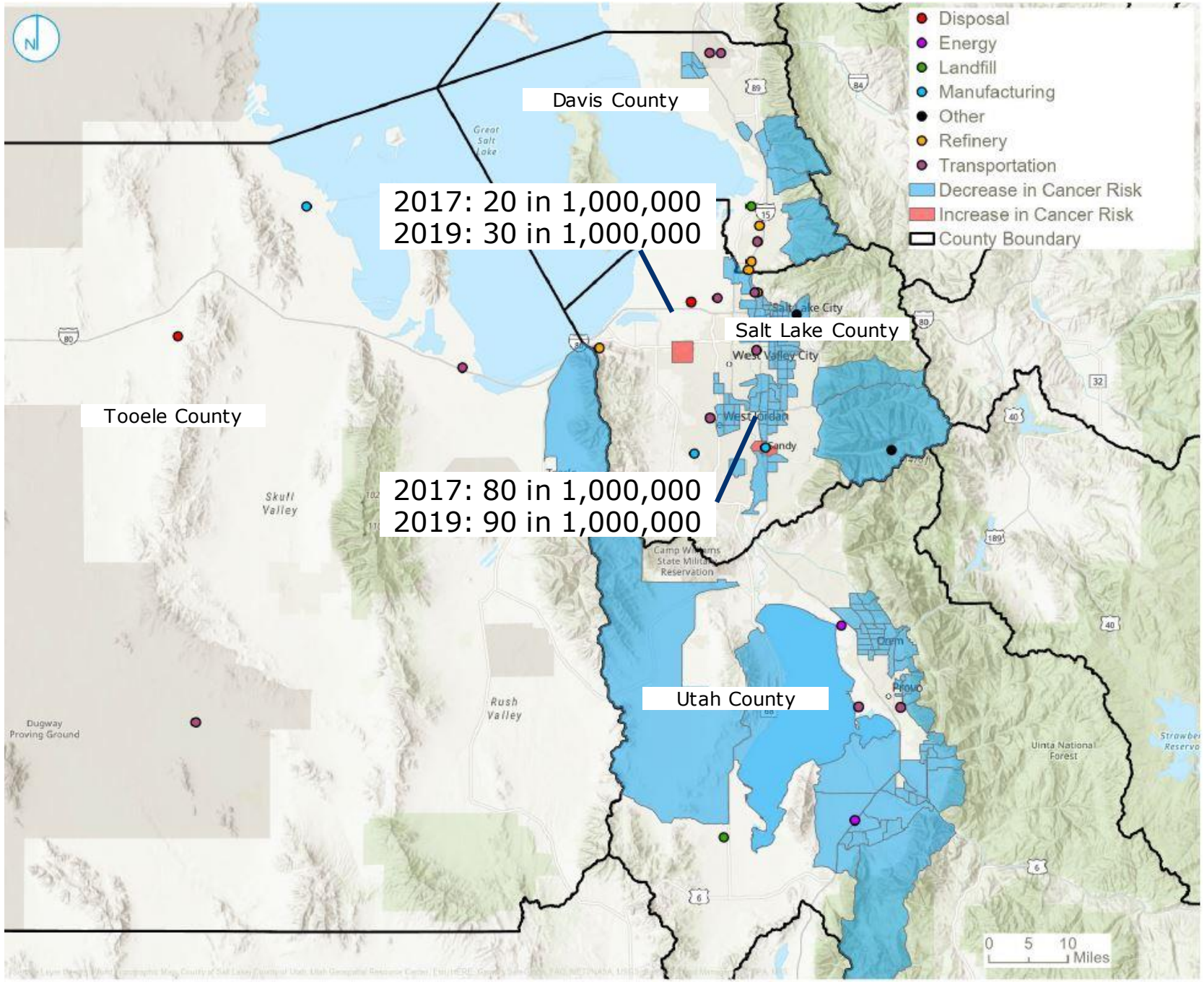
- **Point sources:** Can be difficult to quantify the significance of change:
  - Reduction of 2,500 tons ~60%
  - Increase of 0.4 tons ~ 1,700%

- **Commercial airports:**
  - Increases in acetaldehyde, benzene, and formaldehyde



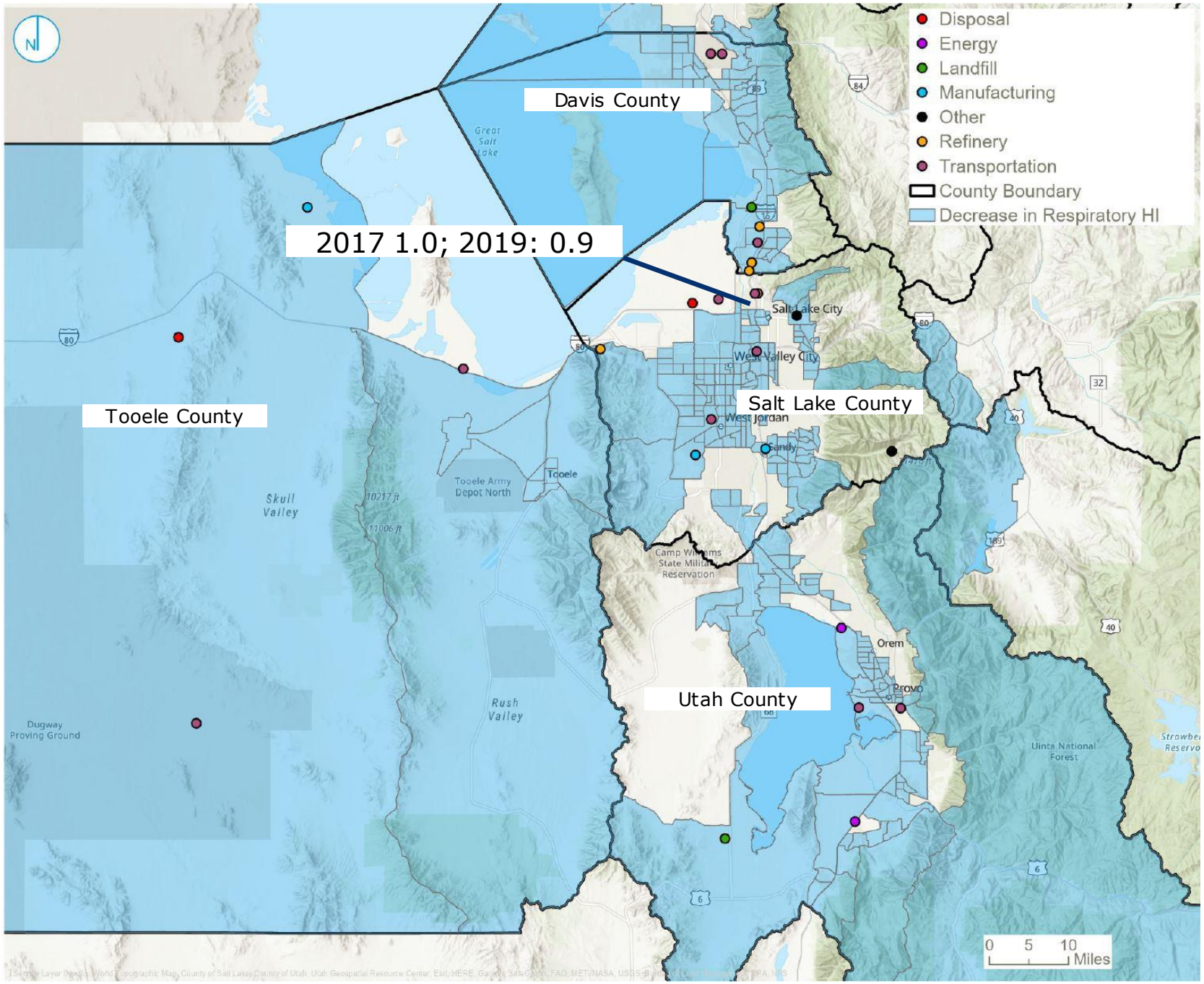
Changes in Cancer Risk 2017 to 2019

- **Acceptable risk** is 100 in 1,000,000
- **Increased** cancer risk in only **2 out of 424** census tracts
  - 1 of the 2 close to potential risk
- **Decreased** cancer risk in 143 out of 424 (**34%**) of census tracts
- No change in the Western Salt Lake Valley and northern Utah County



Changes in Respiratory HI 2017 to 2019

- Values **below 1.0** indicate noncancer health **impacts are unlikely**
- Widespread respiratory HI decreases in 266 out of 424 (63%) of census tracts
- No increases in respiratory HI
- One census block's value reduced from 1.0 to 0.9



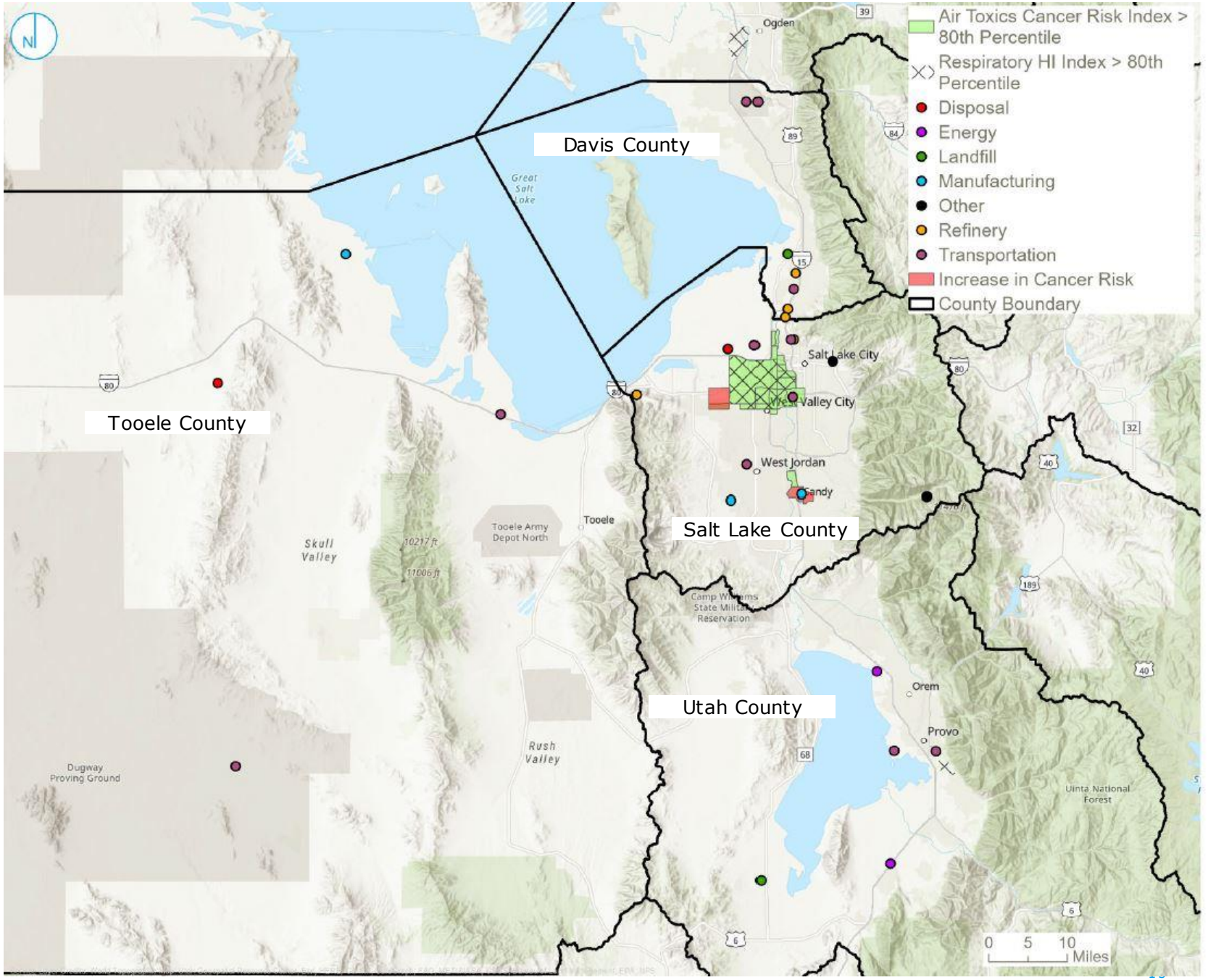
Part 2: EJ Considerations based on AirToxScreen Results

Comparison to EJ Screen Data

- EJ Screen combines environmental indicators with demographic data:
  - Air toxics cancer risk or respiratory HI
  - Low-income and people of color population

- Important observations:
  - Most communities above 80th percentile are near downtown and transit
  - Tracts above 80th percentile in map have decreasing cancer risk and respiratory HI

- Theoretical next steps:
  - Combine modeling data to identify upwind contributors
  - Analyze demographic information to add more information

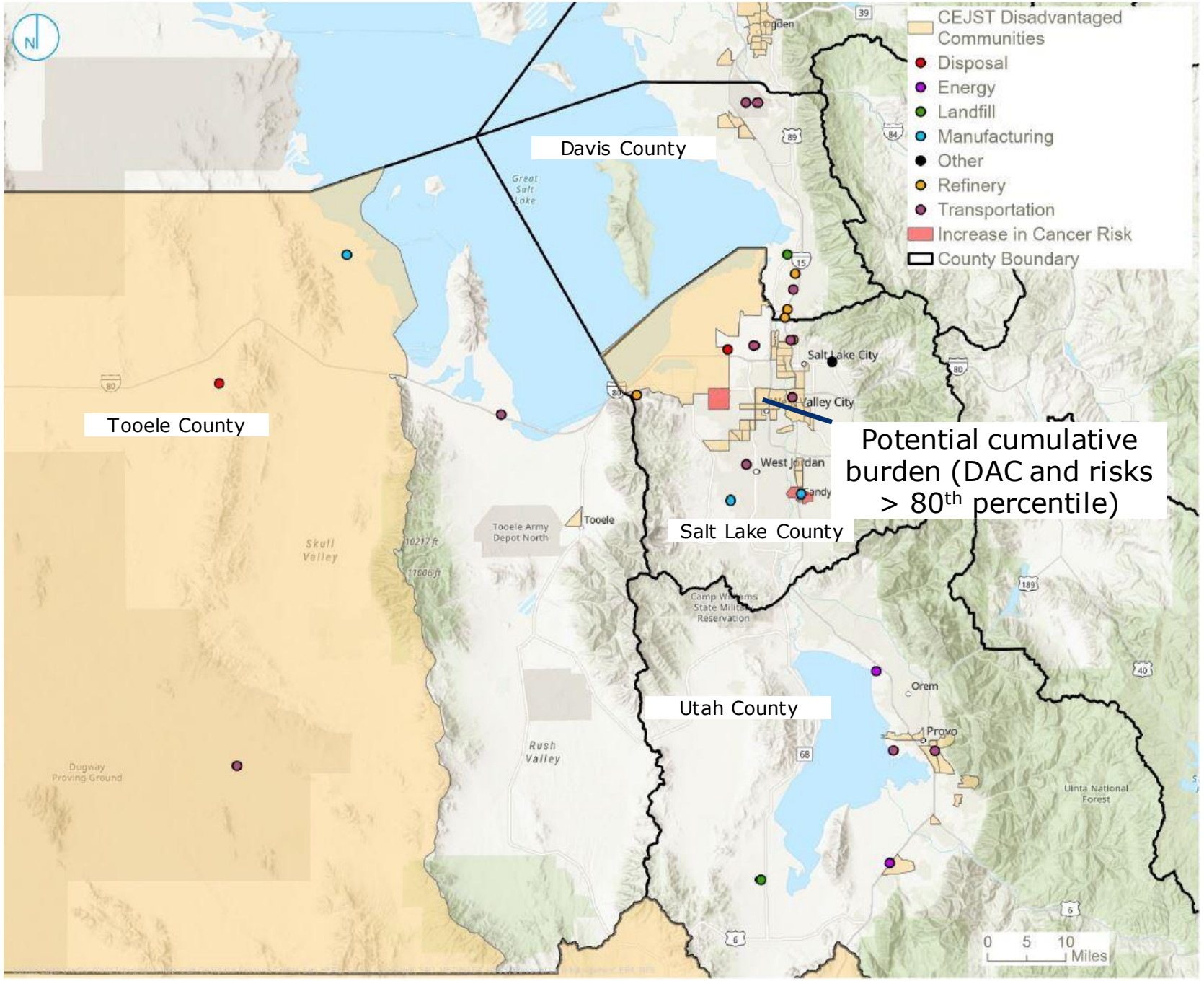


Comparison to CEJST Data

- Climate and Economic Justice Screening Tool (CEJST) identifies disadvantaged communities (DACs)
  - Communities warrant additional consideration

- Factors for DAC classification:
  - Low-income population
  - High school non-attainment
  - Asthma
  - Traffic Proximity and Diesel PM

- Important Takeaways:
  - General decrease in cancer risk and respiratory HI in DACs
  - Increase in cancer risk **not** in DACs
  - Further research can help connect ATS results to asthma

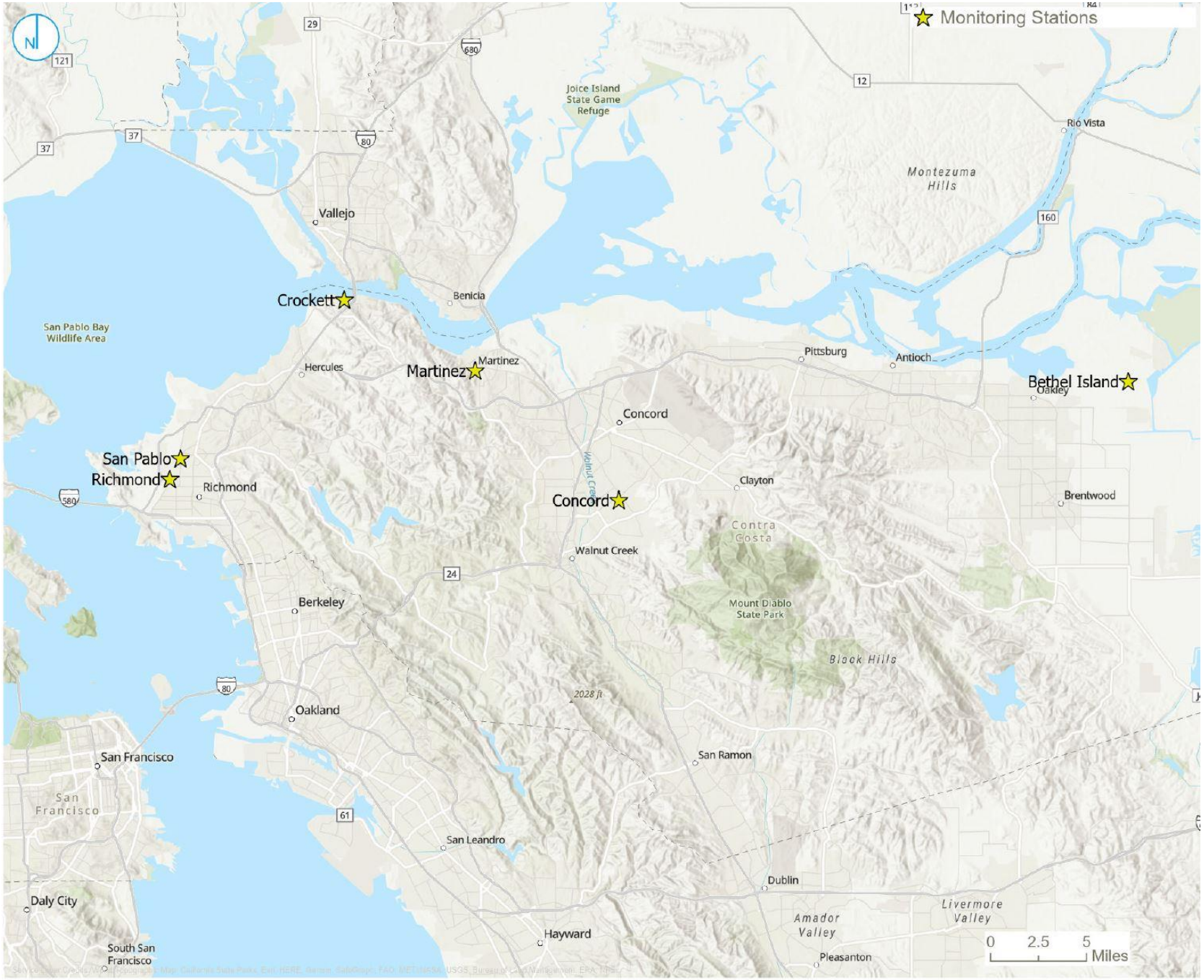


Part 3: Comparison of AirToxScreen Data to Monitors

Monitoring Network Study Area

- EPA Outdoor Air Quality Hazardous Air Pollutants (HAPS) Monitor Values Report
  - 6 stations in Contra Costa County
- Benzene Data Available:
  - 4th largest contributor to cancer risk
- Comparison:
  - How do monitors match up with AirToxScreen-predicted ambient concentrations
  - What discrepancies exist that require further investigation

Note: AirToxScreen results **not supported** by this monitoring network



2019: Comparison of AirToxScreen to Local Monitors

Location	Monitor Average (µg/m³)	ATS Ambient Concentration (µg/m³)	% Difference Ambient Concentration
San Pablo	0.428	0.220	+95%
Concord	0.339	0.201	+69%
Richmond	0.285	0.282	+1%
Martinez	0.283	0.215	+32%
Bethel Island	0.261	0.178	+47%
Crocket	0.181	0.295	-39%

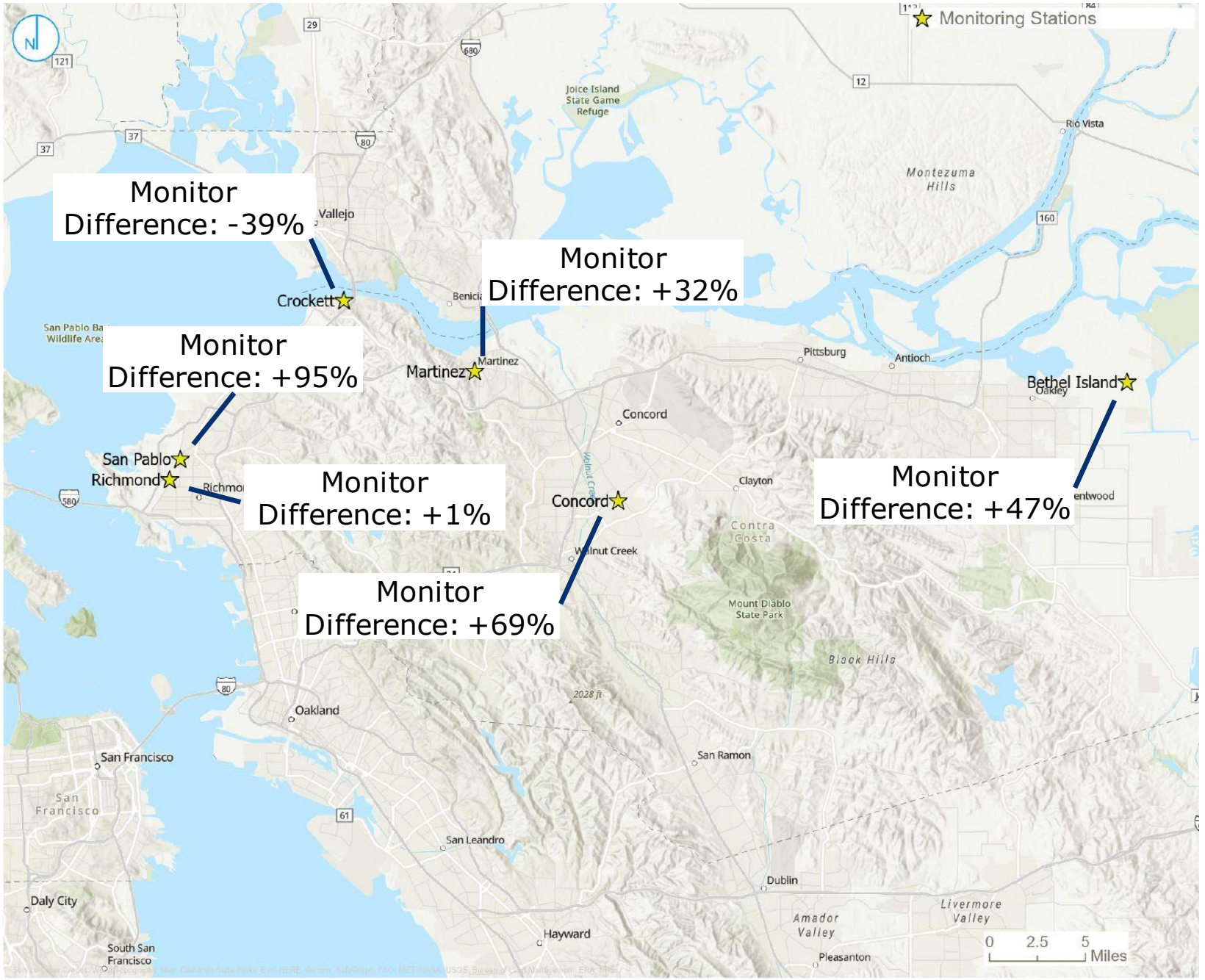
- All monitors (except one) are higher than the ATS predicted ambient concentration
  - Various degrees of discrepancies exist
- Patterns in the monitors do not match patterns in ambient concentrations
  - Highest monitor concentration is 4th highest ATS ambient concentration
  - Highest ATS ambient concentration is lowest monitor concentration

Comparison Takeaways

- Monitors reading higher concentrations of Benzene show potential patterns

- Discrepancies do not mean one dataset is better or worse:
  - Monitors are sparse and cover a small area
  - ATS data covers census tracts
  - Must acknowledge differences and need for additional research

- Differences can be investigated to improve ATS models:
  - Would need more extensive monitoring network
  - Confidence in monitors may mean ATS ambient concentrations are biased low



General Takeaways and Conclusions

General Takeaways and Conclusions

- Comparing 2019 ATS to 2017 ATS/NEI demonstrates general risk decreases in the Salt Lake Valley:
  - Impacted by **more accurate** point source data, modeled data, and projections of trend behavior
  - **Year to year comparisons** are one way the **public uses this data**

- AirToxScreen adds a layer of information to EJ analyses
  - Shows what **chemicals drive** air toxics cancer **risk** and respiratory HI
  - Shows which sources emit chemicals that contribute to risk
  - Shows whether risk in certain areas of interest is increasing or decreasing

- Comparing ATS data to monitoring data can help identify potential patterns:
  - Contra Costa County monitors showed **consistently higher benzene** concentrations than ATS
  - Systematic comparison between ATS and monitoring data could help identify pollutants, sources, or geographic areas where refinement of emissions inventories would provide more accurate ATS results
  - More extensive monitoring network would lead to higher confidence in the comparison

Takeaway: AirToxScreen, **which is based on the NEI**, is a great tool for gathering information, but **proceed with caution** when using data to make decisions`

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Contact us if: You are curious how AirToxScreen can add value to your EJ analysis or if you have a site that could benefit from an in-depth AirToxScreen analysis.