Analysis of 2000-2011 Arizona Dust-Related Traffic Incidents

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March 5, 2013
Dust Storm Workshop

Data Source

- Annual Traffic Incident Database compiled by Arizona Department of Transportation (ADOT), Risk Management Section

- Data are stored in CSV format with one year's worth of data on one CD

- Years used: 2000-2011

- Public request sent to ADOT

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Data Methodology, 2000-2011

- Total incidents statewide: **1,531,331**

- Records were screened for the "Weather" flag

- Latitude and Longitude values required for Geographic Information Systems (GIS) analysis

- After weather and lat/long filters applied, **1,446** were flagged with weather factor identified as dust/sand

  - 29 incidents had 1+ fatalities
  - 520 incidents had 1+ injuries with no fatalities
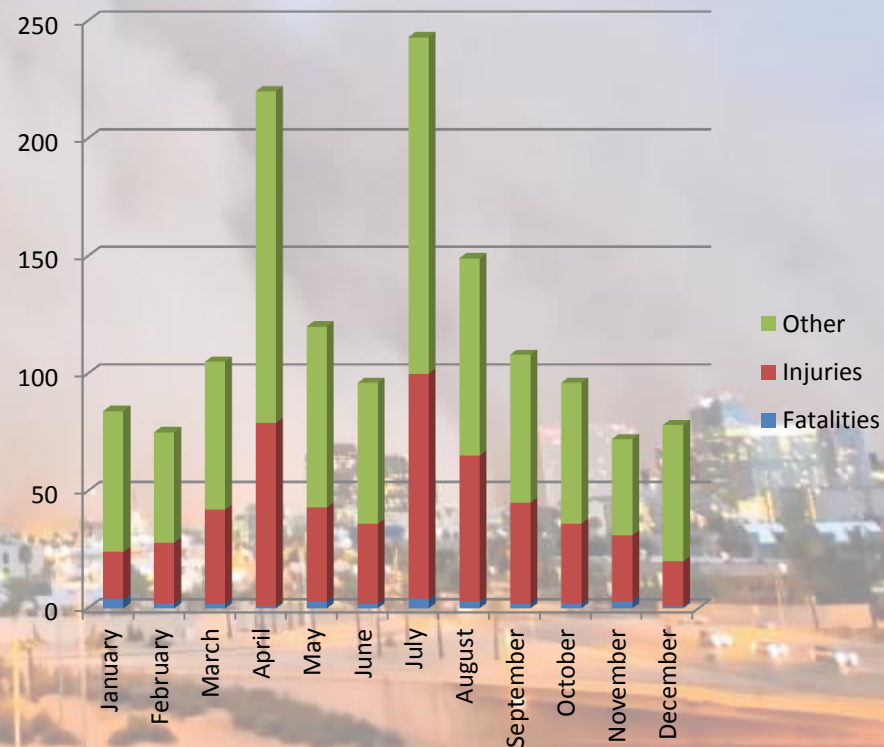 - 897 incidents had no reported injuries/fatalities

Weather Flag	Meaning
0	No weather
1	Clear
2	Cloudy
3	Sleet/Hail/Freezing Rain
4	Rain
5	Snow
6	Severe crosswinds
7	Dust or sand
8	Fog or smoke
9	Blowing Snow
97	Other
99	Unknown

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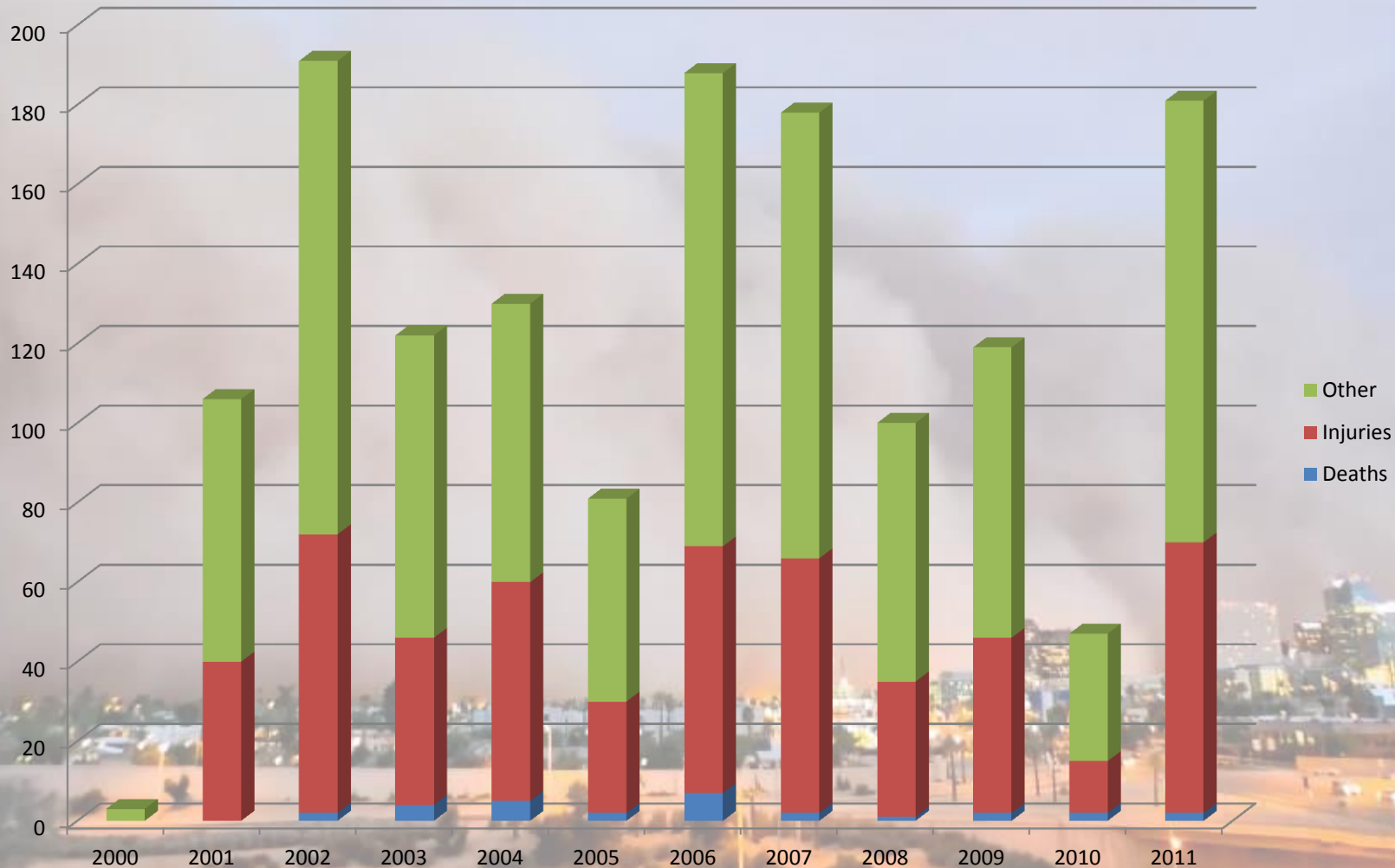# Dust-Related Incidents by Month
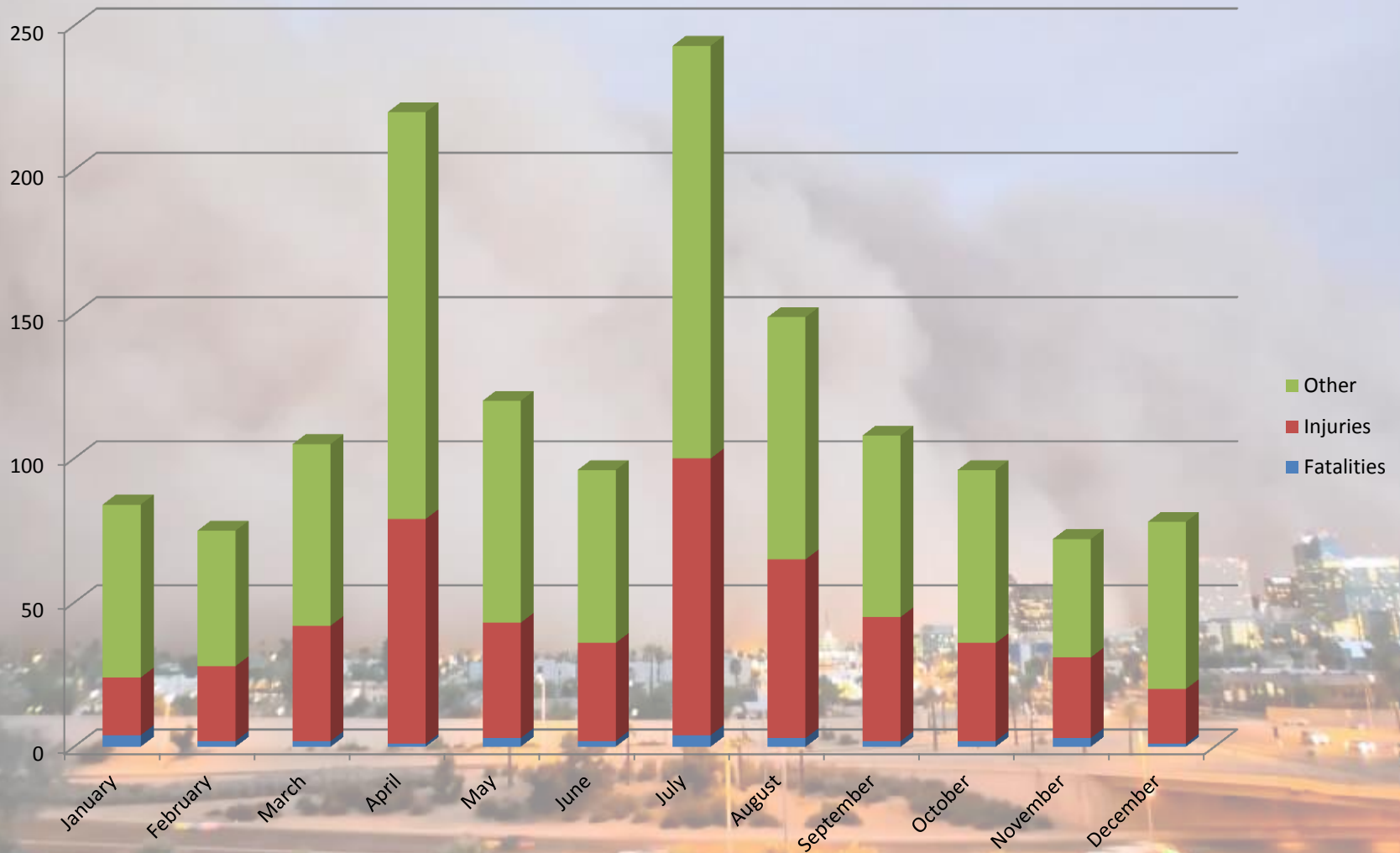
Monthly Analysis

- Two peaks

  - April: likely due to synoptic spring wind events, especially across Northern Arizona [e.g., I-40]
  - July: definitely due to high frequency of monsoon thunderstorms --- downbursts producing dust storms

- Note that dust-related incidents occur **year-round**

Legend: Other, Injuries, Fatalities

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Dust-Related Incidents by Year

NOTE: Only a few reports from the year 2000 included latitude and longitude and so those records could not be used in this study.

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Yearly Analysis

- High values in 2002, 2006, 2007, and 2011

- Seems to correlate well with drought/precipitation pattern

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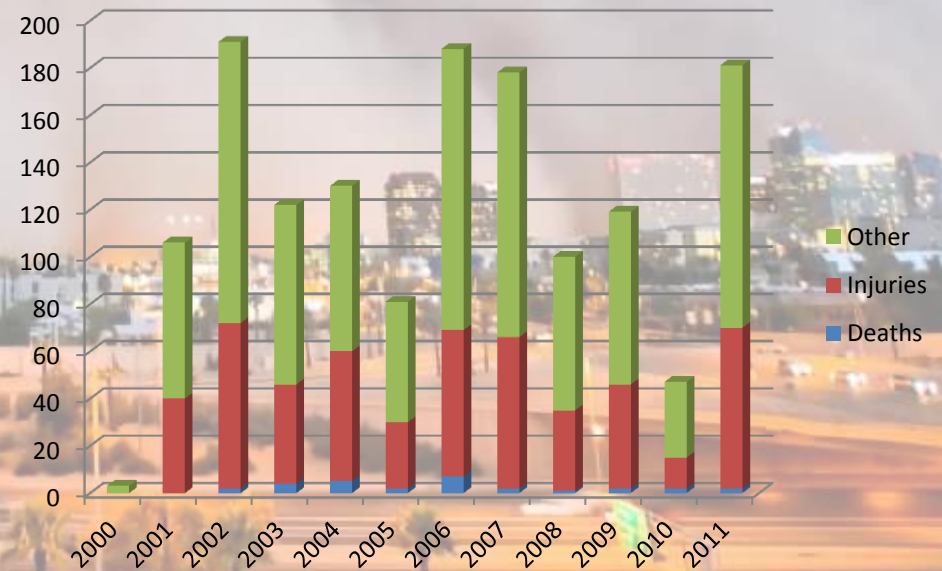
Geographic Analysis

- Initial Observations:
  - As expected, strong correlation with traffic density (greatest numbers in Phoenix and Tucson and points between)
  - Some indication of "clumping" of reports indicating possible trouble spots --- more apparent after zooming

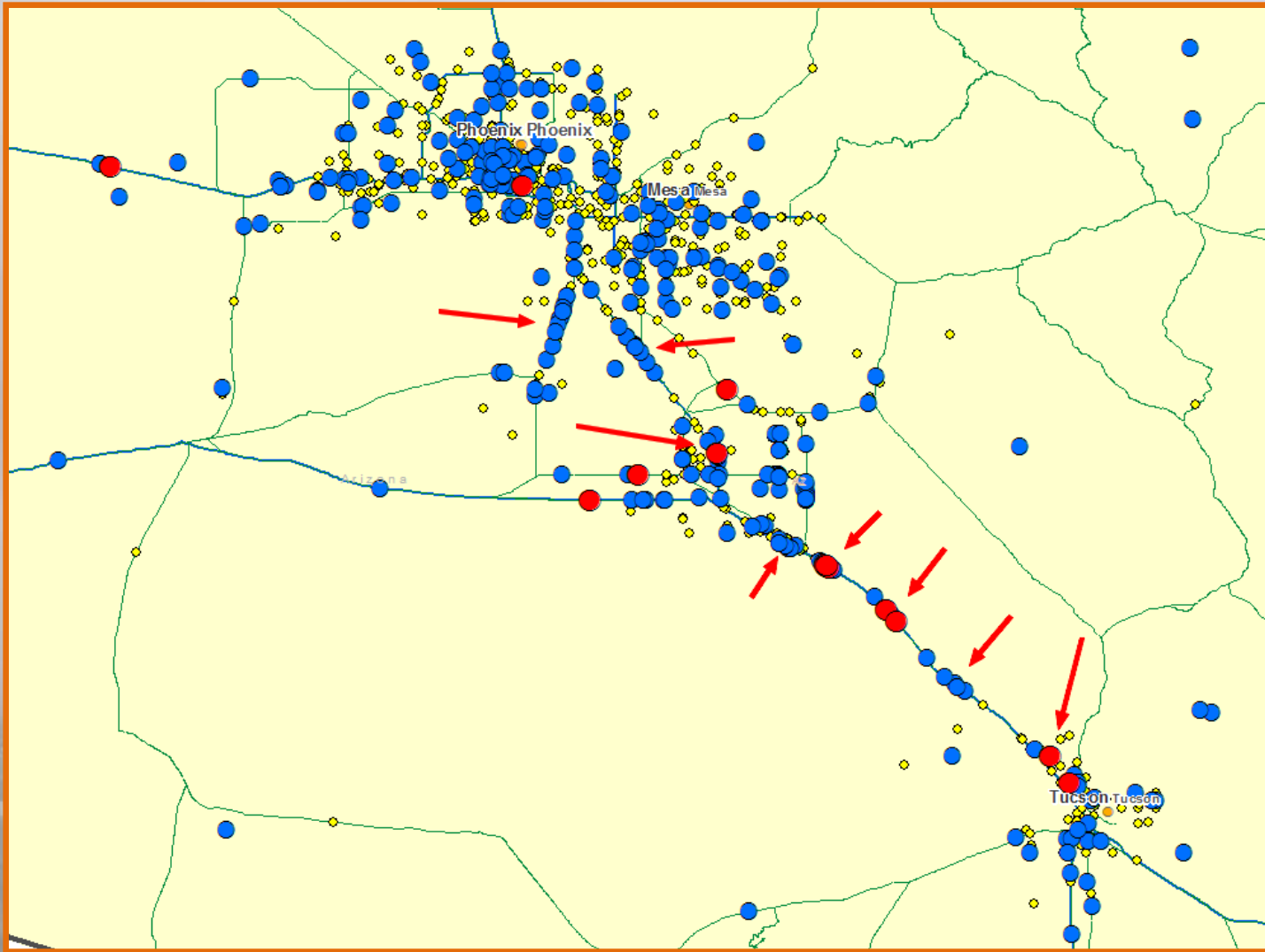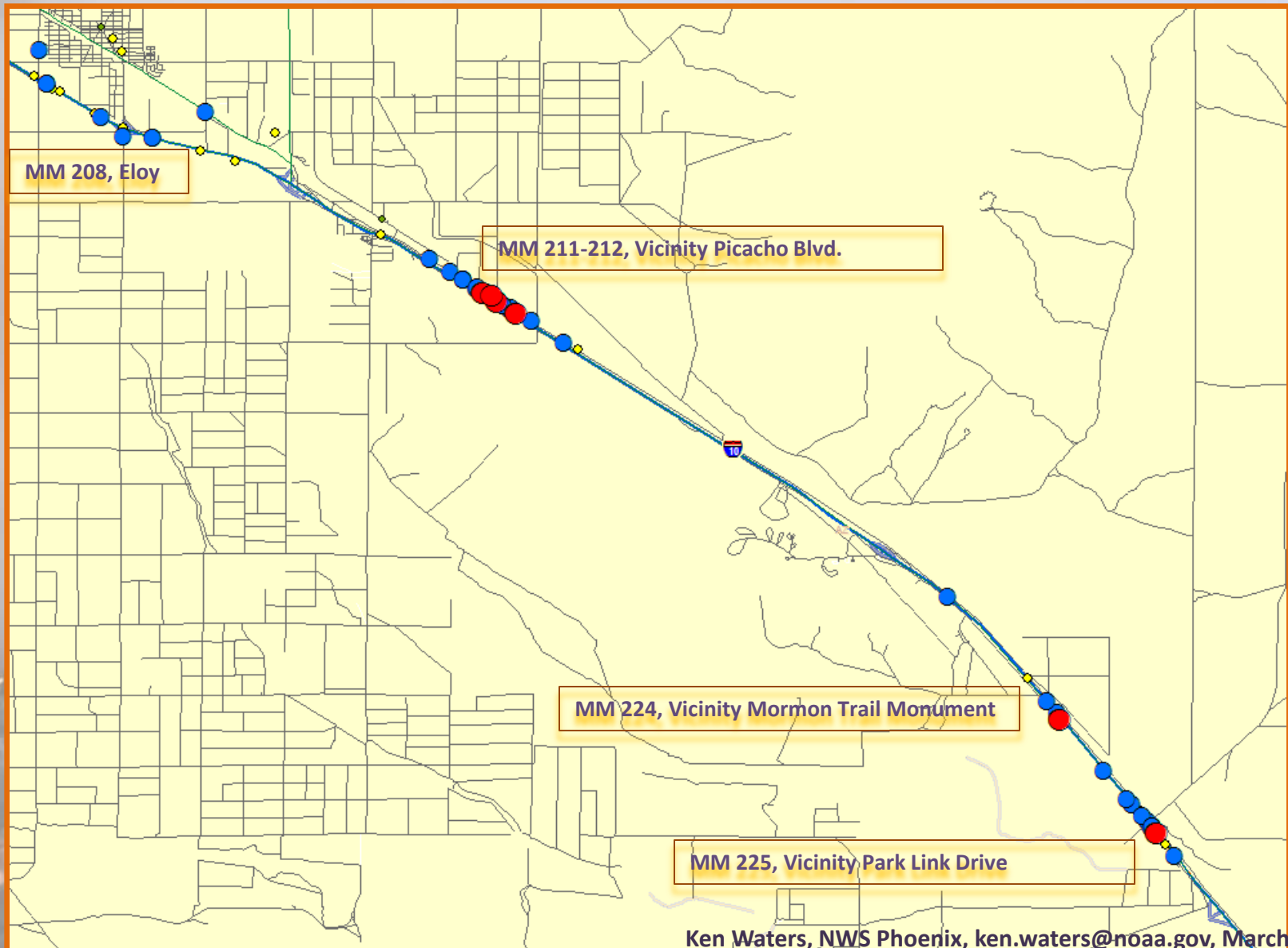Arizona Dust-Related Traffic Incidents
2000-2011
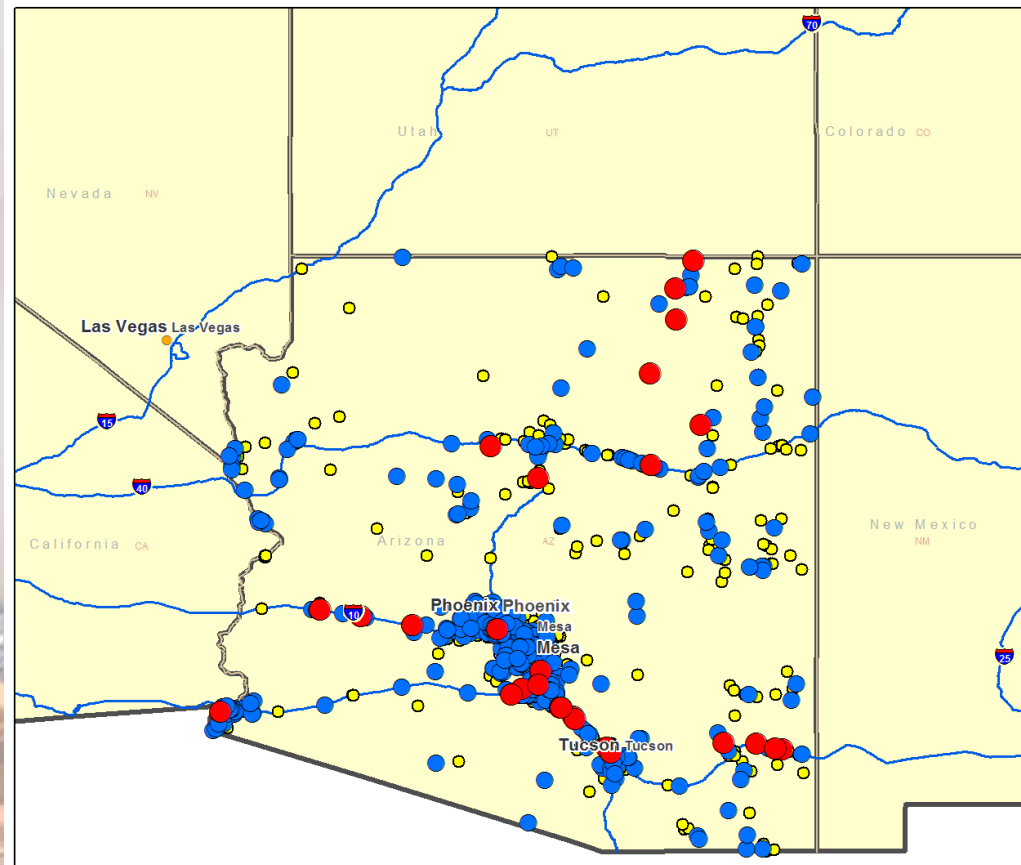
Legend

- 🔴 ADOT-2000-2011 - Deaths.csv Events
- 🔵 ADOT-2000-2011 - Injuries.csv Events
- 🟡 ADOT-2000-2011 - No Inj-Deaths.csv Events

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Problem Area Identification

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I-10 Corridor Phoenix-to-Tucson

MM 208, Eloy

MM 211-212, Vicinity Picacho Blvd.

MM 224, Vicinity Mormon Trail Monument

MM 225, Vicinity Park Link Drive

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Casa Grande

MM 192, Vicinity McCartney Rd to Cottonwood
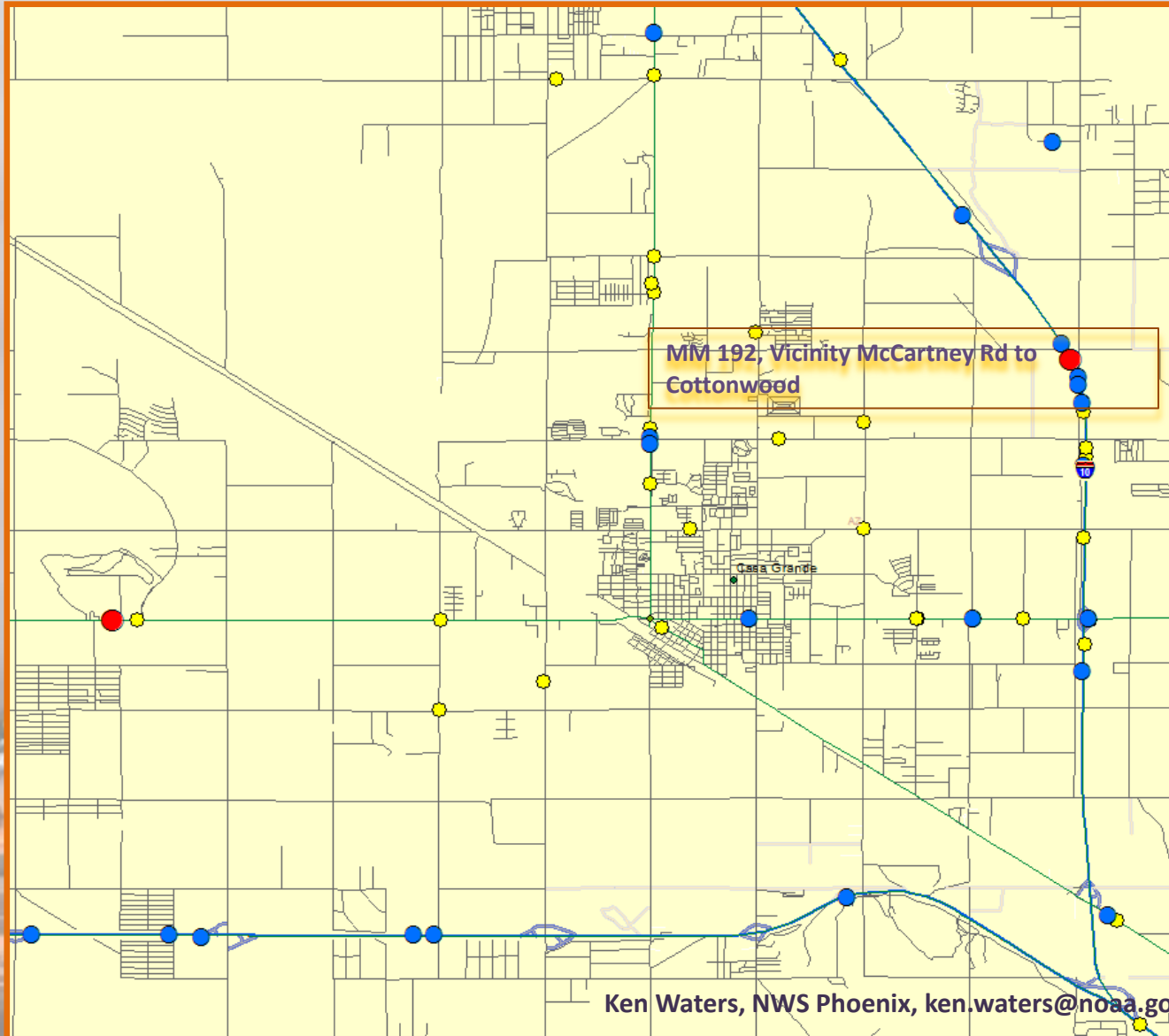
Casa Grande

Northeast of Eloy, East of Casa Grande

Eleven Mile Road & AZ-287

Selma Hwy & AZ-87

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Maricopa to Sun Lakes

AZ-347 (Maricopa Hwy) near Casa Blanca Rd.

I-10 MM 175, Near AZ-587 & Nelson Rd.

Maricopa

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Yuma

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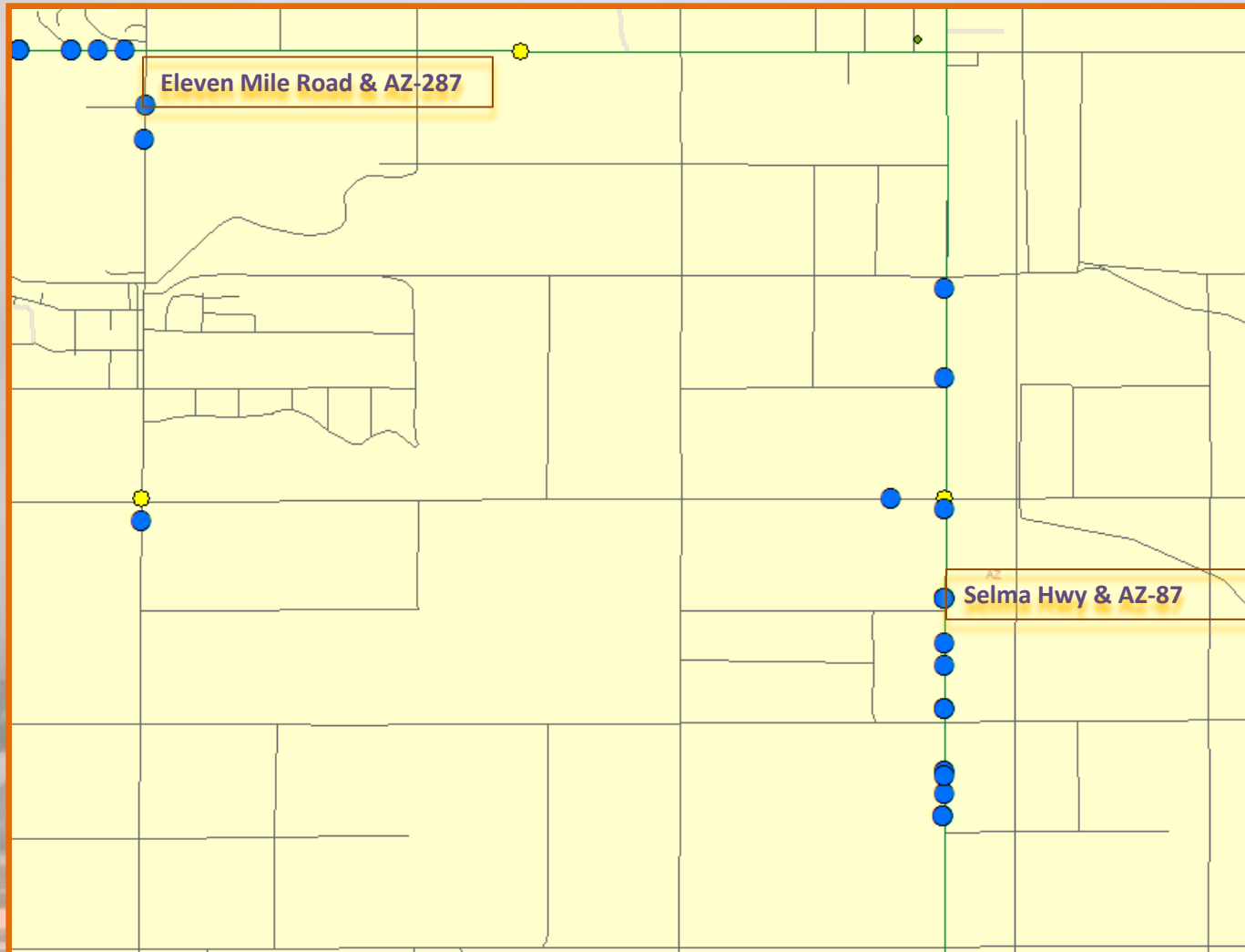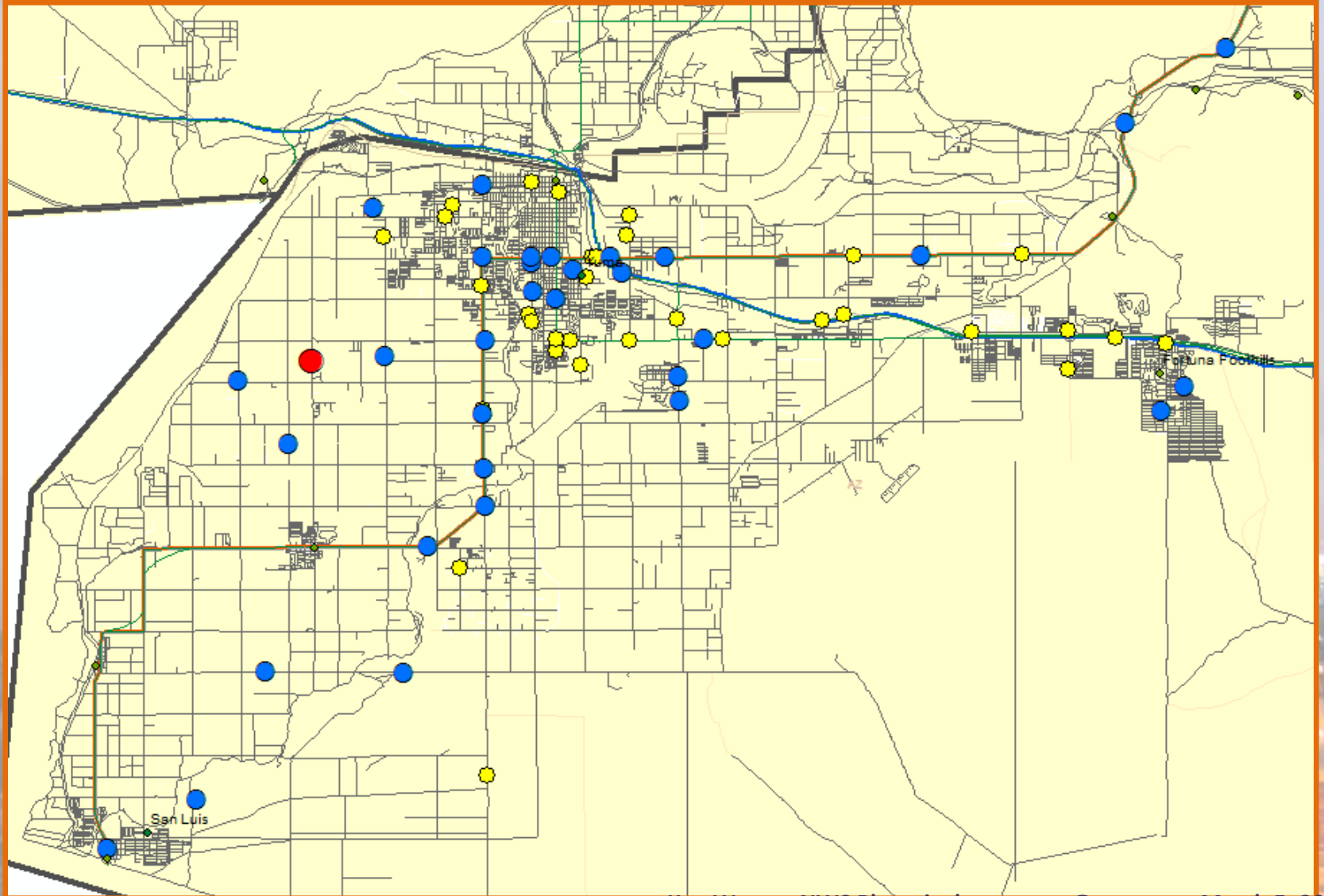
Tucson

I-10 Willcox to San Simon

Willcox

Bowie

San Simon

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I-40, Winslow to Holbrook

Labels show date of incident. Note many occurred during March and April
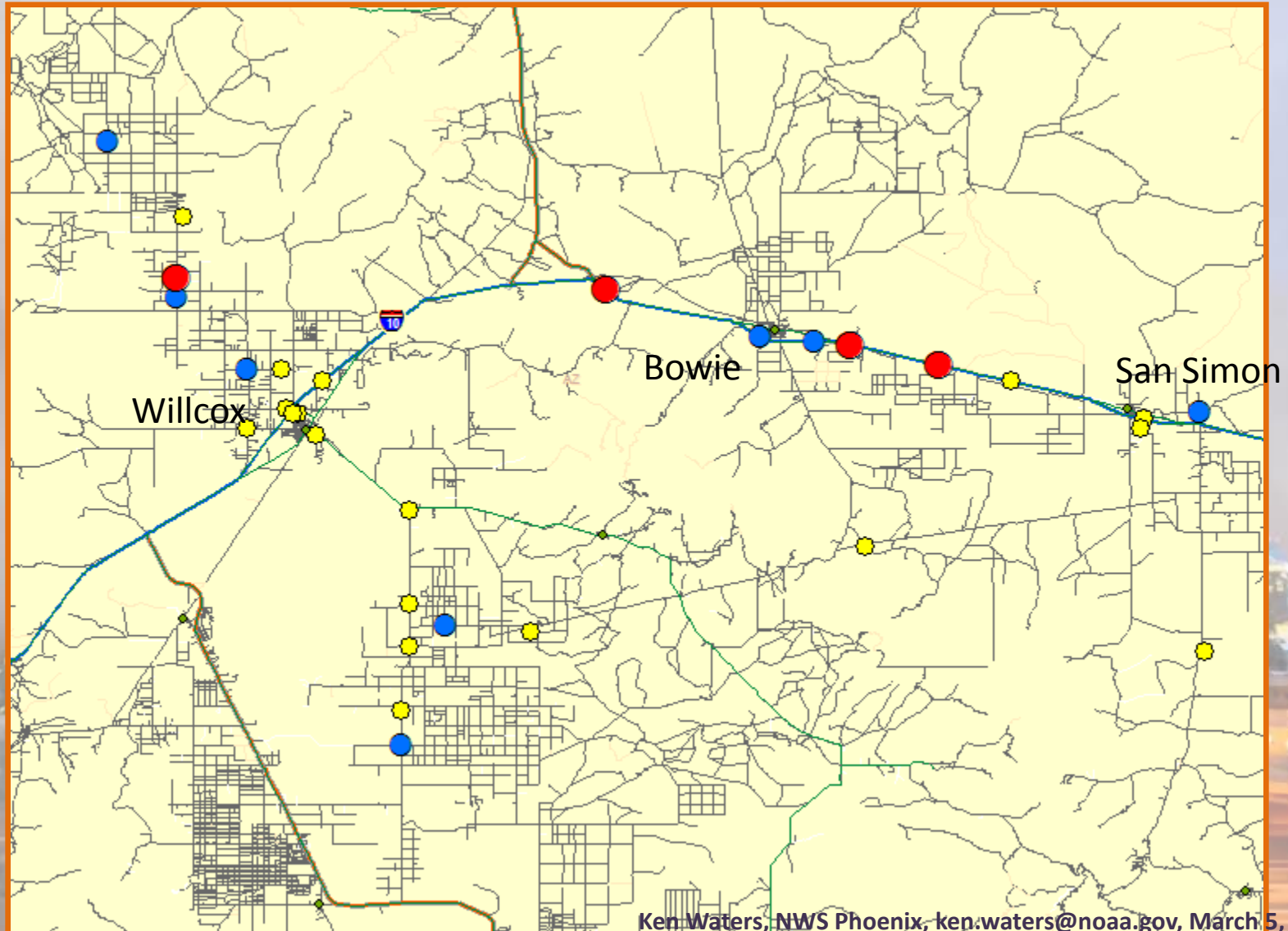
Conclusion

- ADOT Accident Database useful to find temporal and geospatial trends
  - Common problem locations with high frequency of accidents
    - Linked with land use data can be used for mitigation
    - Helps identify locations where dynamic alert signs would be useful
  - Linked to drought/precipitation patterns

- Questions?
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  - 602-275-0073

Dust Origins Project

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Goal

- Develop a database of Dust Events for 2011 and 2012 to determine "Dust Origin" locations from thunderstorms.

Methodology

- Define events from 2011 and 2012 using Dust Warning issuances and reports.

- Review radar data using GR-Analyst to determine locations of initial outflow resulting in dust.

- Plot the data using ESRI GIS online explorer

2011 and 2012 Dust Origins

Caveats

- The single point referenced was the first initiation of strong winds originating from the early thunderstorm(s) of the day.

- As the cold outflow air is pushed away from these initial storm(s), new storms then form thus creating new outflow and additional dust.

- The secondary or third series/clusters of storms are not plotted for both simplicity and because they are too numerous.

Future Work Possibilities

- Combine the "Dust Origin" data with land use data to determine similarities.

- Create data sets for additional years.

- Differentiate event types

Questions?

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