ADWR's Land Subsidence Monitoring Program and the Arizona Continuously Operating Reference Station Network (AZCORS)

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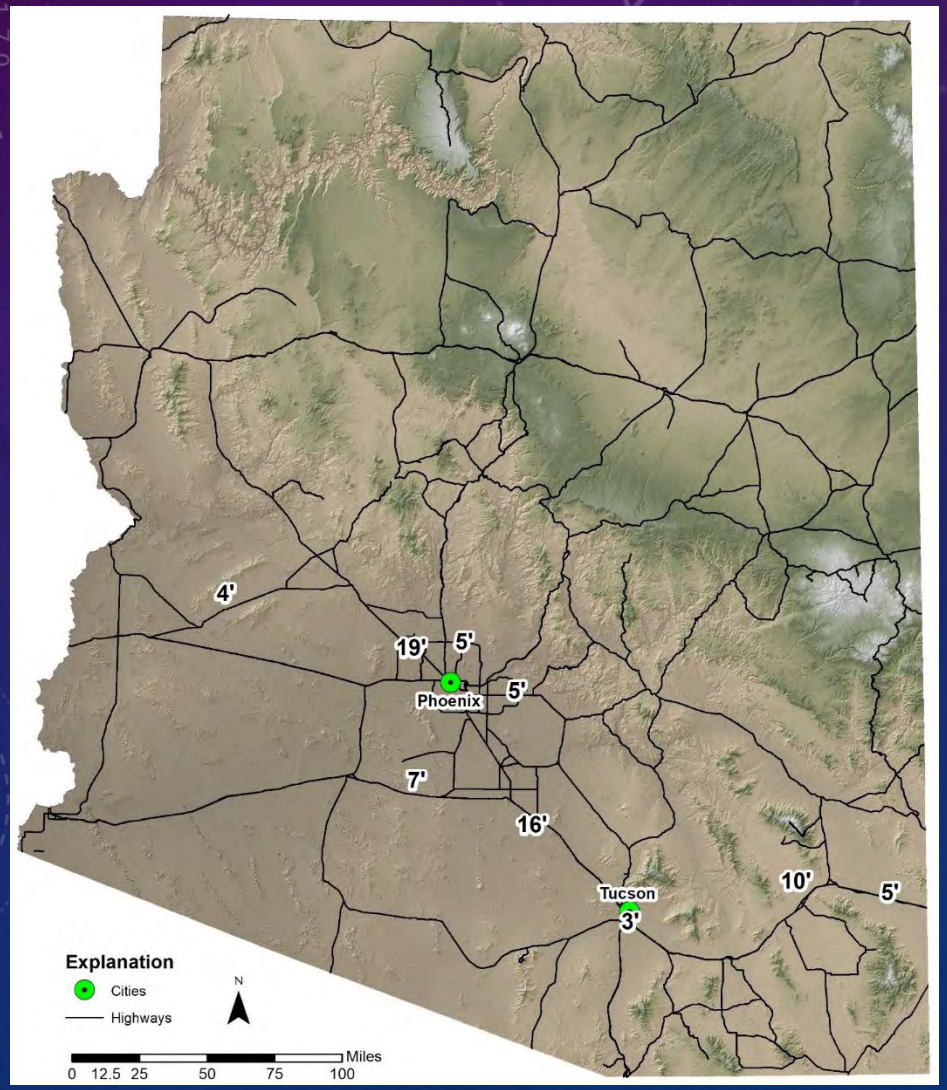
Protecting Arizona's Water Supplies For Its Next Century

ADWR's Land Subsidence Monitoring Program

- Repeat surveys revealed land subsidence up to 19 feet



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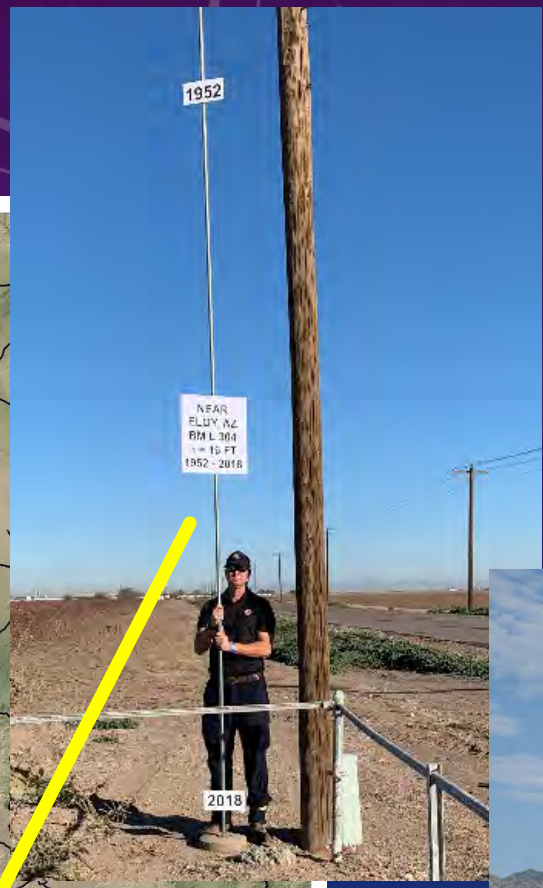
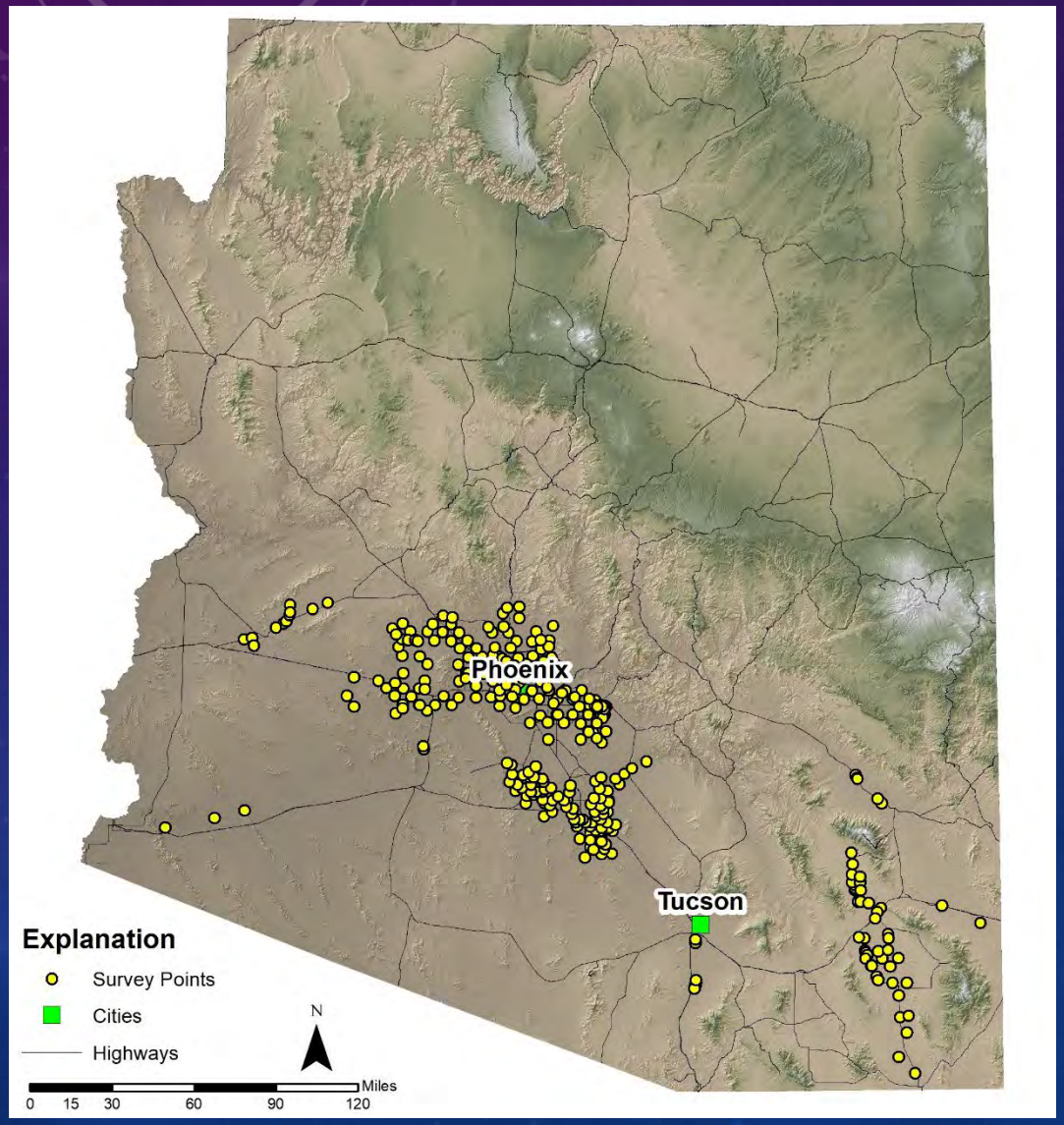


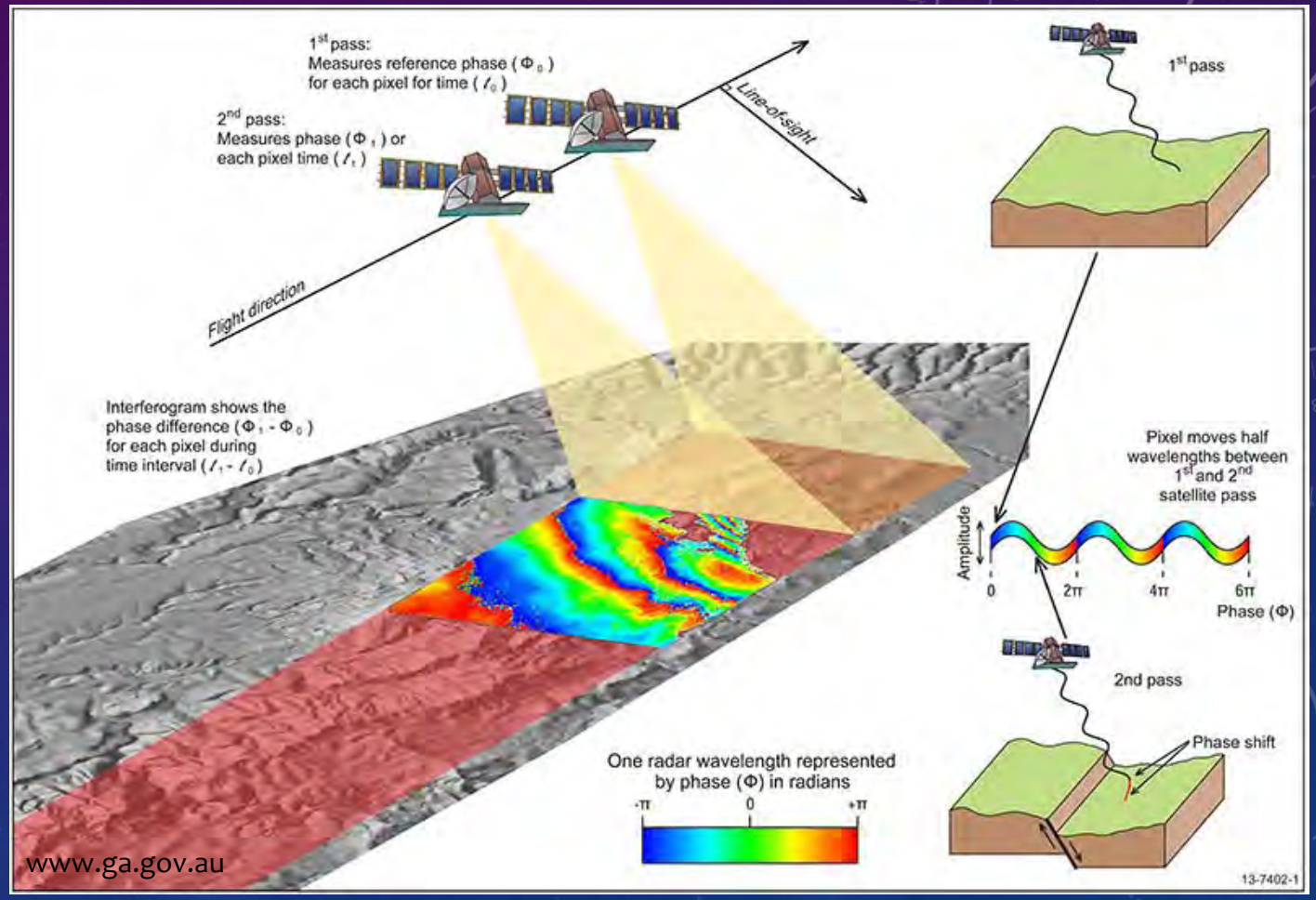
ADWR's InSAR Land Subsidence Monitoring Program

- Have been completing GNSS surveys since 1998
- Data is processed using Trimble Software, NGS OPUS, OPUS-Share, and OPUS Projects
- Networks have been expanded to improve monitoring
- Surveys vary from monthly, seasonally, and annually



Synthetic Aperture Radar Interferometry (InSAR)

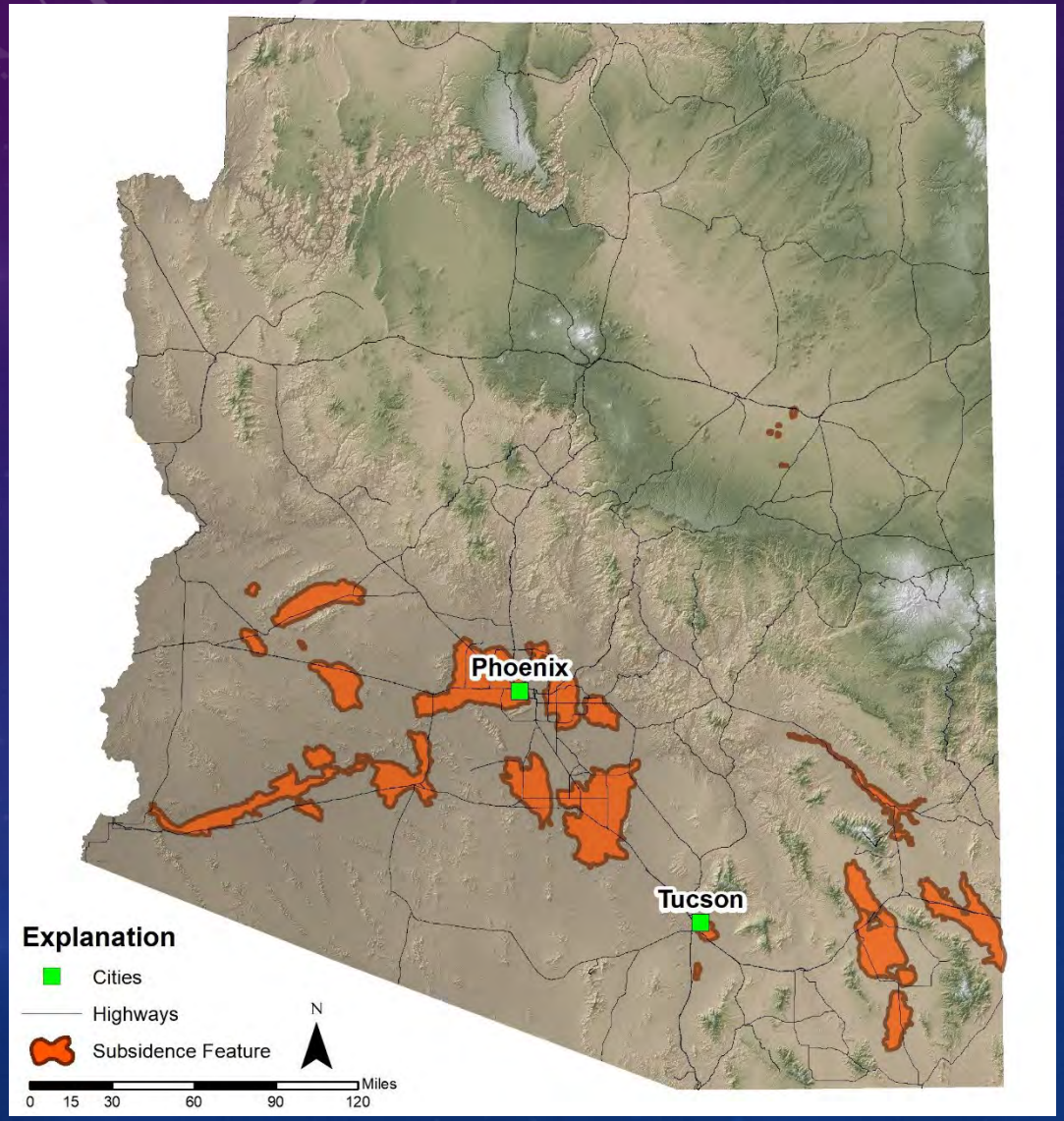
- Interferometric Synthetic Aperture Radar (InSAR) is a geodetic technique that can identify movements of the Earth's surface.
- Observations of surface movement made using InSAR can be used to detect, measure, and monitor crustal changes associated with geophysical processes.
- InSAR can identify surface movements with high spatial resolution on a millimeter to centimeter scale.
- Subsidence and uplift induced by anthropogenic activities such as groundwater extraction or injection.



Two SAR images of the same area are acquired at different times. If the surface moves between the two acquisitions a phase shift is recorded. An interferogram maps this phase shift spatially.

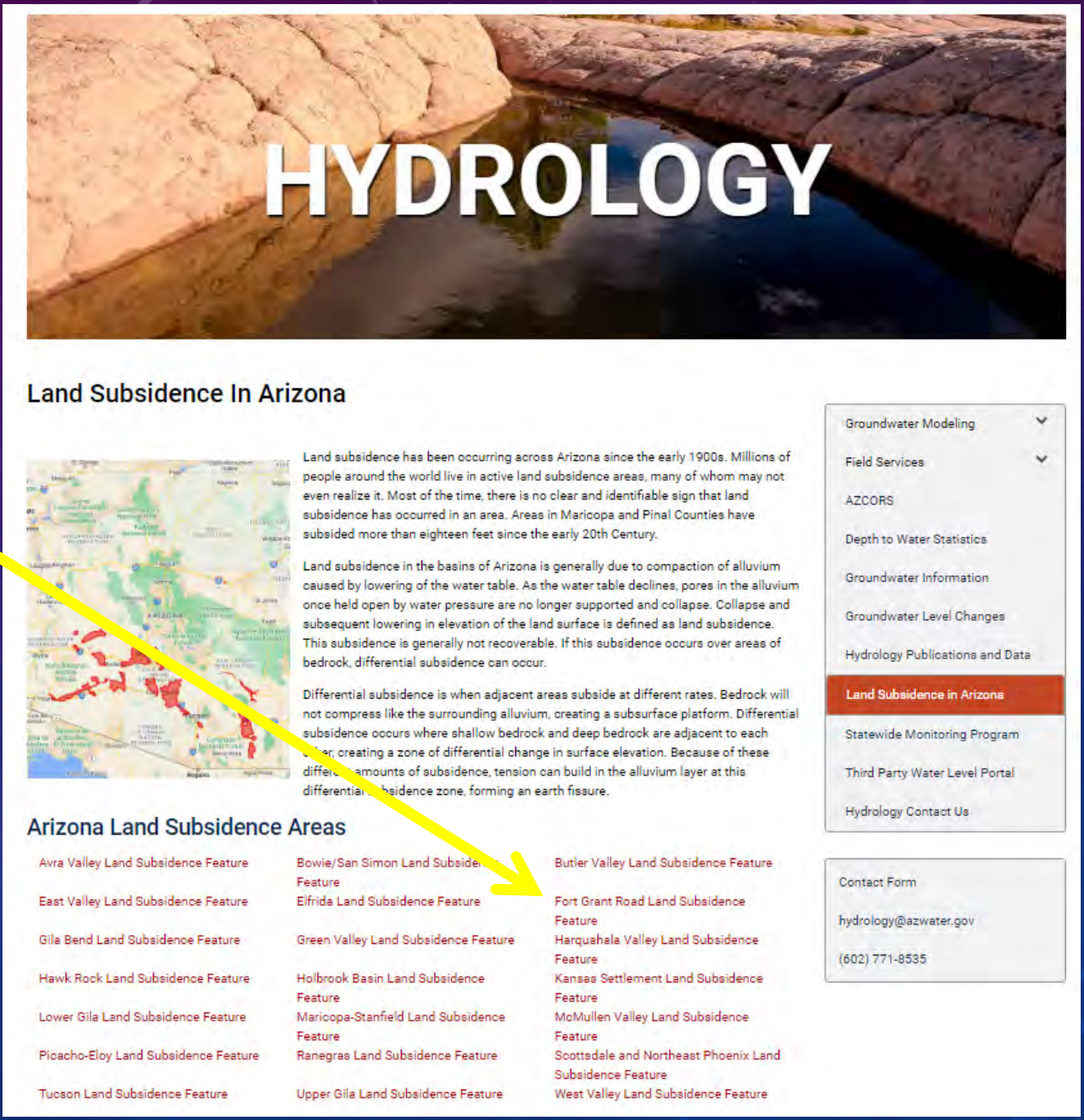
ADWR's InSAR Land Subsidence Monitoring Program

- Started in 2002 from a NASA grant
- Have an extensive InSAR library, data between 1992 and present
- By 2025, identified 30 individual land subsidence features covering an area greater than 4,300 square miles
- Cost of the InSAR data has exceeded $2.2 million dollars

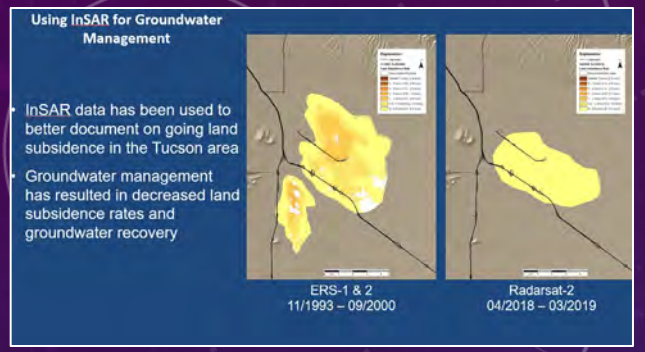


ADWR's Land Subsidence Website

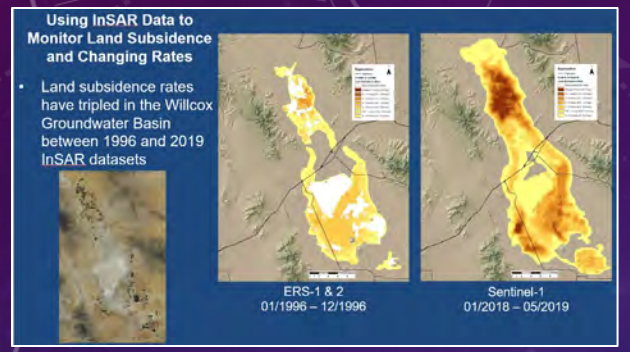
- ADWR's website has a dedicated land subsidence section
- Each land subsidence feature has a dedicated webpage
- A total of 811 land subsidence maps are available for download
- The InSAR-derived maps cover various periods of time between 1992 and 2000, 2004 to 2010, and 2010 to present



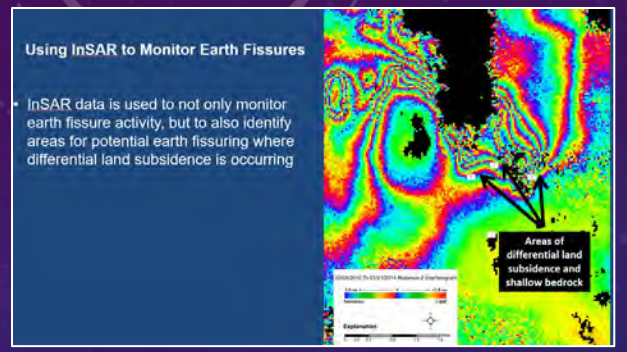
Applications of InSAR in Arizona



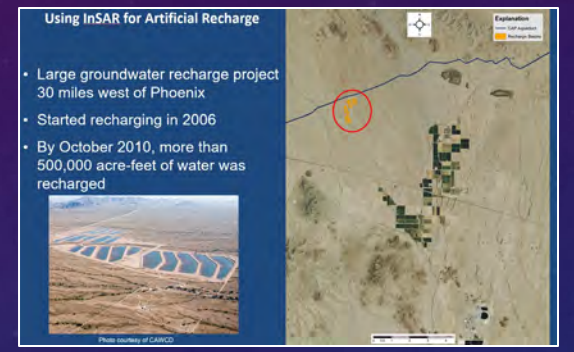
Groundwater Management



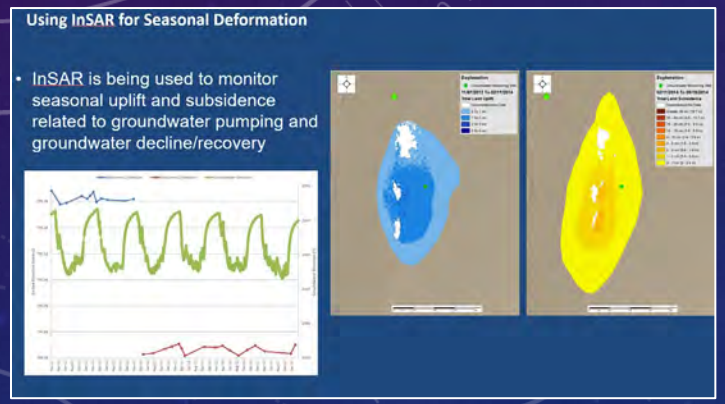
Land Subsidence



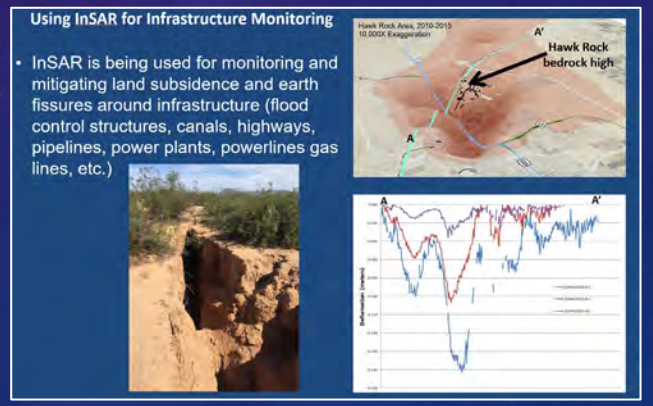
Earth Fissures



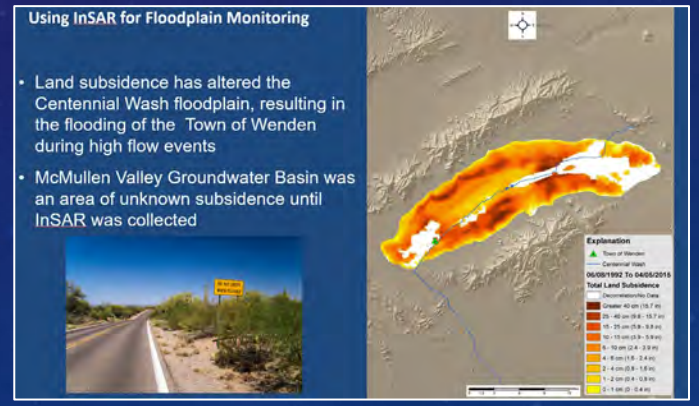
Recharge



Seasonal Deformation



Infrastructure

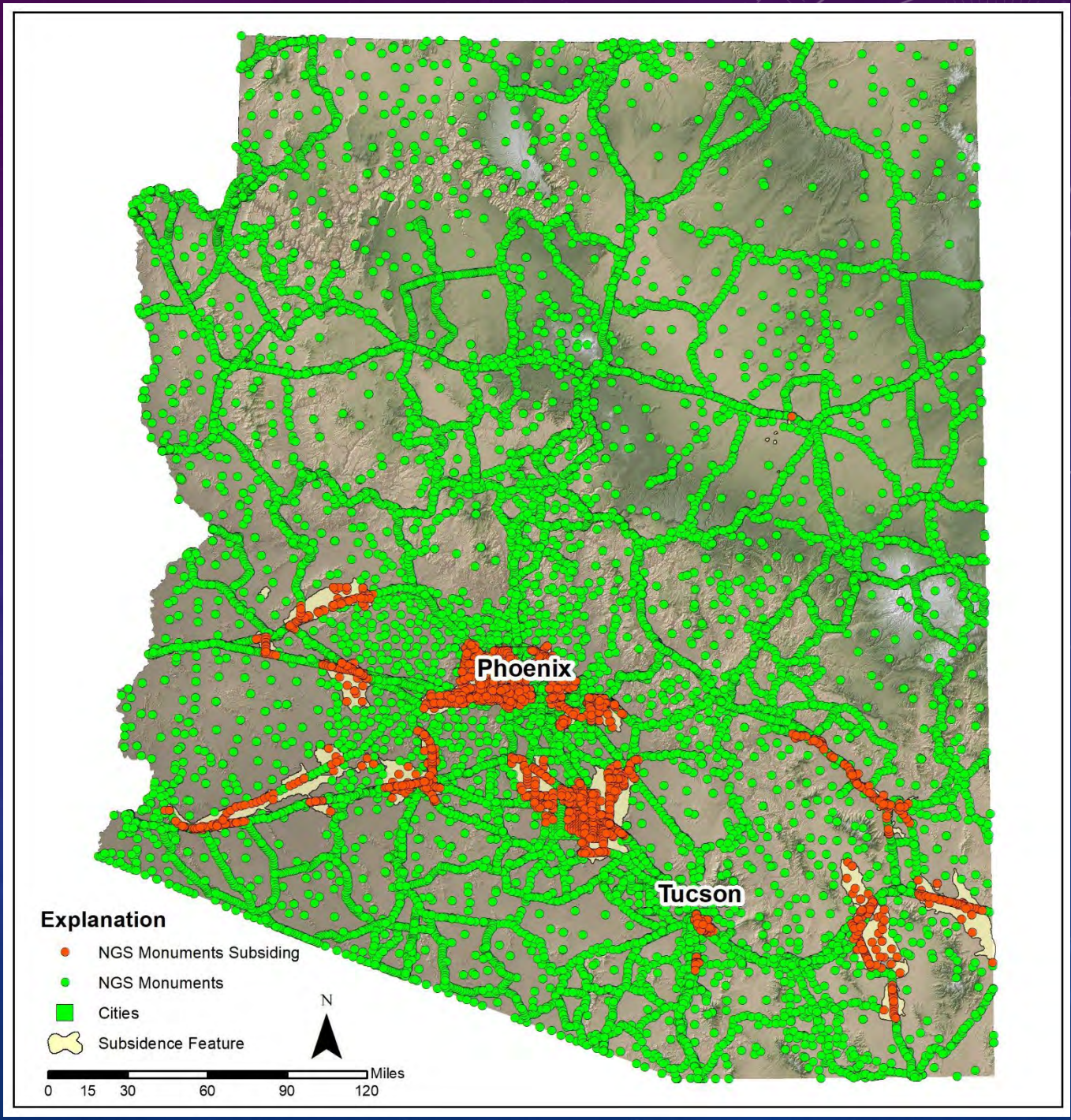


Floodplains

Surveying

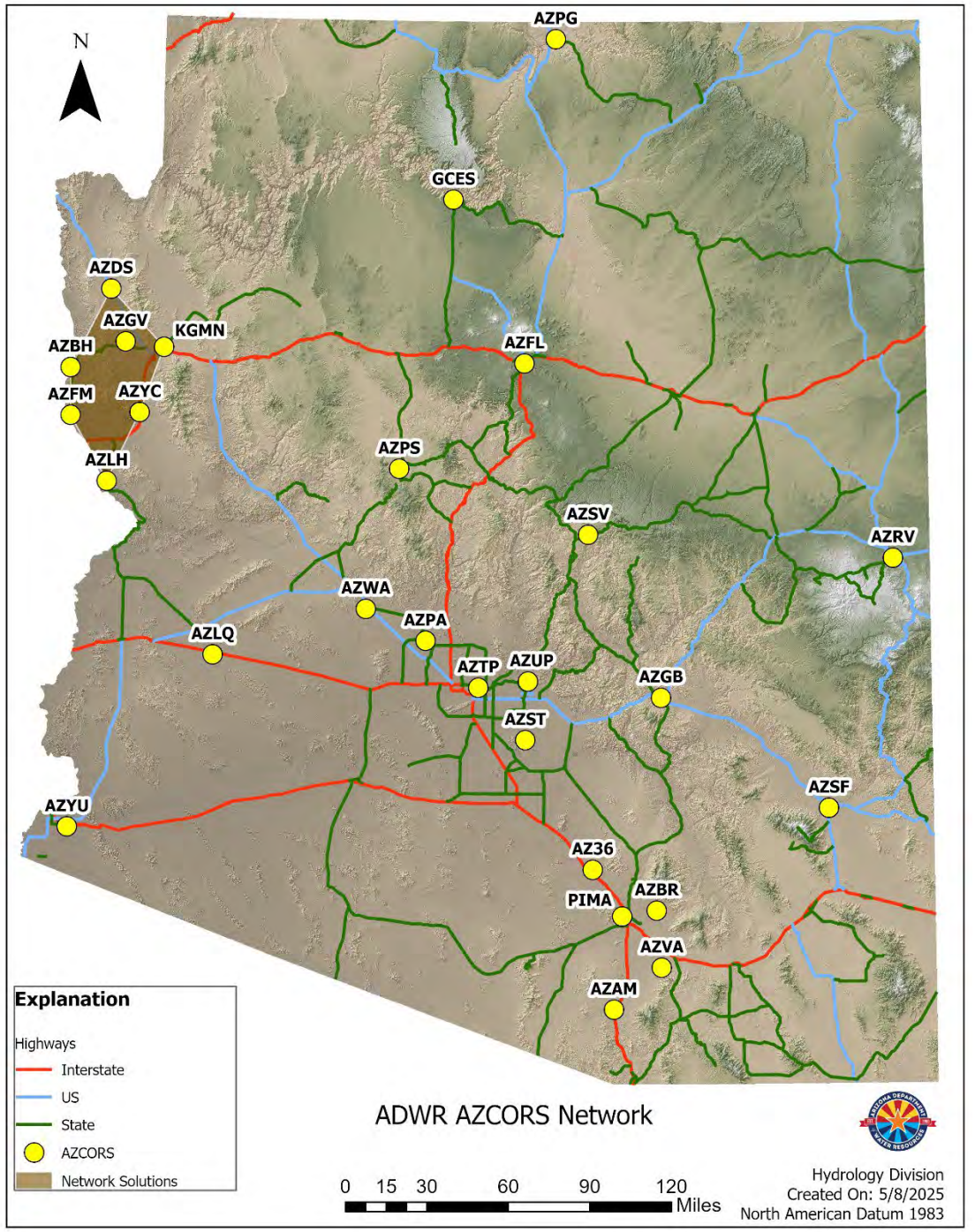
- Land subsidence is compromising vertical surveying control monuments
- Surveying control should be verified

2,669 Monuments Affected by Land Subsidence



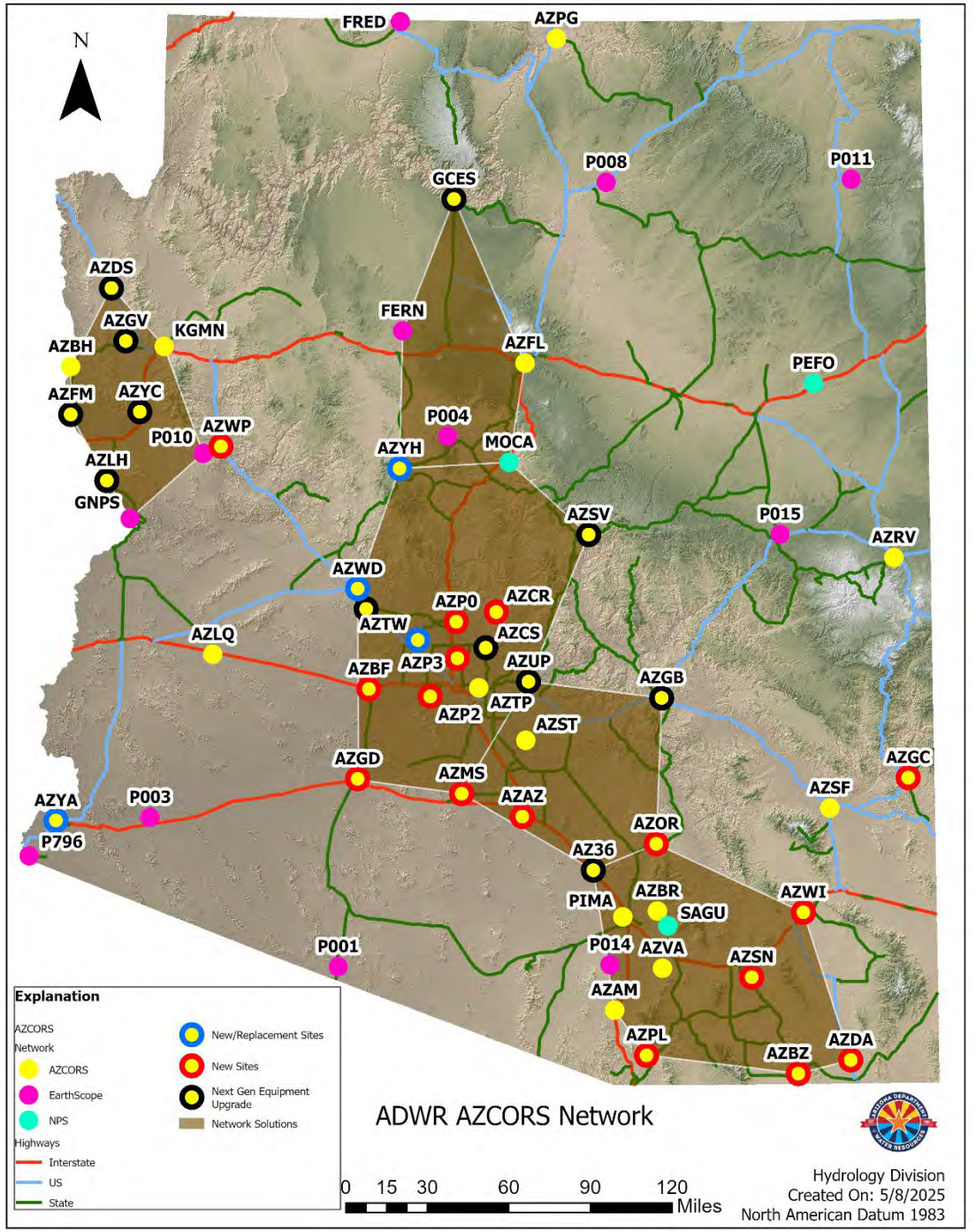
ADWR AZCORS Program

- Took over management and operation of AZCORS from ADOT in March 2023
  - 27 CORS sites
  - 1 Network Solution in Mohave County
  - 2 Network Servers



ADWR AZCORS Program

- Replaced/upgraded legacy equipment
- 20 braced monuments built
  - 4 replacement sites, 16 new sites
- Created 4 new Network Solutions
- Ingest data from NPS and EarthScope
- New servers and website
  - azcors.azwater.gov (open data policy)
- 59 total CORS sites (44 AZCORS, 12 EarthScope and 3 NPS)



ADWR AZCORS Program

Braced Monument Construction









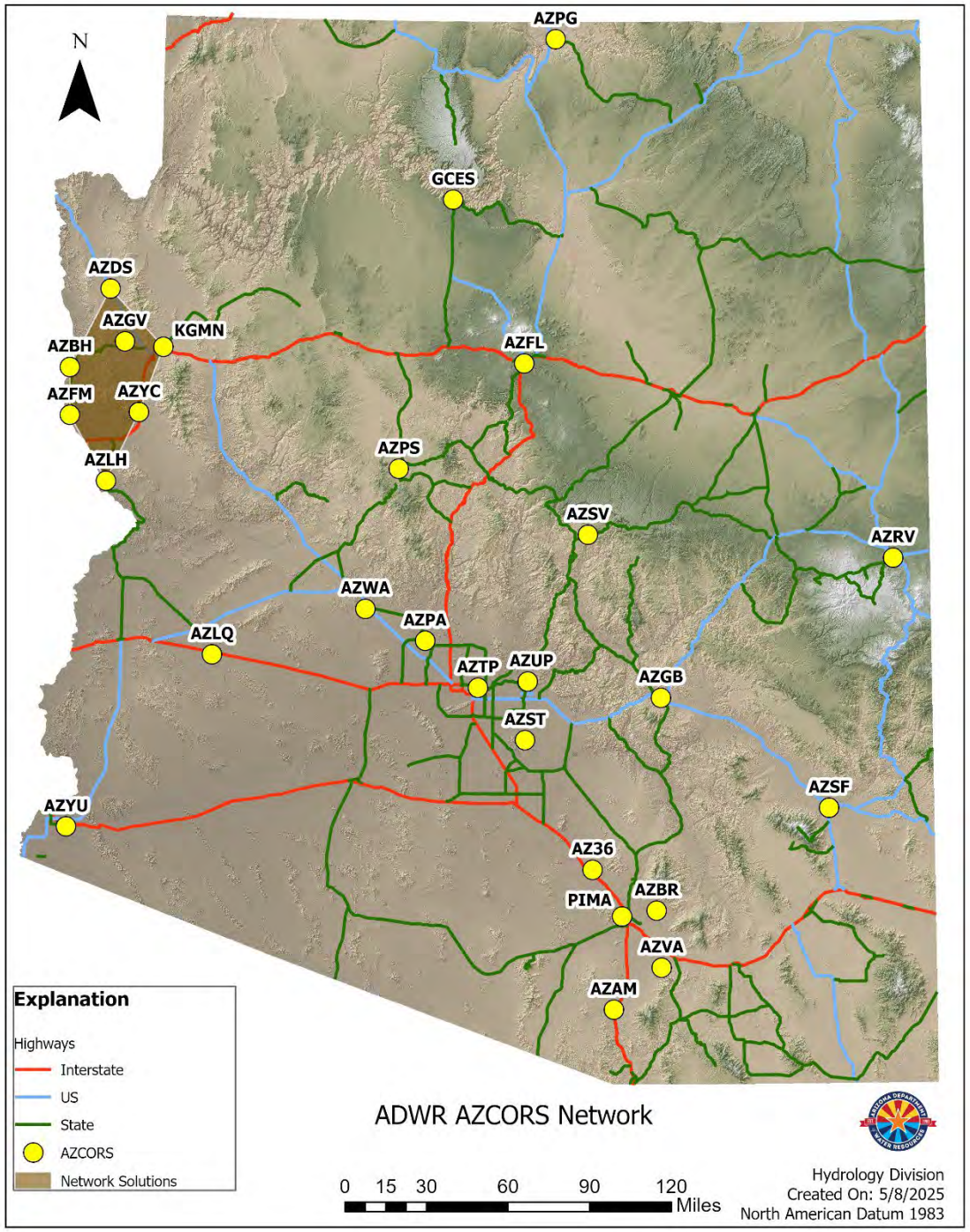








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Explanation
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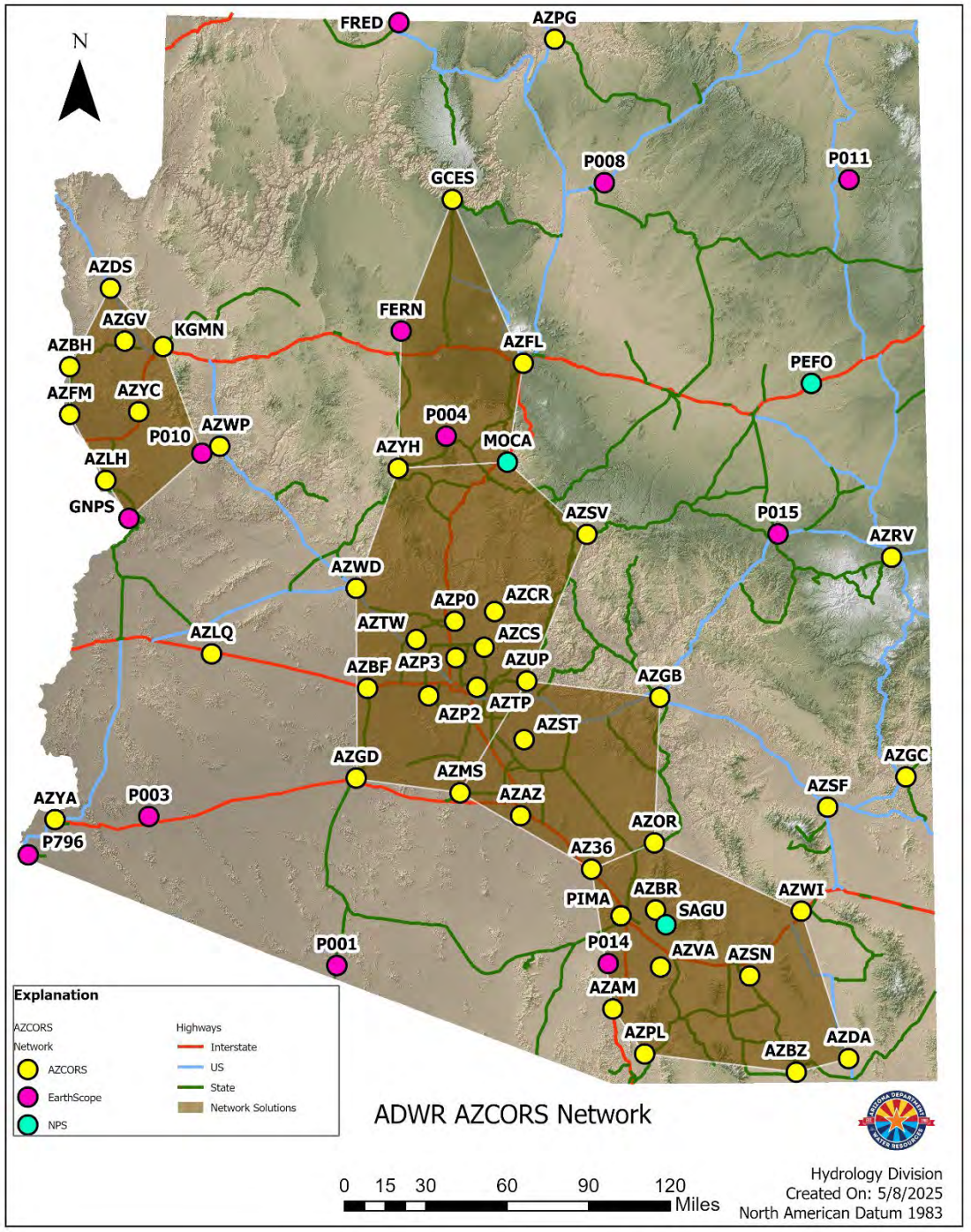
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Thank you

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