Remote Sensing Applications in Water Management

Jeanine Jones

Department of Water Resources

September 2015

The Water Sector in General

- The water sector has many specialized sub-sectors, and types of users
- Needed spatial scales vary widely
- Historically limited usage of remote sensing products, and limited applicability
- Continuity of monitoring data important

Challenges from State Perspective

- Fitting square peg into round hole
- Spatial scale
- Sustainability of observations
- Cost-benefit analysis
  - $$$$$$$!!!!!!!!!!
  - Staff resources, training

Data Source

Satellite

- NASA data free – free is good!
- Potentially have data continuity for 5+ years
- Offers broad spatial coverage

Aircraft

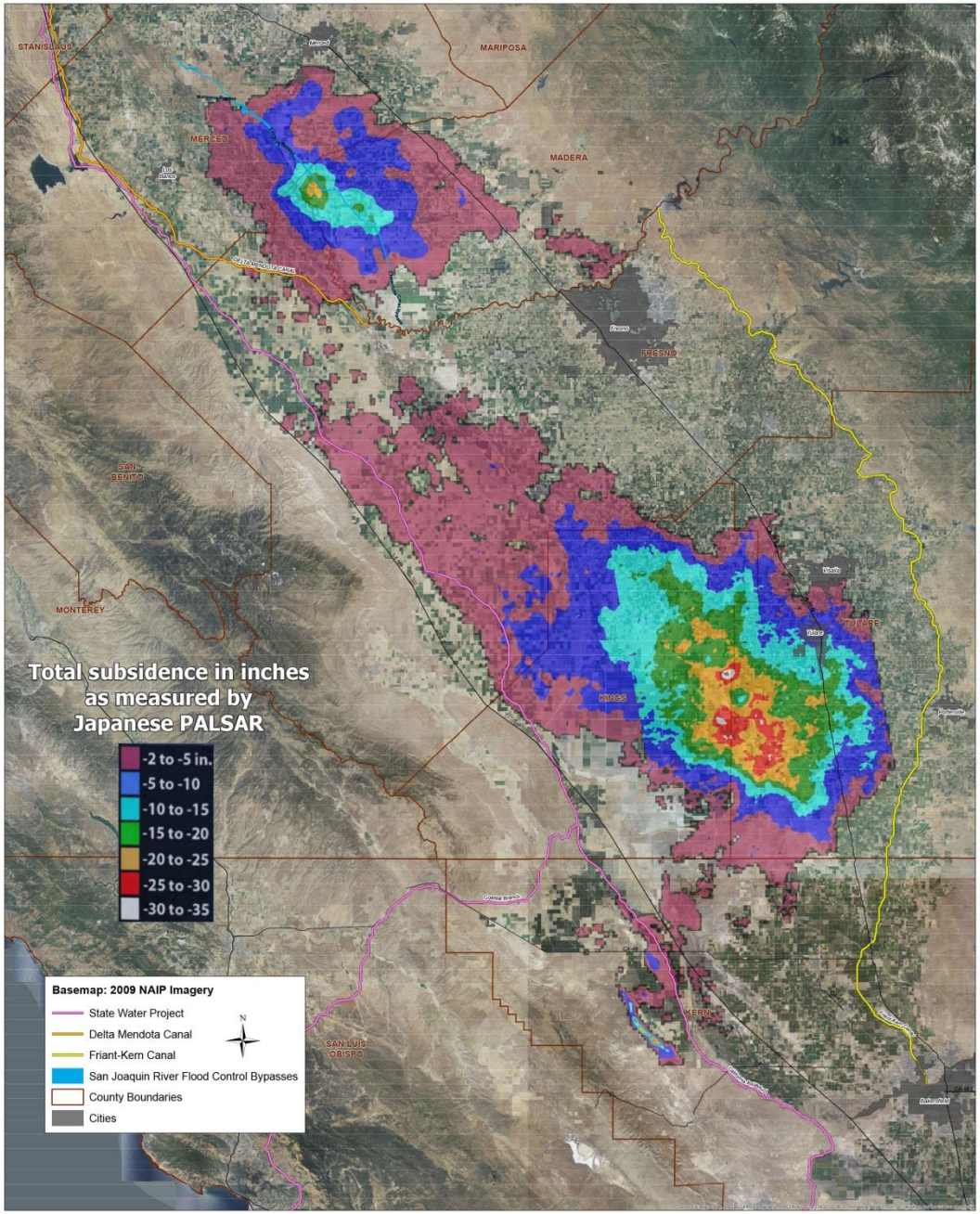
- Not free – not good!
- Limited-term use, not sustainable monitoring
- Very limited (but high resolution) spatial coverage

Example Operational Applications -- Satellite

- Crop water use with Landsat TIR sensor – Idaho DWR
  - Desired spatial scale is statewide
- Agricultural land fallowing in California (in progress)
  - Desired spatial scale is statewide
- Land subsidence with InSAR (ADWR, CDWR working on it)
  - Desired spatial scale is statewide

San Joaquin Valley Subsidence

June 2007 to December 2010

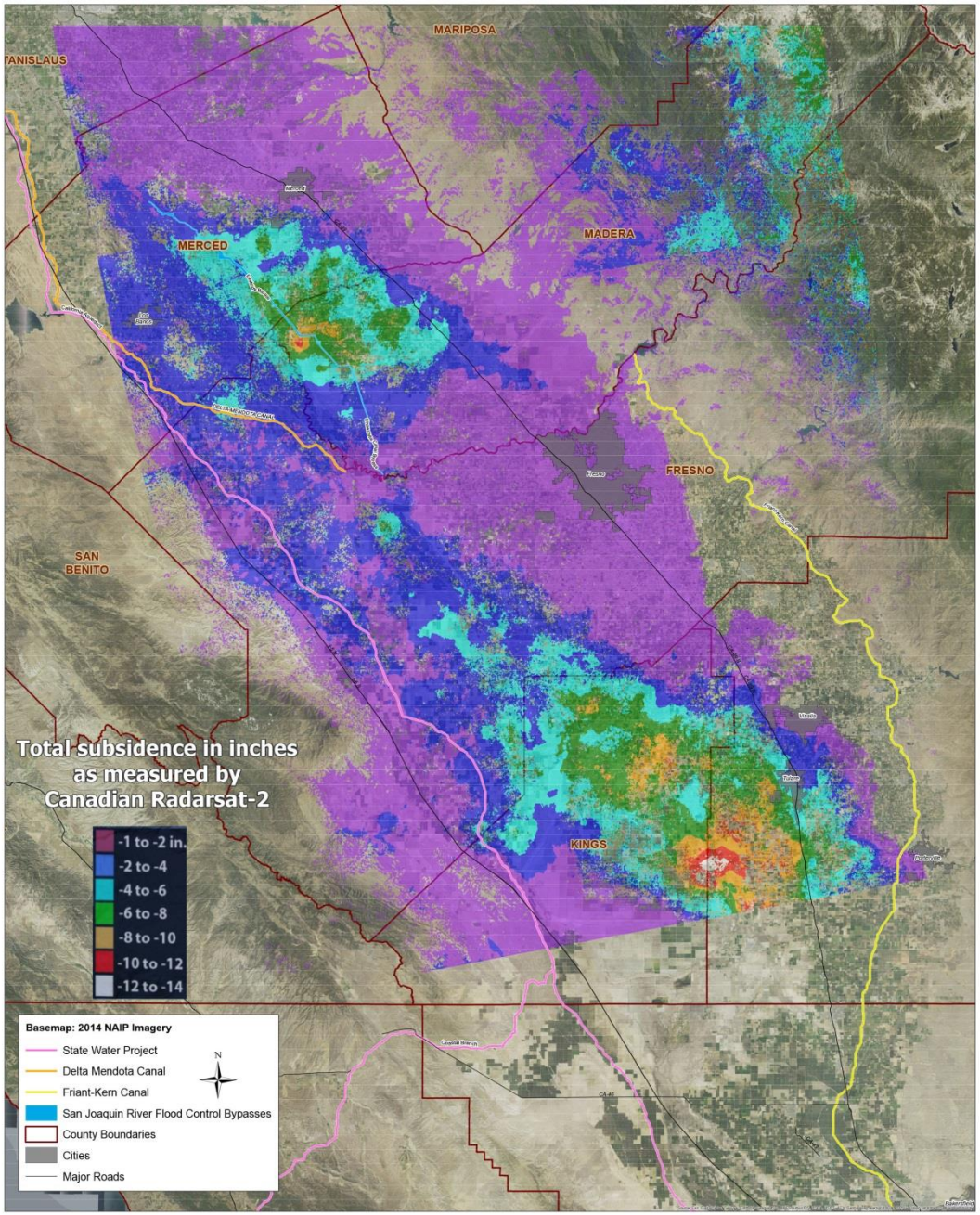


1:350,000 1 in = 6 miles

jane.schaffer-kramer@water.ca.gov Document Path: U:\GIS\Projects\Subsidence_2015\Subsidence-NASA_Fig1_20150908.mxd

San Joaquin Valley Subsidence

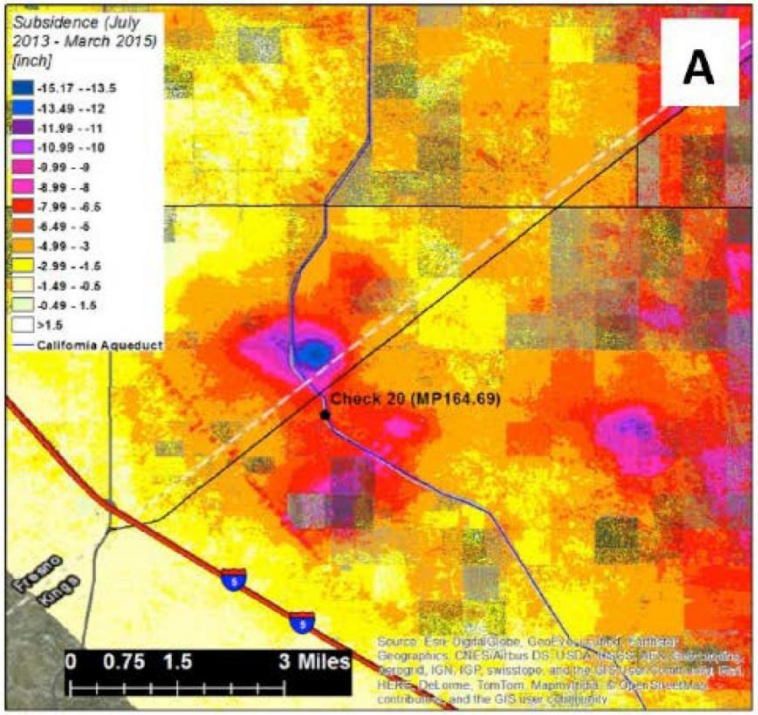
May 2014 to January 2015

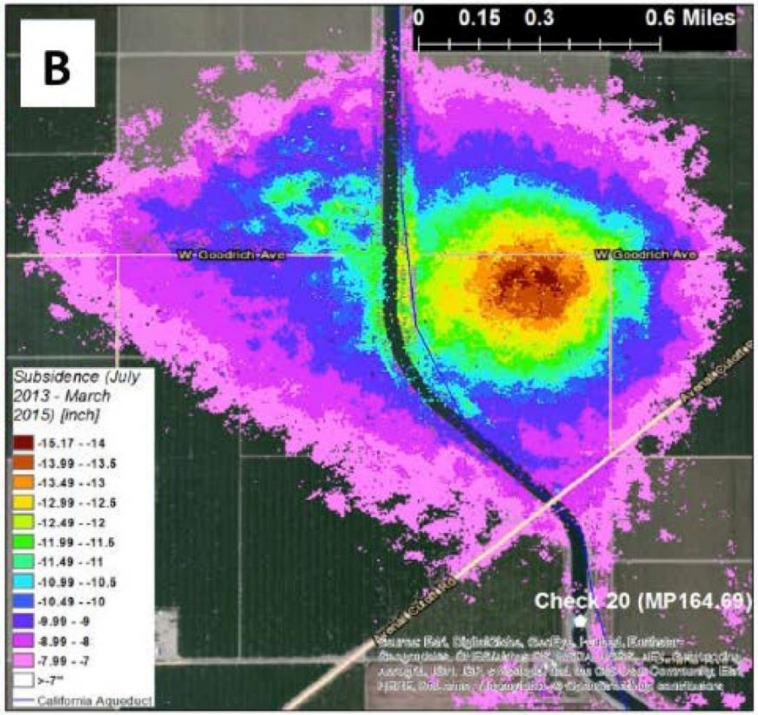


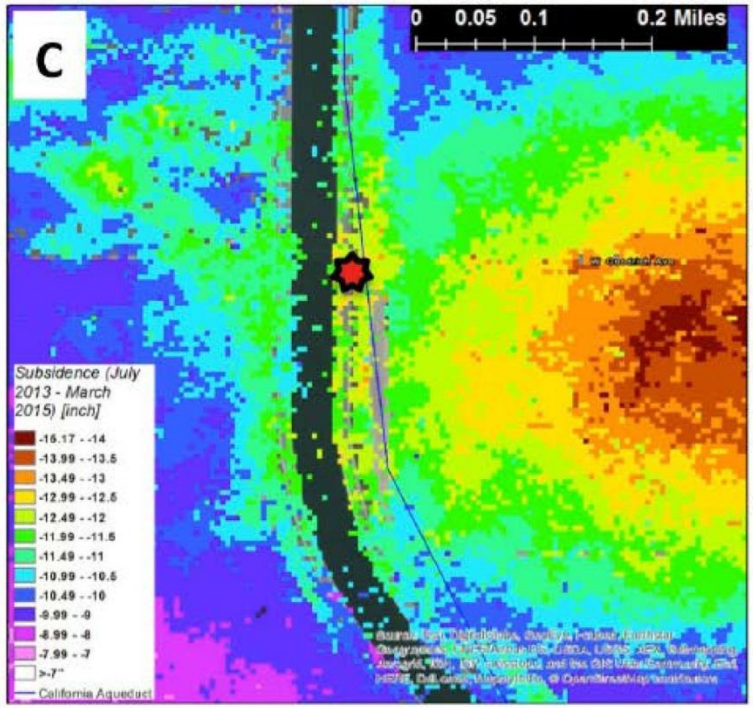
1:350,000 1 in = 6 miles

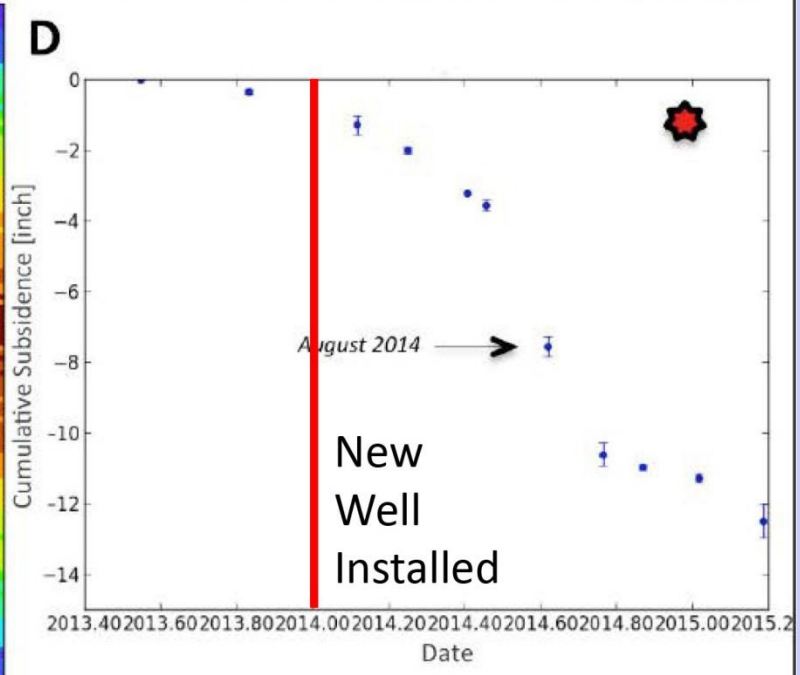
Example Research Applications -- Aircraft

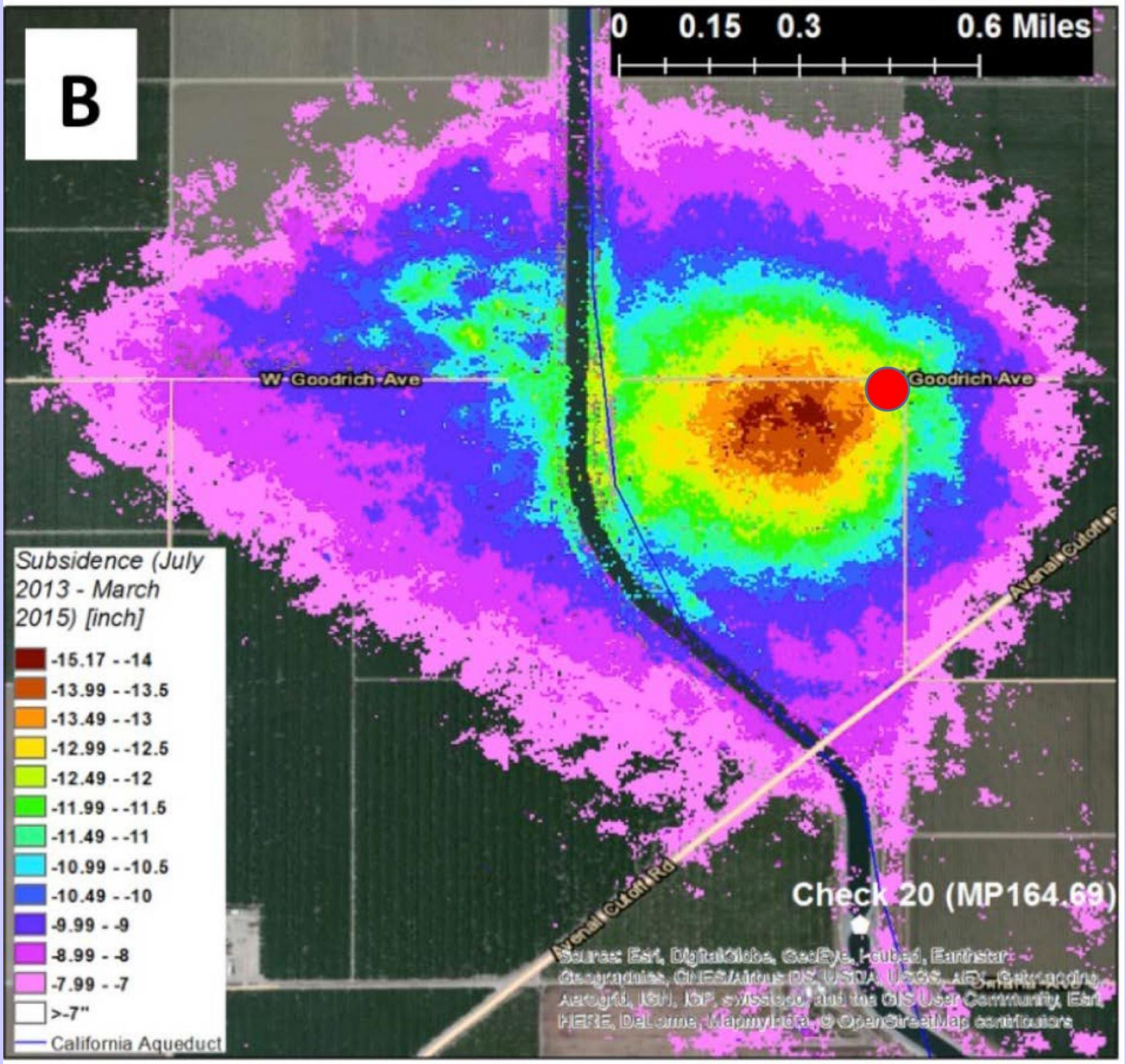
- Snowpack water content (potential precursor for satellite application at statewide scale)
- InSAR monitoring of Delta levee deformations
- InSAR monitoring of land subsidence along California Aqueduct


A
Subsidence (July 2013 - March 2015) [inch]
-15.17 - -13.5
-13.49 - -12
-11.99 - -11
-10.99 - -10
-9.99 - -9
-8.99 - -8
-7.99 - -6.5
-6.49 - -5
-4.99 - -3
-2.99 - -1.5
-1.49 - -0.5
-0.49 - 1.5
>1.5
California Aqueduct
Check 20 (MP164.69)
0 0.75 1.5 3 Miles


B
0 0.15 0.3 0.6 Miles
W Goodrich Ave
Subsidence (July 2013 - March 2015) [inch]
-15.17 - -14
-13.99 - -13.5
-13.49 - -13
-12.99 - -12.5
-12.49 - -12
-11.99 - -11.5
-11.49 - -11
-10.99 - -10.5
-10.49 - -10
-9.99 - -9
-8.99 - -8
-7.99 - -7
>-7"
California Aqueduct
Check 20 (MP164.69)


C
0 0.05 0.1 0.2 Miles
Subsidence (July 2013 - March 2015) [inch]
-15.17 - -14
-13.99 - -13.5
-13.49 - -13
-12.99 - -12.5
-12.49 - -12
-11.99 - -11.5
-11.49 - -11
-10.99 - -10.5
-10.49 - -10
-9.99 - -9
-8.99 - -8
-7.99 - -7
>-7"
California Aqueduct


D
Cumulative Subsidence [inch]
0
-2
-4
-6
-8
-10
-12
-14
August 2014
New Well Installed
2013.40
2013.60
2013.80
2014.00
2014.20
2014.40
2014.60
2014.80
2015.00
2015.2
Date


B
0 0.15 0.3 0.6 Miles
W Goodrich Ave
Goodrich Ave
Subsidence (July 2013 - March 2015) [inch]
-15.17 - -14
-13.99 - -13.5
-13.49 - -13
-12.99 - -12.5
-12.49 - -12
-11.99 - -11.5
-11.49 - -11
-10.99 - -10.5
-10.49 - -10
-9.99 - -9
-8.99 - -8
-7.99 - -7
>-7"
California Aqueduct
Check 20 (MP164.69)

Thoughts About Aircraft Applications

- Cost a major limiting factor, including agencies' costs of RTO
- Operationalizing these applications into on-going programs is inherently difficult ("snapshot monitoring")
- Satellites better for many state agency monitoring applications
- Opportunities for specialized applications, e.g. disaster response, one-time monitoring

RTO/Product Development

- Co-production of information essential
- Need for capacity building, among both practitioners and researchers
- Long-term relationship building among practitioners and researchers; contracting limitations if private sector
- Typically 5-10 year lead time to operationalize
- $$$$$$$$$