NOAA/NGS
Aligning RTNs with the NSRS

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Common Referencing Datum in US

- Official horizontal datum: **NAD83(2011) epoch 2010.0** (GRS80 ellipsoid)
- Official vertical orthometric datum: **NAVD88 (GEOID12B)**

- GPS referencing datum: WGS84(G1762) (WGS84 ellipsoid)
- IGS08 epoch 2005.00: GPS satellite orbits
- ITRF08 epoch 2005.0 defines the motions of sites
- Different state, different projection: SPC

- Historical referencing datum: NAD27, HARN, WGS84(1986), NGVD29

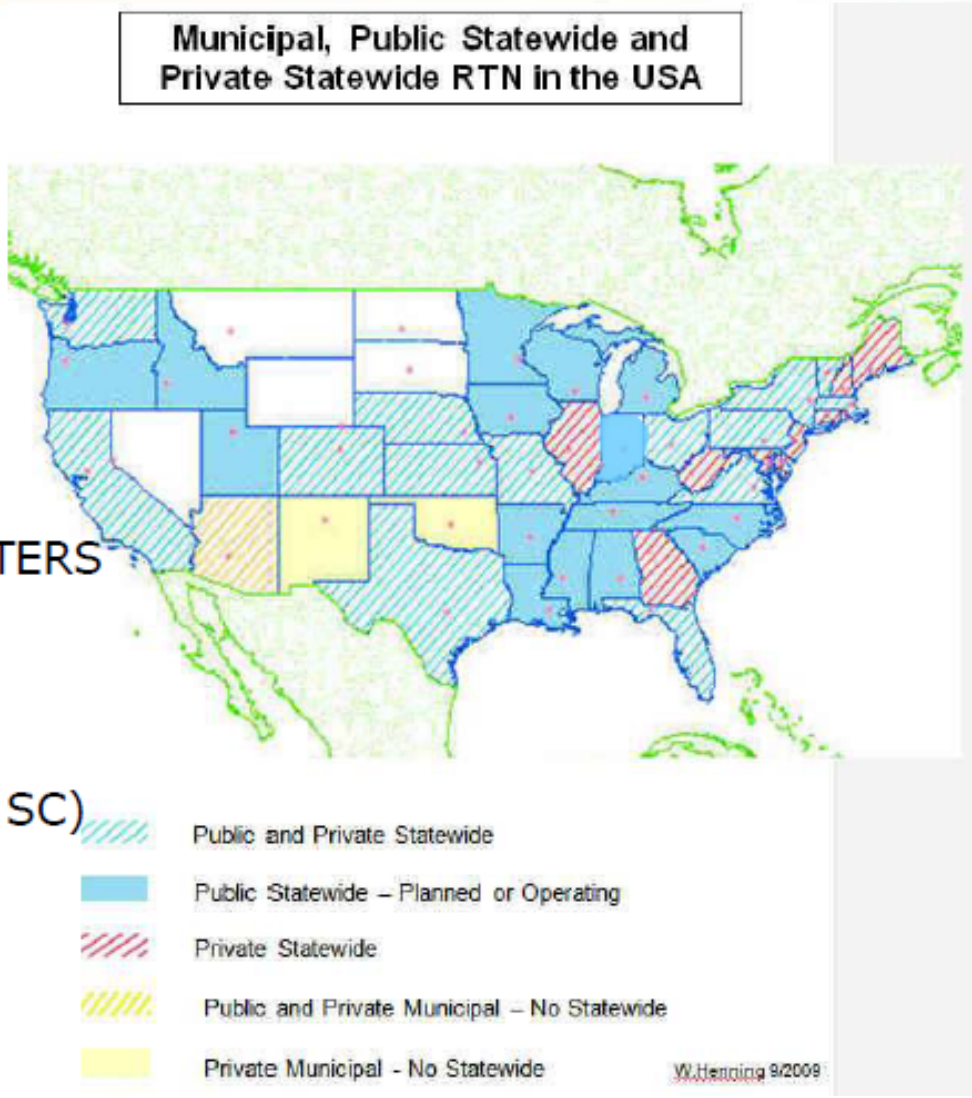
- In the early 2000, NGS had assembled a team of over 60 experts to work together to provide recommending procedures/best practices for RTNs.
- 2011: NGS had released the draft Guidelines for Real-time GNSS Networks for public comment.
- 2013: The Guidelines for Real-time GNSS Networks version 2.2 was released: https://www.ngs.noaa.gov/PUBS_LIB/NGSGuidelinesForRealTimeGNSSNetworks.pdf
- 2014 : The Guidelines for Single base Real time GNSSS Positioning, version 3.1: https://www.ngs.noaa.gov/PUBS_LIB/UserGuidelinesForSingleBaseRealTimeGNSSPositioningv.3.1APR2014-1.pdf

≥200 RTN WORLDWIDE

≥80 RTN USA

≥35 DOT

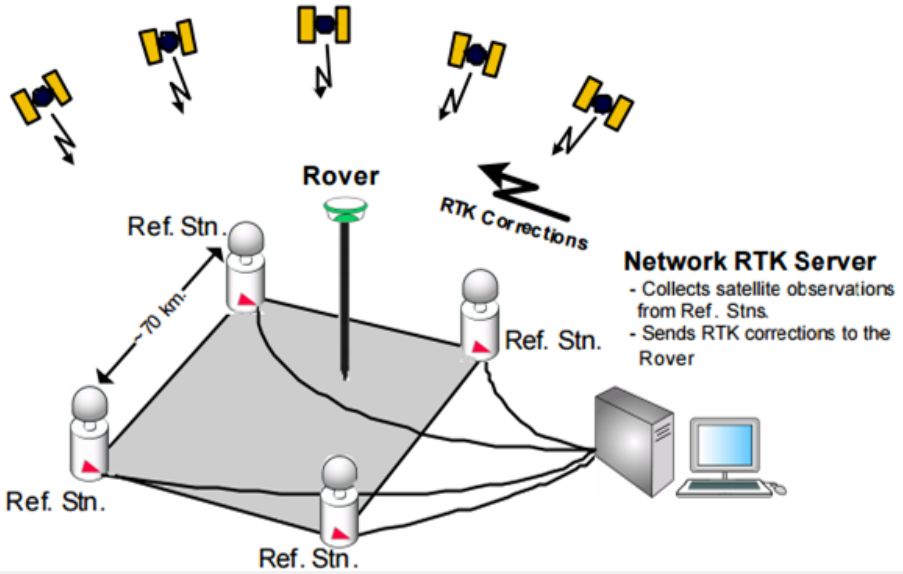
- ACADEMIC/SCIENTIFIC
- SPATIAL REFERENCE CENTERS
- VARIOUS DOTS
- COUNTY
- CITY
- GEODETIC SURVEYS (NC, SC)
- MANUFACTURERS
- VENDOR NETWORKS
- AGRICULTURE
- MA & PA NETWORKS



NOAA/NGS seven “C”

- Check equipment, data collector parameters & site information
- Conditions: DOP, weather, multipath
- Coordinates: datums with epoch, accuracy requirement of both user’s project and those provided by the RTN
- Communication between rover and RTN servers: radio or mobile (NTRIP or TCP/IP, which port)
- Calibration: constrain to passive monuments for acquiring orthometric heights
- Collections: check known points before, during and at the end of data collections
- Confidence: redundancy: satellite config., field conditions

- **Network Planning & Implementation**:
  - RTN monument guidelines: power supply, mounting, security
  - Network design: station spacing, use/become CORS, central processing servers, data communication
  - Network Administration: communication, referencing datums, station coordinates, maintenance



Source: http://smartnet.leica-geosystems.us/documents/System1200_52_RTK_Networks_-_An_Introduction_en.pdf

- **Network Administration**: Obtaining Station Coordinates Consistent with NSRS

  NGS encourages RTN admins to use both NAD83 and ITRS

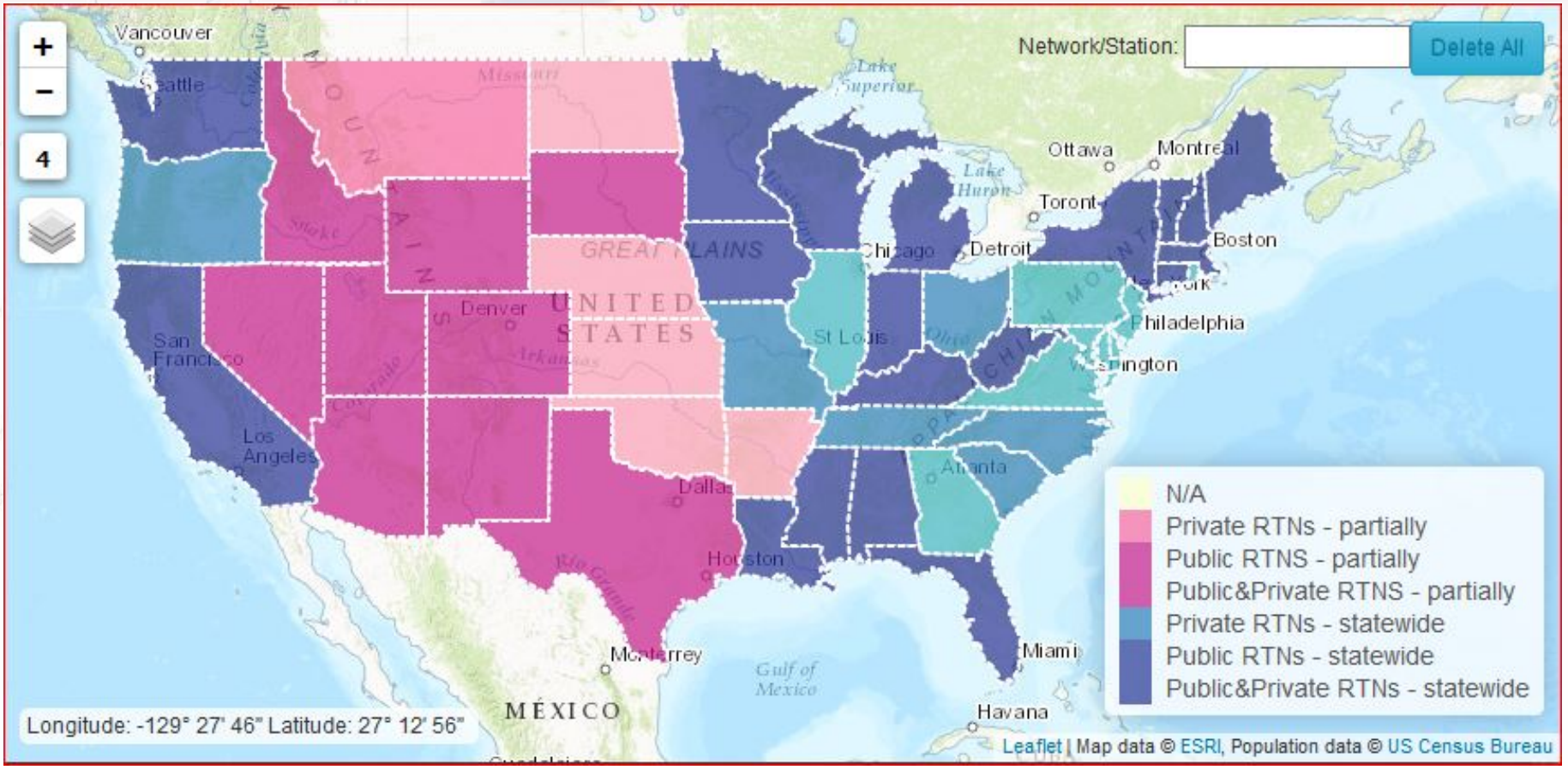
  » NAD83(2011) epoch 2010.0

  » ITRF08 epoch 2005.0

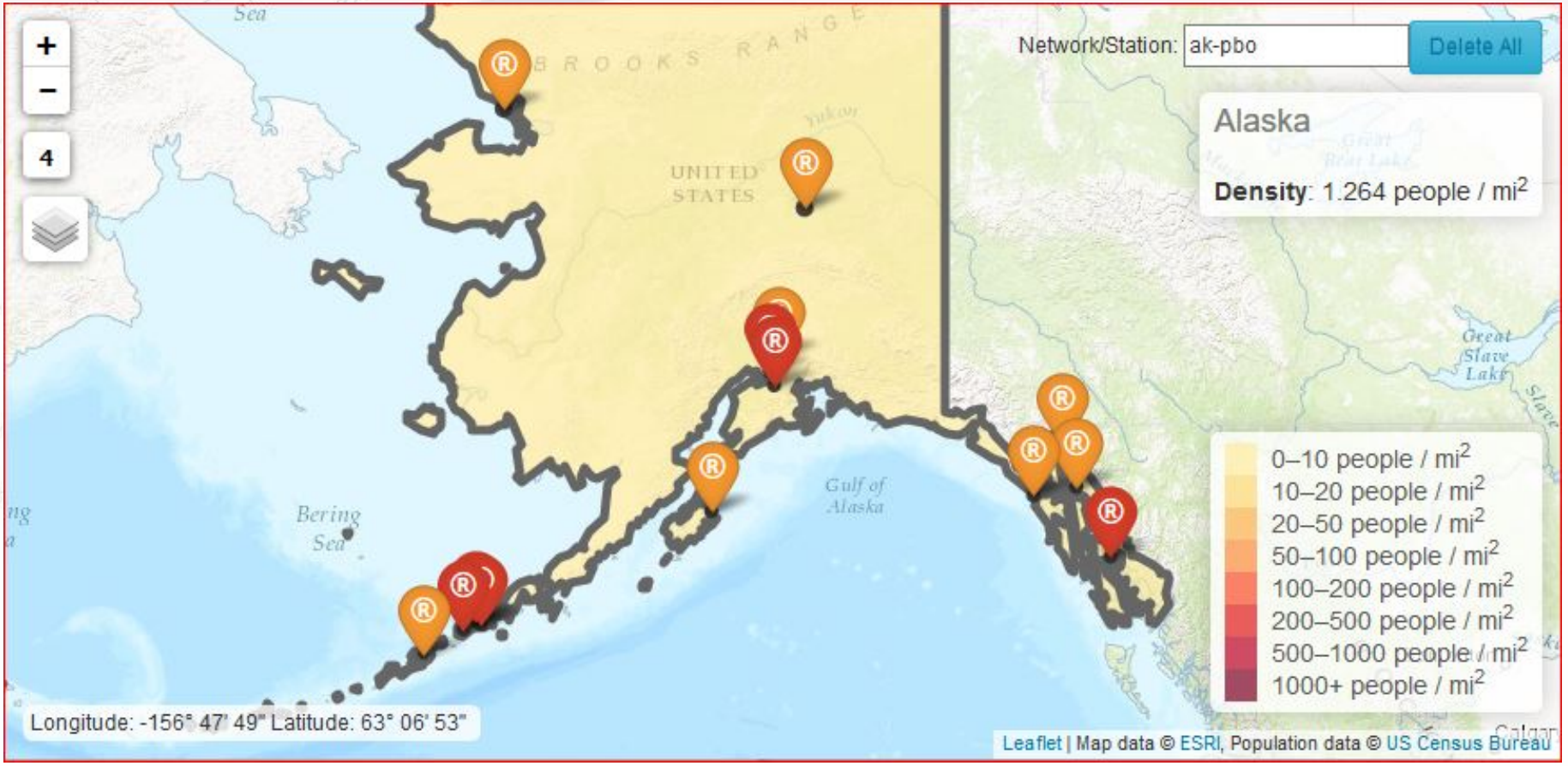
– Rec. #1: some RTN stations should be CORS

– Rec. #2: each RTN station as CORS, should adopt 3-D coordinates & velocities at a selected reference date that are **consistent** with corresponding NGS-adopted values at this station, to within 2cm horizontally and 4cm vertically

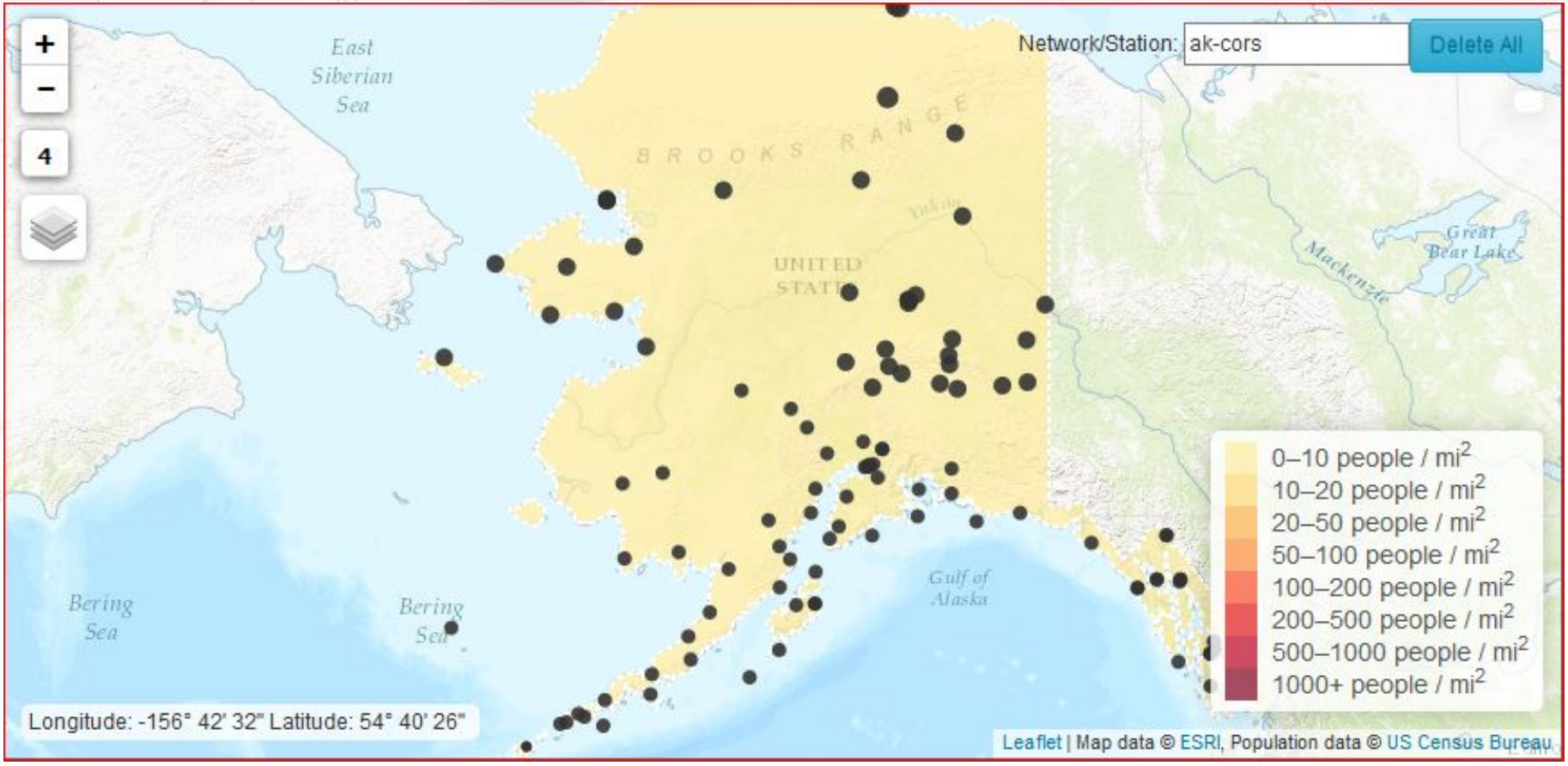
– Rec #3: **test** the continued consistency of the station's positional coordinates & velocities, and **revise** these values if coordinate differences in excess of 2cm horizontally and 4cm vertically persist over a period of several days.



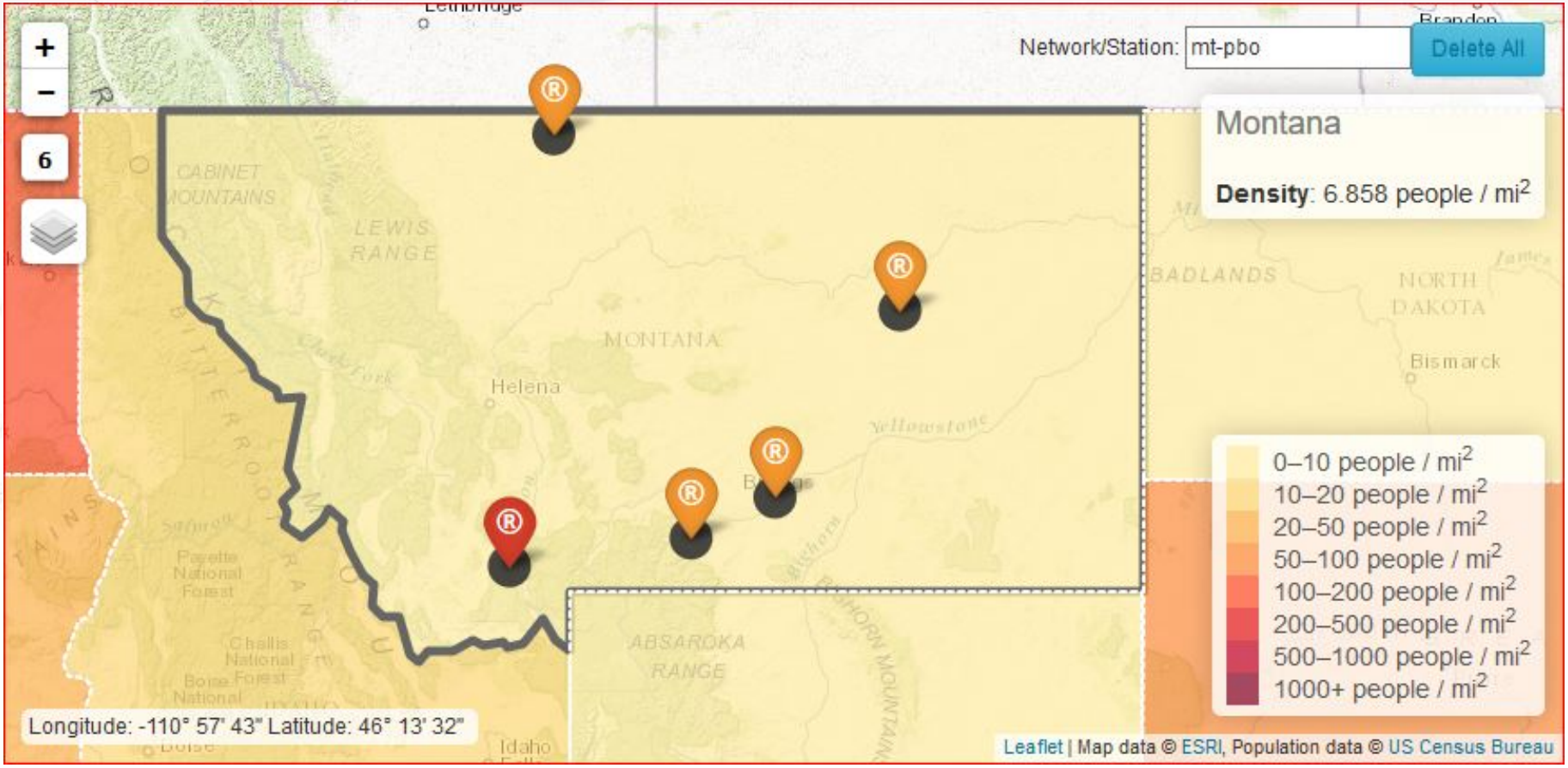
RTN Coverages



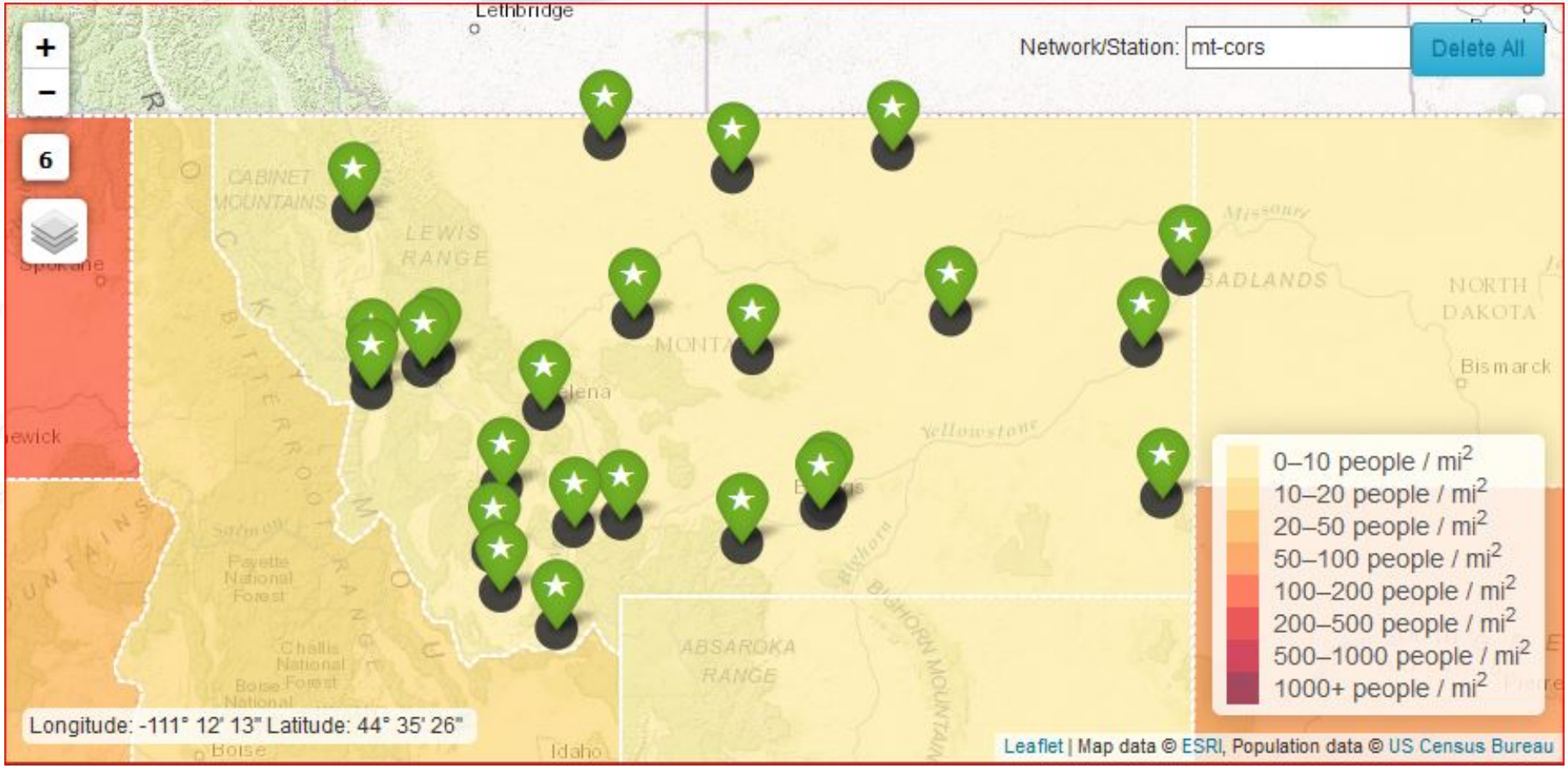
Alaska – UNAVCO Real-time GNSS Network stations (14)



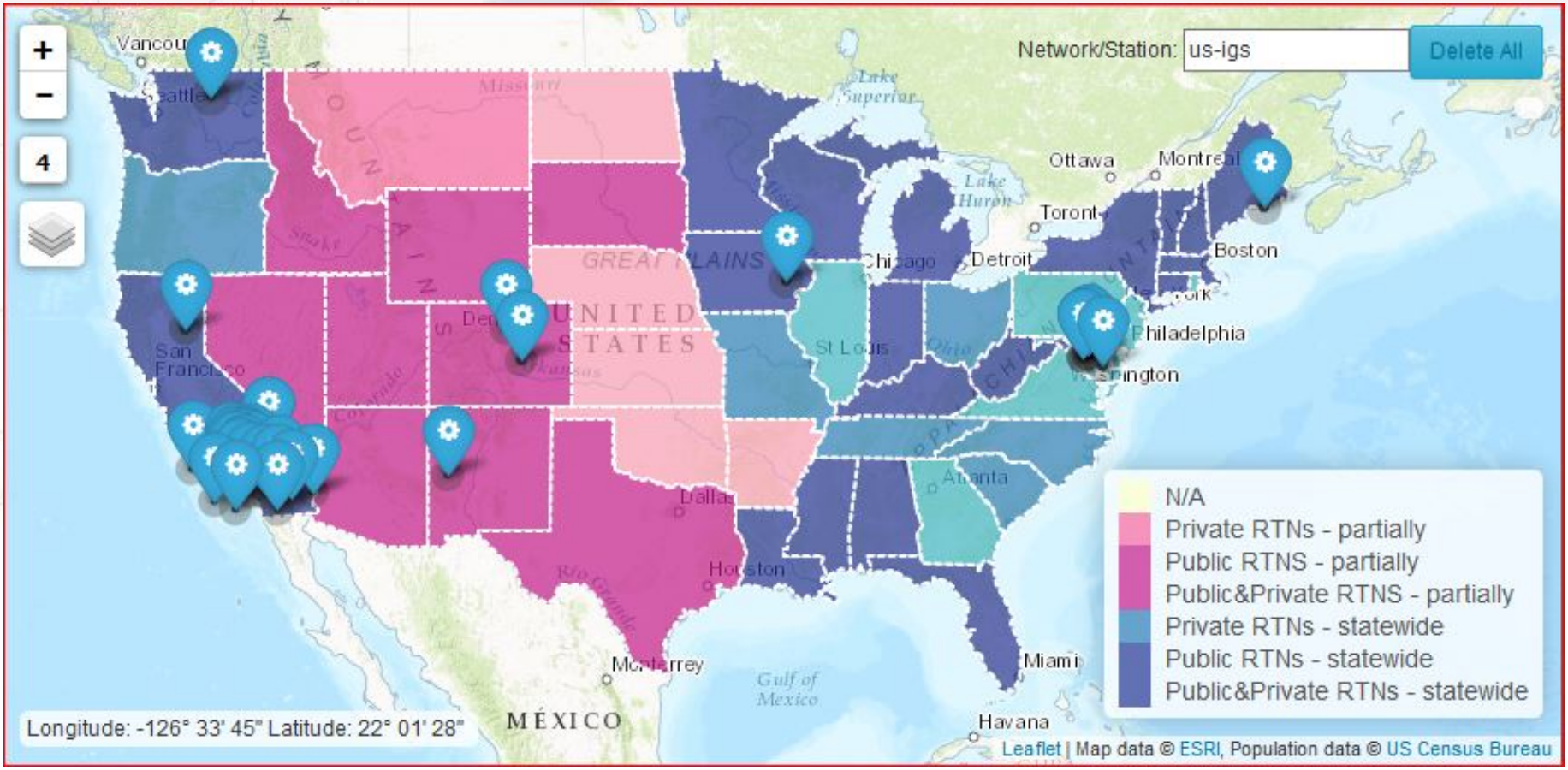
Alaska – CORS (97)



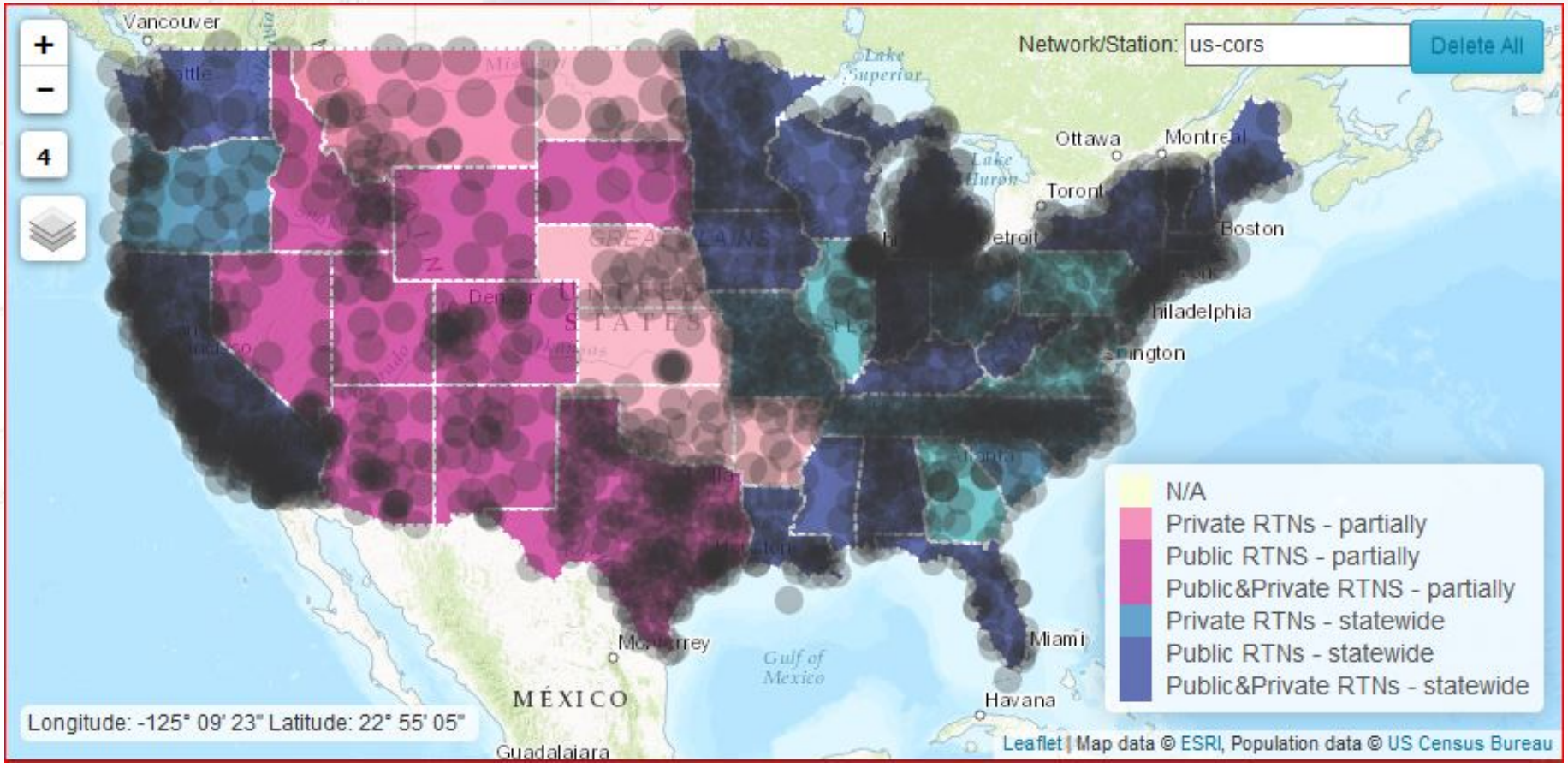
Montana – UNAVCO Real-time GNSS Network stations (5)



Montana – CORS (24)



Operating IGS stations in CONUS (44/53)

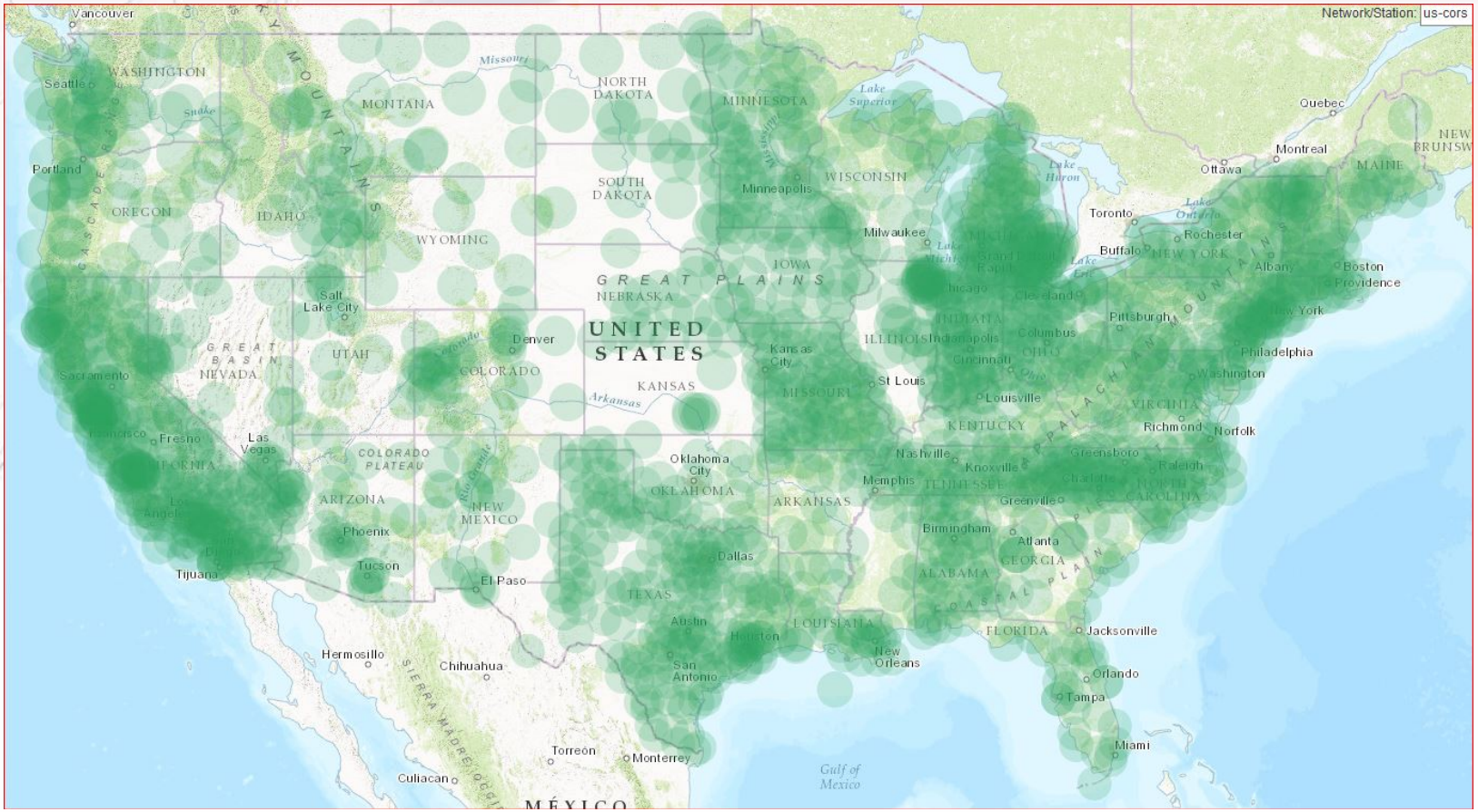


Operational CORS (~1700) with 70km-buffer

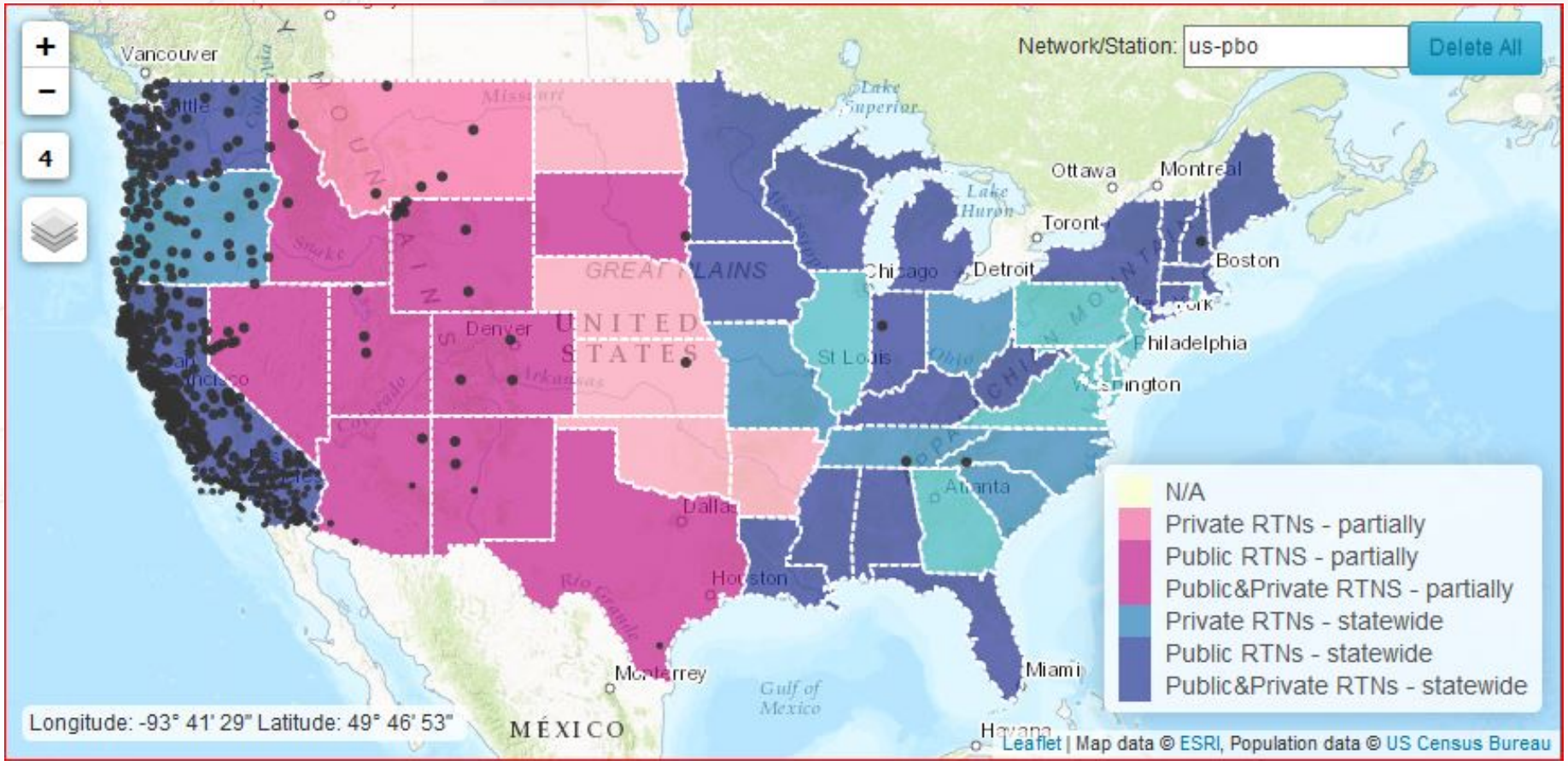
NOAA/NGS: Aligning RTNs with the NSRS

Where now ? | **What next ?** | https://geodesy.noaa.gov

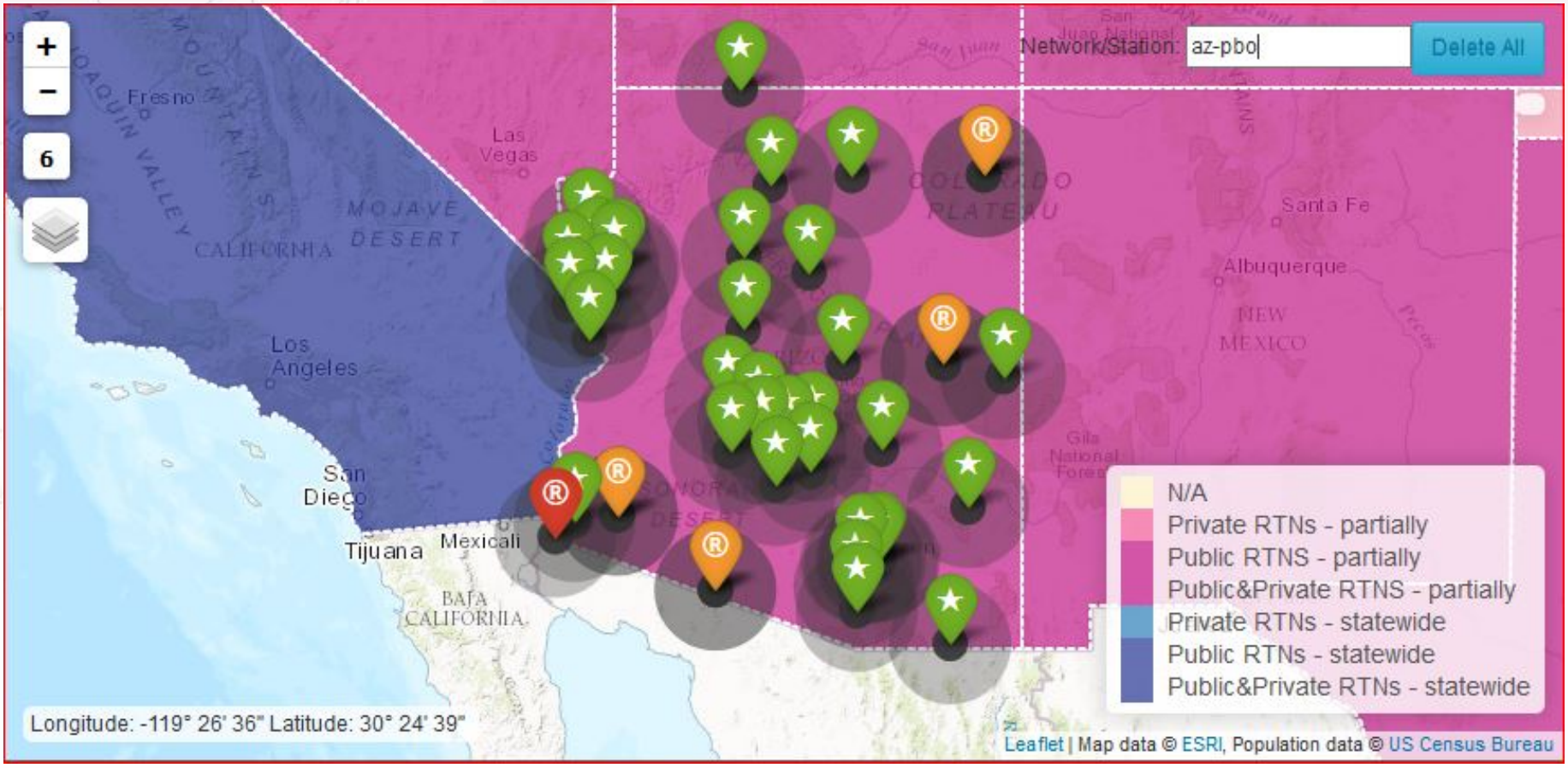
Overview | **RTN User Guidelines** | **RTN Operator Guidelines**



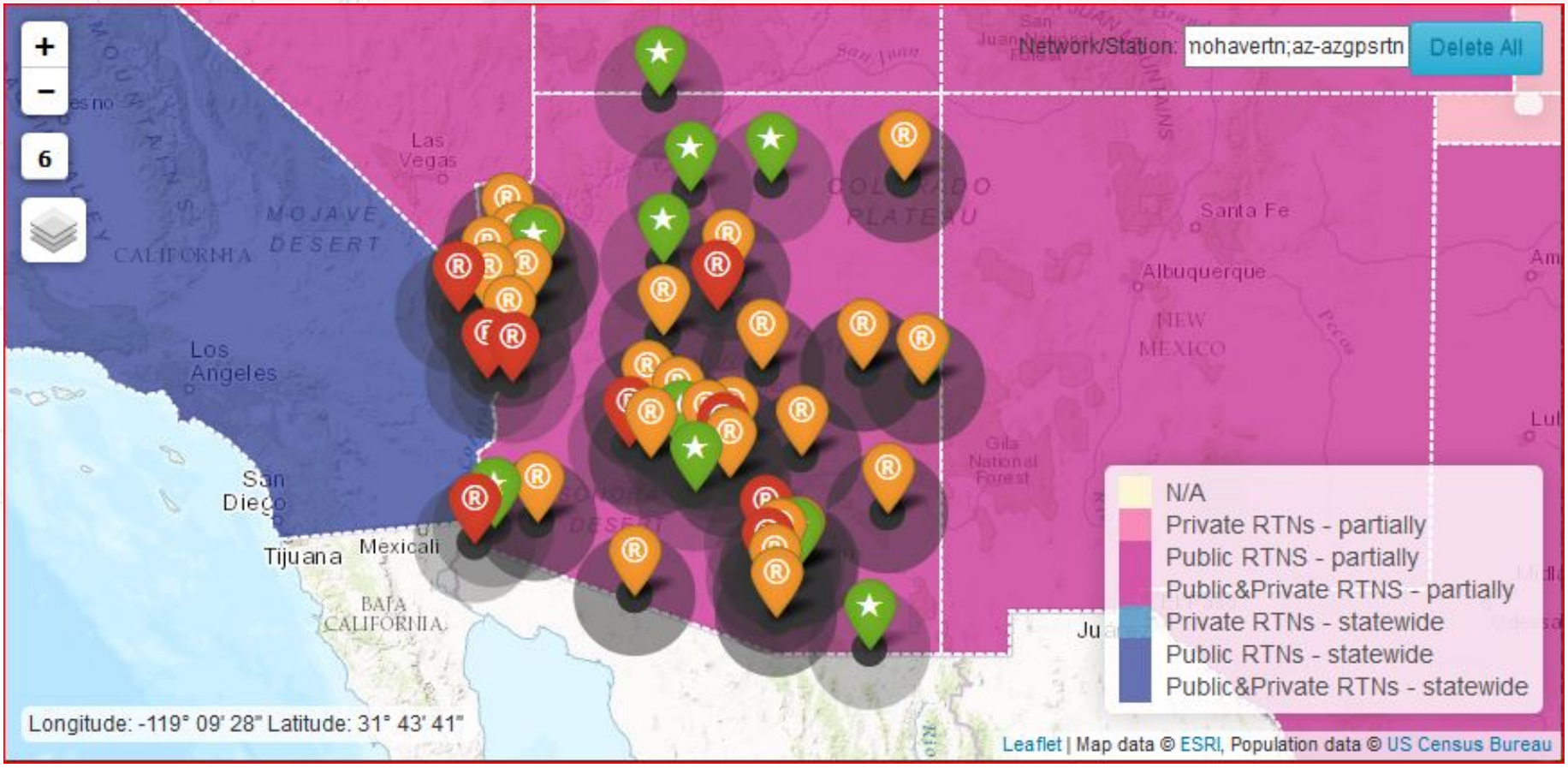
Operational CORS (~1700) with 70km-buffer



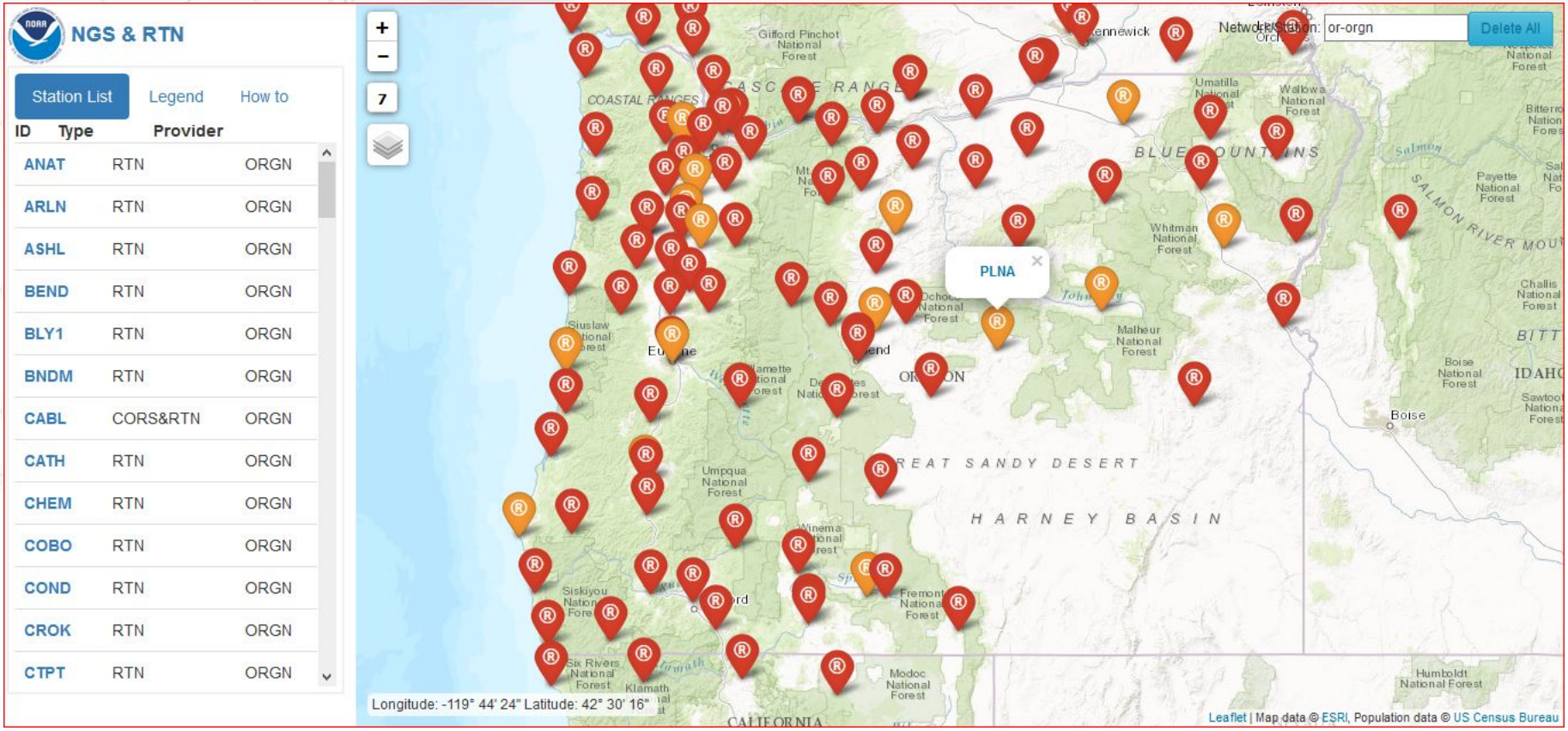
UNAVCO Real-time GNSS Network stations (560) with 20km-buffer



Arizona – Operational CORS & UNAVCO Real-time



Arizona – RTN networks: AZGPS, MohaveRTN



NGS's RTN website with all-in-one map (on-going)

- Update the RTN Guidelines

- Network validation service for RTN operators to align network RTK with NSRS:
  - Using OPUS-Project:
    - Automatic, multiple sites upload to OPUS-Project instead of 5 clicks per site x 99 sites maximum
  - Another OPUS “extension” ~ OPUS-Project for non-GUI lovers with minimum interactive

- Other suggestions/requests/feedback from surveying community, please feel free to send to Ira.Sellars at Ira.Sellars@noaa.gov

Thank you!