NSRS Modernization
New Datums are Coming in 2022

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What's Being Replaced?

Horizontal

- NAD 83(2011)
- NAD 83(PA11)
- NAD 83(MA11)

Latitude
Longitude
Ellipsoid Height
State Plane Coordinates

Vertical

- NAVD 88
- PRVD 02
- VIVD09
- ASVD02
- NMVD03
- GUVD04
- IGLD 85

Heights

Nomenclature

- A chance to increase accuracy in **naming**!
  - "North American"?
    - Ignores Guam, Hawaii, American Samoa, Northern Mariana Islands
  - Datum vs. Reference Frame?
  - Plate-specific?
  - Vertical vs. Geopotential?

- 6/8/2016: NGS and the Canadian Geodetic Survey (CGS) negotiated a naming proposal
  - Approved by the NGS Executive Steering Committee
  - Approved by the CGS leadership (with minor reservations)
- Early 2017:
  - Approved by the Mexico's INEGI

(DRUM ROLL Please)

New Reference Frame Names

NAD 83 becomes:

- North American Terrestrial Reference Frame (NATR2022)
- Caribbean Terrestrial Reference Frame (CTRF2022)
- Mariana Terrestrial Reference Frame (MTRF2022)
- Pacific Terrestrial Reference Frame (PTRF2022)

NAVD88 becomes:

- North American-Pacific Geopotential Datum of 2022 (NAPGD2022)

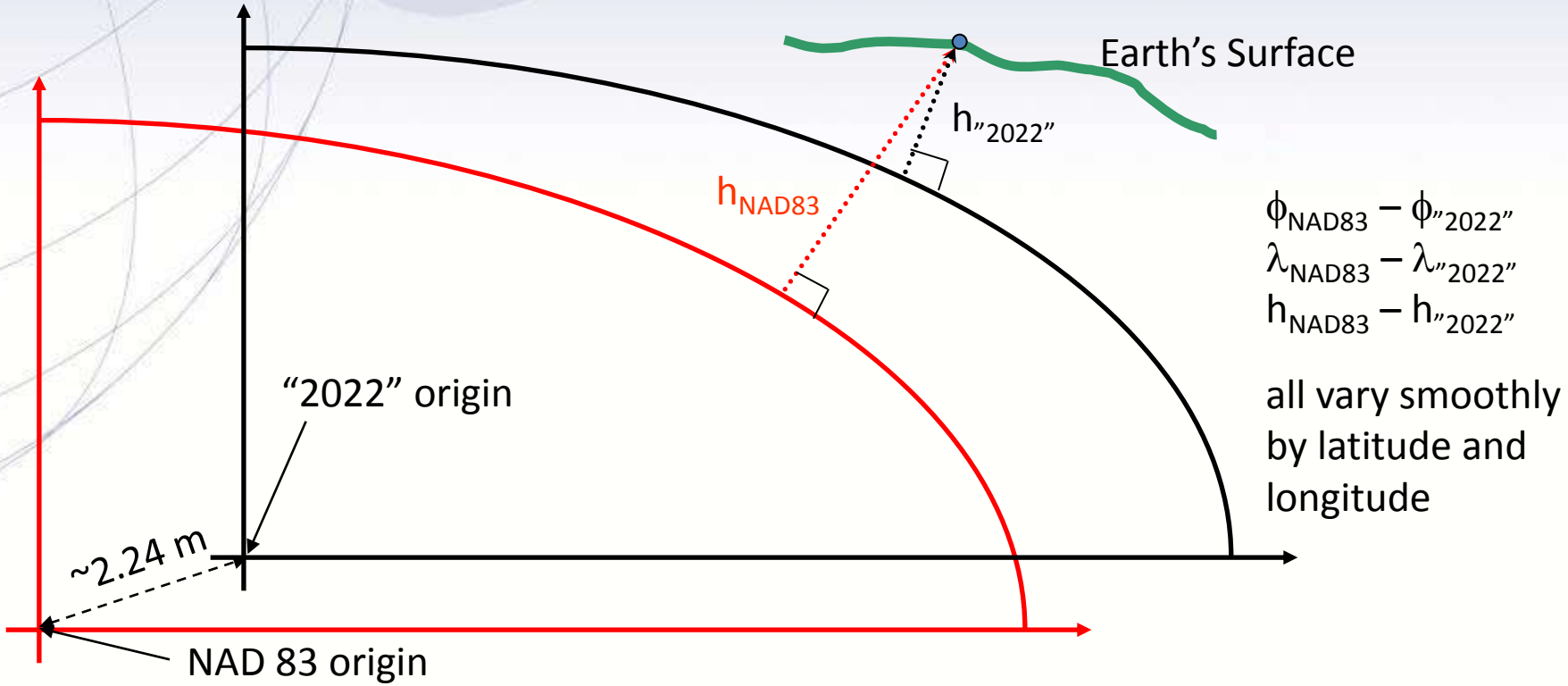
(Realized by GEOID2022)

Legislation

- When NAD 83 replaced NAD 27, the Federal NSRS users were required to switch to NAD 83
- Through the 1980s and 1990s NGS worked with the *states* to update their laws
  - To encourage use of the new system beyond the feds
- 48 states now have laws that refer to NAD 83 *by name*
  - A name which will be *retired* in 2022

Replace NAD 83

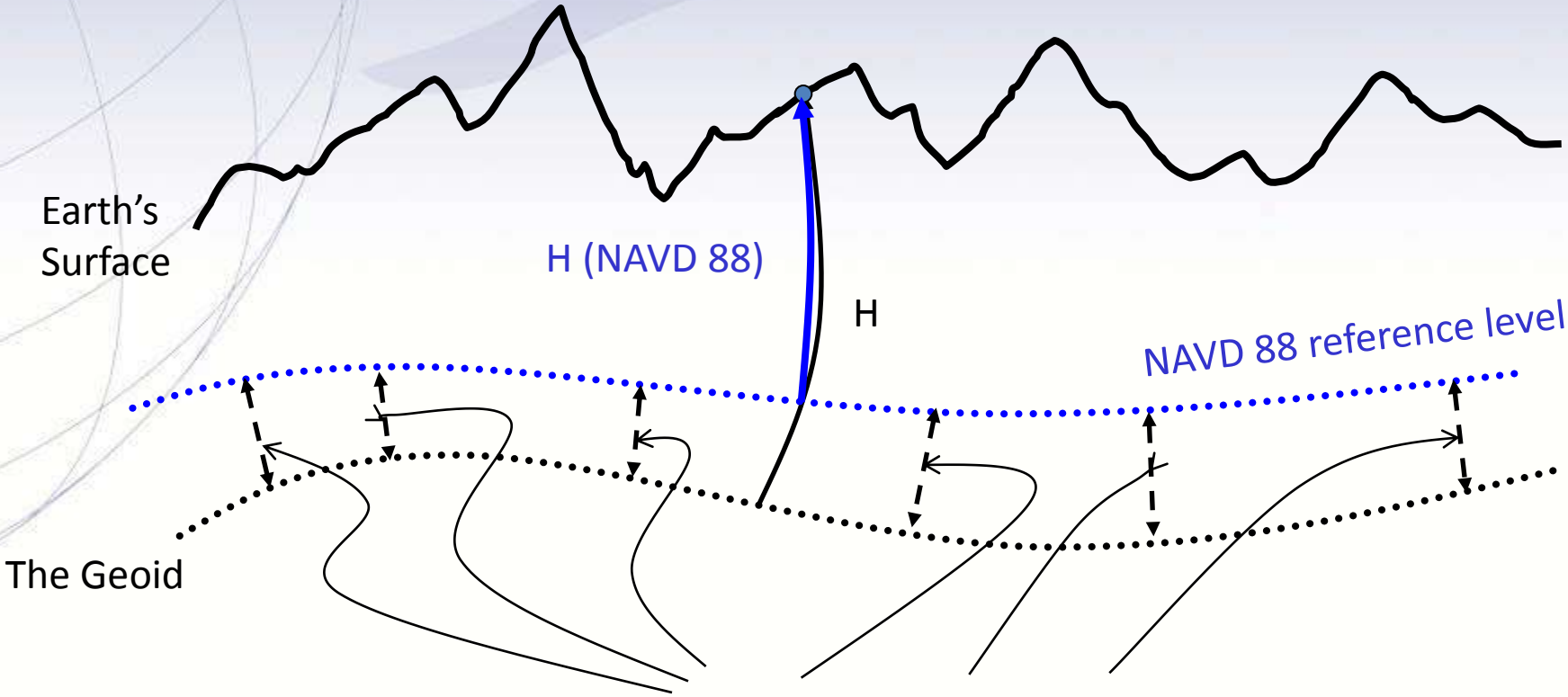
Simplified concept of NAD 83 vs. "2022"



$\phi_{NAD83} - \phi_{"2022"}$
$\lambda_{NAD83} - \lambda_{"2022"}$
$h_{NAD83} - h_{"2022"}$

all vary smoothly by latitude and longitude

Replace NAVD 88

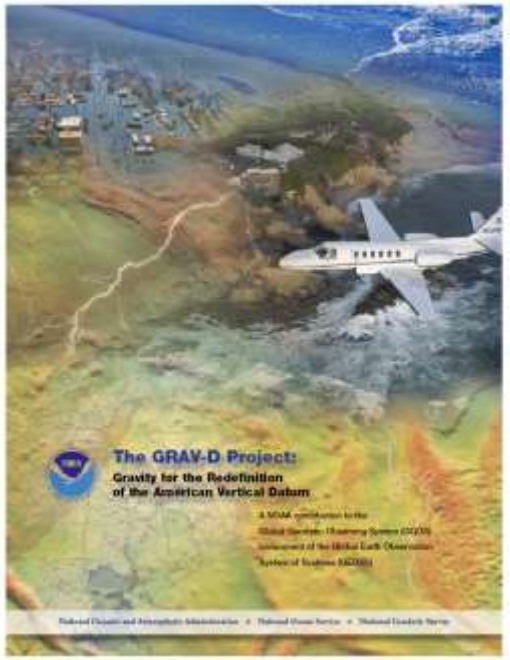


Errors in NAVD 88: ~50 cm average, 100 cm CONUS tilt, 1-2 meters average in Alaska, NO tracking

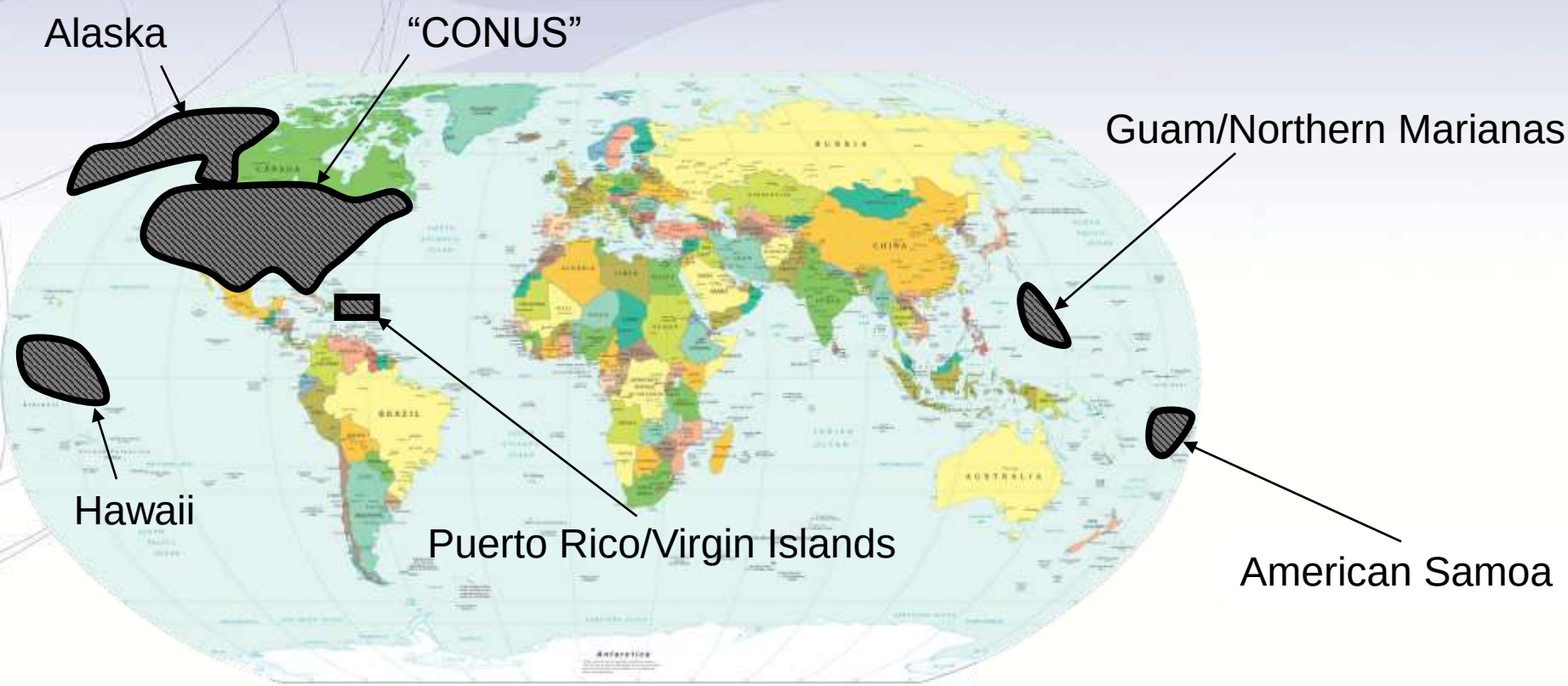
Replace NAVD 88

- Changing from a leveling-based to a geoid/GNSS-based vertical datum

- Biggest requirement: An updated, accurate, nationwide gravity survey
  - Airborne
  - GRAV-D!
    - **G**ravity for the **R**edefinition of the **A**merican **V**ertical **D**atum



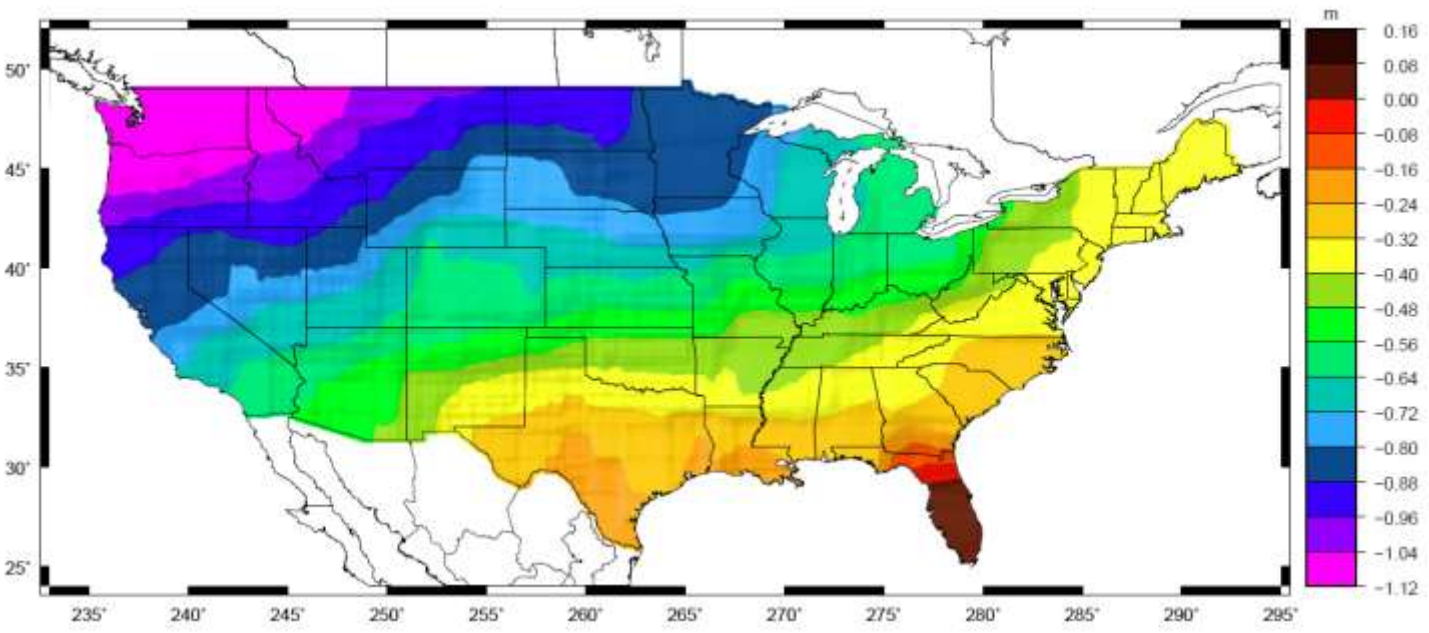
GRAV-D Coverage



Orthometric Heights

Approximate EXPECTED SHIFTS

- Approximate level of geoid mismatch known to exist in the NAVD 88 zero surface
- Does not include local subsidence issues

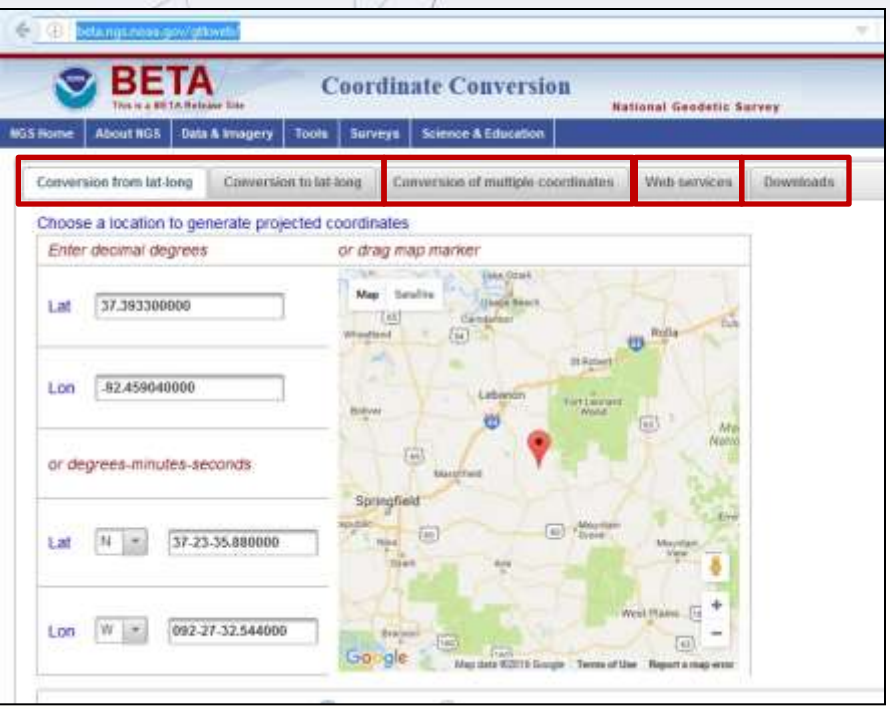


NGS Toolkit

- A set of (mostly FORTRAN-based) geodetic tools
- Little integration
- Many with no online capability
- No web services

New Toolkit

http://**beta**.ngs.noaa.gov/gtkweb/



- Convert to/from latitude and longitude
  - State Plane Coordinates
  - UTM
  - US National Grid
- Upload file of points
- Web service
- Download and run offline

NADCON 5

- Replacing NADCON 4.2 and GEOCON 2.0
- Support for nearly all horizontal datums since 1897
  - Exceptions: Regional Alaska
- No "state by state" grids
- Fixing all existing bugs

- Web service
- Consistent
- Documented
- Rigorous location-dependent error estimates
- **Ready to support 2022**

Toolkit Future

The entire NGS Toolkit will be integrated eventually

- VERTCON 3.0
- HTDP
- VDatum
- All other tools

Summary

NSRS Modernization

- More than just replacing NAD 83 and NAVD 88
- Affects most tools, products and services of NGS
- Dozens of interdependent, multi-year projects ongoing
- Expect rollouts and announcements throughout the next 6 years!

To Learn More

Visit the New Datums web page

geodesy.noaa.gov/datums/newdatums/index.shtml

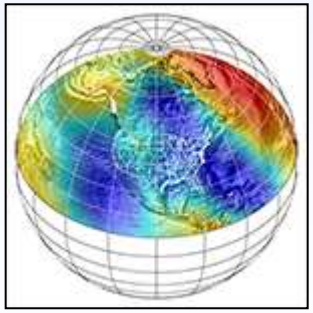
To Learn More
Attend the Geospatial Summit

- Silver Spring, MD
- April 24-25, 2017
- FREE

geodesy.noaa.gov/geospatial-summit/index.shtml

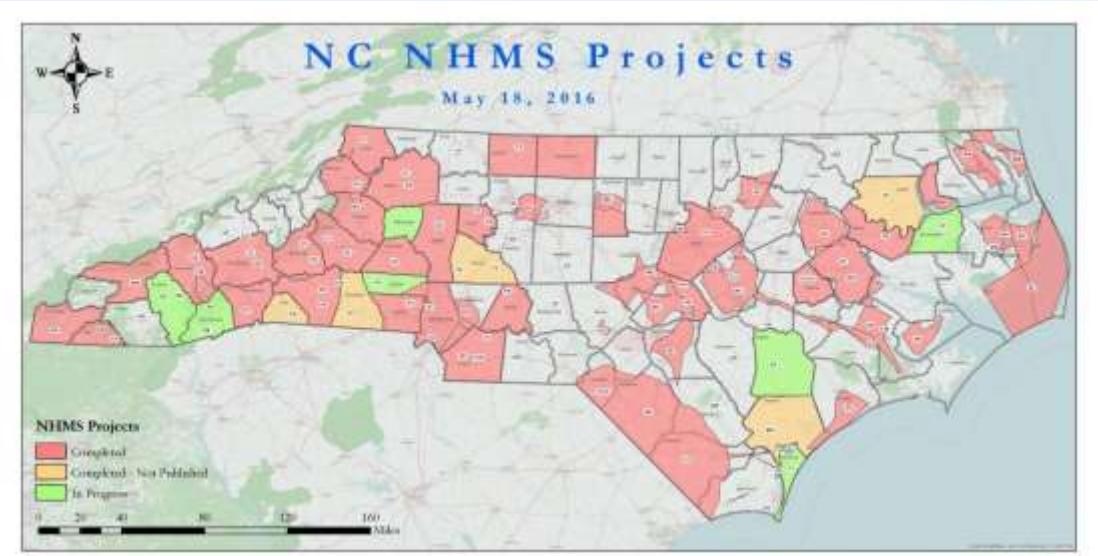
What are we doing to prepare for the new datums (reference frames) in 2022

- Created a 2022 Datum Working Group to develop implementation recommendations
- Partnering with UNCC on a grant proposal (National Science Foundation) to purchase an absolute and relative gravity meter (grant proposal has been submitted)
- Working with SC Geodetic Survey to develop common implementation plans

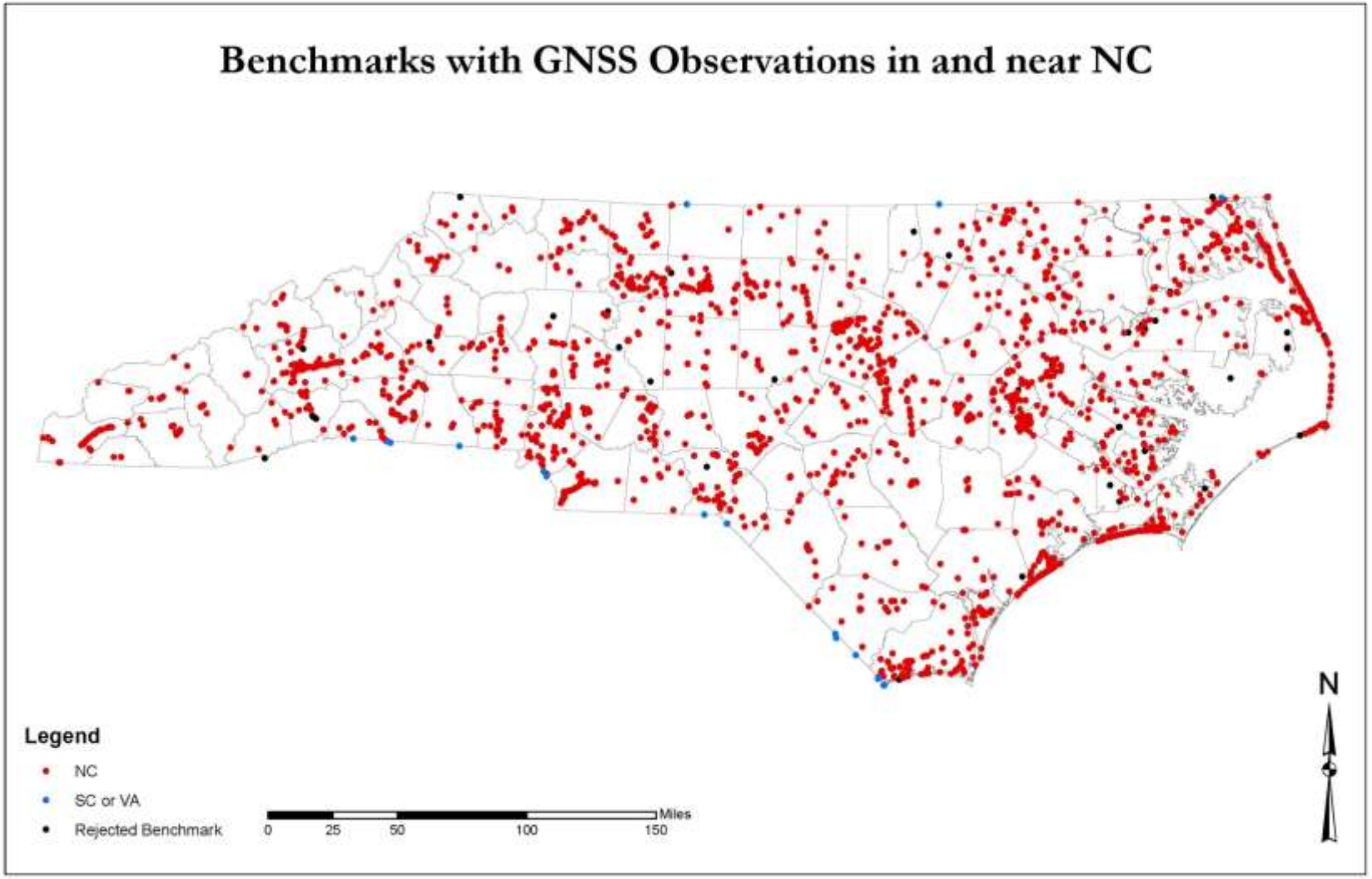


What are we doing to prepare for the new datums (reference frames) in 2022

- Potential future grant proposal would involve obtaining gravity data from airborne IMU's (during imagery or LiDAR data collection)
- Obtaining precise ellipsoidal heights on NAVD88 bench marks (Height Modernization surveys)



Benchmarks with GNSS Observations in and near NC



DEPARTMENT OF PUBLIC SAFETY

North Carolina Emergency Management

QUESTIONS?