LRO SNAPSHOT
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Finding the Right Direction(s): Understanding Datums and Mapping Changes

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Preparing for a New Geospatial Era in North America

North America is undergoing a major geospatial transformation. By late 2025 or 2026, the United States will transition to a modernized spatial reference framework that will redefine how latitude, longitude, and elevation are measured. Although the shift may seem minor—typically a few meters—it will significantly impact sectors that rely on accurate positioning, from agriculture and construction to emergency management and mapping.

Figure 1: Estimated Horizontal Change from NAD83 to New Geometric Datum

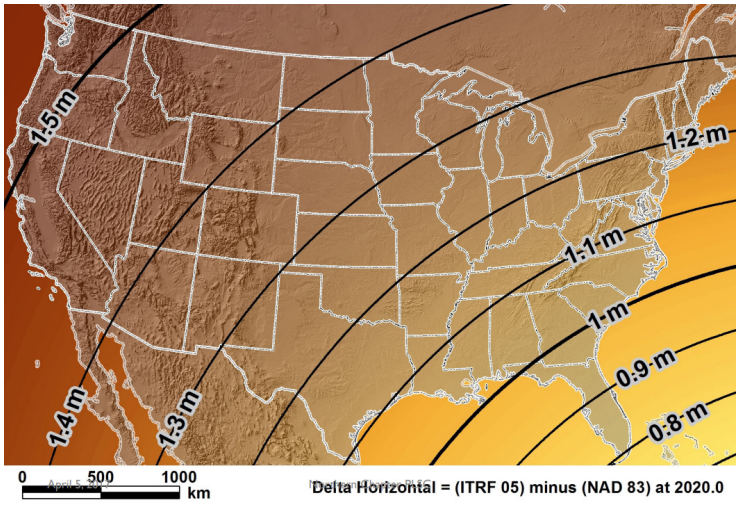

Image Credit: Scott (2024)

Understanding the Change: What Is the NSRS?

The National Spatial Reference System (NSRS), managed by the National Geodetic Survey (NGS), is the foundational coordinate system for the United States. It includes data for latitudes, longitudes, elevations, and more, and it's used across public and private sectors for navigation, surveying, mapping, and infrastructure development.

Currently, most systems are based on datums established in the 1980s: the North American Datum of 1983 (NAD83) for horizontal positioning and the North American Vertical Datum of 1988 (NAVD88) for elevation. These will soon be replaced by:

- Four new terrestrial reference frames (TRFs):
  - NATRF2022 (North America)
  - PATRF2022 (Pacific)
  - CATRF2022 (Caribbean)
  - MATRF2022 (Mariana)
- A geopotential datum for elevation measurements

These new frames will align with the International Terrestrial Reference Frame 2020 (ITRF2020) and account for tectonic plate movements, providing more dynamic and accurate location data.

Why Now?

Advancements in satellite and GNSS (Global Navigation Satellite System) technology—especially GPS—have made the current system outdated. Increasing demands for centimeter-level precision in various industries make a more modern, adaptable geospatial reference system essential. The new NSRS will:

- Eliminate reliance on physical benchmarks (which degrade over time)
- Offer better compatibility with international systems
- Improve long-term consistency and data accuracy

Data collected since 2022 has been used to model this change, and the modernization is the result of a multiyear national effort by NGS and other stakeholders. (National Oceanic and Atmospheric Administration , 2024)

Figure 2: Approximate Predicted Change from NAVD88 to New Vertical Datum

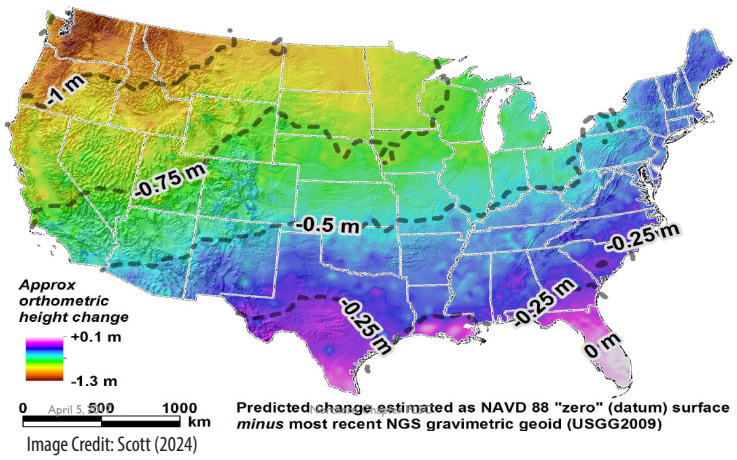

Image Credit: Scott (2024)

Real-World Impacts

Agriculture

Farmers using GPS-guided tractors and A-B line systems will need to recalibrate. In Nebraska, shifts in location data will range up to 2 meters (about 6.5 feet in some regions). Failure to update could cause overlapping or missed rows, reducing yield and efficiency. (Grassi, 2024)

Infrastructure and Engineering

Bridges, roads, tunnels, and rail systems depend on precise geospatial data. The new datums will improve accuracy for planning and maintenance and reduce cumulative errors in construction projects.

Disaster Response and Environmental Planning

More accurate shoreline mapping and aerial imagery will improve emergency response, revise floodplain modeling and insurance risk assessments. Faster and more precise data will support decision-making in the face of natural disasters.

Figure 3: Estimated Ellipsoid Height Change from NAD83 to New Geometric Datum

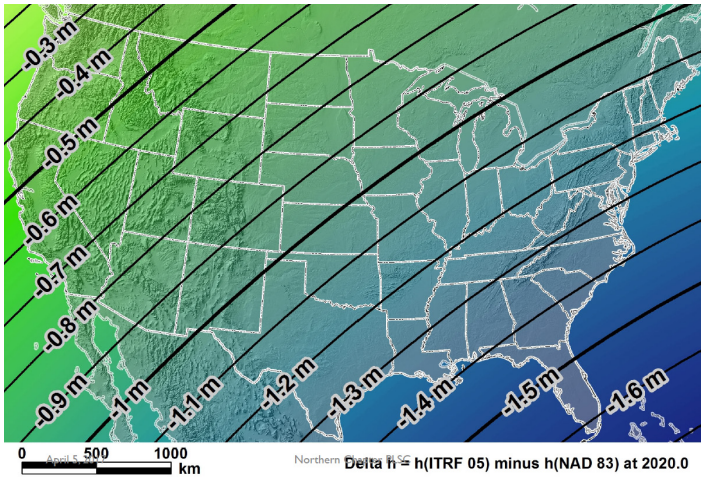

Image Credit: Scott (2024)

Figure 4: Territorial Reference Frames – NATRF2022, PATRF2022, CATRF2022, MATRF2022

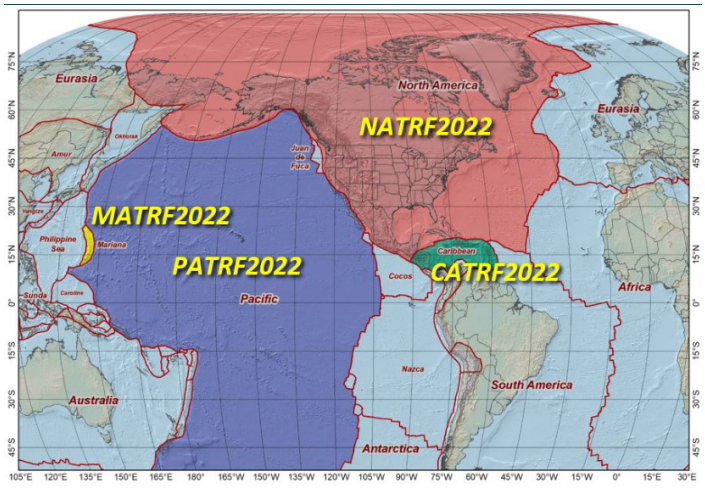

Image Credit: National Society of Professional Surveyors (2025)

Autonomous and Smart Technologies

Navigation systems for autonomous vehicles and smart highways will benefit from improved location accuracy, enabling safer and more reliable travel.

Nebraska's Preparation

In Nebraska, all geospatial measurements—including latitude, longitude, and ellipsoid heights—will shift. The Nebraska State Surveyor's Office and the GIS Steering Committee are monitoring the transition, but broader awareness and preparation remain.

Key recommendations for state and local agencies include:

- Documenting all mapping metadata
- Re-inventorying and preserving existing geospatial data
- Updating field survey standards and contractual requirements
- Planning for re-surveys, boundary adjustments, and GIS data transformations

(National Society of Professional Surveyors, 2025)

A Note on Map Projections

This isn't Nebraska's first brush with mapping reform. In 2024, the Legislature revisited LB 962 (amended into LB 1329), which examined the Peters versus Mercator projection debate. While projections differ in how they represent Earth's surface, both rely on datums as the foundational reference system—highlighting how fundamentally accurate geospatial positioning is to all forms of mapping.

Conclusion

Although the NSRS modernization might seem like a technical adjustment, its implications will ripple across daily life and vital industries. From farmers to engineers, surveyors to city planners, this transformation will redefine how we understand and interact with geographic space.

"Moving day" may not involve shifting ground beneath our feet, but in geospatial terms, it's a significant step forward.

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