



Federal Surveyors Supporting NSRS/NCN

Cadastral Program / Bureau of Land Management / Department of the Interior

Presenter:

Ben Johnson

62nd Meeting of Civil GPS Service Interface Committee (CGSIC)

September 19, 2022

<https://www.gps.gov/cgsic/meetings/2022/>

Agenda

- Introduction
- Preface “acronyms”
- Mission and Heritage of the BLM Cadastral Program (237 years)
- Update & Ongoing Initiative within Wyoming
- Collaboration Potential into the Future

Disclaimer:

The views expressed herein do not necessarily represent the views of the Department of the Interior, Bureau of Land Management, Cadastral Program, or the United States.

Introduction

Ben Johnson

- 18 years of land surveying experience
 - 12 years non-federal land surveying experience
 - State licensed in Arizona and Utah
 - Certified Federal Surveyor (CFedS) Certificate
 - 6 years federal land surveyor, general schedule (GS) 1373

Preface

Terms; *acronyms*:

- Federal Surveyors: (Land Surveyor)
 - Office of Personnel Management (OPM): 1373 series
 - Bureau of Labor and Statistics (BLS) Standard Occupational Classification (SOC): 17-1022
 - Executive Branch employs approximately 440
Approximately 120 within Cadastral Program (27%)

Preface

Terms; *acronyms*:

- **NSRS**: National Spatial Reference System=
In simplest terms, Consistent Coordinate System, managed by NGS



Preface

Terms; *acronyms*:

- **NCN**: **National** Oceanic Atmospheric Administration (NOAA)
National Geodetic Survey (NGS)
Continuously Operating Reference Stations (**CORS**) **Network**



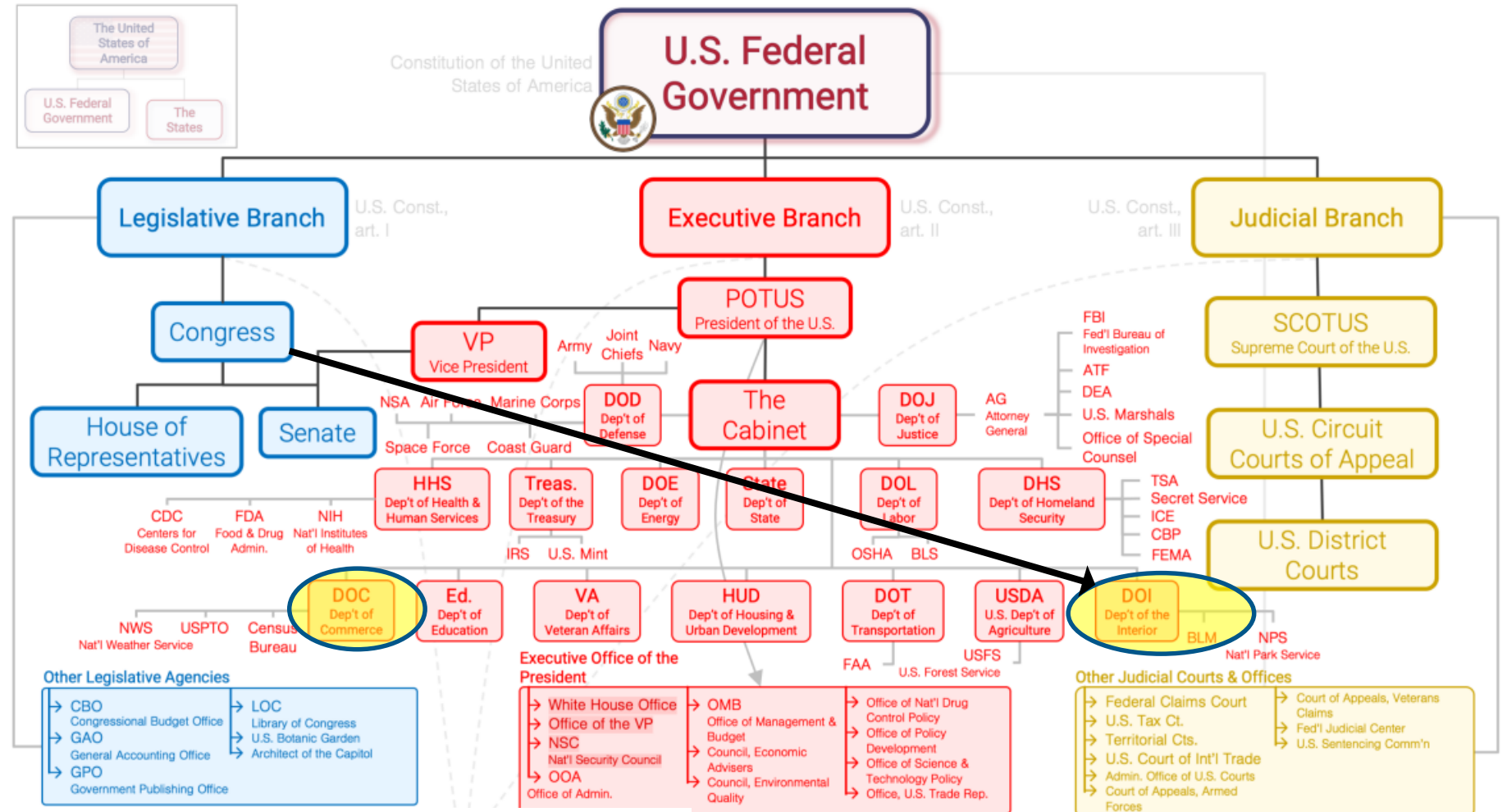
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Considerations:

15 Departments within Executive Branch.

Varying missions and priorities throughout.

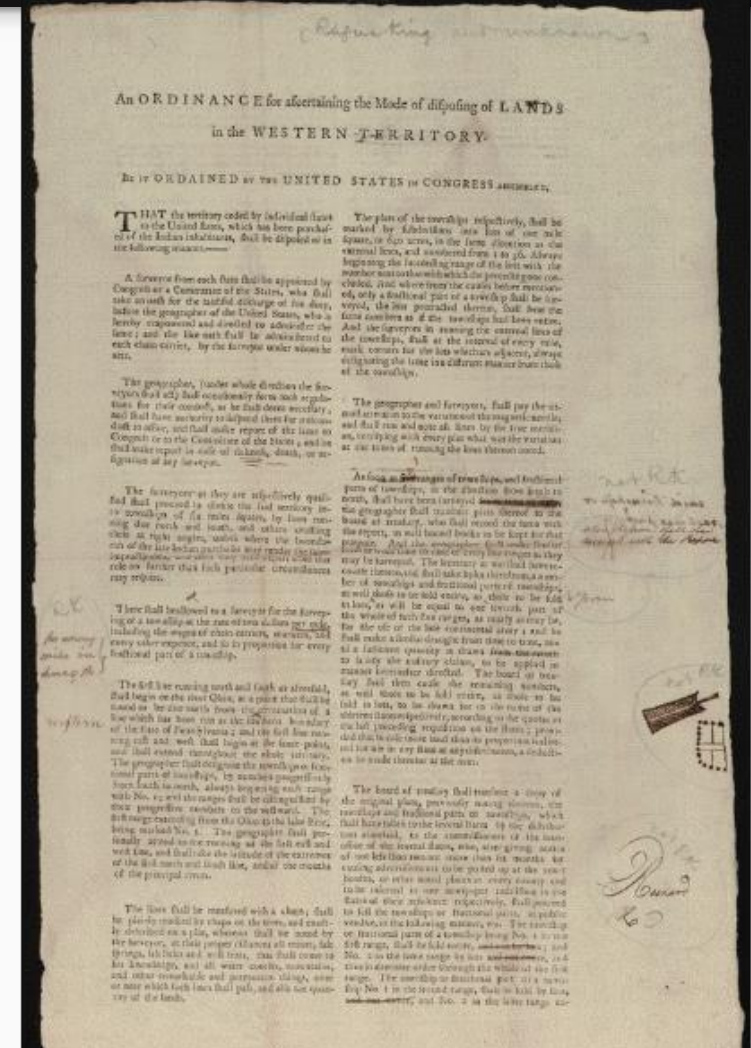
Delegated Authority from Congress, since 1785, currently through the Secretary of the Interior to Cadastral Chiefs, for Federal / non-Federal Boundaries.



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Brief History:

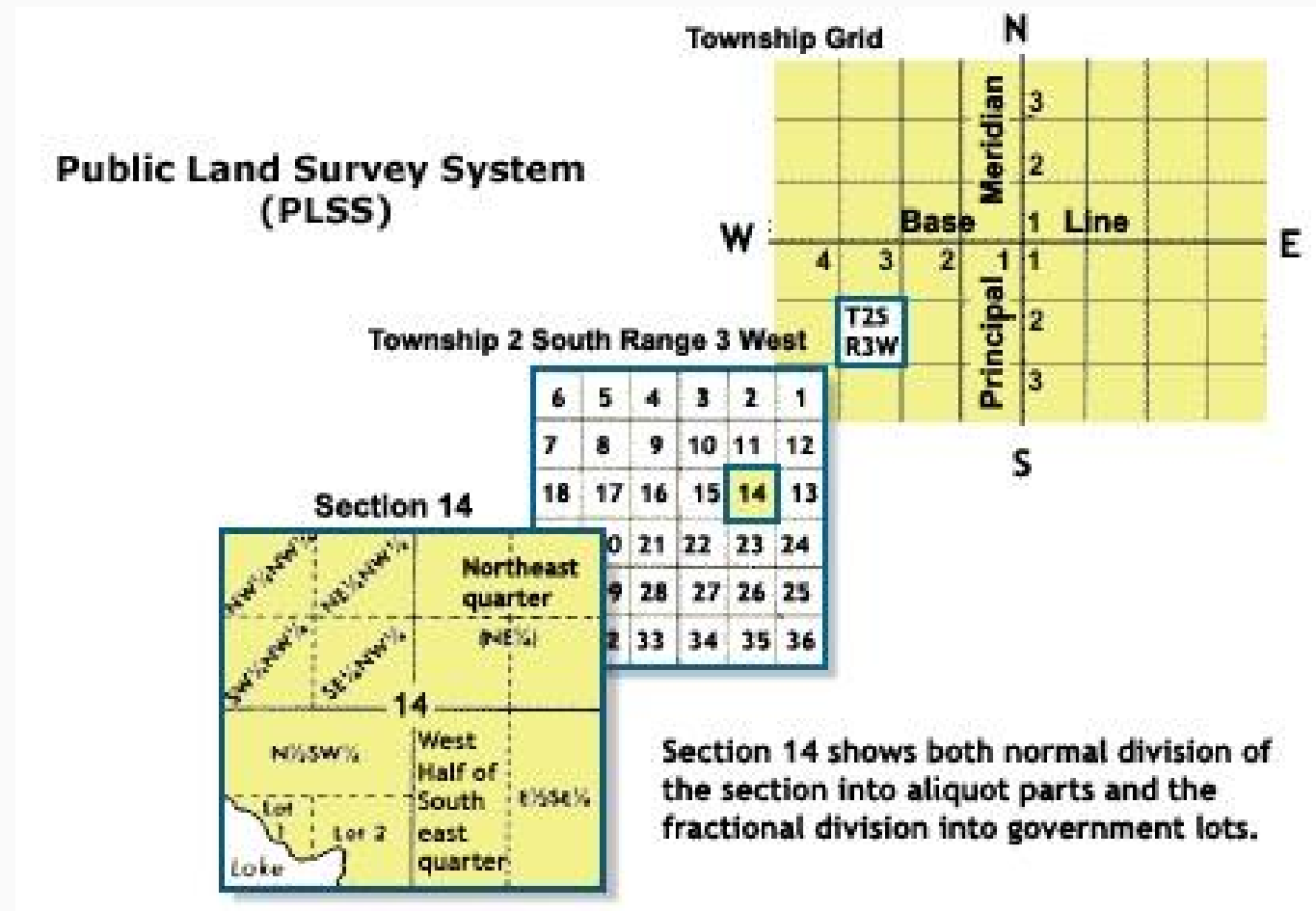
- 1785 Land Ordinance (27 years)
 - 1785-1796 US Geographer (11 years)
 - 1796-1812 Surveyor General (16 years)
- 1812-1849 Department of Treasury (37 years)
 - General Land Office (GLO)
- 1849-1946 Department of the Interior (97 years)
 - General Land Office (GLO)
- 1946-2022 Bureau of Land Management (76 years)
 - Cadastral Program [GLO Records]



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Surveys:

- Public Land Survey System (PLSS)
 - Also known as the Rectangular Survey
- Process to produce simultaneous surveys to reduce gap and overlap from metes-and-bounds.
- Constantly evolved.
- As many equal area sections (square miles).

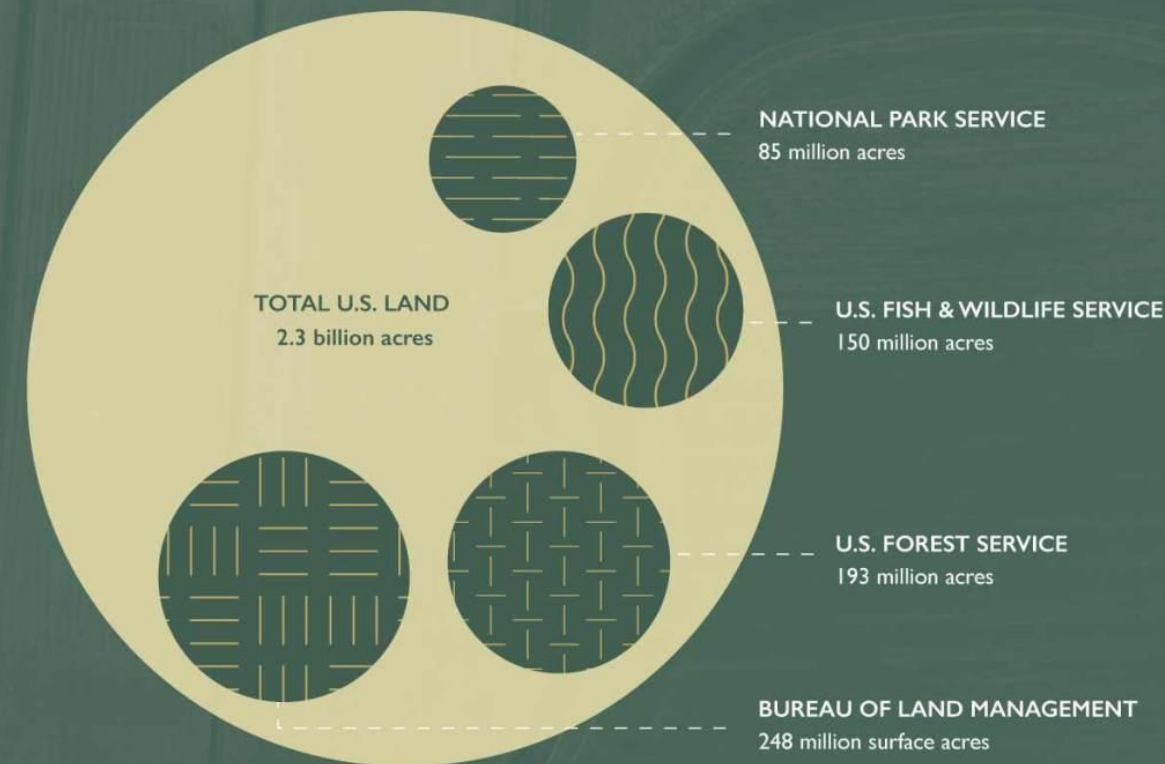


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Area:

- Total US 2.3 Billion Acres
 - 24% compared to the Earth's Moon*
 - With 680 Million Acres of Public Lands
 - 5.6 million acres per surveyor
 - 8,800 townships per surveyor
 - 5.3 million monuments (44k per surveyor)
- Our Moon Approx. 9.4 Billion Acres
 - Will the Moon's surface be surveyed?
 - Who, How? (490 surveyors?)

HOW MUCH LAND DOES THE U.S. GOVERNMENT MANAGE?



Sources: National Park Service, U.S. Fish & Wildlife Service, U.S. Forest Service, Bureau of Land Management
Created by University of Dayton's online J.D.

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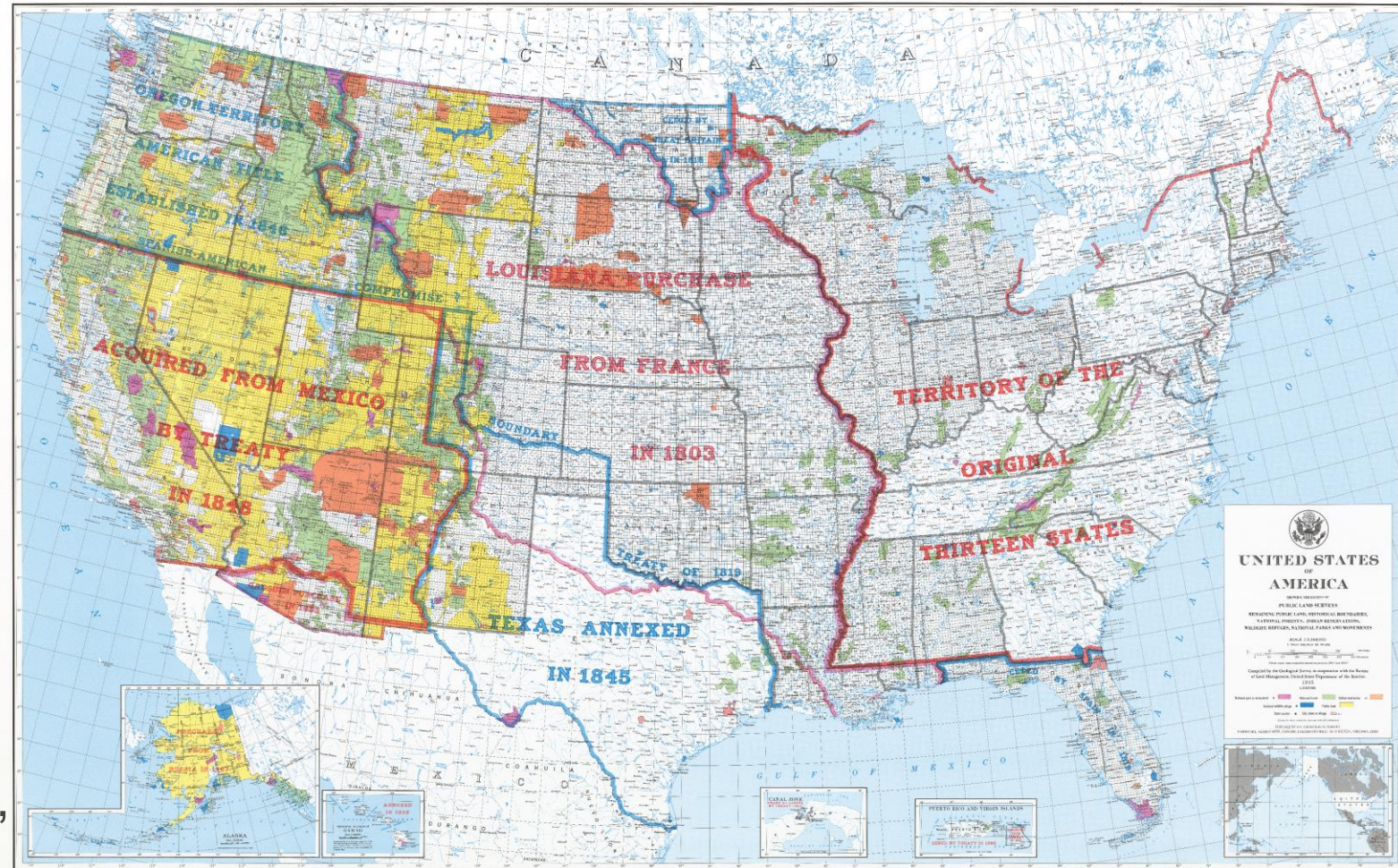
Monuments:



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Mission:

- Conduct Official US Government Land (Boundary) Surveys
- Land Status Records
- Public Land Survey System (PLSS) experts and data stewards
- Many Others...
 - Collaboration, Consultation, Committees, Outreach, etc.



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Why is BLM Cadastral Supporting NSRS/NCN:

- Aligning with NSRS is a requirement of the materials BLM Cadastral produces.
- Generally, more efficient than using passive marks to align with NSRS.

Chapter II - Methods of Survey

Coordinate Systems and Projections

Geodetic Reference Systems

2-29. The National Geodetic Survey (NGS) defines and manages the NSRS throughout the United States. The NGS provides the cadastral surveyor with a consistent national coordinate system that defines latitude, longitude, height, scale, gravity, and orientation for the Nation. The **NSRS** is dynamic and subject to refinement.

In general terms, datum and reference ellipsoids are not cited here because different datums of North America produce virtually identical results when reducing the length and direction of a line. This is, of course, dependent on the precision or number of significant figures used when reporting measurements.

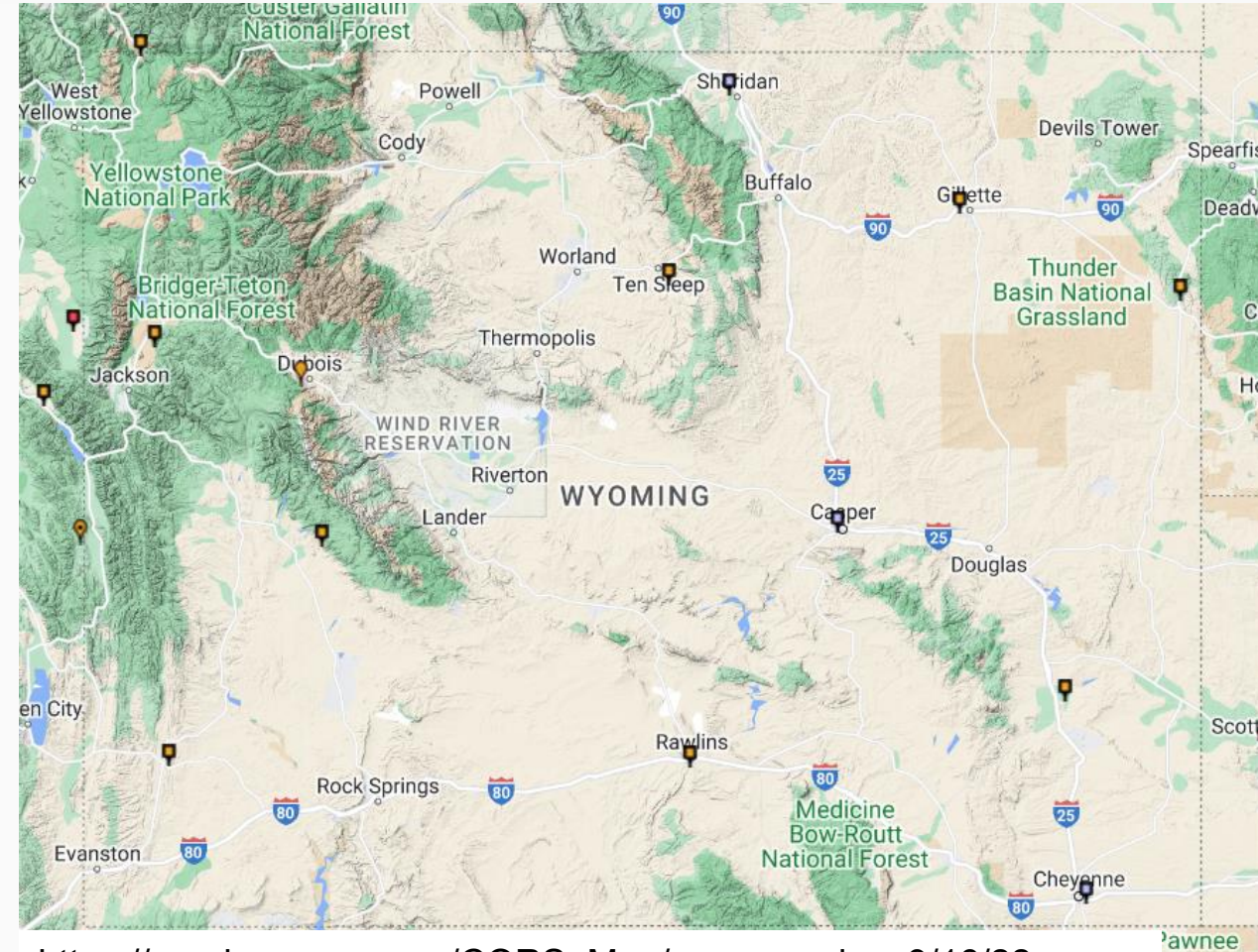
Cadastral surveyors should use automated computational systems as well as geographic and projected grid coordinate systems oriented directly to the NSRS to conduct official surveys.

Ongoing Initiative Within Wyoming

NSRS/NCN Development

Current Status of NCN:

- **13 Stations**
 - **9 UNAVCO (NSF/NASA)**
 - **3 BLM Cadastral**
 - **1 City of Gillette**

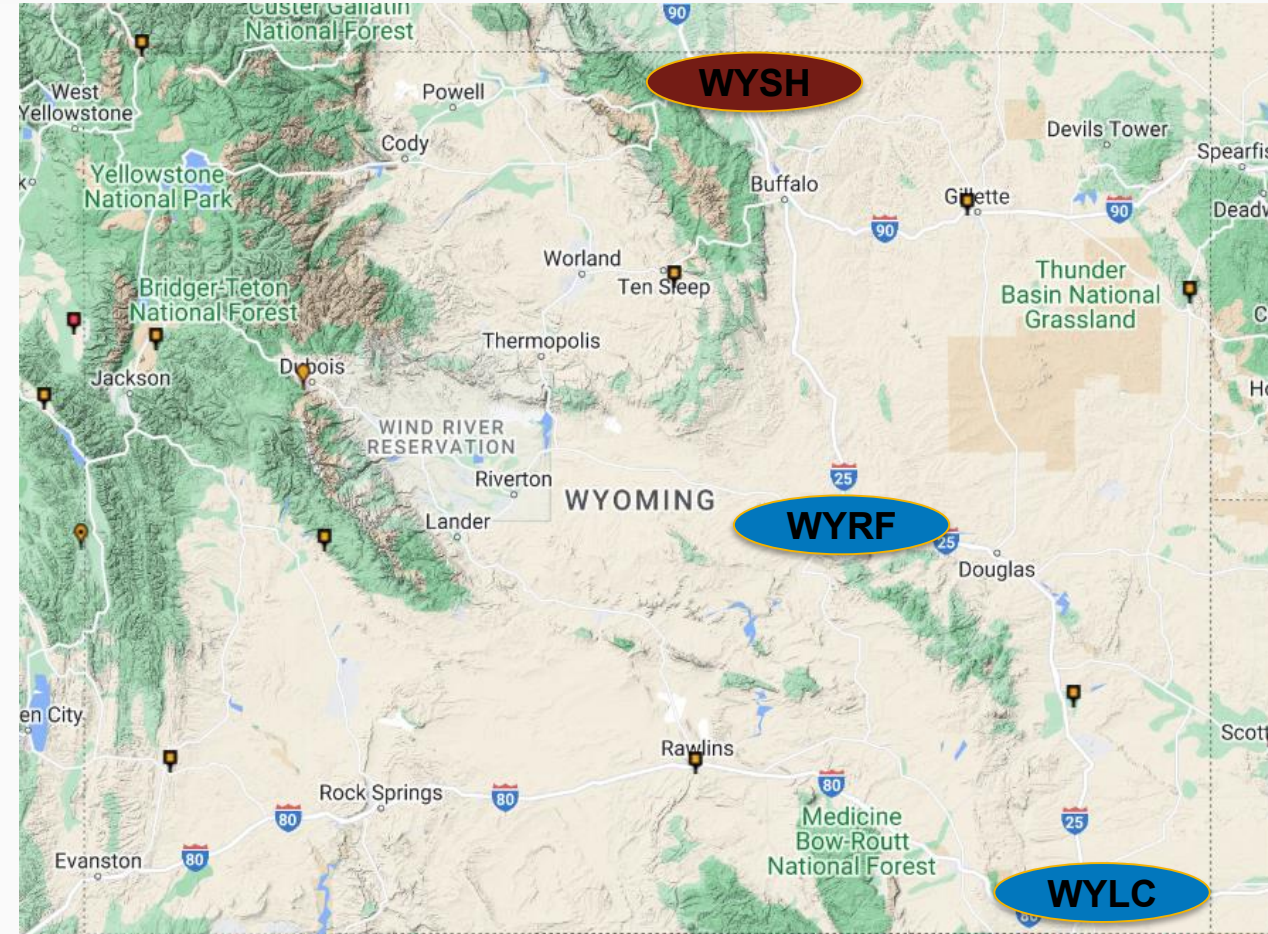


https://geodesy.noaa.gov/CORS_Map/, accessed on 9/16/22

Ongoing Initiative Within Wyoming

BLM Cadastral Stations:

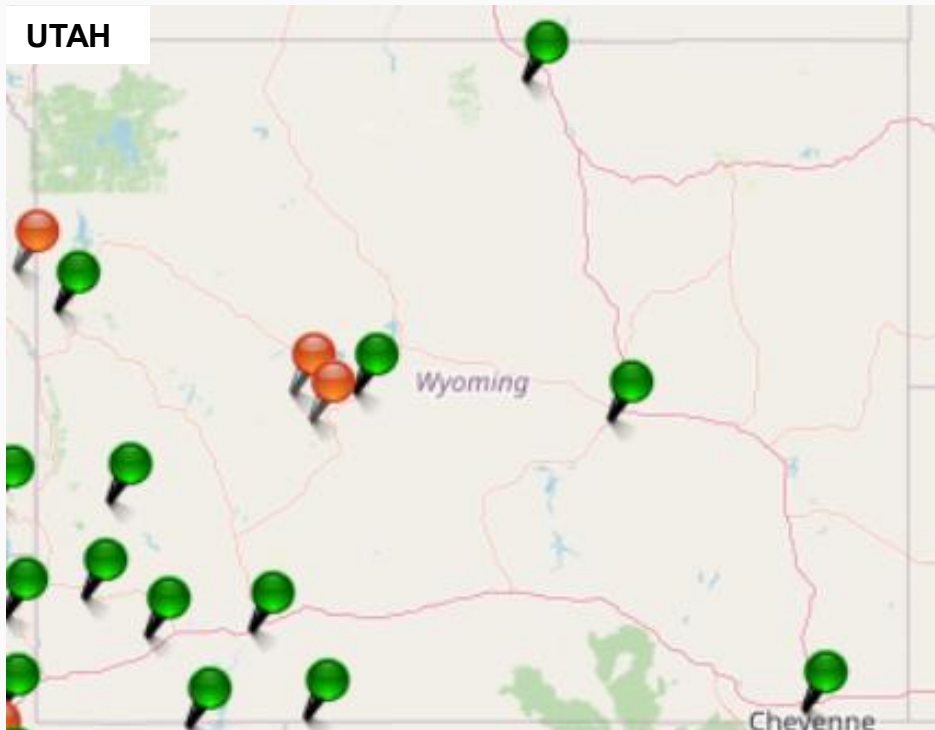
- **WYLC**
 - Upgraded to multi-frequency / constellation receiver in 2020
- **WYRF**
 - Upgraded to multi-frequency / constellation receiver in 2021
- **WYSH**
 - Planned upgraded 2022/2023



https://geodesy.noaa.gov/CORS_Map/, accessed on 9/16/22

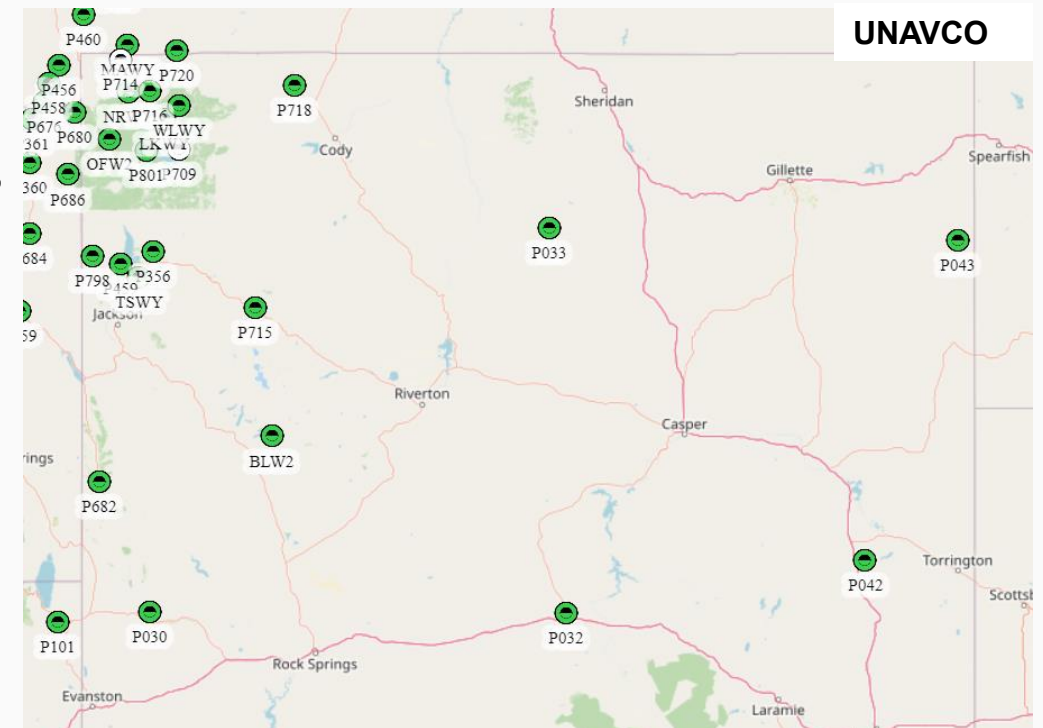
Ongoing Initiative Within Wyoming

Existing CORS in WY, not all are NCN or RTN contributing...



<http://turngps.utah.gov/Map/SensorMap.aspx>,
accessed on 9/16/22

Can we connect
others' business
needs in order
to densify the
NCN resources?



<https://www.unavco.org/data/gps-gnss/real-time/real-time.html>,
accessed on 9/16/22

A Few Considerations

Inquire, Promote, Educate, Advocate, etc...

- Continue collaborating, finding links to our varied missions and priorities.
- Promote more than our own initiatives.
- Develop centralized resources, if possible.

Federal Surveyors could play a vital role in furthering NSRS/NCN modernization efforts throughout the Country.

Collaboration Into The Future

Furthermore...

Federal Surveyors and Monuments could contribute to future technologies...?

Examples:

- InSAR artificial reflectors?
- Monuments which can report data to LEO SVs?
- Terrestrial calibration for future EMS manipulation?



(a)



(b)



(c)

<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5579533/bin/sensors-17-01753-g006.jpg>, accessed on 9/16/22



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Program Contacts can be found:

<https://www.blm.gov/programs-lands-and-realty-cadastral-survey-contacts>

Questions, if any, at the end of the session.

Thank you