Building Geospatial Foundations: Historic Ties for Modern Concerns

Neil MacGaffey

Director, MassGIS

GEOSPATIAL FOUNDATIONS:

foun·da·tion (foun-dā'shən)

noun

1. The act of founding, especially the establishment of an institution with provisions for future maintenance.

2. Something that gives rise to or supports something else.

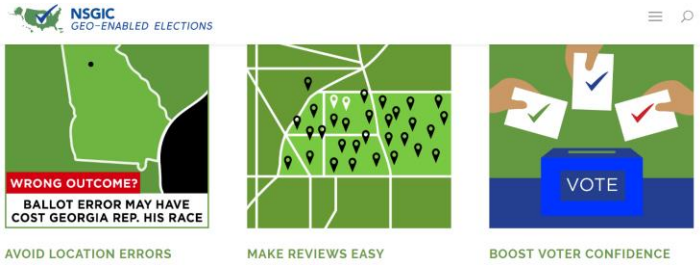
Source: On-Line American Heritage Dictionary

GEOSPATIAL FOUNDATIONS

Democratic Function

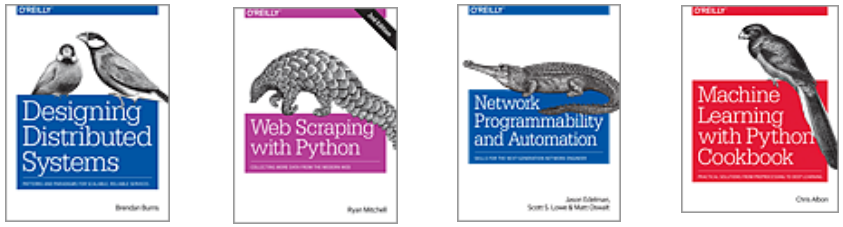
“The foundation of our democracy is maps because without correct maps we can’t assign voters the correct ballot”.

Jared Dearing, Executive Director of Elections, Commonwealth of Kentucky



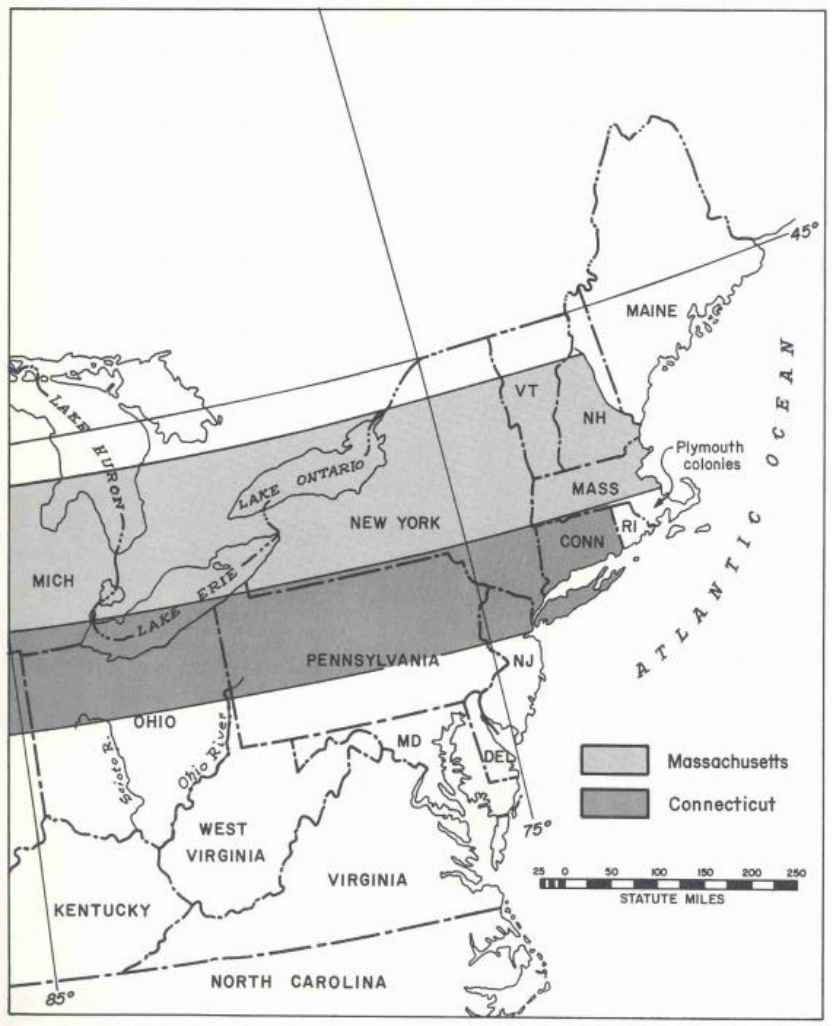
"Location is the key to the relevance of government to its citizenry, as well as to a host of non-governmental services.“

Tim O’Reilly, O’Reilly Media on social.techcrunch.com, Sept. 2009



GEOSPATIAL FOUNDATIONS:

Selected Land Charters, 1629 and 1662



Source: "A History of the Rectangular Survey System" USDI-BLM 1983 https://www.blm.gov/sites/blm.gov/files/histrect.pdf

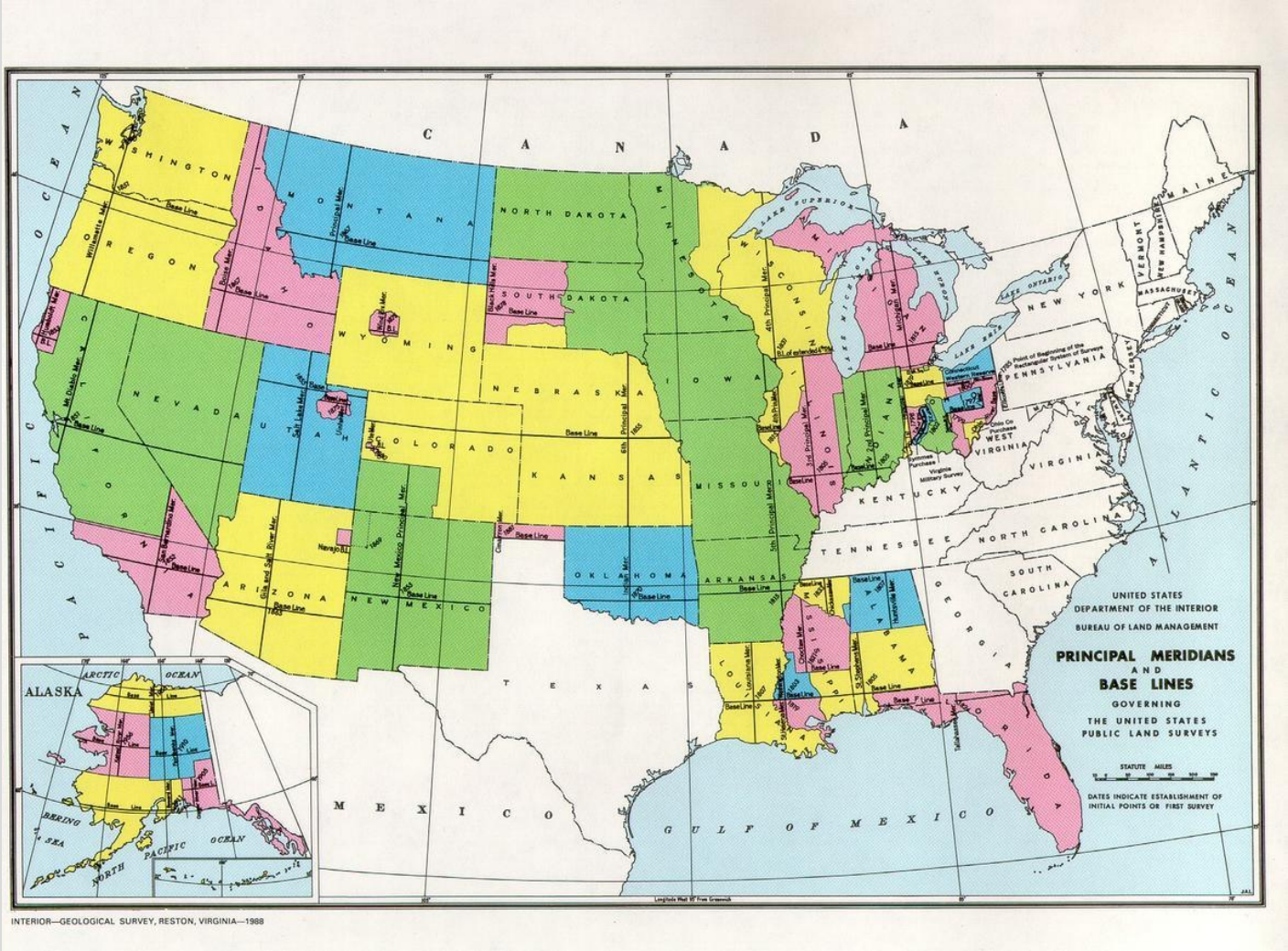
GEOSPATIAL FOUNDATIONS

Mapping a Nation

GEORGE WASHINGTON, SURVEYOR

MAPPING THE USA

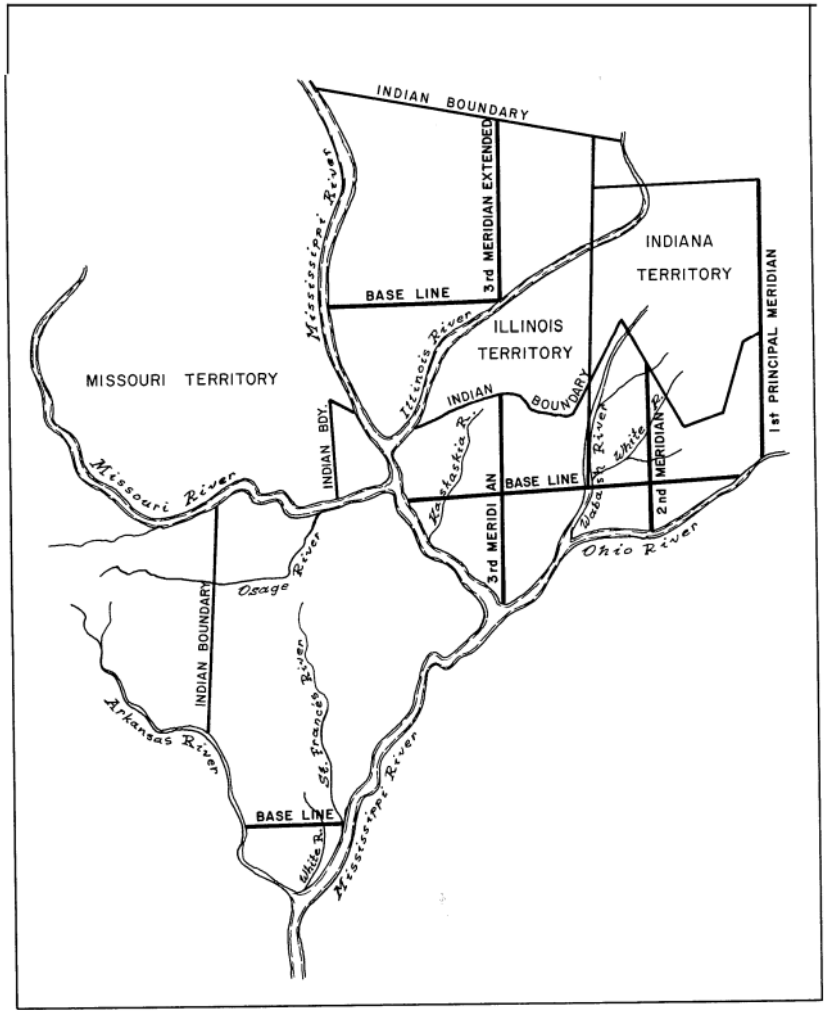
Extent of Public Land Survey System



https://www.usgs.gov/media/images/PLSS

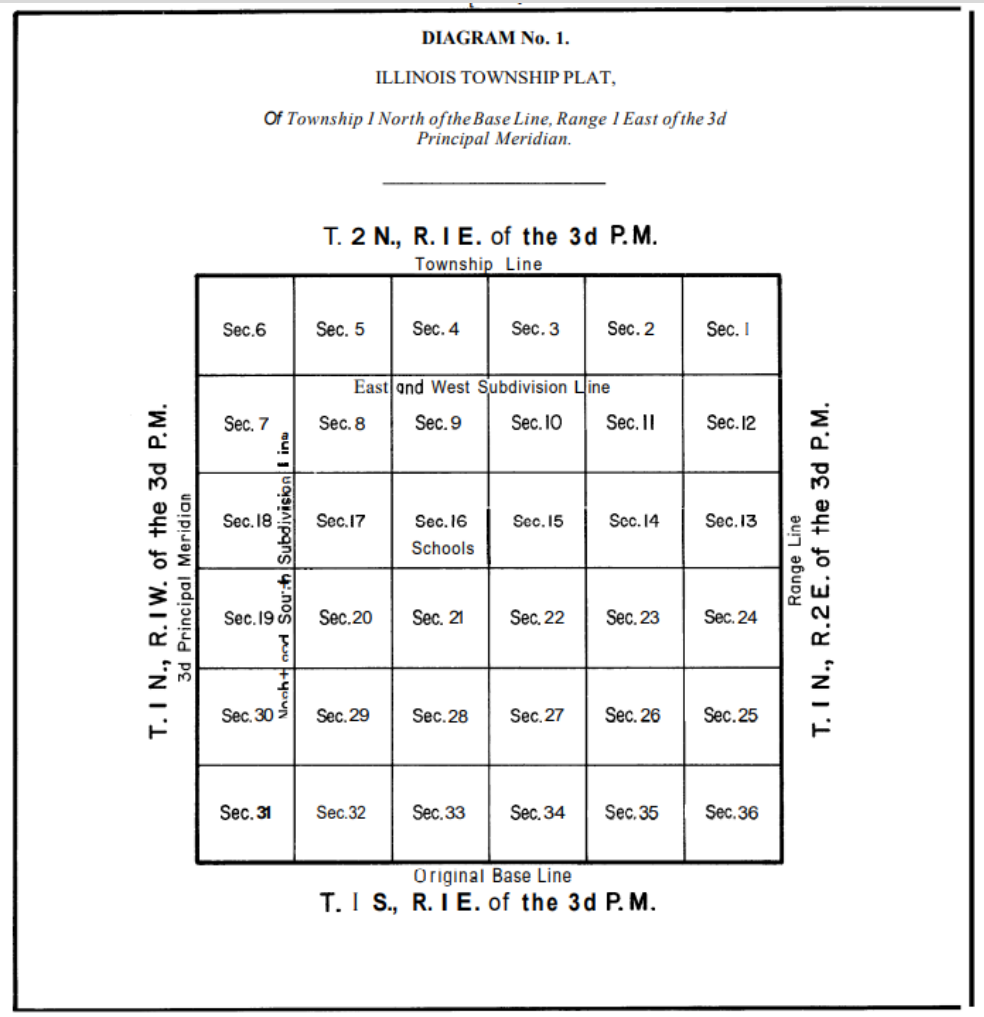
MAPPING THE USA

"Western Territories"



Source: "A History of the Rectangular Survey System" USDI-BLM 1983 https://www.blm.gov/sites/blm.gov/files/histrect.pdf

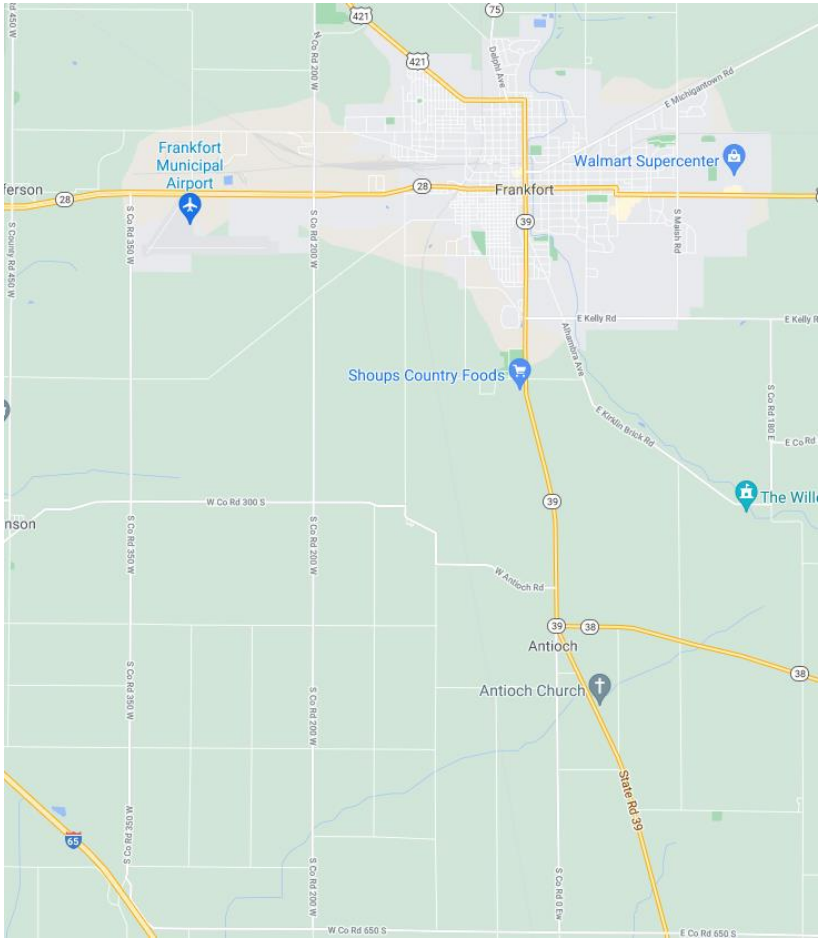
GEOSPATIAL FOUNDATIONS:
Public Land Survey System



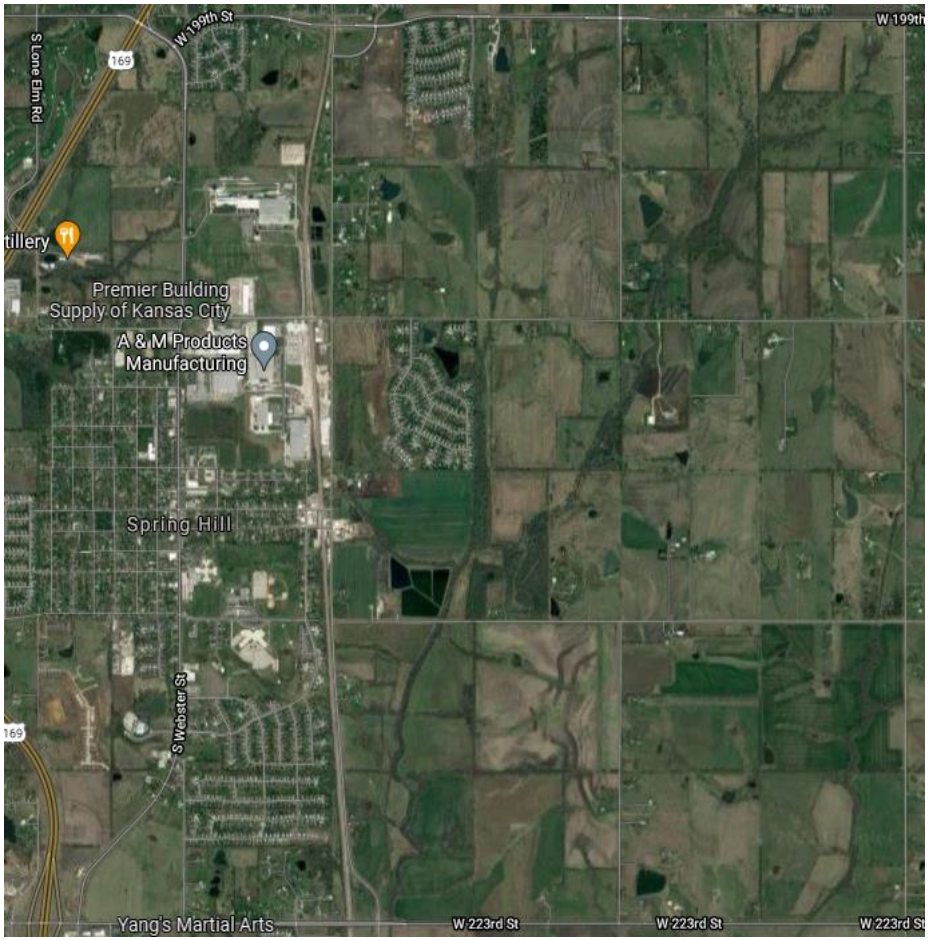
Source: "A History of the Rectangular Survey System" USDI-BLM 1983 https://www.blm.gov/sites/blm.gov/files/histrect.pdf

MAPPING THE USA

PLSS Impact on Landscape



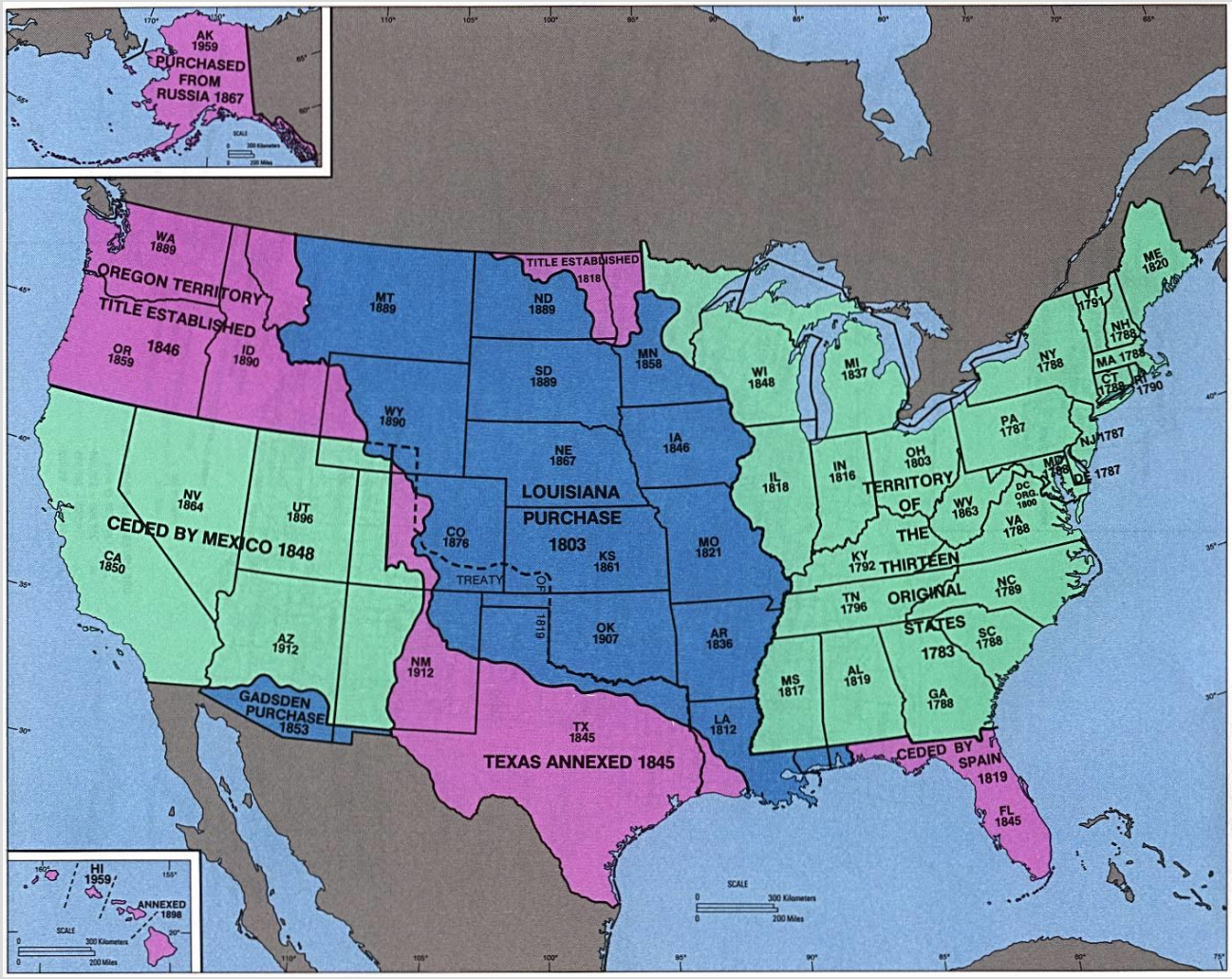
Frankfort, IN



Spring Hill, KS

https://www.google.com/maps

HOW THE UNITED STATES GREW



By US gov - US gov, Public Domain, https://commons.wikimedia.org/w/index.php?curid=3899376

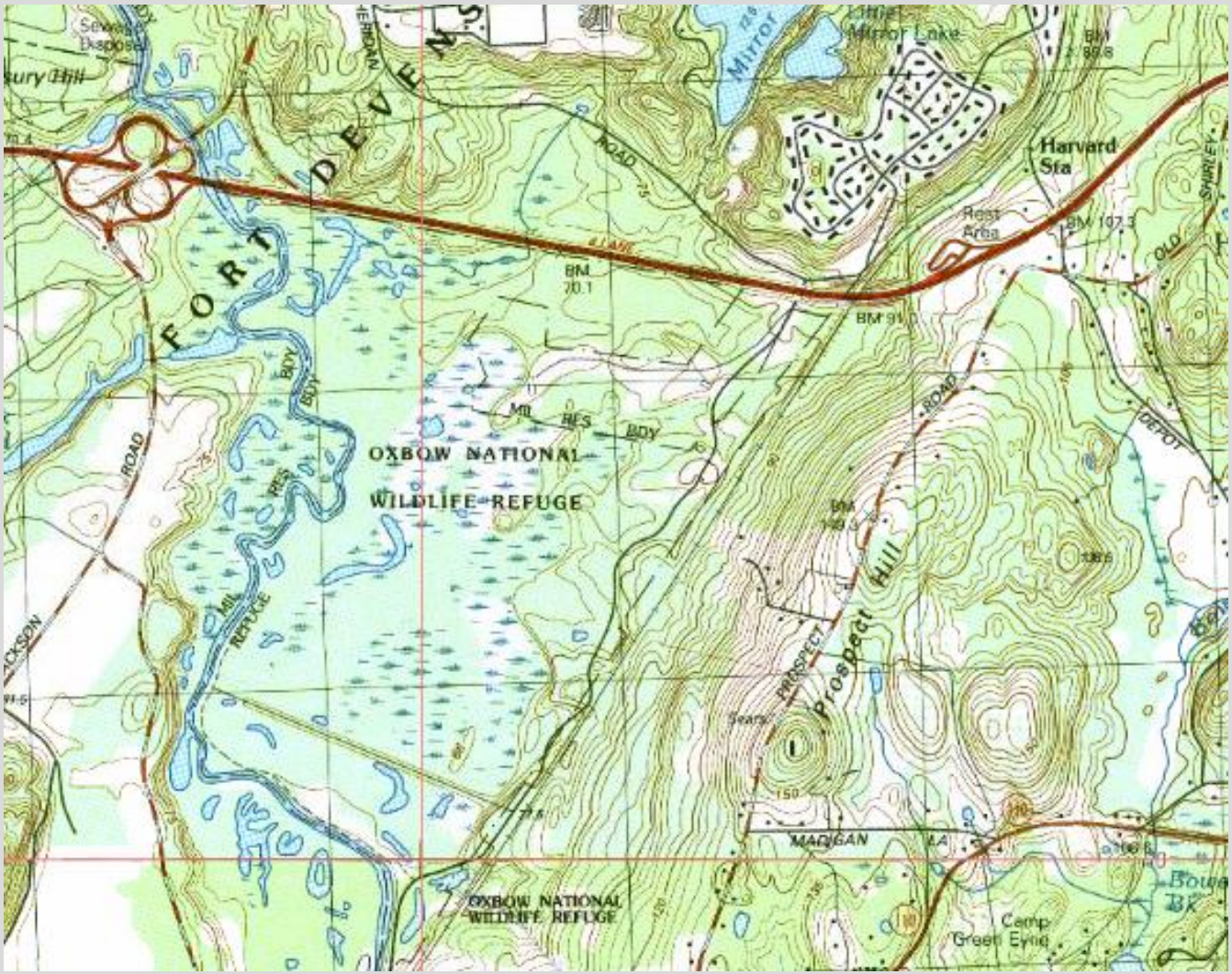
MAPPING THE LOWER 48 STATES

A Daunting Proposition for the USGS

https://viewer.nationalmap.gov/advanced-viewer/

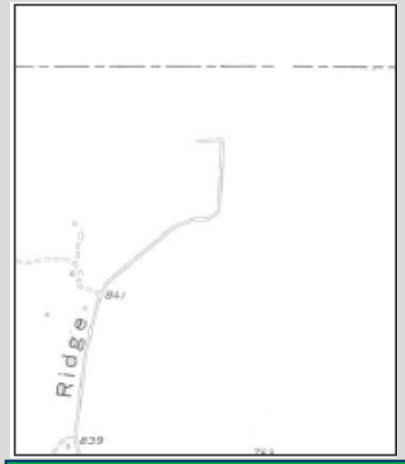
GEOSPATIAL FOUNDATIONS

USGS Topographic Quadrangle Maps



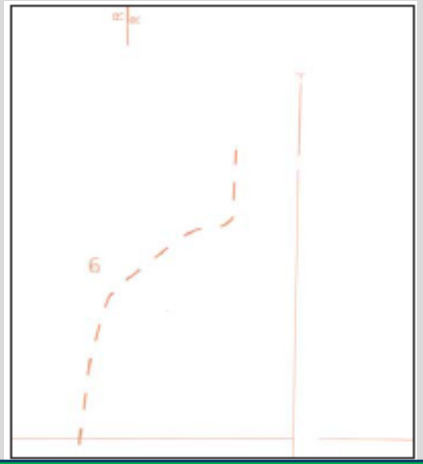
GEOSPATIAL FOUNDATIONS:

USGS Topographic Quadrangles



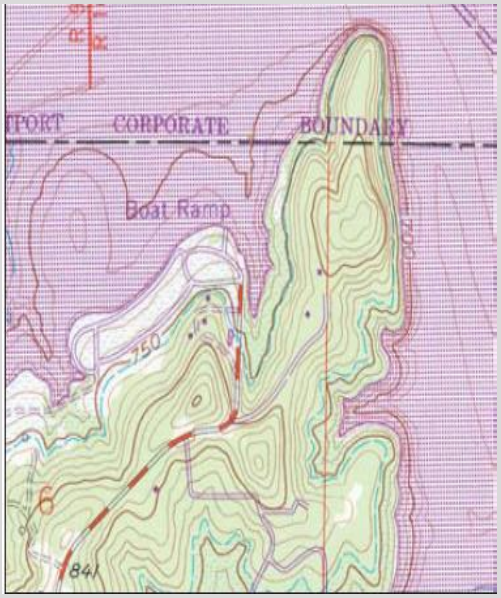
Boundaries, Place Names

Water Features



Roads, Grid Lines

Printed Map Sheet

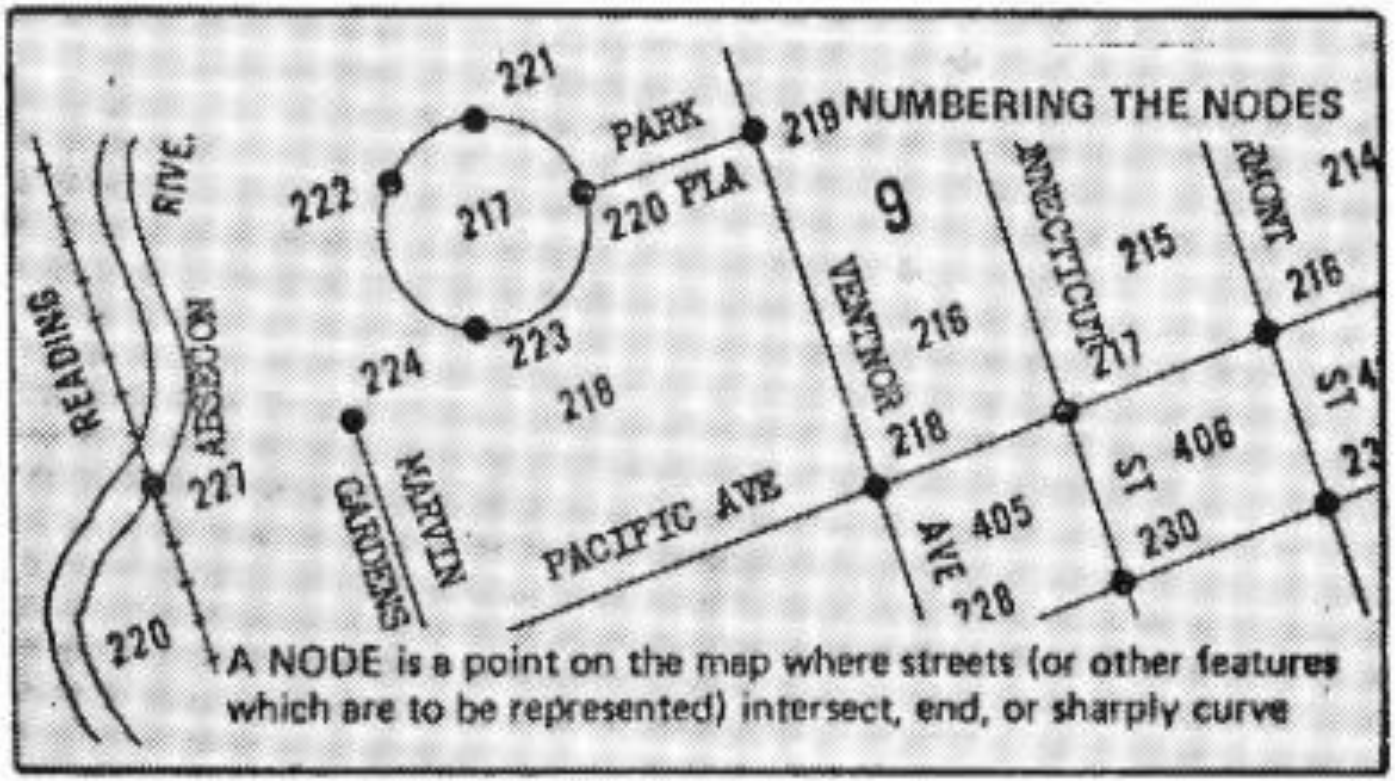


Forested Areas

Elevation Contours

Source: USGS_FactSheet_042-0_MapSeparates

GEOSPATIAL FOUNDATIONS
US Census GBF/DIME



http://libraryarchives.metro.net/DPGTL/us-department-of-commerce/1974-census-use-study-report-15-uses-of-gbf-dime-june.pdf

OGC®
Making location count.

About Standards Innovation News & Events Membership Resources

OpenGIS Web Map Tile Service Implementation Standard

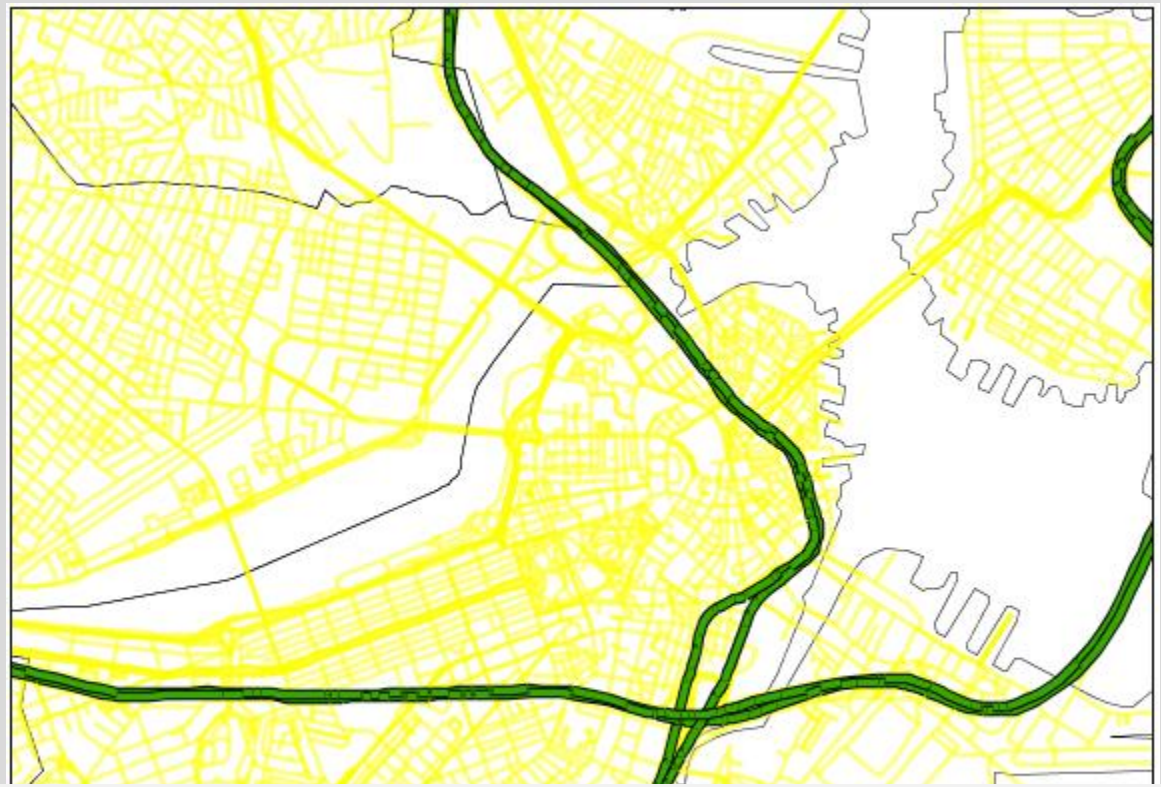
1) Downloads
2) Official Schemas
3) Related News

1) Downloads

Version	Document Title (click to download)	Document #	Type
1.0.0	OpenGIS Web Map Tile Service Implementation Standard	07-057r7	IS
1.0	OGC Web Map Tile Service (WMTS) Simple Profile	13-082r2	Profile
0.3.0	OWS-6 DSS Engineering Report - SOAP/XML and REST in	09-006	PER

- OGC® Standards
  - 3D Tiles
  - 3dP
  - ARML2.0
  - Cat: ebRIM App Profile: Earth Observation Products
  - Catalogue Service
  - CDB
  - CityGML
  - Coordinate Transformation
  - Filter Encoding
  - GML in JPEG 2000
  - GeoAPI
  - GeoPackage
  - GeoSciML
  - GeoSPARQL

GEOSPATIAL FOUNDATIONS
Web Mapping Services



The following URL is a WMS 'GetMap' request:
http://giswebservices.massgis.state.ma.us/geoserver/wms?VERSION=1.1.1&REQUEST=GetMap&SERVICE=WMS&LAYERS=massgis:GISDATA.TOWNS_POLYM,massgis:GISDATA.NAVTEQRDS_ARC,massgis:GISDATA.NAVTEQRDS_ARC_INT&SRS=EPSG:26986&BBOX=232325.38526025353,898705.3447384972,238934.49648710093,903749.1401484597&WIDTH=570&HEIGHT=435&FORMAT=image/png&STYLES=Black_Lines,GISDATA.NAVTEQRDS_ARC::ForOrthos,GISDATA.NAVTEQRDS_ARC_INT::Default&TRANSPARENT=TRUE

GEOSPATIAL FOUNDATIONS
Address Data Standards

NENA Next Generation 9-1-1 (NG9-1-1) United States Civic Location Data Exchange Format (CLDXF) Standard

NENA Next Generation 9-1-1 (NG9-1-1) United States Civic Location Data Exchange Format (CLDXF) Standard

NENA-STA-004.1.1-2014
DSC Approval: 12/17/2013
PRC Approval: 03/10/2014
NENA Executive Board Approval: 03/23/2014

Prepared by:
National Emergency Number Association (NENA) Core Services Committee, Data Structures Subcommittee, Civic Location Data Exchange Work Group

Published by NENA
Printed in USA

FGDC Document Number FGDC-STD-016-2011

United States Thoroughfare, Landmark, and Postal Address Data Standard

Sponsored by the Urban and Regional Information Systems Association (URISA) and the National Emergency Number Association (NENA)

FGDC Subcommittee for Cultural and Demographic Data

February 2011

“State-Level Foundation Building”

GEOSPATIAL FOUNDATIONS

Massachusetts 19th Century Municipal Boundary Mapping

Commonwealth of Massachusetts

HARBOR AND LAND COMMISSION

ATLAS OF THE

BOUNDARIES OF THE

CITIES OF

CHICOPEE AND SPRINGFIELD

AND TOWNS OF

BRIMFIELD EAST LONGMEADOW

HAMPDEN HOLLAND LONGMEADOW LUDLOW MONSON

PALMER WALES WILBRAHAM

HAMPDEN COUNTY

BELCHERTOWN GRANBY SOUTH HADLEY WARE

HAMPSHIRE COUNTY

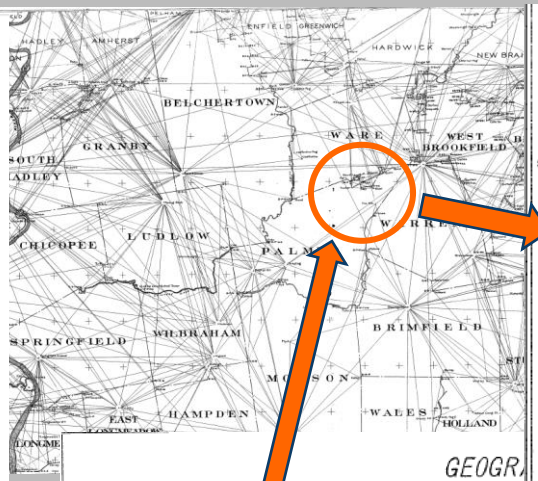
BROOKFIELD NORTH BROOKFIELD SOUTHBRIDGE

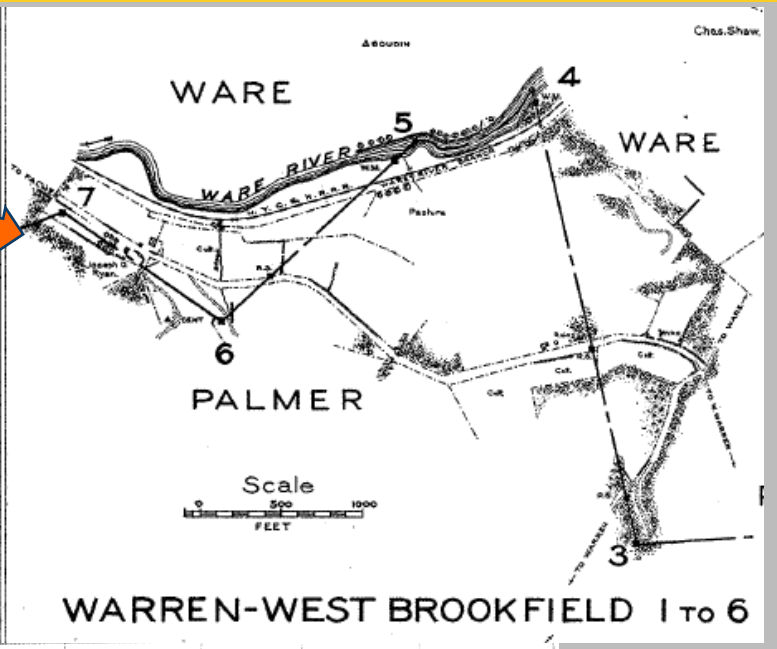
STURBRIDGE WARREN WEST BROOKFIELD

WORCESTER COUNTY

George E. Smith
Samuel M. Mansfield
Charles C. Paine
} Commissioners

1912





PALMER–WARE 3.

Location. — The corner is situated i
the easterly slope of a ridge.

Mark. — The corner mark is a rough
ment 3 feet high and averaging 8 x 12 in
The letter W is cut on the north face, and
face.

GEOGR

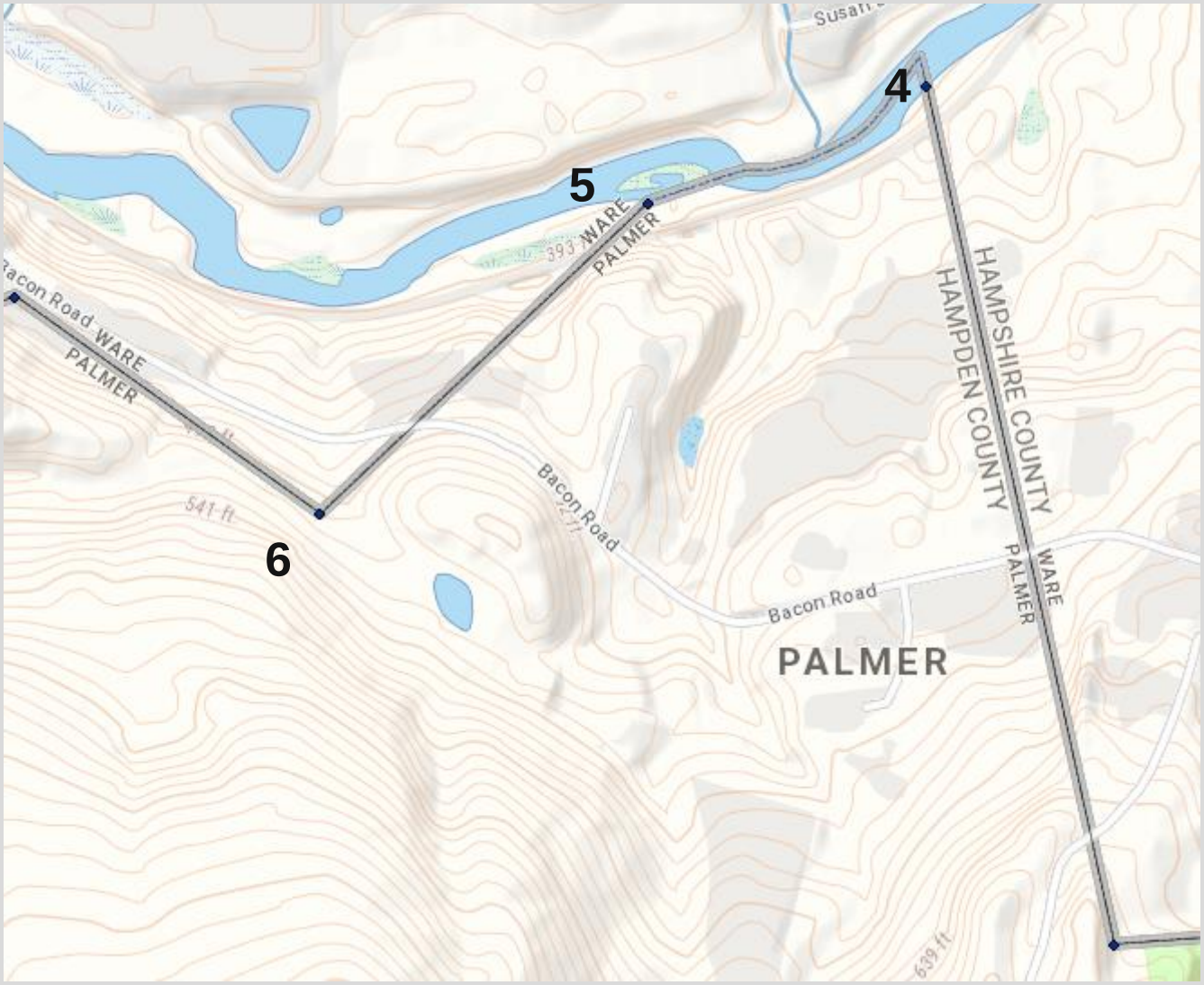
DESC. ON FOLIO	CORNER	LATIT				
	NORTH BROOKFIELD - WEST BRO					
35	North Brookfie West Brookfield 3	42° 15'				
35	North Brookfi –West Brookfield 4	42 14				
21	Brookfield–N Brookfield–W. Brookfield	42 14 19.06	72 06 42.18			
	PALM ER-WARE LINE					
35	Palmer–W –Warren	42 14 48.06	72 13 18.09	P–W 1	80 39 19	260 38 17
35	Palmer–W e 1	42 14 31.70	72 14 50.91	P–W 2	32 49 32	212 49 06
35	Palmer–W re 2	42 13 47.74	72 15 29.06	P–W 3	85 51 40	265 51 14
35	Palmer–Ware 3	42 13 45.68	72 16 07.29	P–W 4	167 35 58	347 35 58
35	Palmer–Ware 4 (W. M.)	42 14 12.98	72 16 15.35	P–W 4		
35	Palmer–Ware 4			P–W 5	Follows the middle of Ware	
35	Palmer–Ware 5			W. M. P–W 5		
35	Palmer–Ware 5 (W. M.)	42 14 09.21	72 16 27.24	P–W 6	46 32 30	226 32 21
35	Palmer–Ware 6	42 13 59.33	72 16 41.27	P–W 7	125 26 14	305 26 05

LINE BETWEEN THE TOWNS OF PALMER AND WARE.

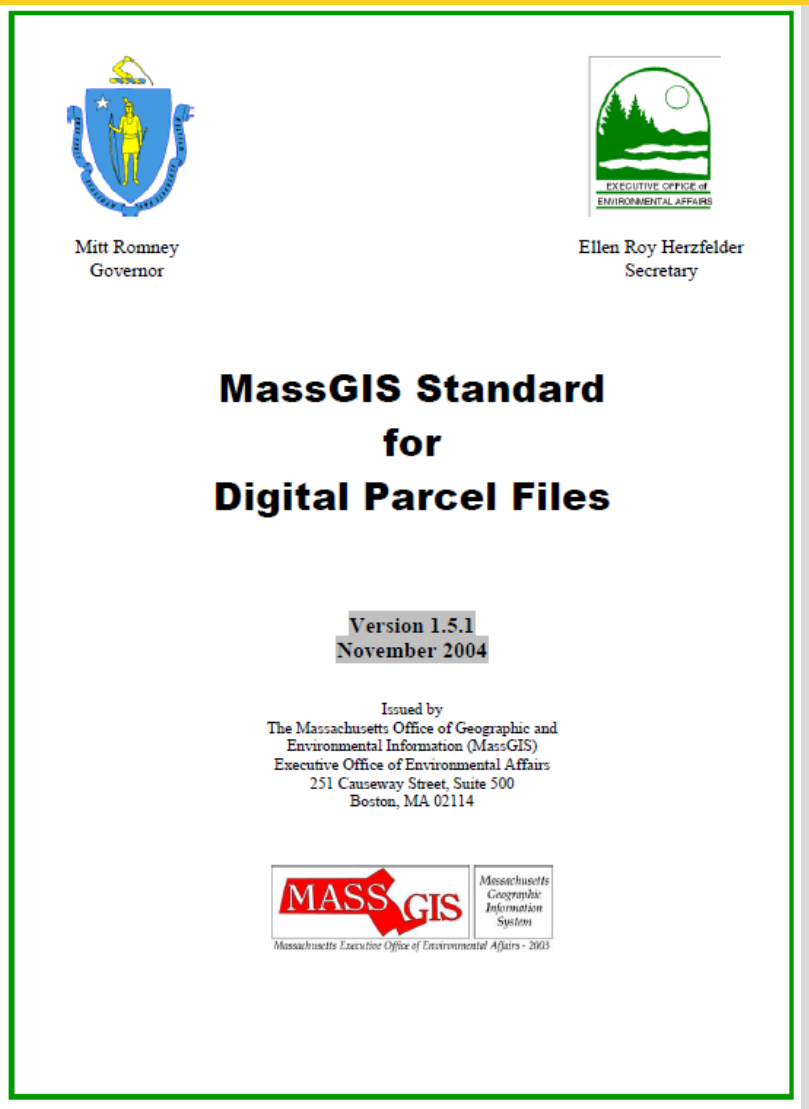
Beginning at the corner of Palmer, Ware and Warren, a rough granite monument, unmarked, situated in a partly-overgrown swamp, about 80 feet west of a boulder 25 x 40 feet in section and 6 feet high; thence south 80° 39′ west,

GEOSPATIAL FOUNDATIONS

Historic Foundations: Modern Municipal Boundaries



GEOSPATIAL FOUNDATIONS
2002: Massachusetts Parcel Standard



Mitt Romney
Governor

Ellen Roy Herzfelder
Secretary

MassGIS Standard
for
Digital Parcel Files

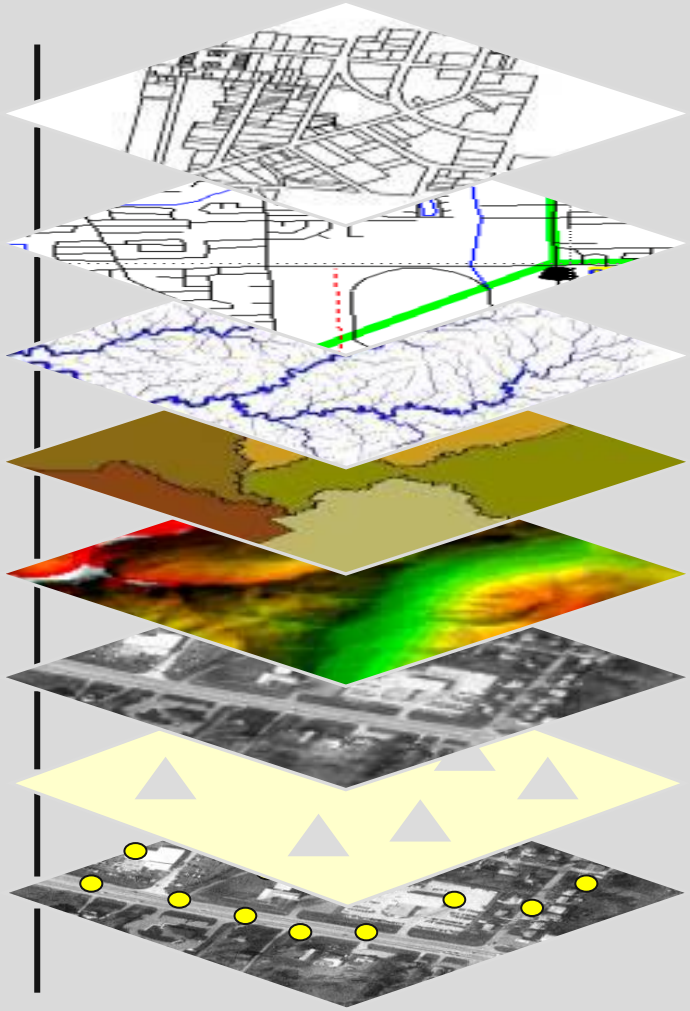
Version 1.5.1
November 2004

Issued by
The Massachusetts Office of Geographic and
Environmental Information (MassGIS)
Executive Office of Environmental Affairs
251 Causeway Street, Suite 500
Boston, MA 02114

MASSGIS
Massachusetts Geographic Information System
Massachusetts Executive Office of Environmental Affairs - 2003

“Modern Concerns”

THE NATIONAL SPATIAL DATA INFRASTRUCTURE



Cadastral

Transportation

Hydrography

Admin. Boundaries

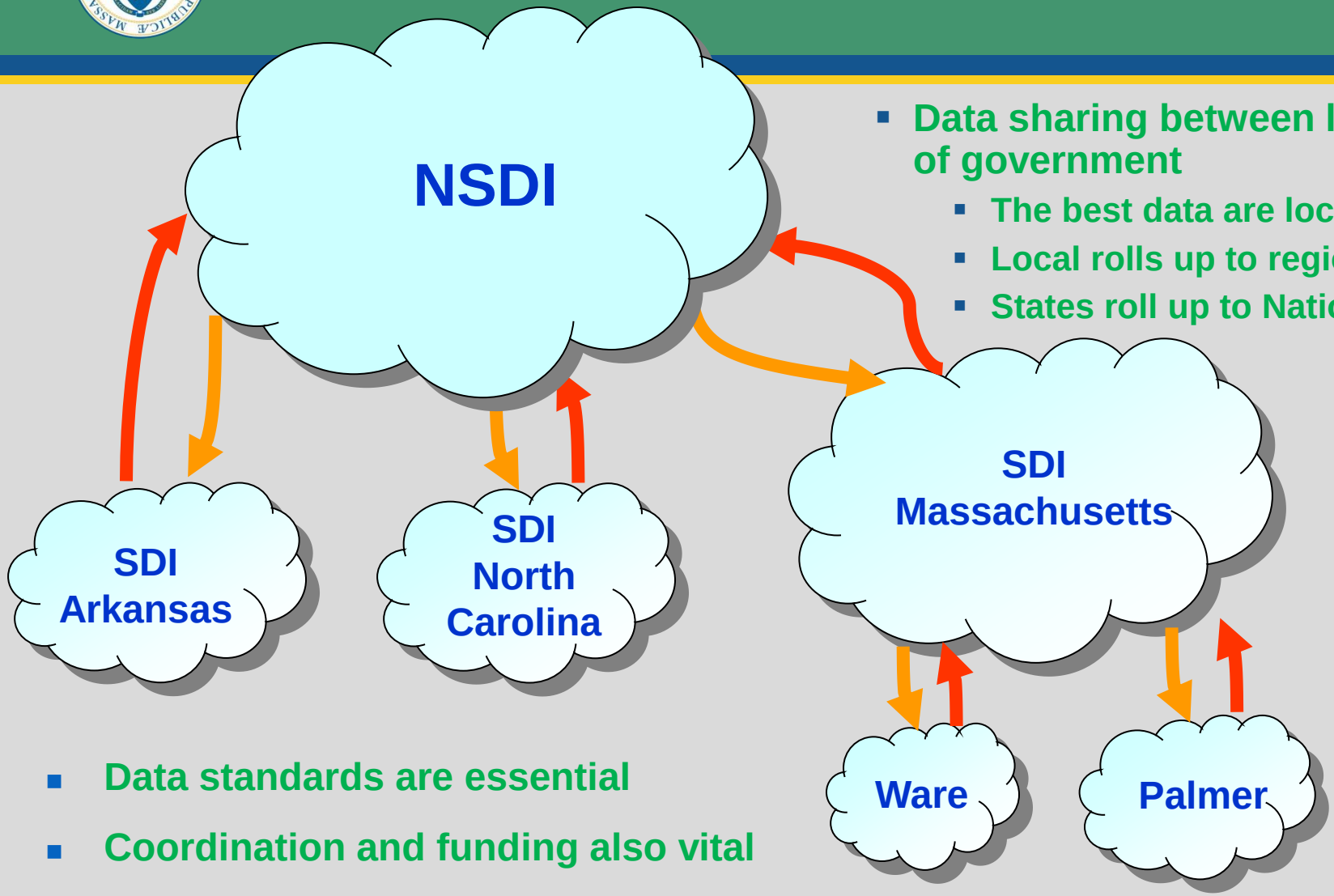
Elevation

Imagery

Geodetic Control

Address Points

National & State Spatial Data Infrastructures Working in Concert



- Data sharing between levels of government
  - The best data are local!
  - Local rolls up to regional/state
  - States roll up to National

- Data standards are essential
- Coordination and funding also vital

GENERAL ACCOUNTING OFFICE
Critique of FGDC and NSDI (2015)

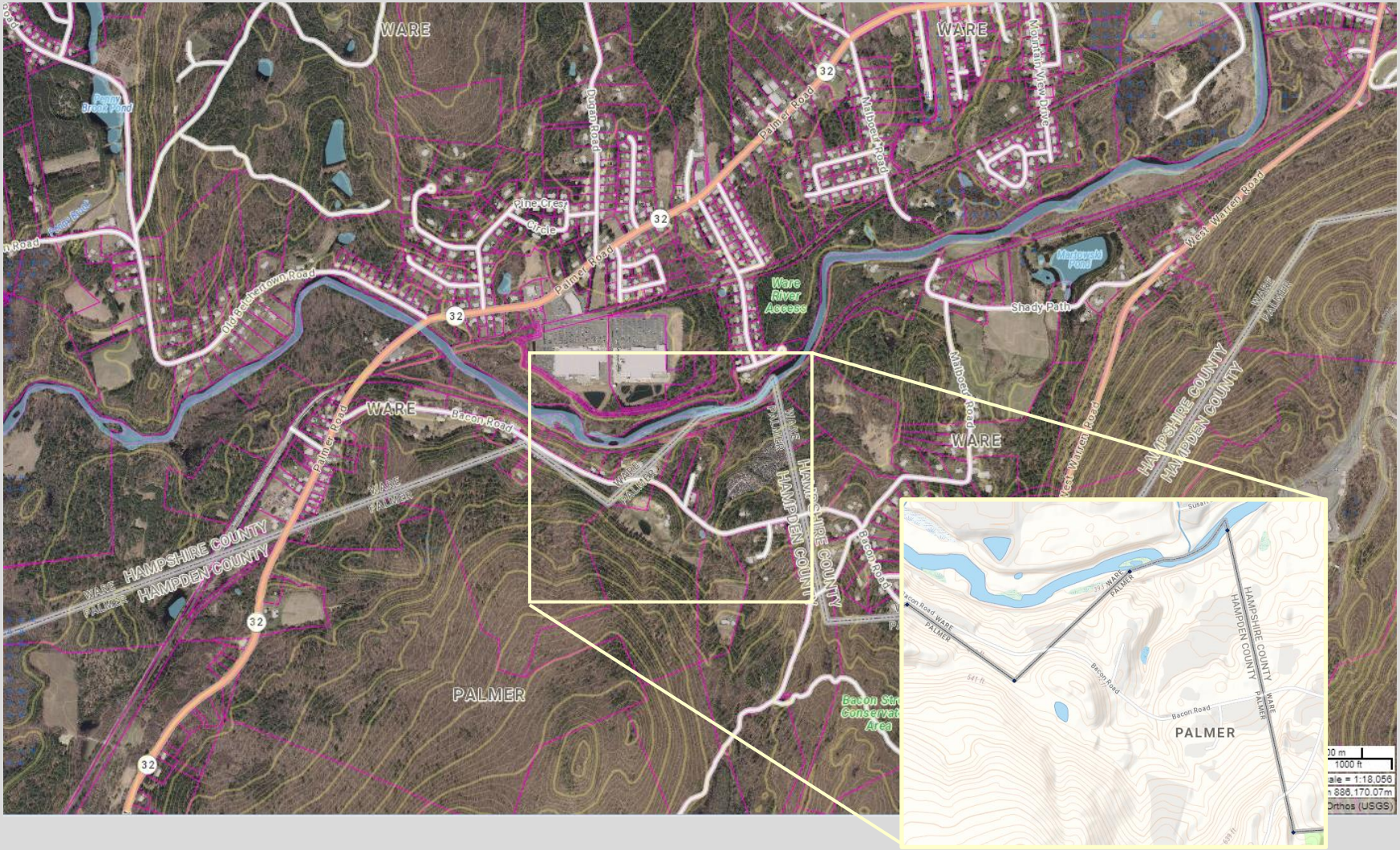
FGDC and selected federal agencies have made progress in implementing the NSDI however, critical items remain incomplete.

The GAO reported:

- The FGDC is falling short on coordinating with state governments on collecting geospatial data
- State officials feel the FGDC is focused on a federal perspective rather than a national one, and that state recommendations are often ignored.
- The vision of improving the coordination of geospatial information and reducing duplicative investments is not being fully realized.
- Some data are collected multiple times by federal, state, and local entities, resulting in duplication in effort and resources.

Source: https://www.gao.gov/products/gao-15-193

GEOSPATIAL FOUNDATIONS
Massachusetts Spatial Data Infrastructure



GEOSPATIAL FOUNDATIONS:

Source: ArcNews Winter 2019

GEOSPATIAL FOUNDATIONS
References and Resources

- Books by Andro Linklater:
  - "Measuring America: How the United States Was Shaped by the Greatest Land Sale in History"
  - "The Fabric of America: How Our Borders and Boundaries Shaped the Country and Forged Our National Identity"
- History of the Rectangular Survey https://www.blm.gov/sites/blm.gov/files/histrect.pdf
- When Maps Were Scribed https://pubs.usgs.gov/of/2008/1385/pdf/stettner.pdf
- ArcNews, Fall 2009, "125 Years of Topographic Mapping" https://www.esri.com/news/arcnews/fall09articles/125-years.html
- USGS 125 Years of Topographic Mapping https://www.usgs.gov/core-science-systems/national-geospatial-program/history?qt-science_support_page_related_con=0#qt-science_support_page_related_con
- https://www.census.gov/history/www/innovations/technology/dual_independent_map_encoding.html
- https://web.archive.org/web/20120722014135/http://www.ncgia.buffalo.edu/gishist/DIME_story.html
- https://gistbok.ucgis.org/bok-topics/us-national-spatial-data-infrastructure
- URISA Fact Sheet on Geospatial Data Act https://www.urisa.org/resources/geospatial-fact-sheets/