

State Plane Coordinate System

Alaska's 2022 Update

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OVERVIEW

The National Geodetic Survey (NGS) is updating the State Plane Coordinate System (SPCS) in 2022 with input from stakeholders in each state.

This presentation will cover Alaska's progress in designing new coordinate system zones for Alaska's 2022 SPCS update.

- Background**
- Information about SPCS 2022**
- Overview view of the update process**
- Overview of progress Alaska has made**

WHAT IS A COORDINATE SYSTEM?

The parameters for this presentation include:

Reference ellipsoid

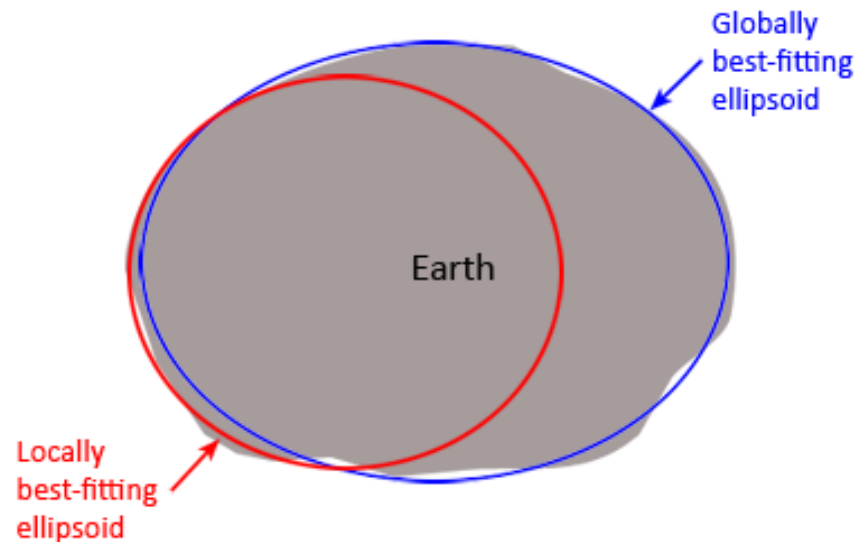
Datum

Projections

WHAT IS A COORDINATE SYSTEM?

Reference ellipsoid is used as a substitute for the earth's surface for measuring locations and making calculations.

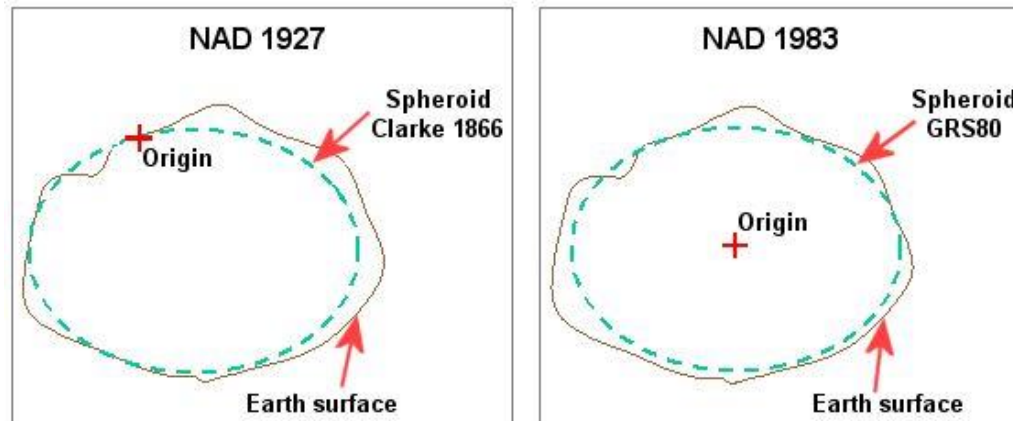
An ellipsoid may be used as a best fit for the entire earth or for part of the earth.



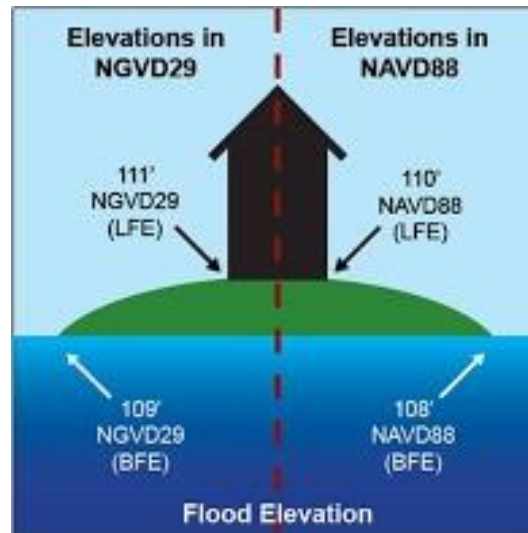
WHAT IS A COORDINATE SYSTEM?

Datum is a set of reference points on the earth's surface against which position measurements are made.

Horizontal Datum



Vertical Datum

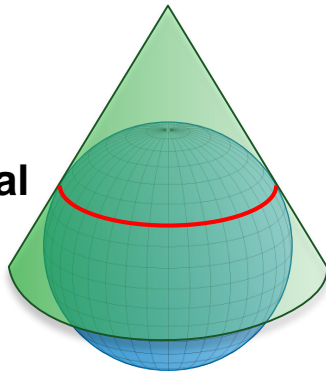


Source:
<https://www.ngs.noaa.gov/datums/horizontal/north-american-datum-1983.shtml>
<http://www.geo.hunter.cuny.edu/~jochen/gtech201/lectures/lec6concepts/05%20-%20Understanding%20datums.html>
<https://sites.google.com/site/region2coastal/sandy/abfe/vertical-datum>

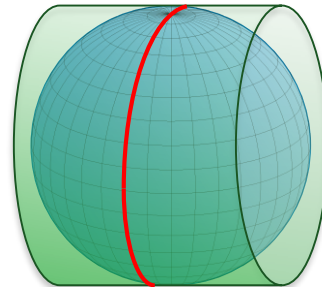
WHAT IS A COORDINATE SYSTEM?

Projections are a way to flatten a globe's surface into a planar surface in order to make a map.

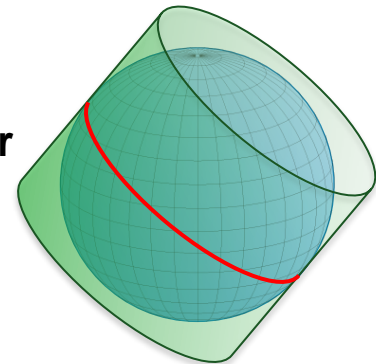
**Lambert
Conformal
Conic
(LCC)**



**Transverse
Mercator
(TM)**

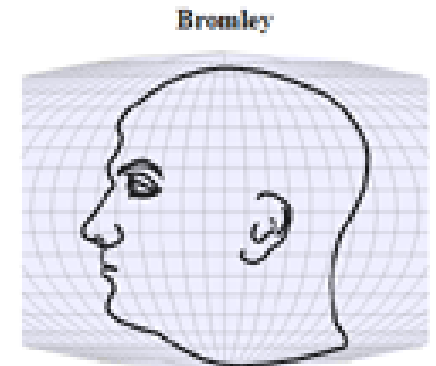
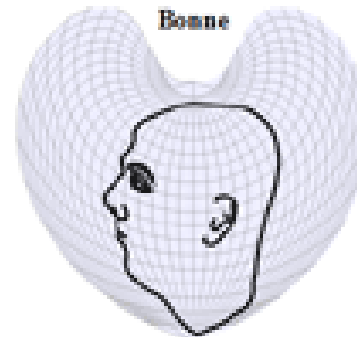
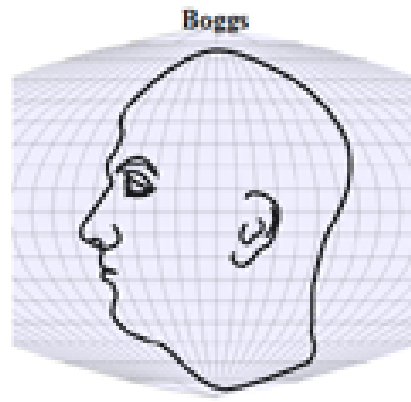
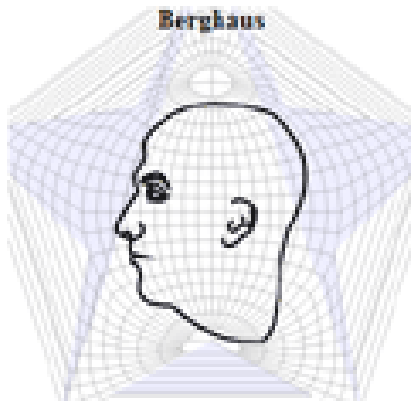
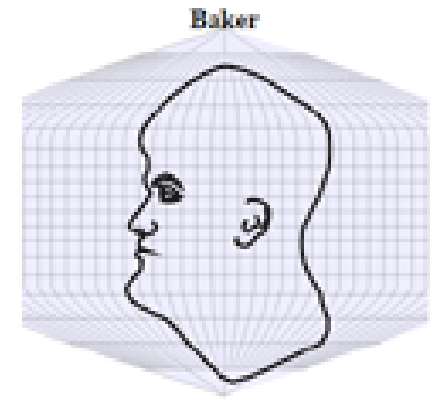
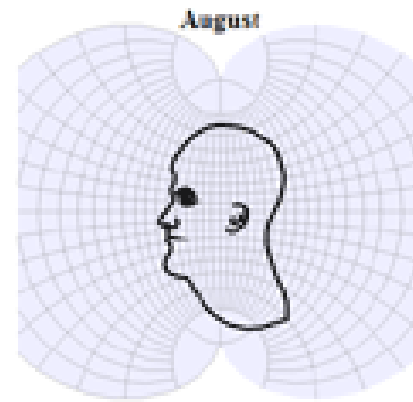
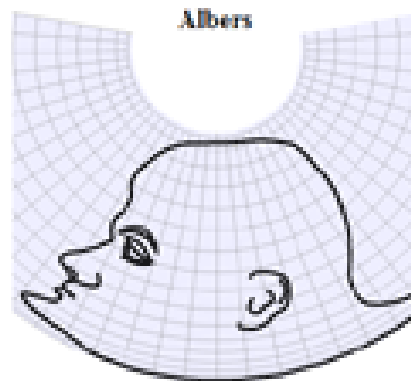
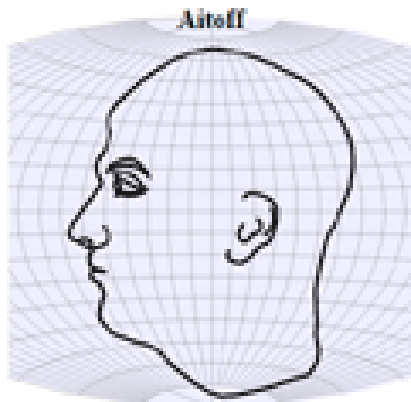


**Oblique
Mercator
(OM)**



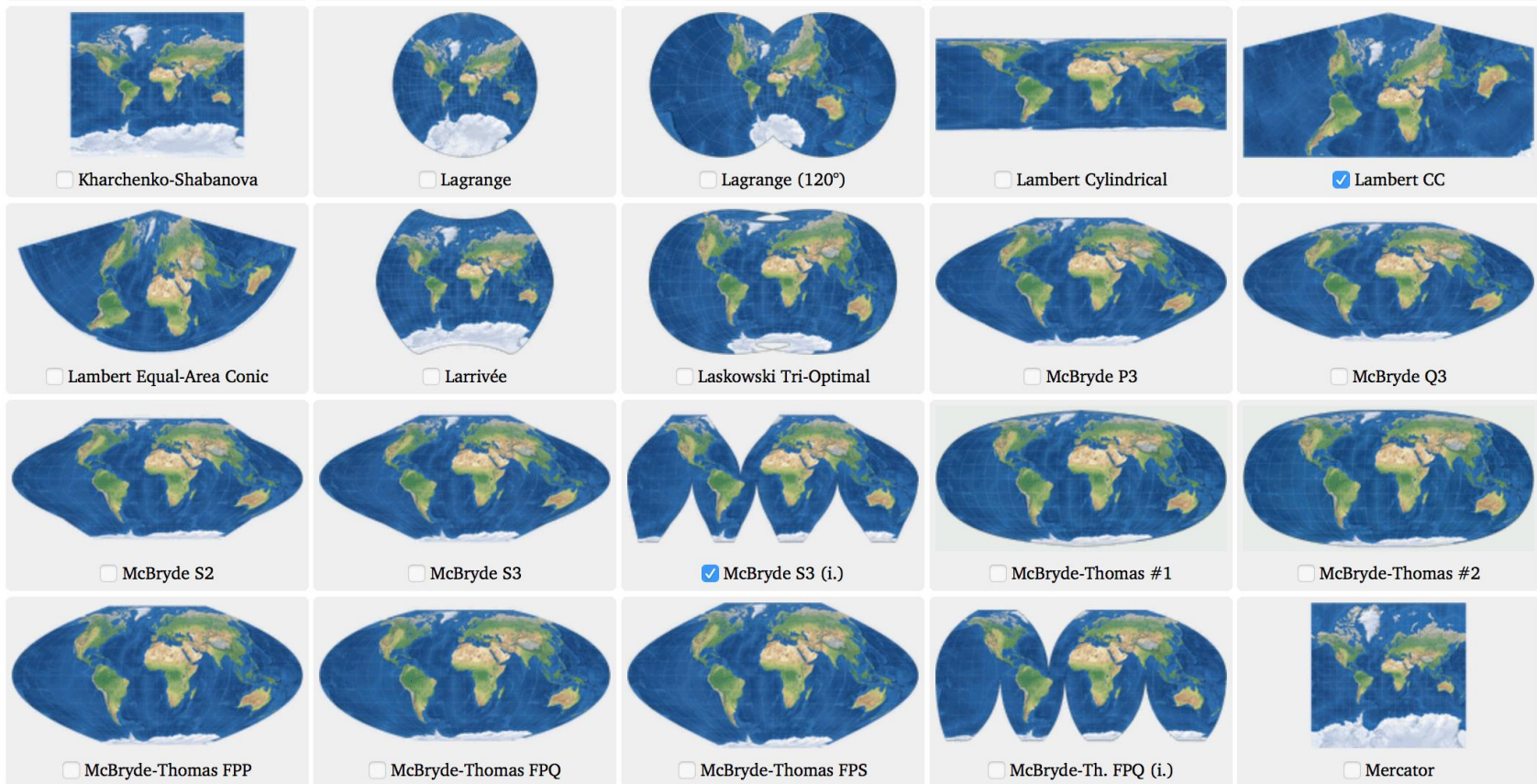
WHAT IS A COORDINATE SYSTEM?

Each projection creates distortion,



WHAT IS A COORDINATE SYSTEM?

Projections and Distortion



Source: https://www.reddit.com/r/MapPorn/comments/b5yaf5/an_incomplete_list_of_map_projections/

SPCS HISTORY

National Geodetic Survey (NGS), National Ocean and Atmospheric Administration (NOAA) established the SPCS.

Circa 1930's

National Spatial Reference System (NSRS)

Used by GIS and Global Navigation Satellite Systems (GNSS)

SPCS HISTORY

- **Highly accurate small-scale mapping.**
- **Localized to each state**
- **Localized into zones within states.**

SPCS HISTORY

Distortion within a zone is reported as parts per million (ppm).

Closer it is to zero, the better.

-5 ppm is better than -200 ppm

+10 ppm is better than +40 ppm

SPCS HISTORY

The first version of the SPCS dates from 1927.

Alaska wasn't a state.

No boroughs or well-defined geographic areas.

Divided Alaska into 10 zones.

The second version of the SPCS was released in 1983.

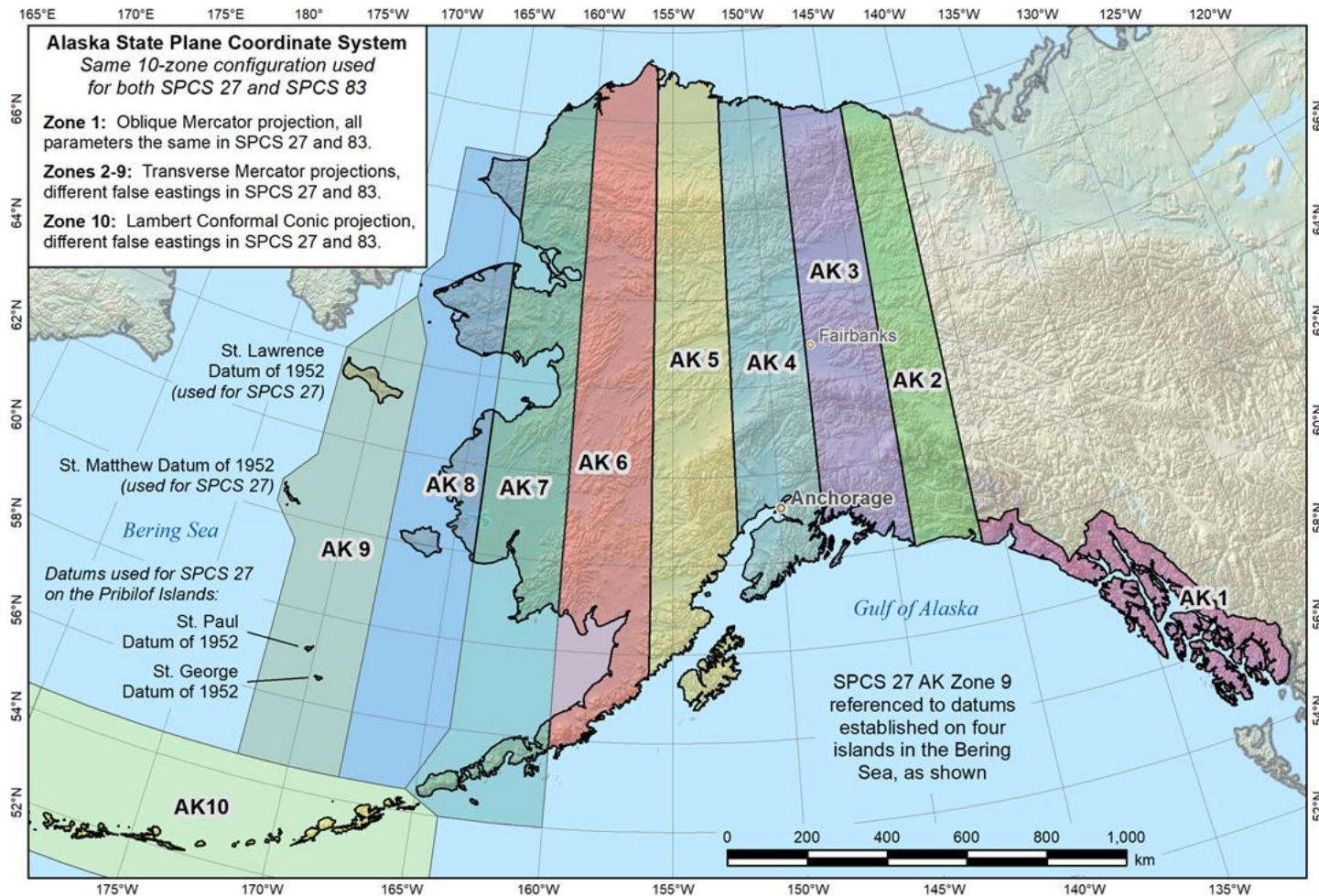
NGS implemented this update.

Alaska got the same 10 zones as in 1927.

Updated the datums to NAV 83 and NAVD 88.

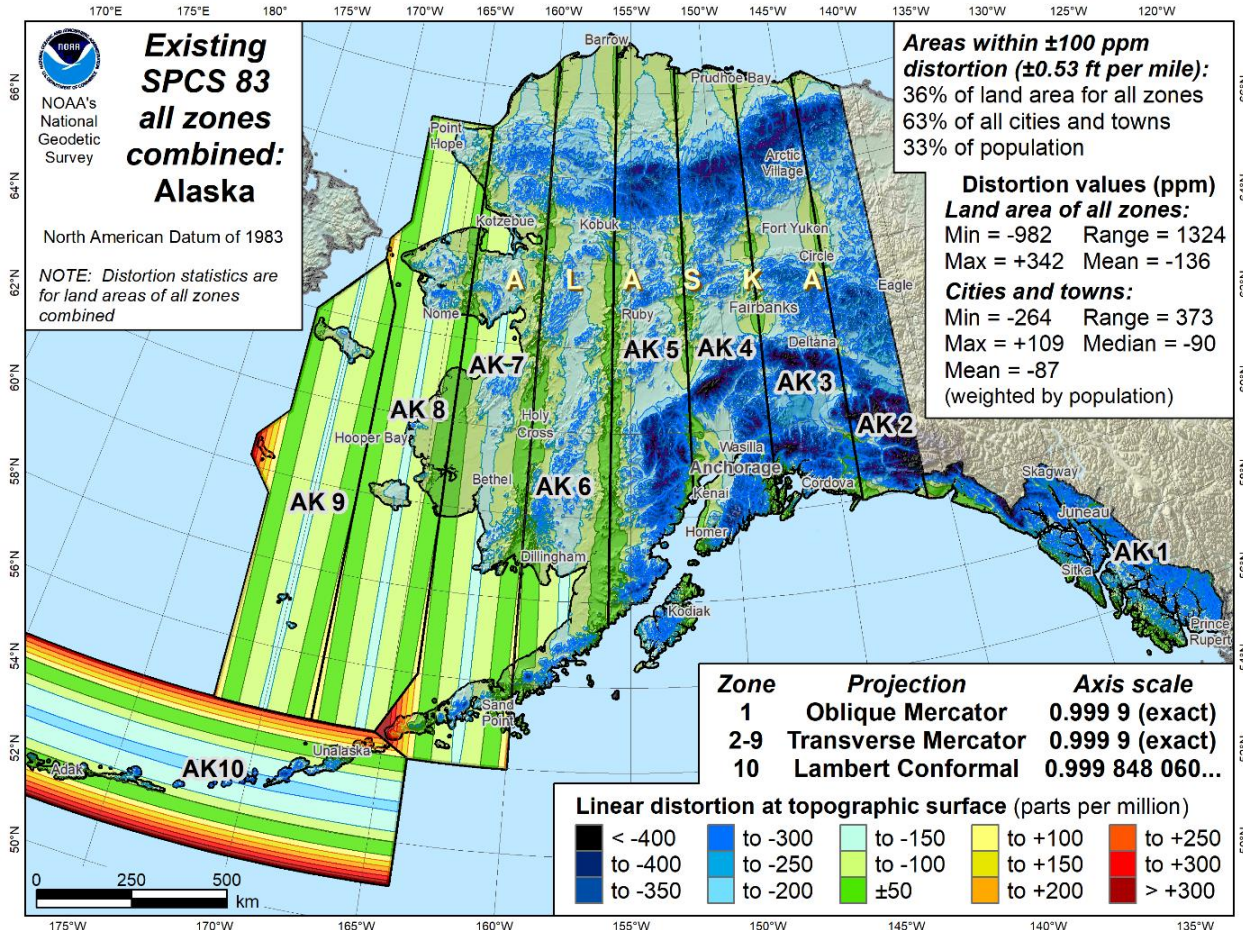
SPCS HISTORY

1927 and 1983 SPCS



SPCS HISTORY

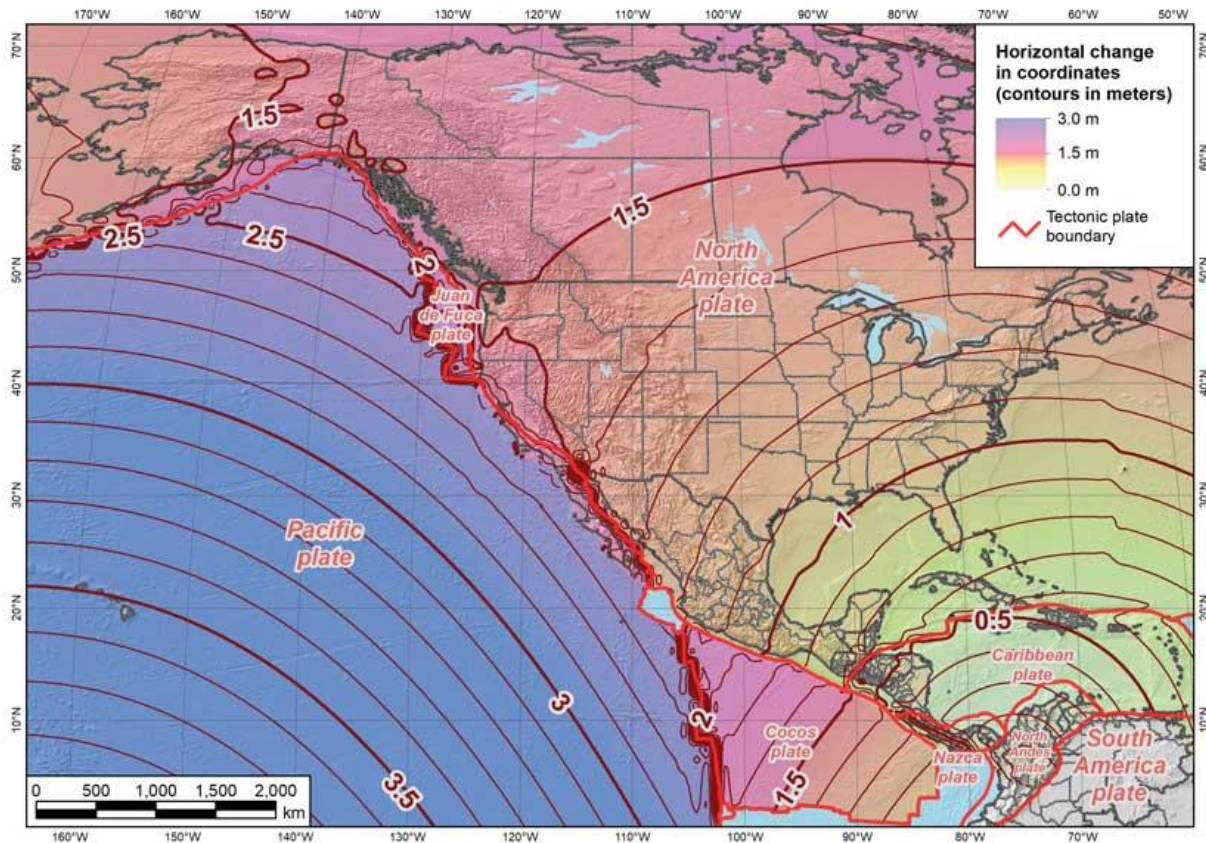
1927 and 1983 SPCS Distortion



SPCS 2022 CHARACTERISTICS

State Plane Coordinate System of 2022 (SPCS2022)

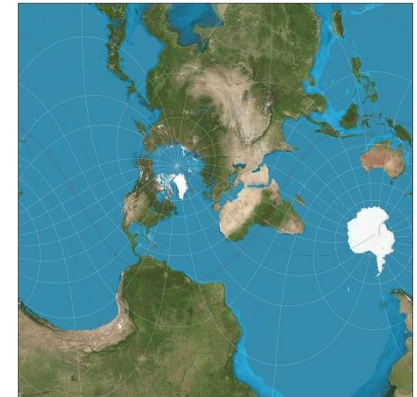
- Referenced to 2022 Terrestrial Reference Frames (TRFs), based on satellite and gravity measurements, instead of NAV 83 and NAVD 88



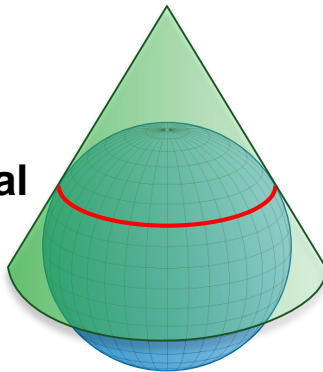
SPCS 2022 CHARACTERISTICS

State Plane Coordinate System of 2022 (SPCS2022)

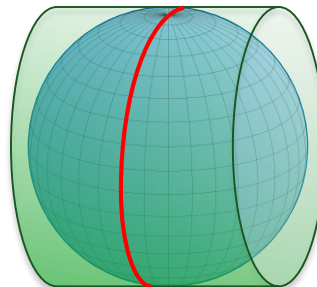
- Same 3 conformal projection types as SPCS 83 and 27
- Based on same reference ellipsoid as SPCS 83 (GRS 80)



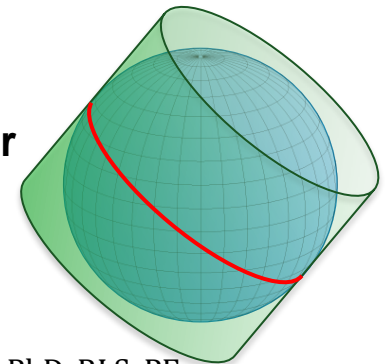
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Source: *Be a Part of the Change: A Guide to Customizing State Plane for 2022* by Michael L. Dennis, PhD, RLS, PE
October 10, 2019 PowerPoint. Last accessed 18 Feb 2020 at
https://geodesy.noaa.gov/web/science_education/webinar_series/guide-customizing-spcs-2022.shtml.

SPCS 2022 CHARACTERISTICS

Like existing State Plane, but improved

- **Zones designed “at ground”**
- **Can have zone “layers”**
 - **Statewide zone for every state**
 - **Allow “low distortion projections” (LDPs)**

SPCS 2022 PROCESS

NGS makes all the rules

- How the process will be conducted**
- What the technical specifications for the SPCS are**
- Who counts as a stakeholder group in Alaska**
 - For example, NGS has not included Federal or Tribal entities as stakeholders for the SPCS design and submission process.**
 - Federal or Tribal entities may contact NGS to see what options may be available.**

SPCS 2022 PROCESS

For SPCS 2022, NGS will design zones based on stakeholder input.

NGS identified stakeholders from each state to include:

- state departments of transportation,**
- state GIS or cartographer offices,**
- state professional surveying society,**
- state professional engineering society,**
- other professional geospatial organizations,**
- universities that perform geospatial education or research,**
- other state departments with roles similar to the above.**

The State Geodetic Coordinator is responsible for convening the stakeholders in each state.

SPCS 2022 PROCESS

Each stakeholder group in Alaska chose a person to represent them.

Contact a representative if you have questions:

| Stakeholder Group | Representative | Location |
|---|--|--------------------|
| State departments of transportation, DOT | Robert Keiner Troy Hicks Dan Ignotov | ANC FBKS JNU |
| State GIS or cartographer offices, IRM | Erin Palmer | ANC |
| State professional surveying society, ASPLS | Neil Robicheau | ANC |
| State professional engineering society, ASCE | Tor Anderzen | ANC |
| Other professional geospatial organizations, ASPRS | David Parret | ANC |
| Other professional geospatial organizations, URISA | Aaron Butterer | ANC |
| Universities that perform geospatial education or research, GINA and UAA | Peter Hickman Caixai Wang | FBKS ANC |
| Other State departments with roles similar to the above, DNR | Gwen Gervelis | ANC |

SPCS 2022 PROCESS

All stakeholders must agree on the designs they want for SPCS 2022.

States must submit their requests or proposals by March 31, 2020.

The State Geodetic Coordinator is responsible for submitting the request and proposals form to NGS on behalf of Alaska.

SPCS 2022 LAYERS

NGS is allowing states to have up to 3 layers with different types of zones.

**Layer 1 will consist of one single statewide zone designed by NGS.
This is a mandatory layer.**



Source: *Be a Part of the Change: A Guide to Customizing State Plane for 2022* by Michael L. Dennis, PhD, RLS, PE October 10, 2019 PowerPoint. Last accessed 18 Feb 2020 at https://geodesy.noaa.gov/web/science_education/webinar_series/guide-customizing-spcs-2022.shtml.

SPCS LAYERS

Layer 2 will be a multi-zone layer with complete state coverage.

This layer is separated into zones.

For the first time, Alaska can have input on what these zones should look like.

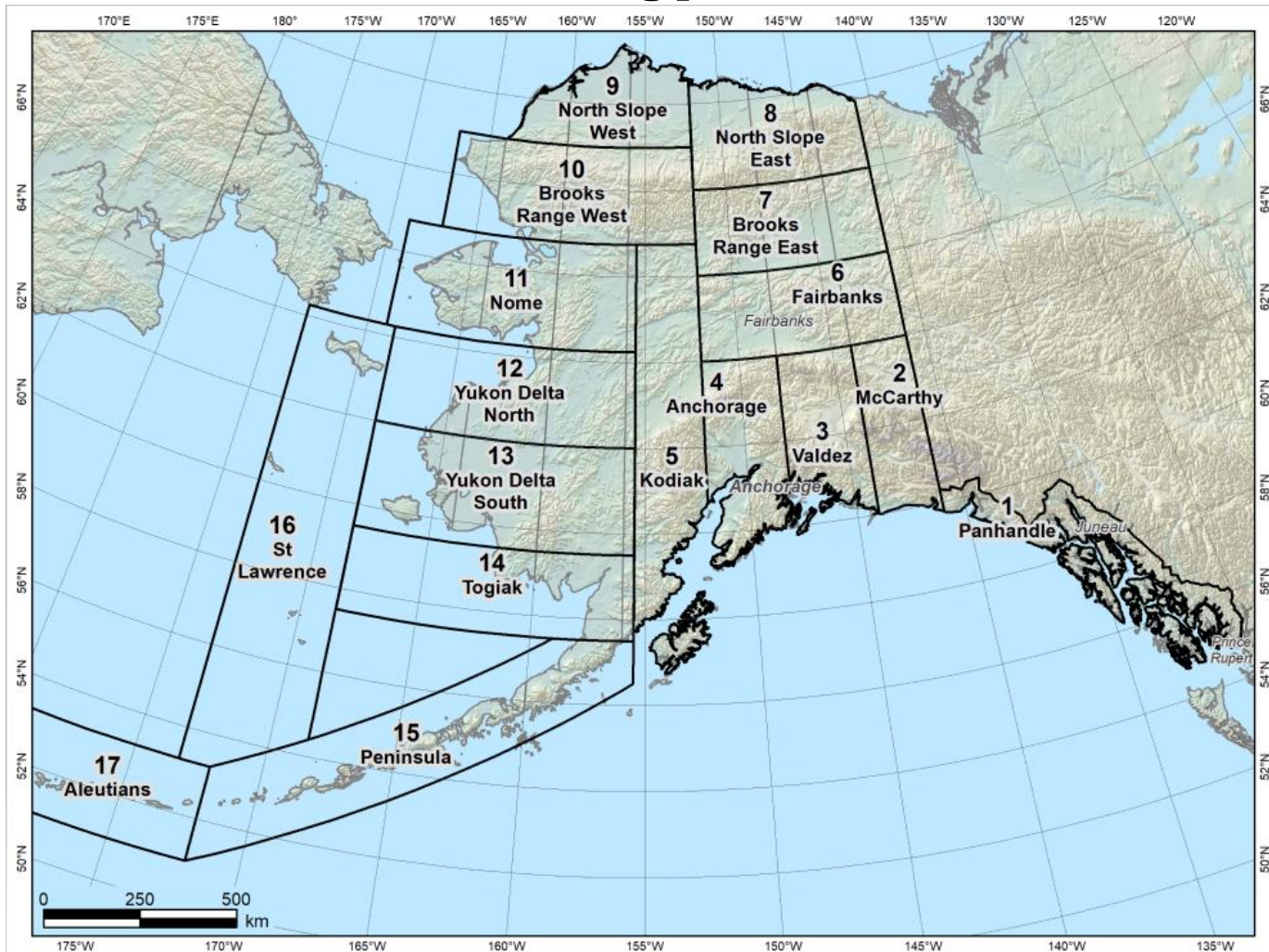
Stakeholders must agree on the design of the zones or Alaska's Layer 2 will end up with the same 10 zones as in 1927 and 1983.

The stakeholder representatives have met twice and had extensive email discussion.

NGS's Dr. Michael Dennis has also provided information for the stakeholders and input into the discussion.

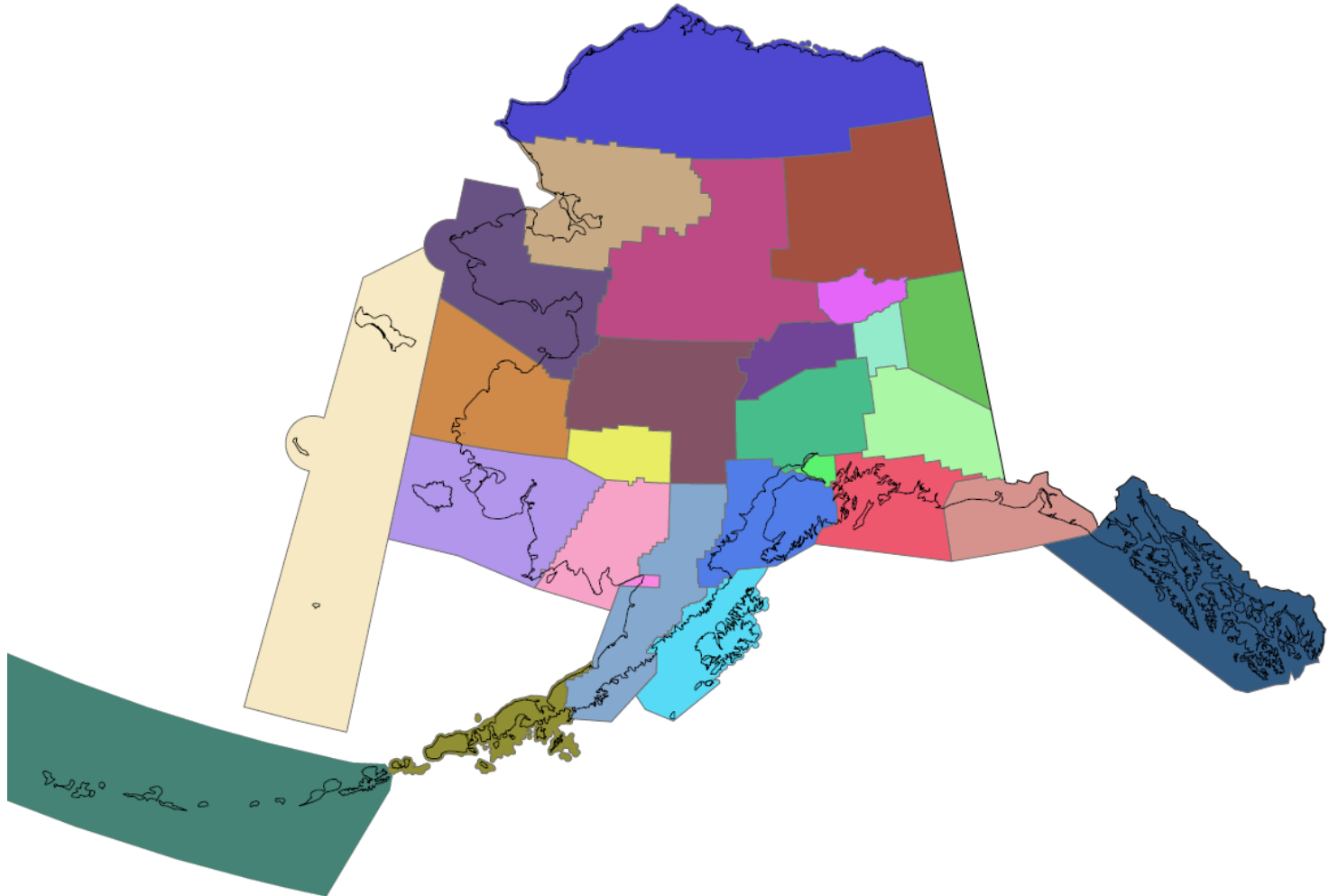
LAYER 2

Draft: Dr. Michael Dennis's starting point.



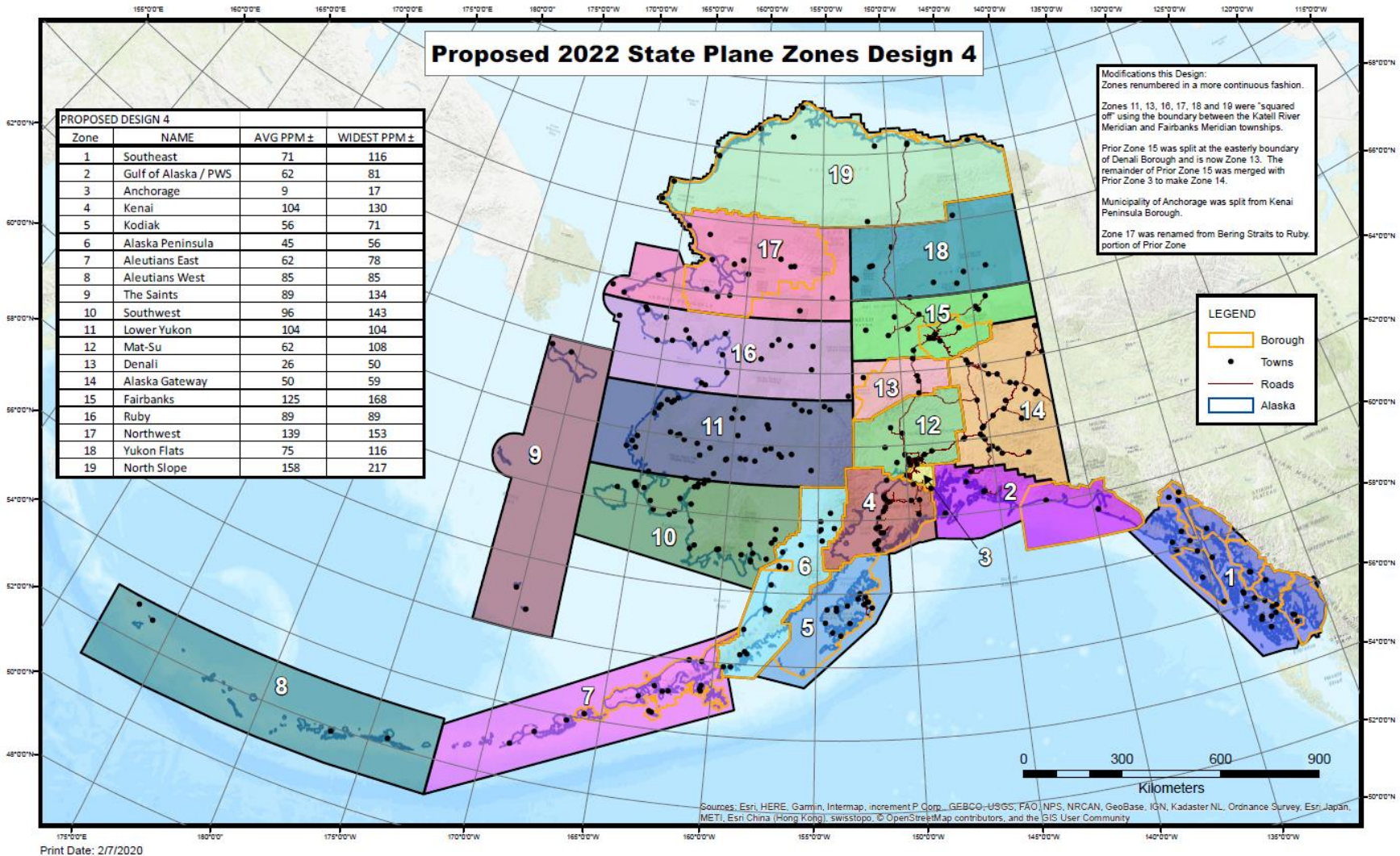
LAYER 2

Draft: DNR's starting point.



LAYER 2

Most Recent Draft: Layer 2 Design 4



LAYER 3

Layer 3 is a multi-zone layer with partial state coverage.

Optional.

Meant for “Low Distortion Projections” for very specific or special uses.

At this time, Alaska stakeholder representatives are proposing a Layer 3.

States are responsible for designing their Layer 3 Zones.

NGS will validate and create transformations for Layer 3 Zones.

An approved design submittal for Layer 3 isn't due until March 31, 2021.

SPCS 2022

Feedback from NGS:

Alaska stakeholders have been doing a wonderful job.

Alaska is further ahead than most other States.

NGS is pleased with Layer 2 Design 4.

SPCS 2022 BENEFITS

Benefits of SPCS 2022

- **Better accuracies for land management, etc.**
- **More usability.**
- **Zones conform more closely to well-defined geographic regions, such as boroughs.**
- **Zones will be available in software packages, such as ESRI.**
- **OPUS, NCAT, Transformation Tools, Record Metadata**

SPCS 2022

What you should know:

SPCS 2022 is coming...on time

NAD 83-Based State Plane-Legislated Coordinates will not be maintained after 2022

Federal Emergency Management Agency (FEMA) flood insurance rate maps will no longer reference NAD 83 or NAVD 88

SPCS 2022

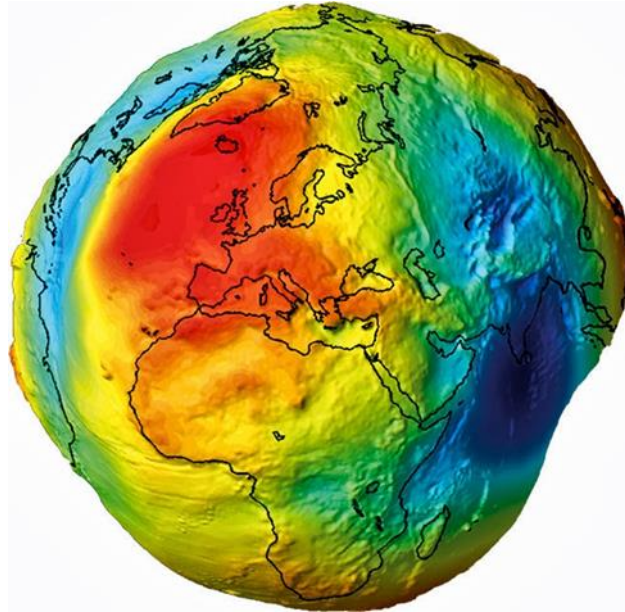
What you should do:

Educate everyone.

Be prepared: plan for the time, personnel, and resources that may be necessary for the transition.

Use it! The benefits of transitioning far outweigh any one-time costs that may be incurred.

THANK YOU



Questions?