The USGS
3D National Topography Model

Cynthia Ritmiller
National Map Liaison

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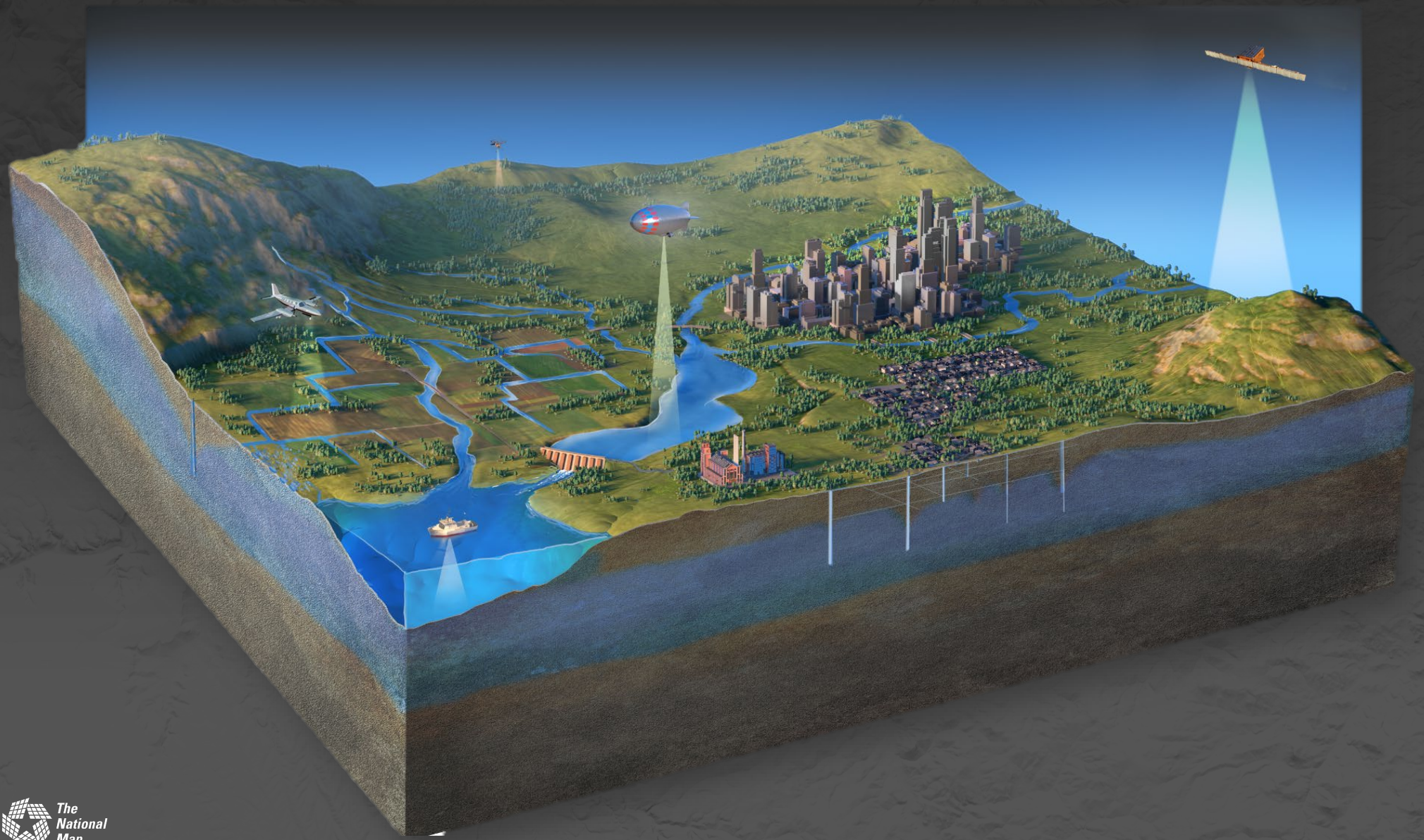
The 3D National Topography Model (3DNTM)



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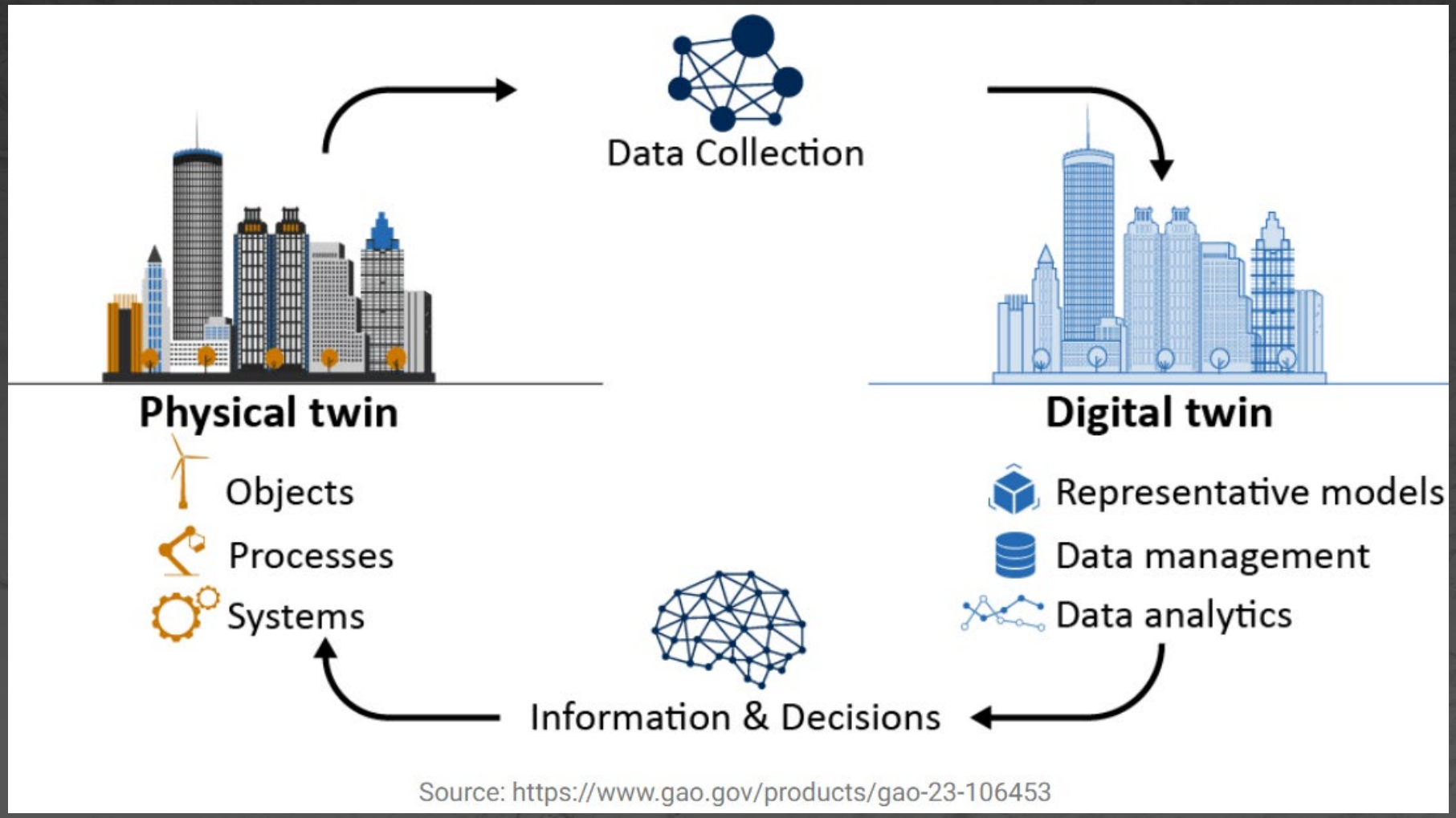
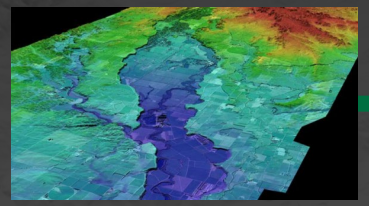
Creating a digital twin of the earth's topography



The 3D National Topography Model

Progression required to produce a fully integrated and continuous topographic model to meet the Nation's critical applications

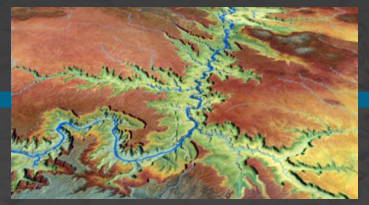
3DEP Baseline



Complete the nationwide 3D Elevation Program (3DEP) baseline

100% of the Nation has 3DEP baseline data available or in progress

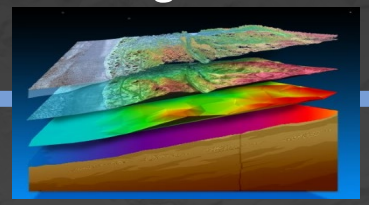
3DHP



Use the 3DEP baseline to derive the 3D Hydrography Program (3DHP)

Launched in FY24

Next gen 3DEP



Implement the next generation of 3DEP to multiply value and improve applications

First full year in FY27 (funding dependent)

3DNTM



Research and develop a 3D data model to fully integrate 3DEP, 3DHP, and other data

Early development stage

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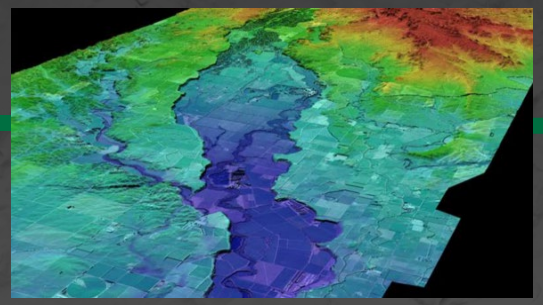
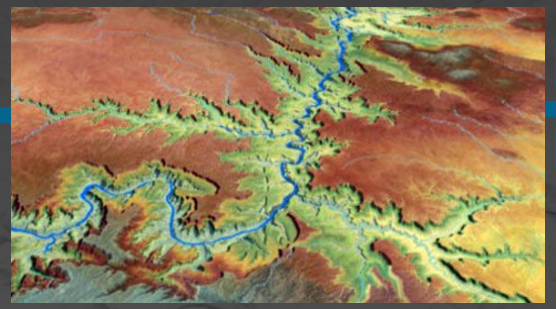
The 3D National Topography Model

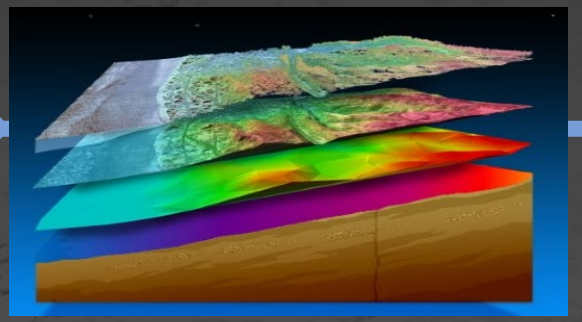
3DEP Baseline



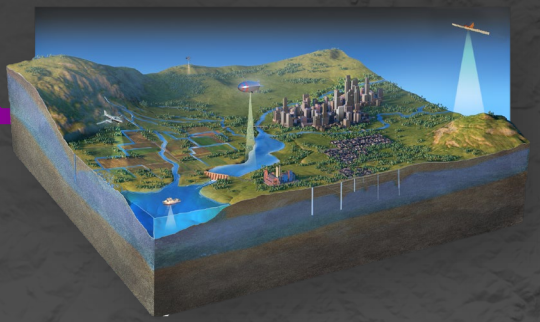
3DHP



Next gen 3DEP



3DNTM



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$13B

Potential annual benefit with ROI of 5:1



> 350

Partner Organizations



65

Percent of total 3DEP cost contributed by partners



75 Trillion

Lidar data points being distributed

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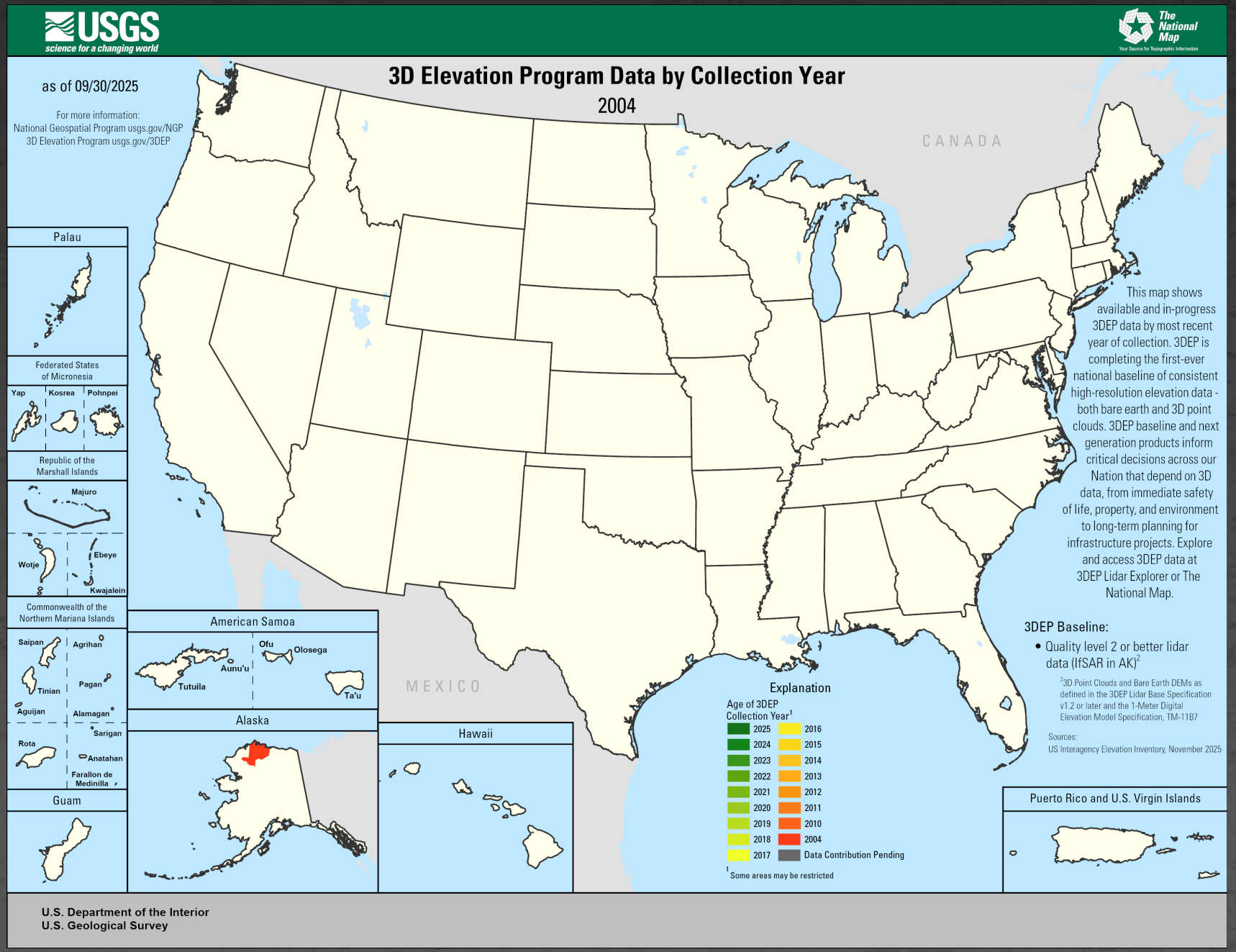

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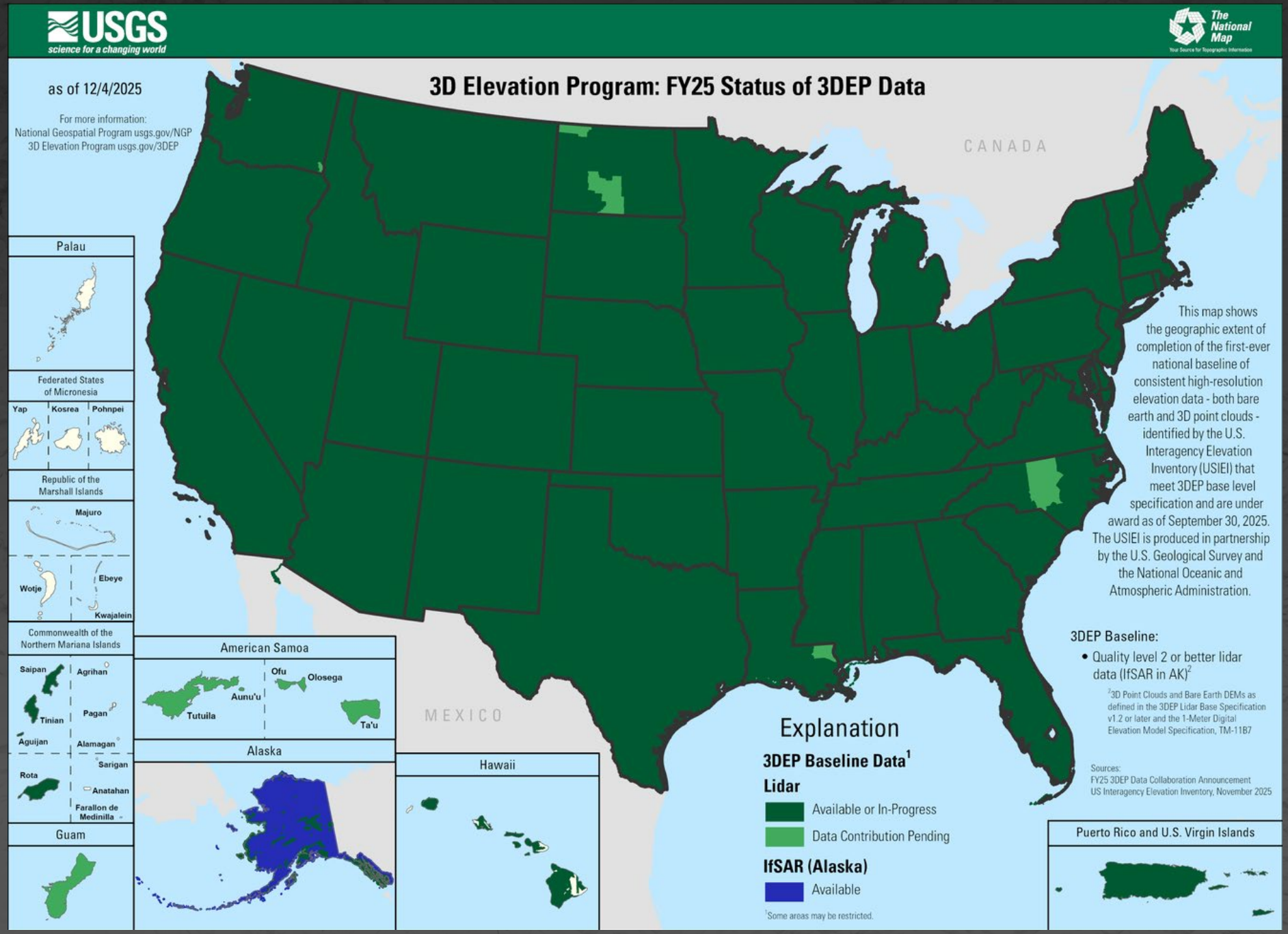

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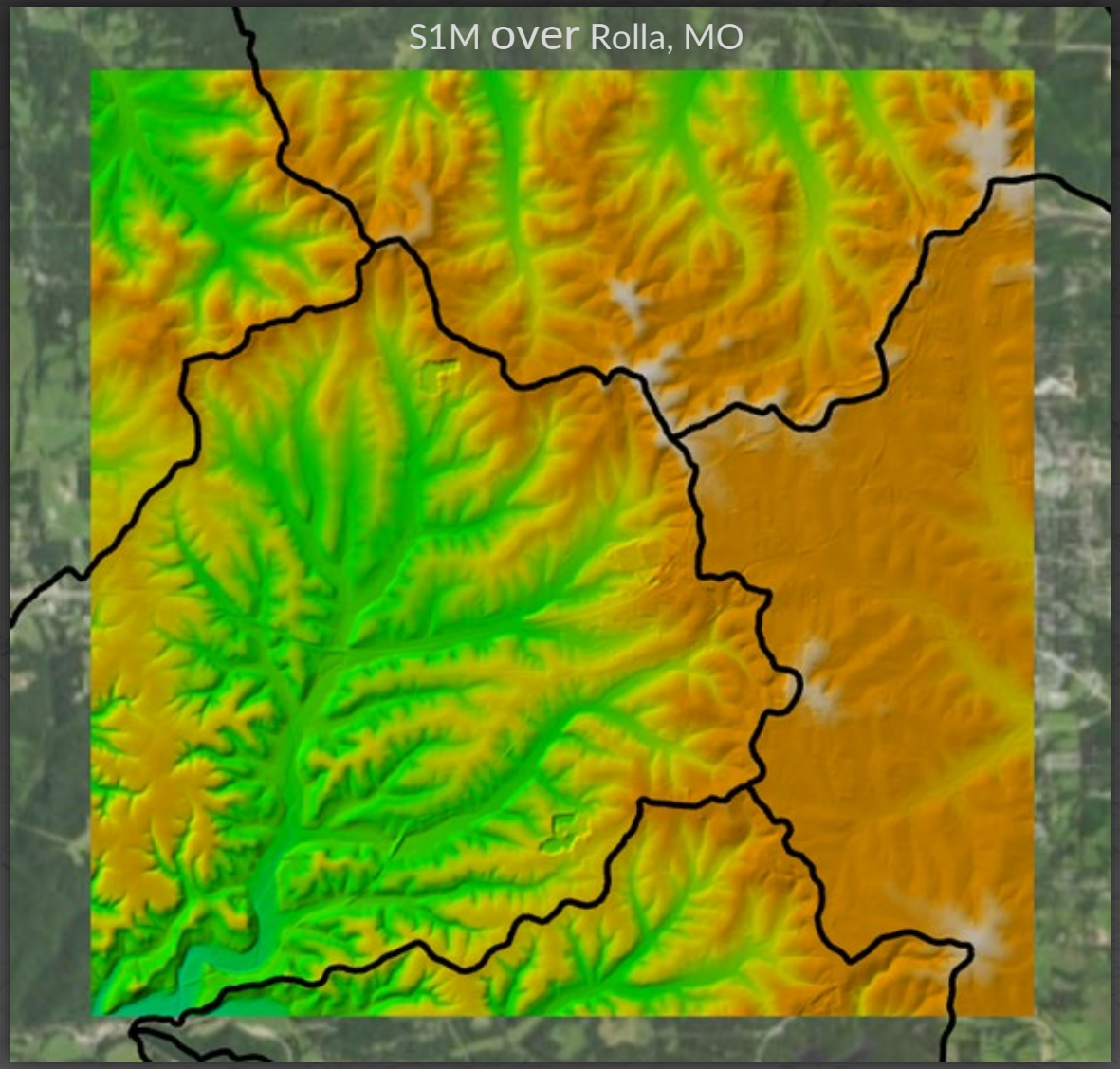
New Seamless 1-meter Digital Elevation Model



USGS lidar coverage in 2,279 individual projects



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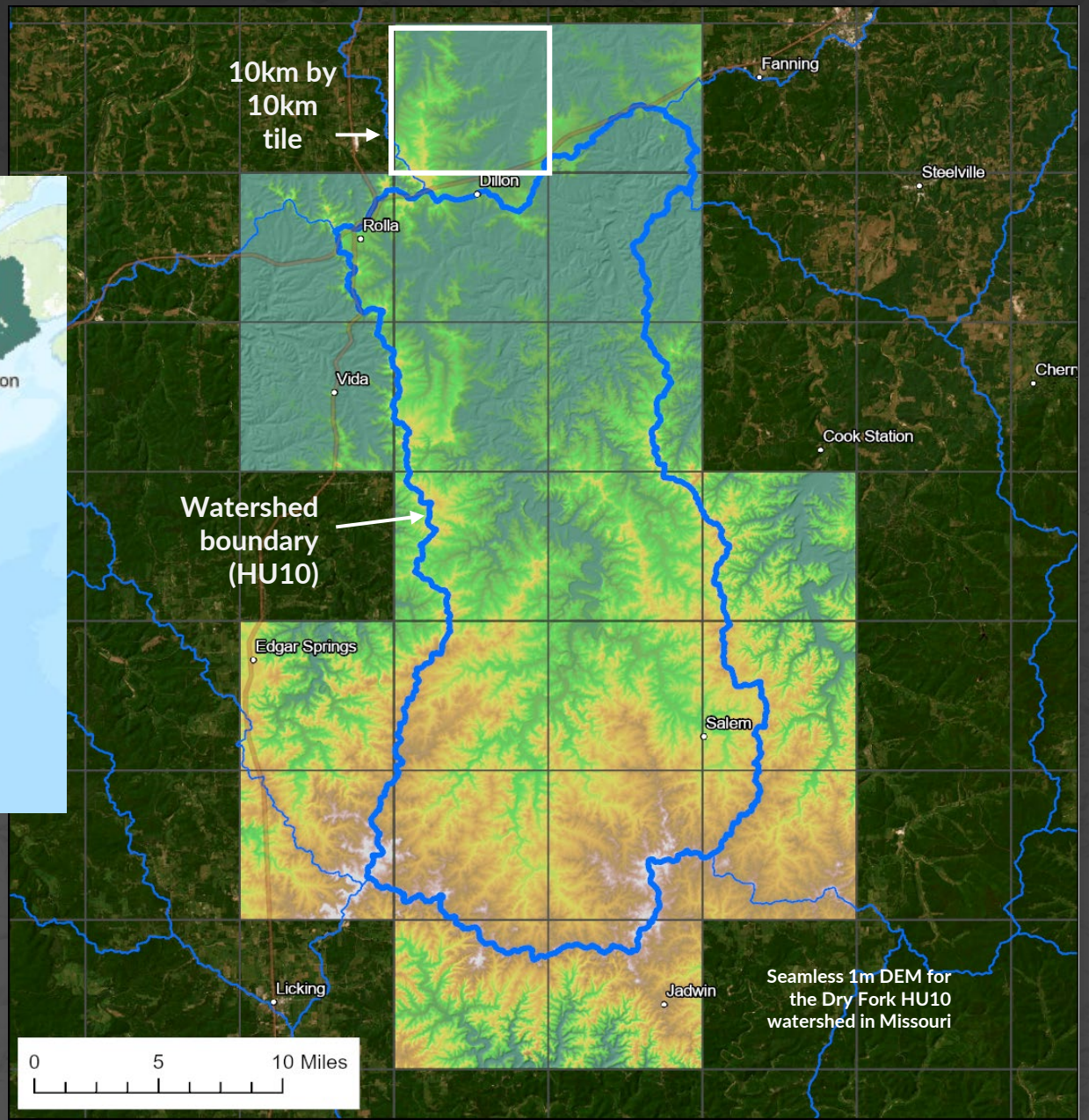
New Seamless 1-meter Digital Elevation Model





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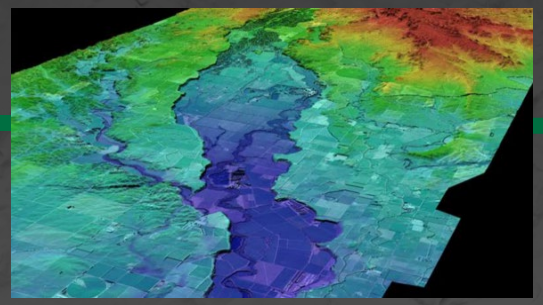
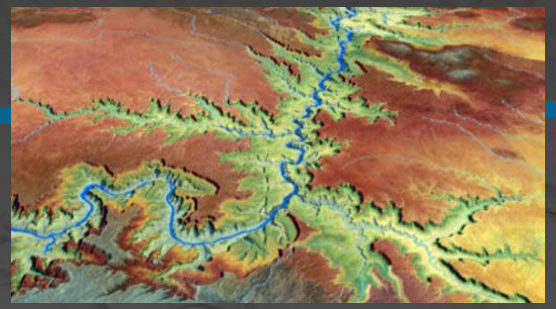
The 3D National Topography Model

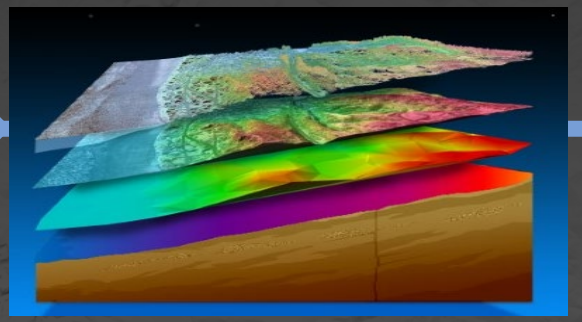
3DEP Baseline



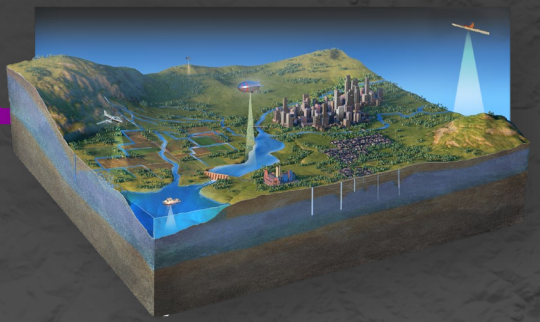
3DHP



Next gen 3DEP



3DNTM



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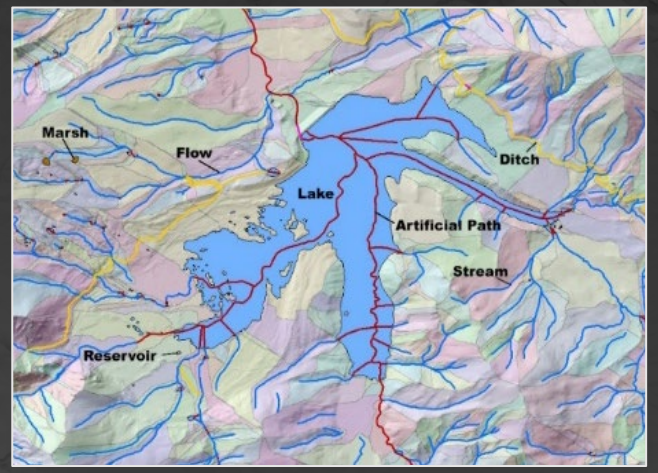
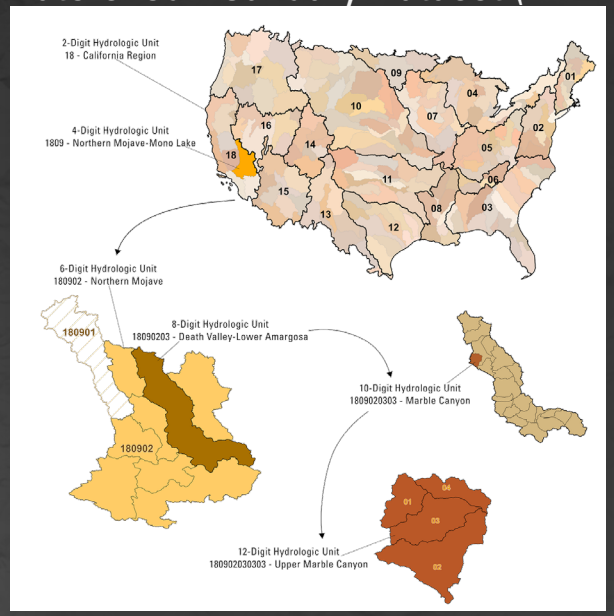
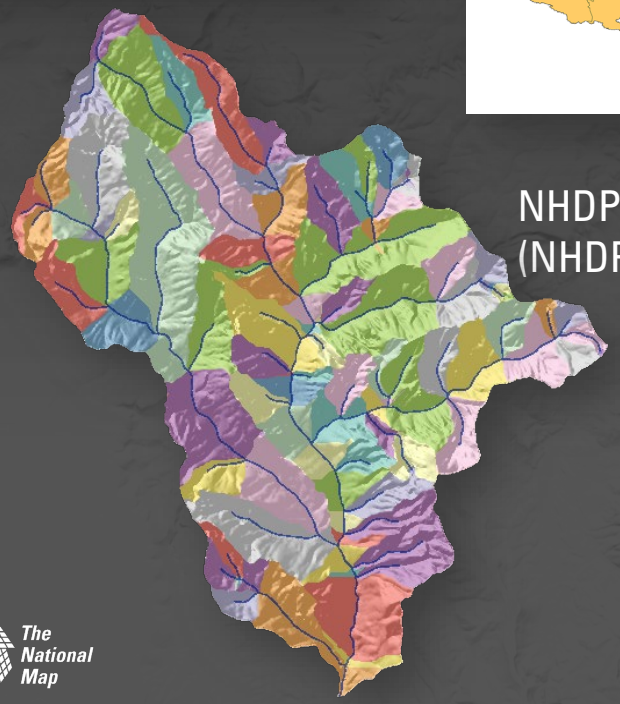
Hydrography data on The National Map

National Hydrography Dataset (NHD)



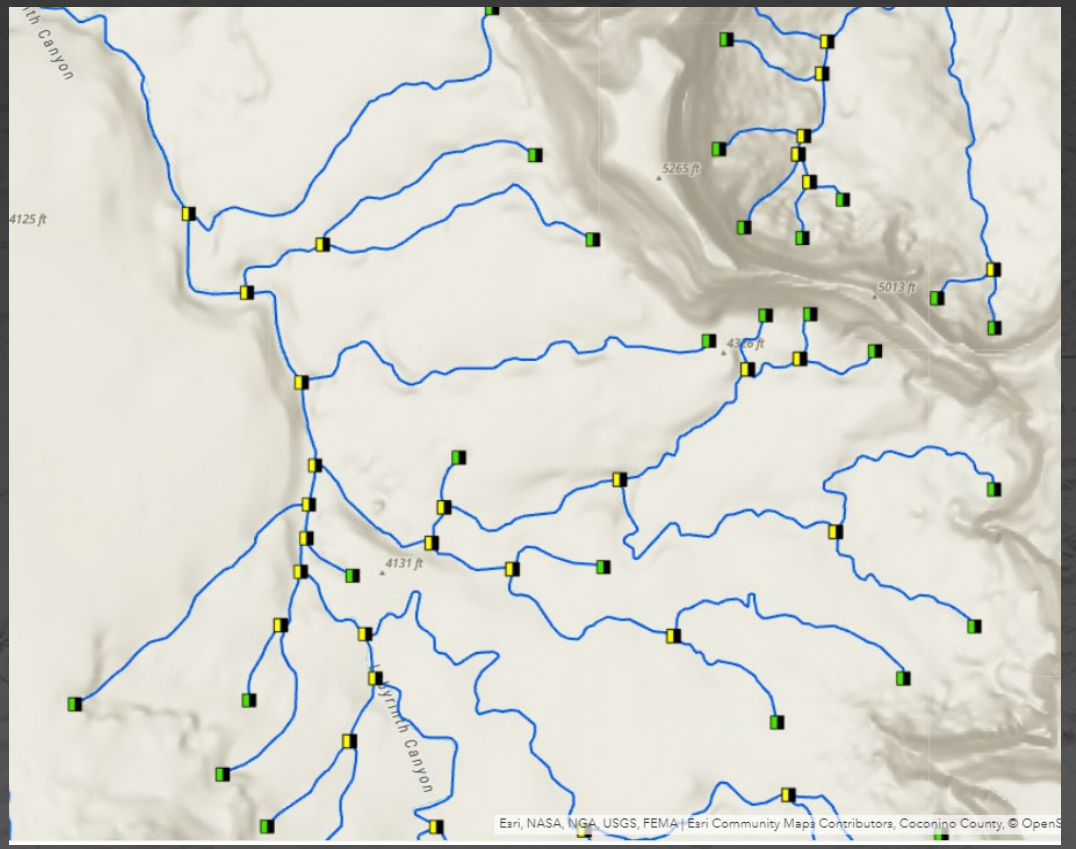
Watershed Boundary Dataset (WBD)





NHDPlus High Resolution (NHDPlus HR)

3D Hydrography Program (3DHP)



Static versions of NHD, WBD, and NHDPlus HR are available and can be found:
https://www.usgs.gov/national-hydrography/access-national-hydrography-products

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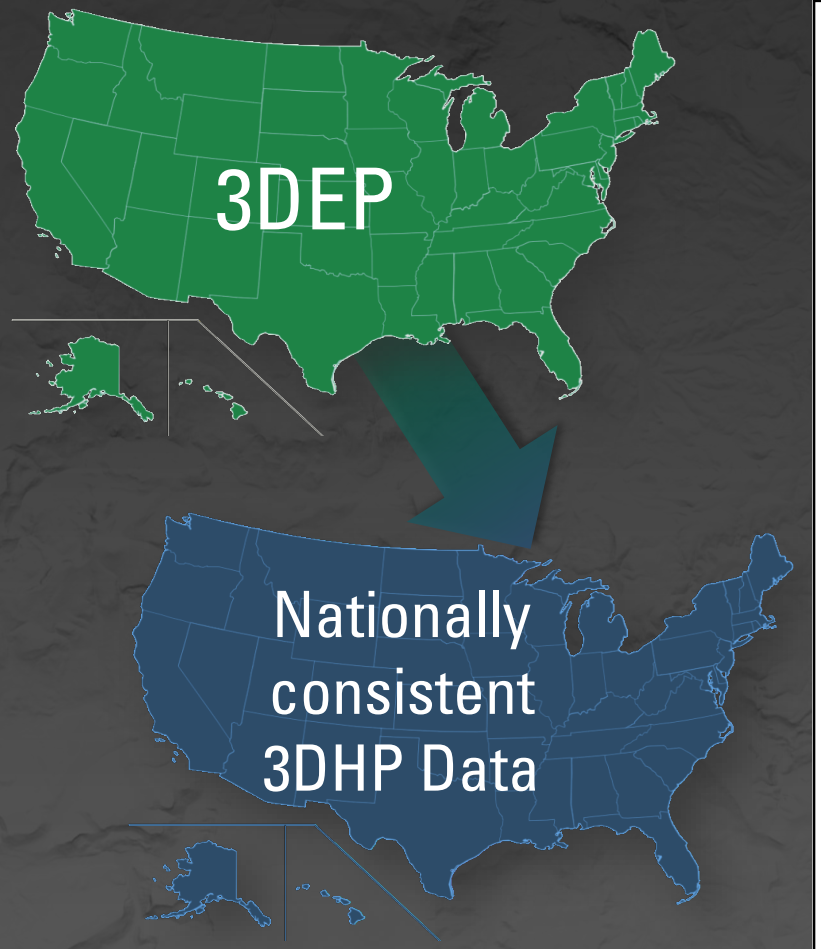
Introducing the 3D Hydrography Program (3DHP)



NHD vs. Hydrography derived from elevation in Pennsylvania

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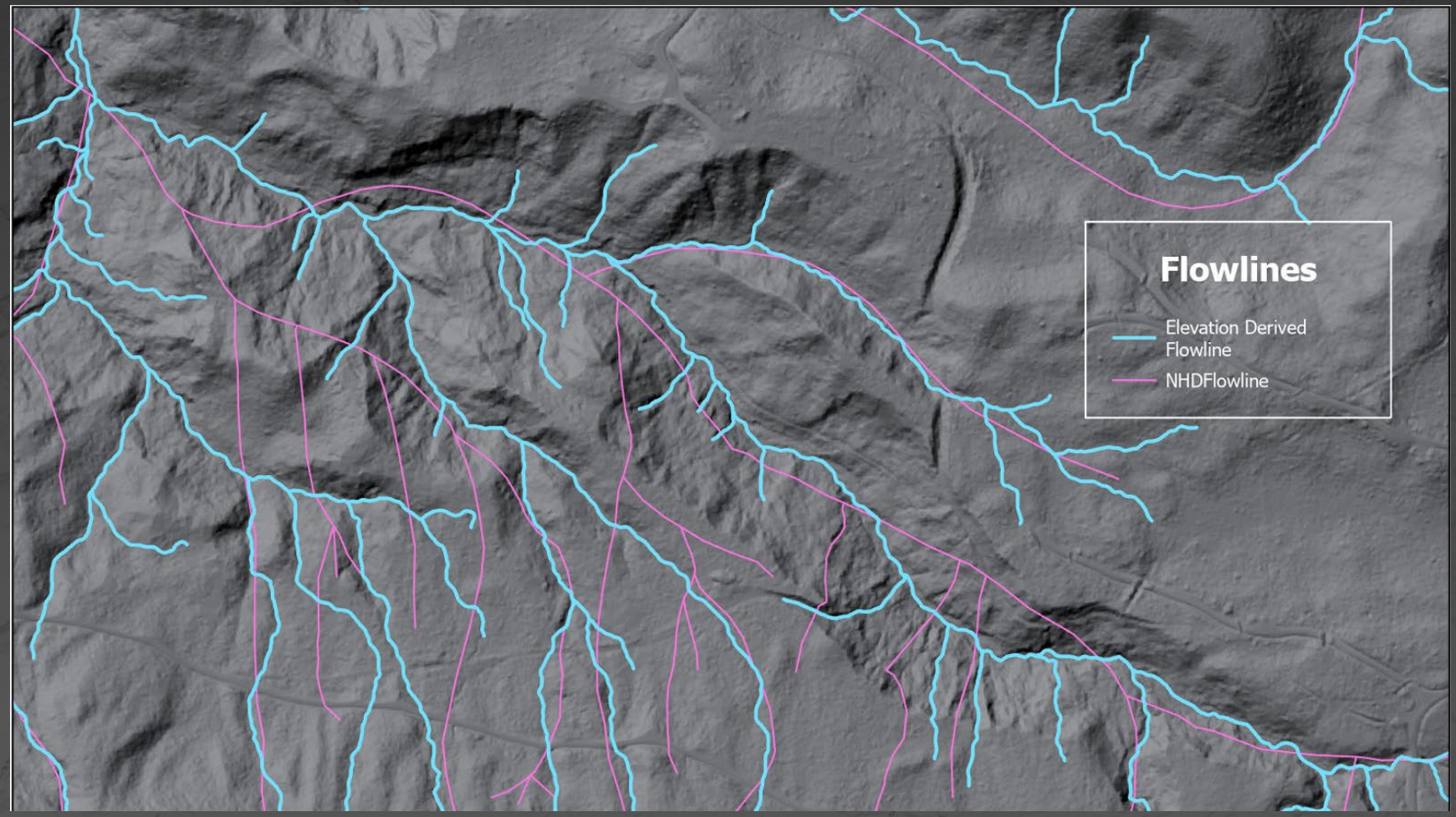
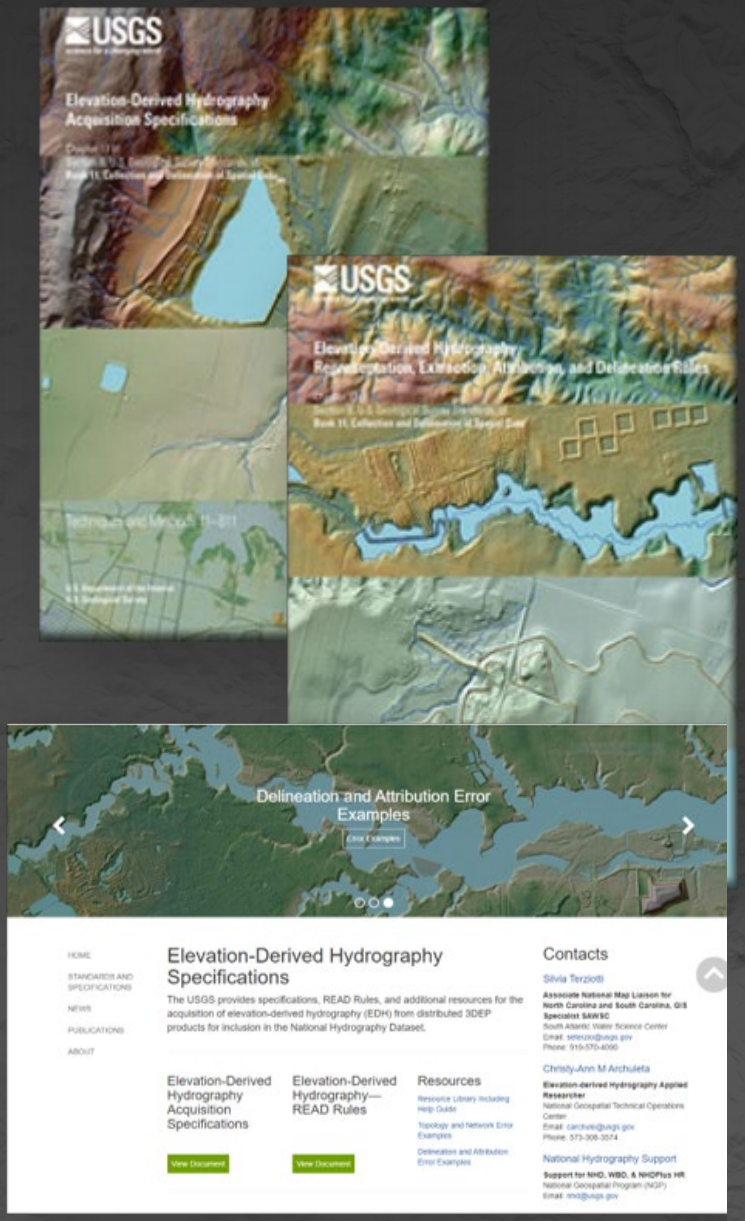
usgs.gov/3dhp

More accurate, more precise, more consistent

Data collected and validated to meet specifications





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The 3DHP Data Lifecycle

Planning

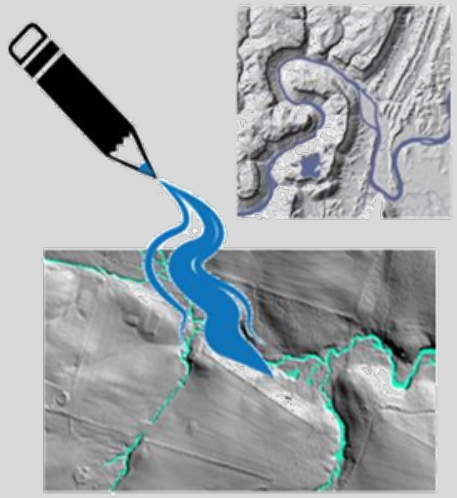
Federal, state, tribal, local or private entities partner on an area of interest

USGS and/or partners plan the project & award a task order



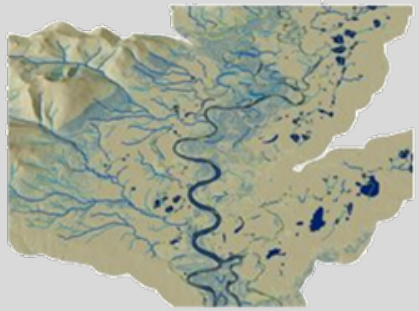
Acquisition

Contractors acquire and process data



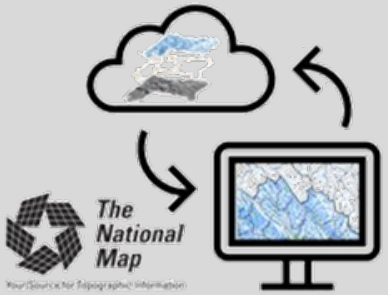
Validation

USGS validates data & produces standard 3DHP data products



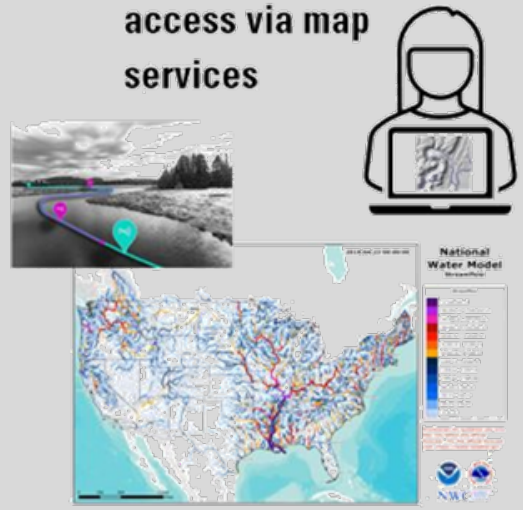
Publication

USGS makes 3DHP data publicly available on The National Map & via services in the Cloud



Access

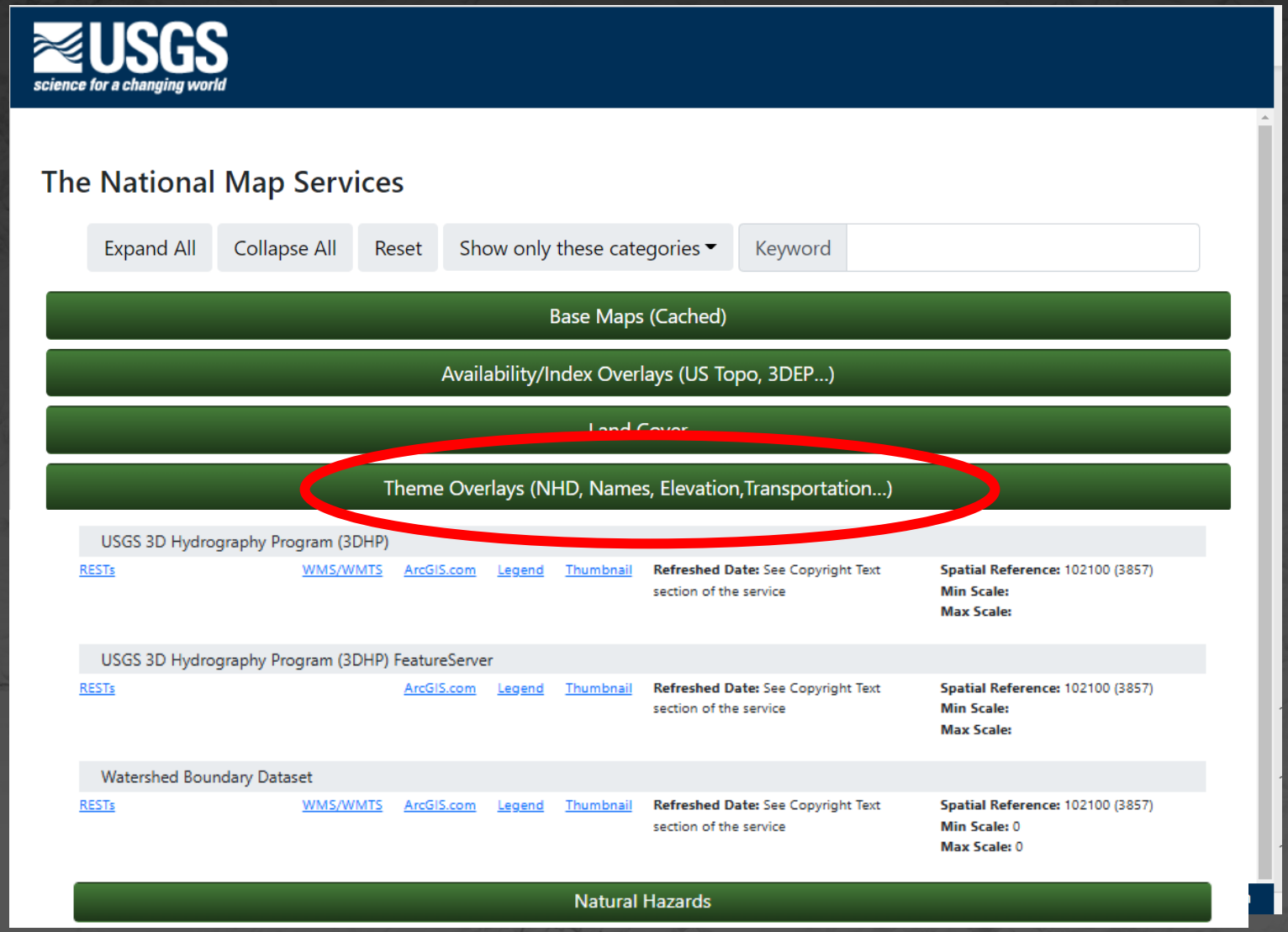
Users can download analysis ready data or access via map services





Over $ 1B in annual benefits to the Nation if hydrography data needs are met (HRBS, 2016)

The National Map Data Access via Services



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3dhp.nationalmap.gov/ or apps.nationalmap.gov/services/

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Downloadable 3DHP Product

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Folders | (browse) → ScienceBase Catalog → National Geospatial Program → ... → The National Map → USGS 3D Hydrography Program (3DHP) - Downloadable Data Collection → **3D Hydrography Program (3DHP) 2025 Staged Product (FY26 Release)**

3D Hydrography Program (3DHP) 2025 Staged Product (FY26 Release) [Folder View]

View

This product is new in federal fiscal year 2026 (FY26), and consists only of vector data in a series of feature classes. The product represents the 3DHP dataset and the schema in which it is contained as of September 30, 2025 Future Annual Staged Product releases will reflect the schema at the ...

Search

Title	Summary	Date Modified
3D Hydrography Program (3DHP) (Alaska) (published 20260123) FileGDB	The USGS 3D Hydrography Program (3DHP) datasets are an integrated, National, 3D-enabled hydrologic dataset derived from the USGS 3D Elevation Program (3DEP) data. For areas where Elevation-derived Hydrography (EDH) has not yet been collected, 3DHP data is supplemented by hydrographic vector data from the (retired) USGS National Hydrography Dataset (NHD). As further EDH-sourced hydrographic data are collected, they will replace the NHD-sourced data in those [...] *Read more...*	2026-01-24T03:41:06.655Z
3D Hydrography Program (3DHP) (Alaska) (published 20260123) GeoPackage	The USGS 3D Hydrography Program (3DHP) datasets are an integrated, National, 3D-enabled hydrologic dataset derived from the USGS 3D Elevation Program (3DEP) data. For areas where Elevation-derived Hydrography (EDH) has not yet been collected, 3DHP data is supplemented by hydrographic vector data from the (retired) USGS National Hydrography Dataset (NHD). As further EDH-sourced hydrographic data are collected, they will replace the NHD-sourced data in those [...] *Read more...*	2026-01-24T03:41:06.654Z
3D Hydrography Program (3DHP) (CONUS) (published 20260123) FileGDB	The USGS 3D Hydrography Program (3DHP) datasets are an integrated, National, 3D-enabled hydrologic dataset derived from the USGS 3D Elevation Program (3DEP) data. For areas where Elevation-derived Hydrography (EDH) has not yet been collected, 3DHP data is supplemented by hydrographic vector data from the (retired) USGS National Hydrography Dataset (NHD). As further EDH-sourced hydrographic data are collected, they will replace the NHD-sourced data in those [...] *Read more...*	2026-01-24T03:41:12.798Z
3D Hydrography Program (3DHP) (CONUS) (published 20260123) GeoPackage	The USGS 3D Hydrography Program (3DHP) datasets are an integrated, National, 3D-enabled hydrologic dataset derived from the USGS 3D Elevation Program (3DEP) data. For areas where Elevation-derived Hydrography (EDH) has not yet been collected, 3DHP data is supplemented by hydrographic vector data from the (retired) USGS National Hydrography Dataset (NHD). As further EDH-sourced hydrographic data are collected, they will replace the NHD-sourced data in those [...] *Read more...*	2026-01-24T03:41:06.654Z

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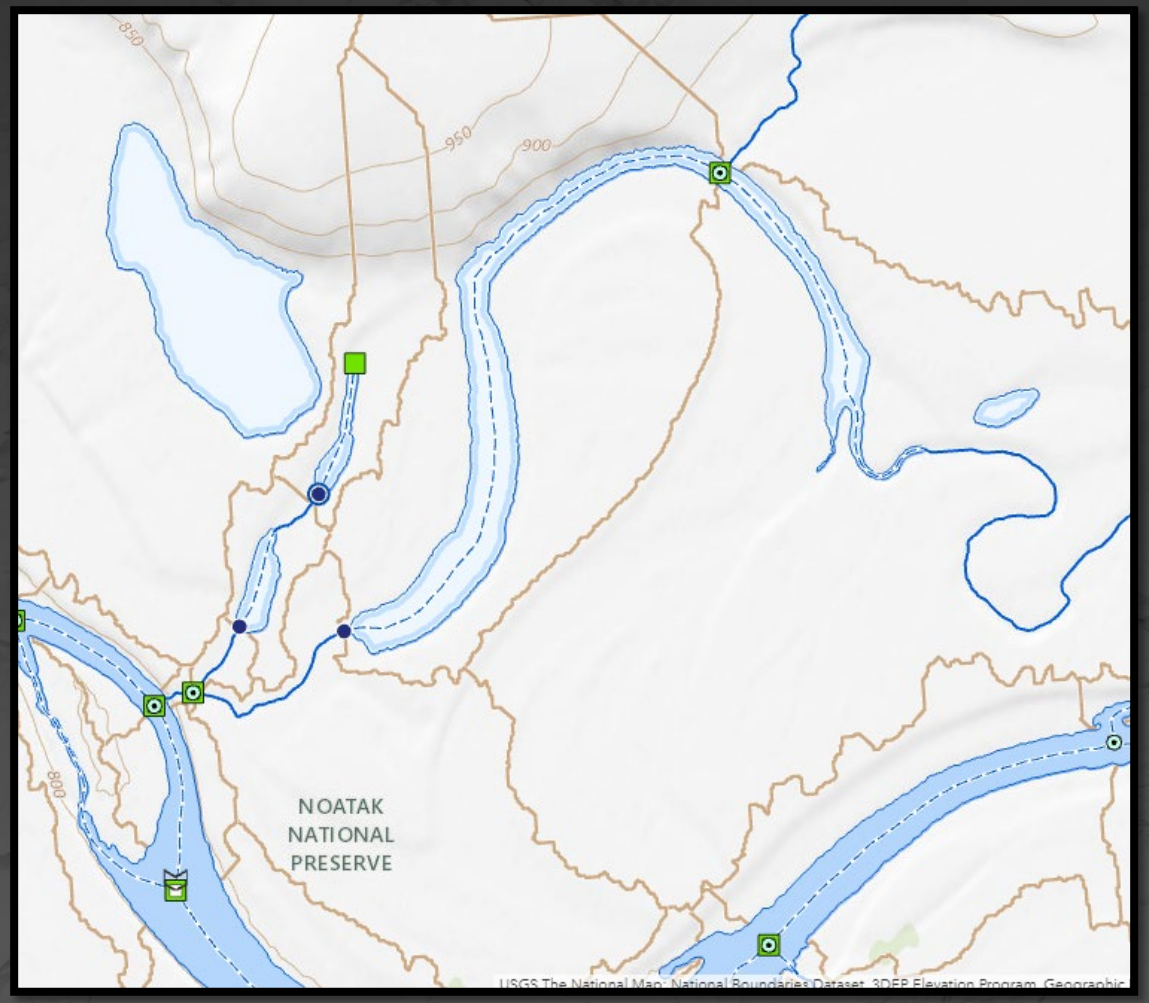
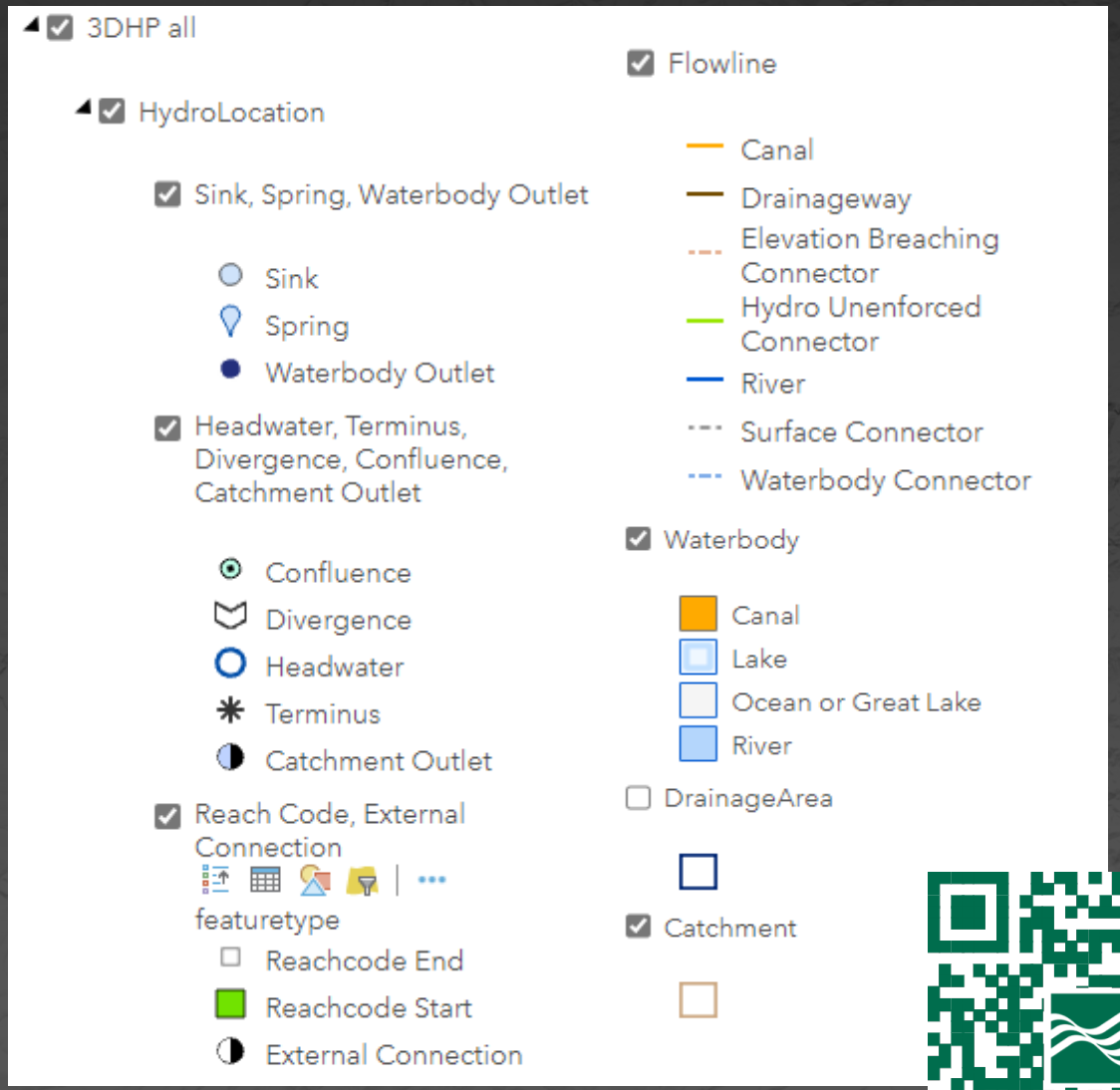
usgs.gov/3DHP/AccessData

https://www.sciencebase.gov/catalog/

3DHP Map Service





3dhp.nationalmap.gov/

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Flow Network Derivatives

Identify, sequence and measure

- Hydro Sequence
- Terminal Path
- Path Length
- Arbolate Sum

Network Flags

- Start Flag
- Terminal Flag
- Divergence
- Return Divergence

Hierarchy of flowlines

- Stream Level
- Level Path
- Stream Order
- Stream Calculator

usgs.gov/3d-hydrography-program/3dhp-flow-network-derivatives

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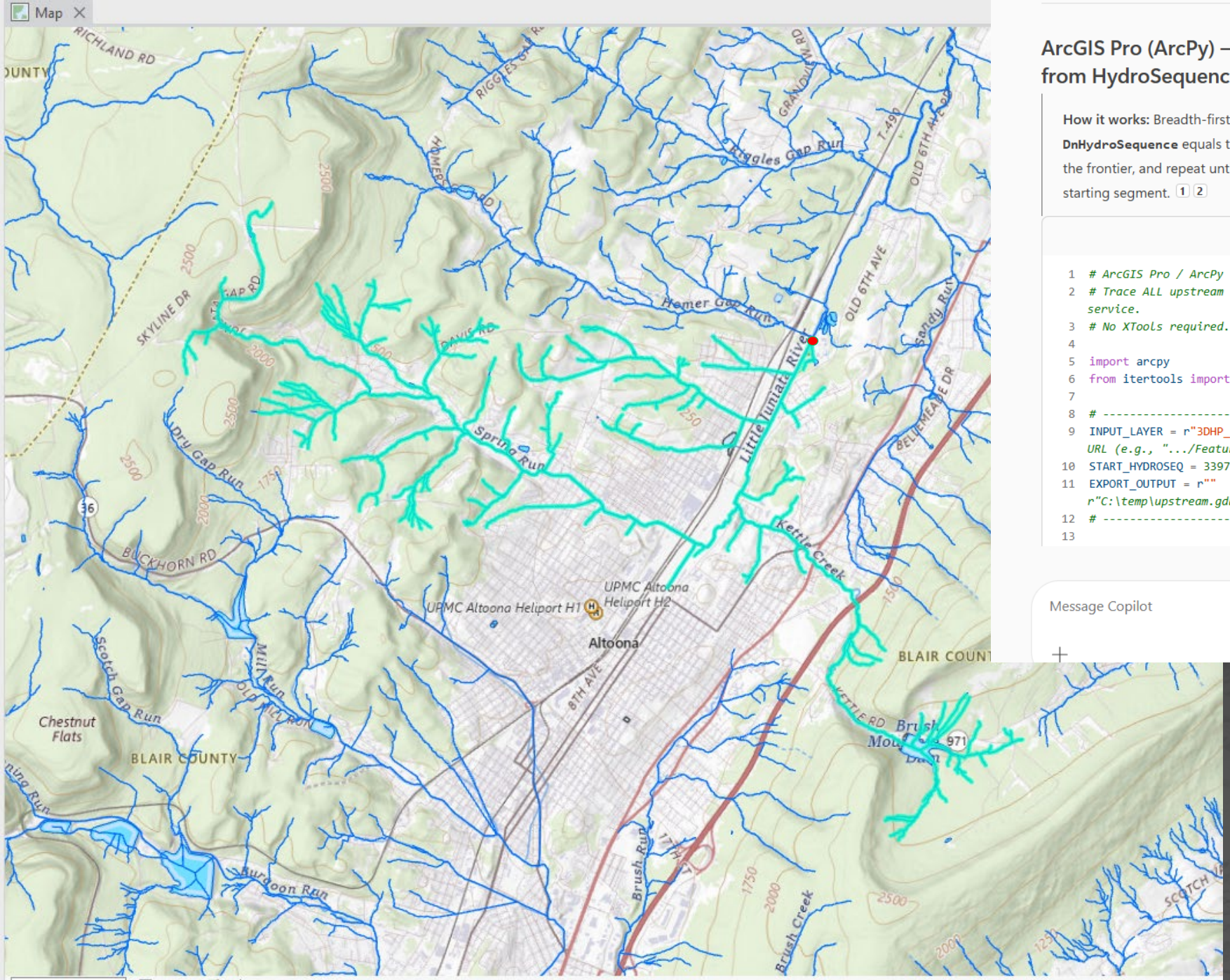


ArcGIS Pro (ArcPy) — Trace ALL upstream segments from HydroSequence 33975

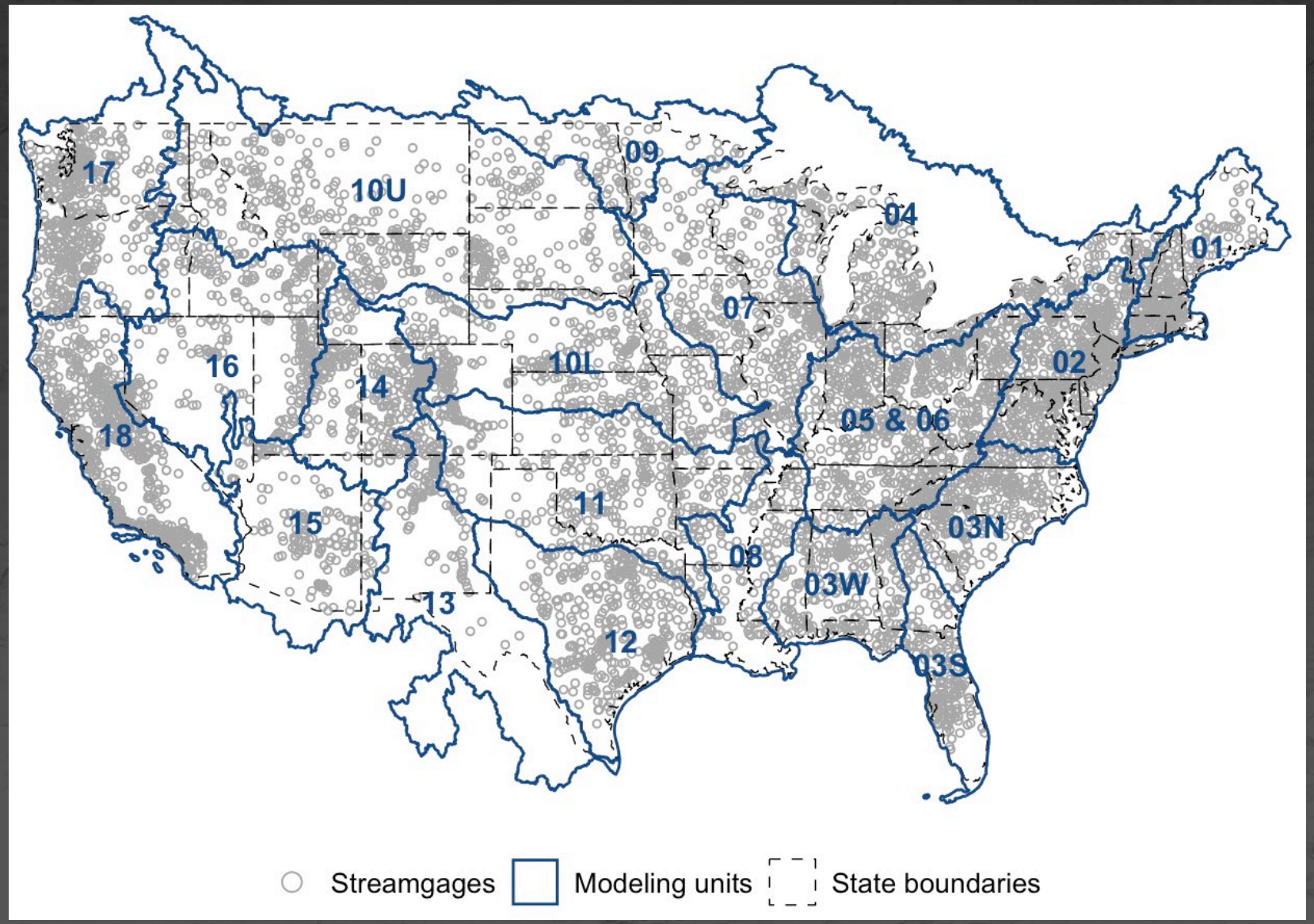
> **How it works:** Breadth-first search (BFS) expansion. In each step we select features whose **DnHydroSequence** equals the current frontier's **HydroSequence**, add their **HydroSequence** values to the frontier, and repeat until no new features are found. This returns **all tributaries** upstream of the starting segment. [1] [2]

Python

```python
# ArcGIS Pro / ArcPy
# Trace ALL upstream segments from a starting HydroSequence in the 3DHP_all feature service.
# No XTools required.

import arcpy
from itertools import islice

# ---------------------- USER SETTINGS ----------------------------------------
INPUT_LAYER = r"3DHP_all"   # Layer name in the active map OR a full feature service layer URL (e.g., ".../FeatureServer/0")
START_HYDROSEQ = 33975      # Starting HydroSequence (as requested)
EXPORT_OUTPUT = r""         # Optional FGDB feature class for saving results, e.g., r"C:\temp\upstream.gdb\H33975_upstream"
# -----------------------------------------------------------------------------

```

Message Copilot

Probabilities of Stream Permanence



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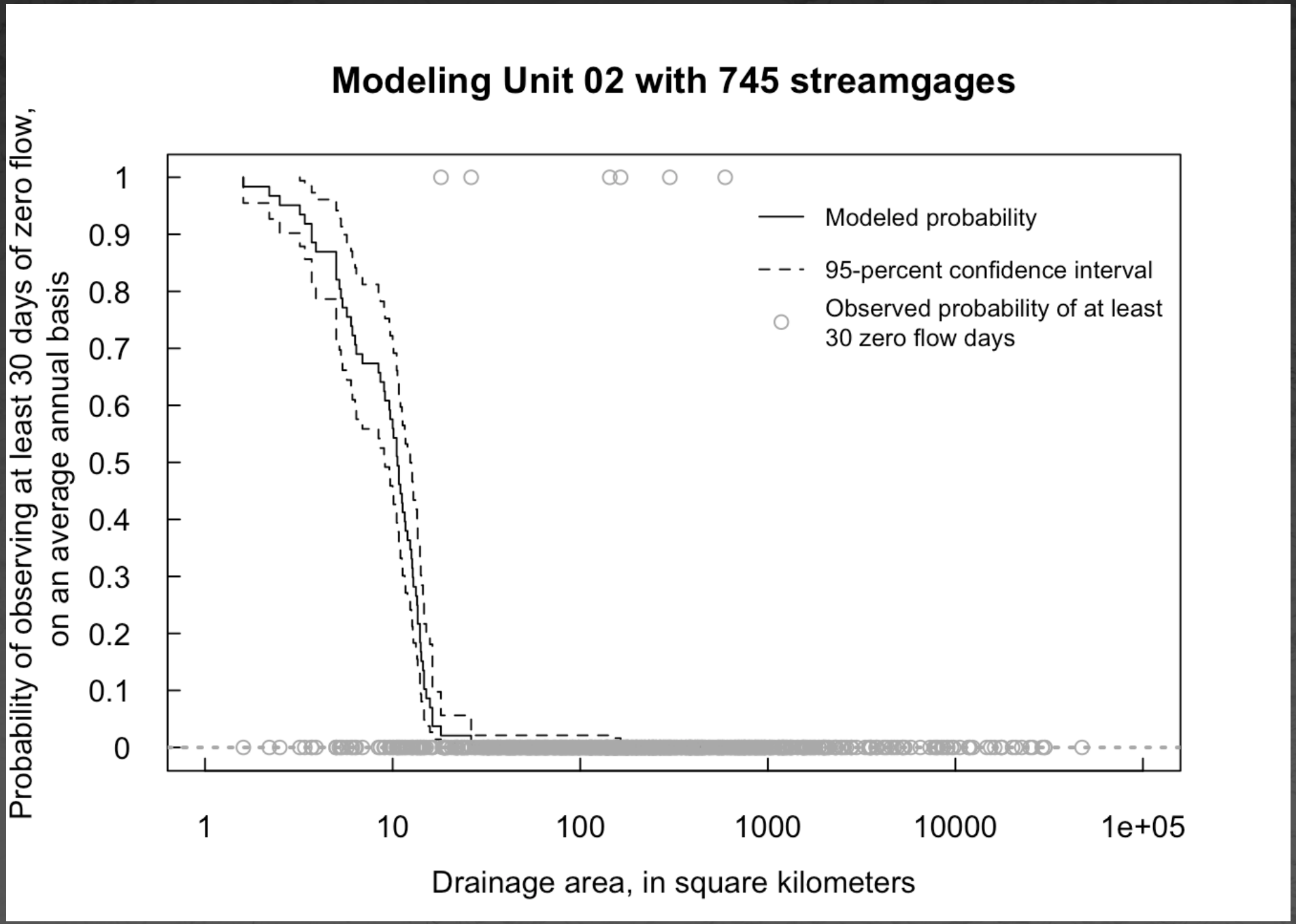
6 out of 745 (0.8 percent) streamgages have at least 30 days of zero flow for Hydrologic Unit 02.



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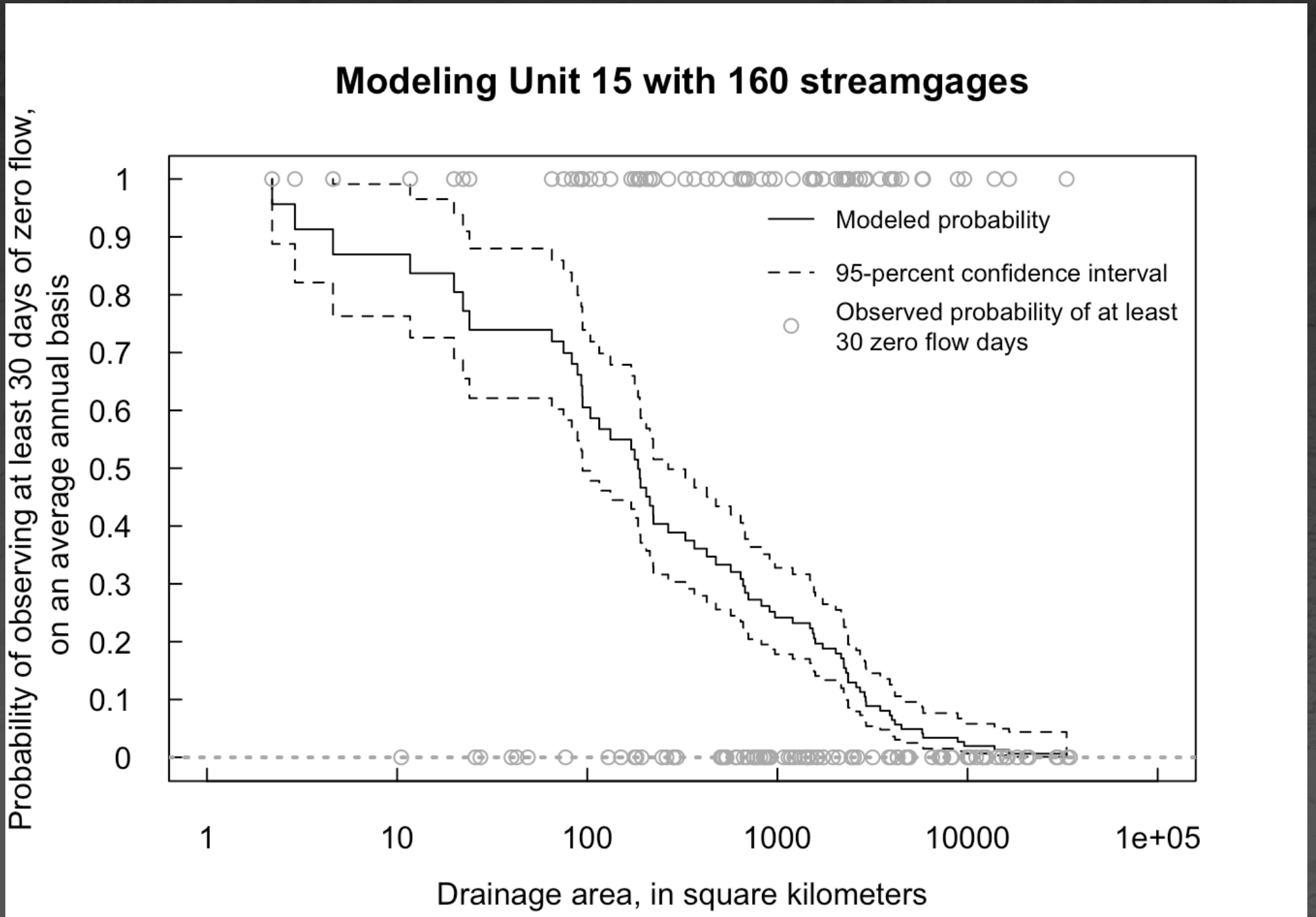
69 out of 160 (43.1 percent) streamgages have at least 30 days of zero flow for Hydrologic Unit 15.



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Probabilities of Stream Permanence

1, 3, 7, or 30 Days of zero streamflow

	A	B	C	D	E	F
1	flowlineid3dhp	catchmentid3dhp	prob_one_dry_day	upper_prob_one_dry_day	lower_prob_one_dry_day	prob_one_dry_day_interval
2	2GNSHO	2H8VQA	0.441786611	0.779008792	0.25054327	0.528465522
3	2GNSHM	2H952W	0.791660874	1	0.521240286	0.478759714
4	2GNSHN	2H95L4	0.791660874	1	0.521240286	0.478759714
5	2GNSHP	2H8W32	0.789558026	1	0.519685123	0.480314877
6	2GNSHQ	2H8V4N	0.789558026	1	0.519685123	0.480314877
7	2GNSHR	2H8VC1	0.441786611	0.779008792	0.25054327	0.528465522
8	2GNSHS	2H8WU9	0.791660874	1	0.521240286	0.478759714
9	2GNSHT	2H96R0	0.791660874	1	0.521240286	0.478759714
10	2GNSHU	2H9AXT	0.791660874	1	0.521240286	0.478759714
11	2GNSHV	2H927S	0.791660874	1	0.521240286	0.478759714
12	2GNSHW	2H901W	0.791660874	1	0.521240286	0.478759714
13	2GNSHX	2H98OW	0.791660874	1	0.521240286	0.478759714
14	2GNSHY	2H911L	0.791660874	1	0.521240286	0.478759714
15	2GNSHZ	2H8V4L	0.791660874	1	0.521240286	0.478759714
16	2GNSI0	2H9CB6	0.791660874	1	0.521240286	0.478759714
17	2GNSI1	2H9BLX	0.791660874	1	0.521240286	0.478759714
18	2GNSI2	2H96FN	0.791660874	1	0.521240286	0.478759714
19	2GNSI3	2H92OL	0.791660874	1	0.521240286	0.478759714
20	2GNSI4	2H96PA	0.791660874	1	0.521240286	0.478759714
21	2GNSI5	2H99H4	0.791660874	1	0.521240286	
22	2GNSI6	2H99FK	0.791660874	1	0.521240286	
23	2GNSI7	2H99ZH	0.791660874	1	0.521240286	
24	2GNSI8	2H94H1	0.791660874	1	0.521240286	
25	2GNSI9	2H99GN	0.791660874	1	0.521240286	
26	2GNSIA	2H8ZB4	0.791660874	1	0.521240286	
27	2GNSIB	2H93TP	0.791660874	1	0.521240286	
28	2GNSIC	2H8VSZ	0.791660874	1	0.521240286	
29	2GNSID	2H99XR	0.791660874	1	0.521240286	

3dhp_PoF_02050302

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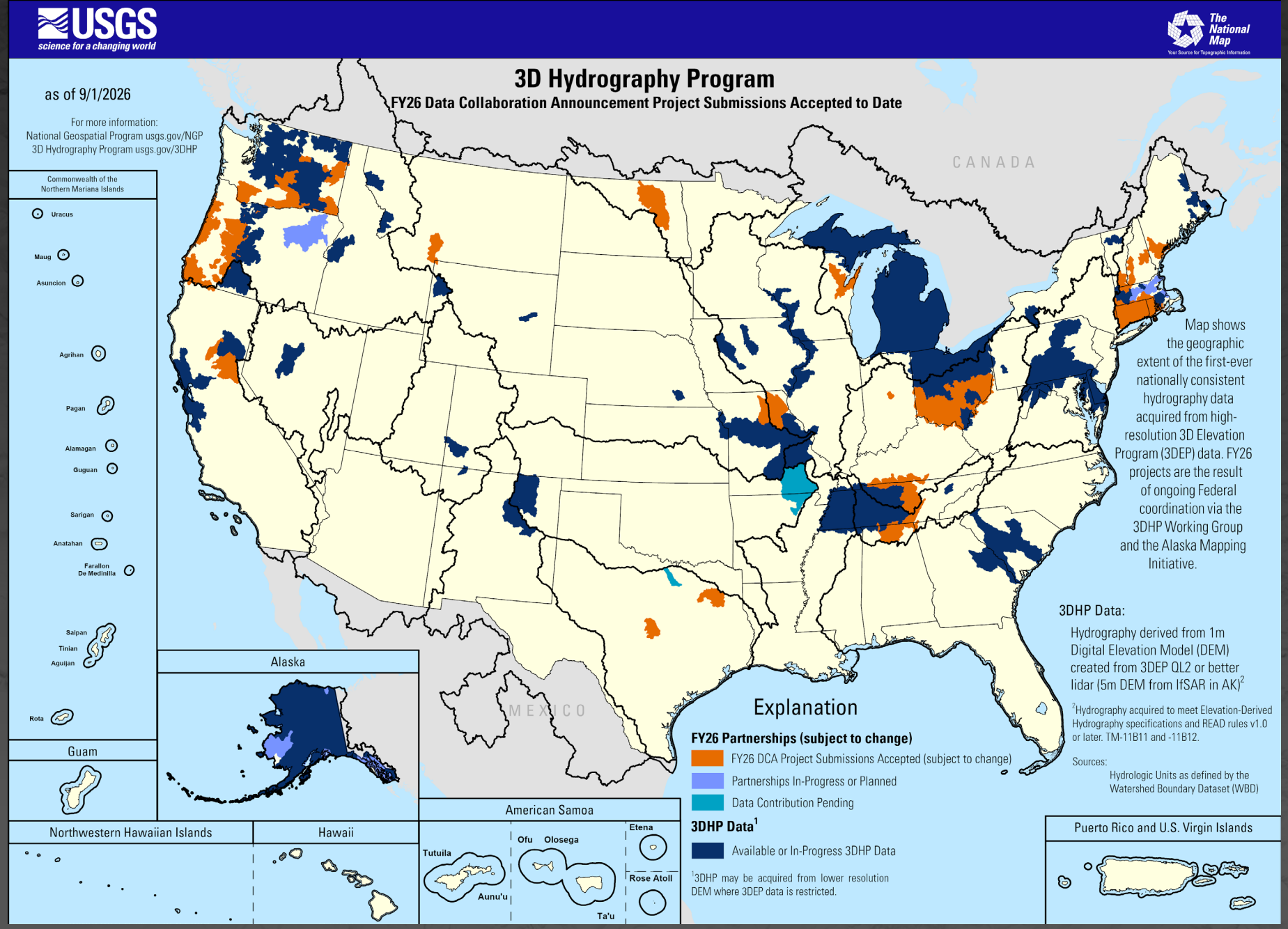

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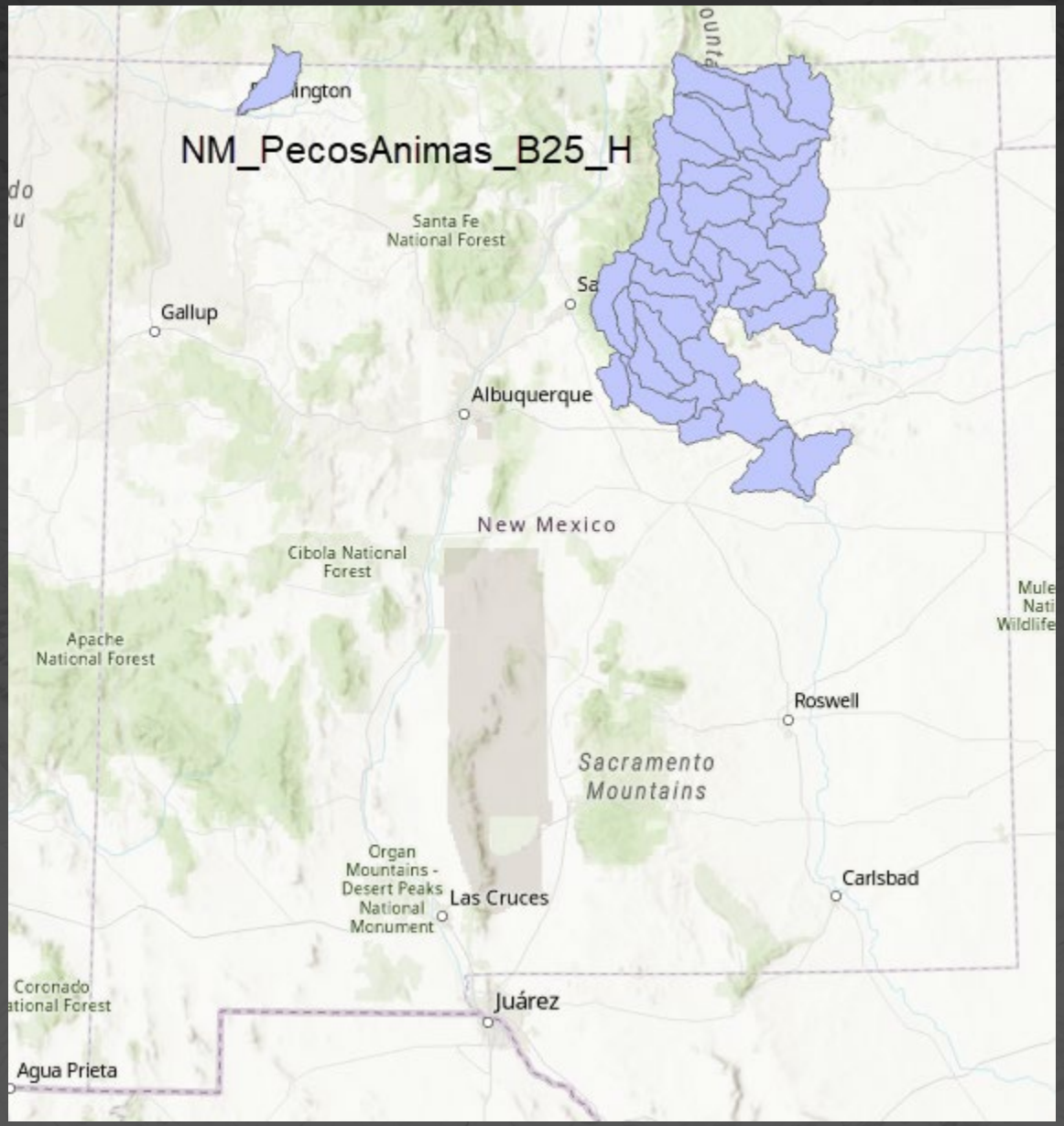
New Mexico 3DHP Project



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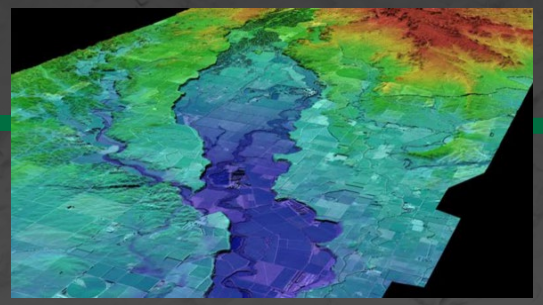
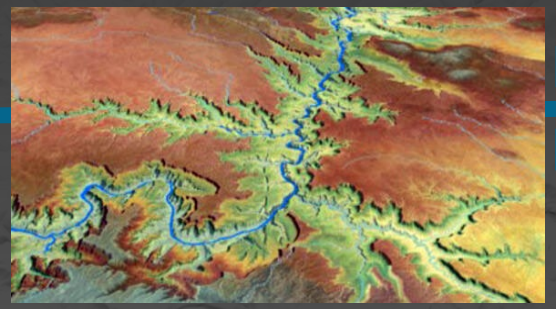
The 3D National Topography Model

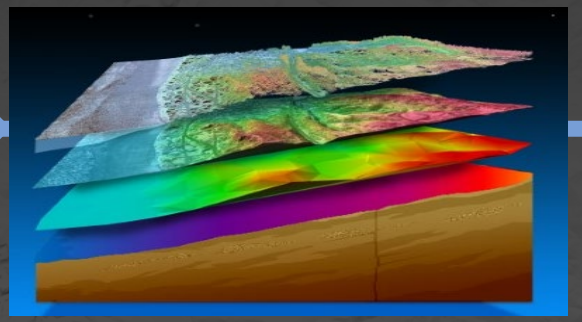
3DEP Baseline



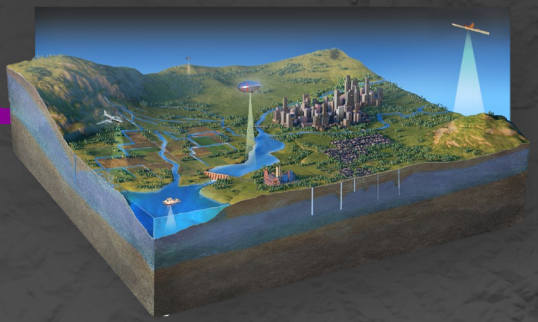
3DHP



Next gen 3DEP



3DNTM



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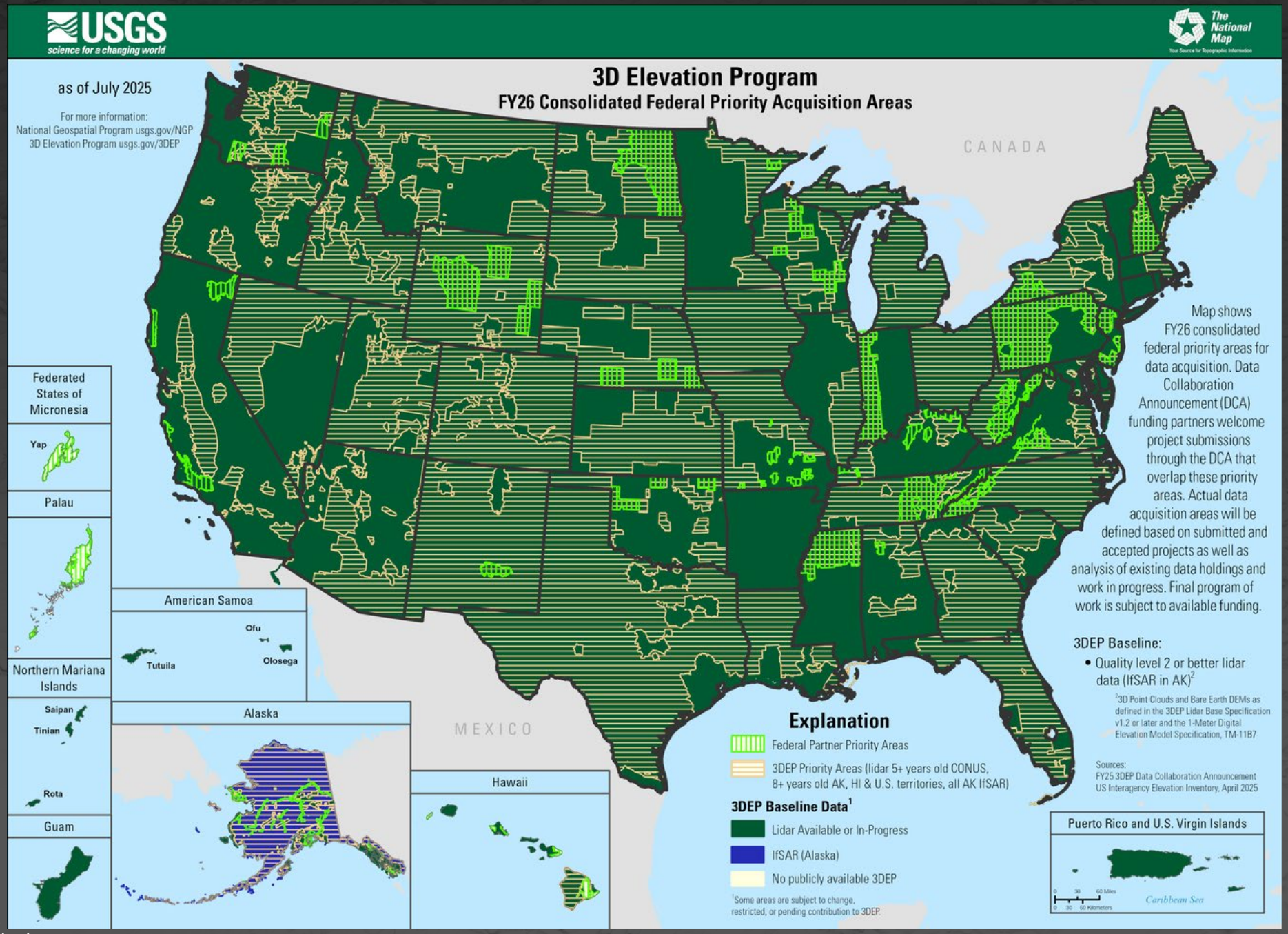
	3DEP Baseline		Next gen 3DEP
Target Quality Level	QL2 / QL5 in AK		QL1 or QL2 as proposed by partners
Scope	Topographic data		Topographic and bathymetric data
Update frequency	8 years		5 years CONUS 8 years AK, HI, Territories
Annual costs	~ $146M	$	$$ ~ $259M
Annual benefits	$690M		 $7.6B



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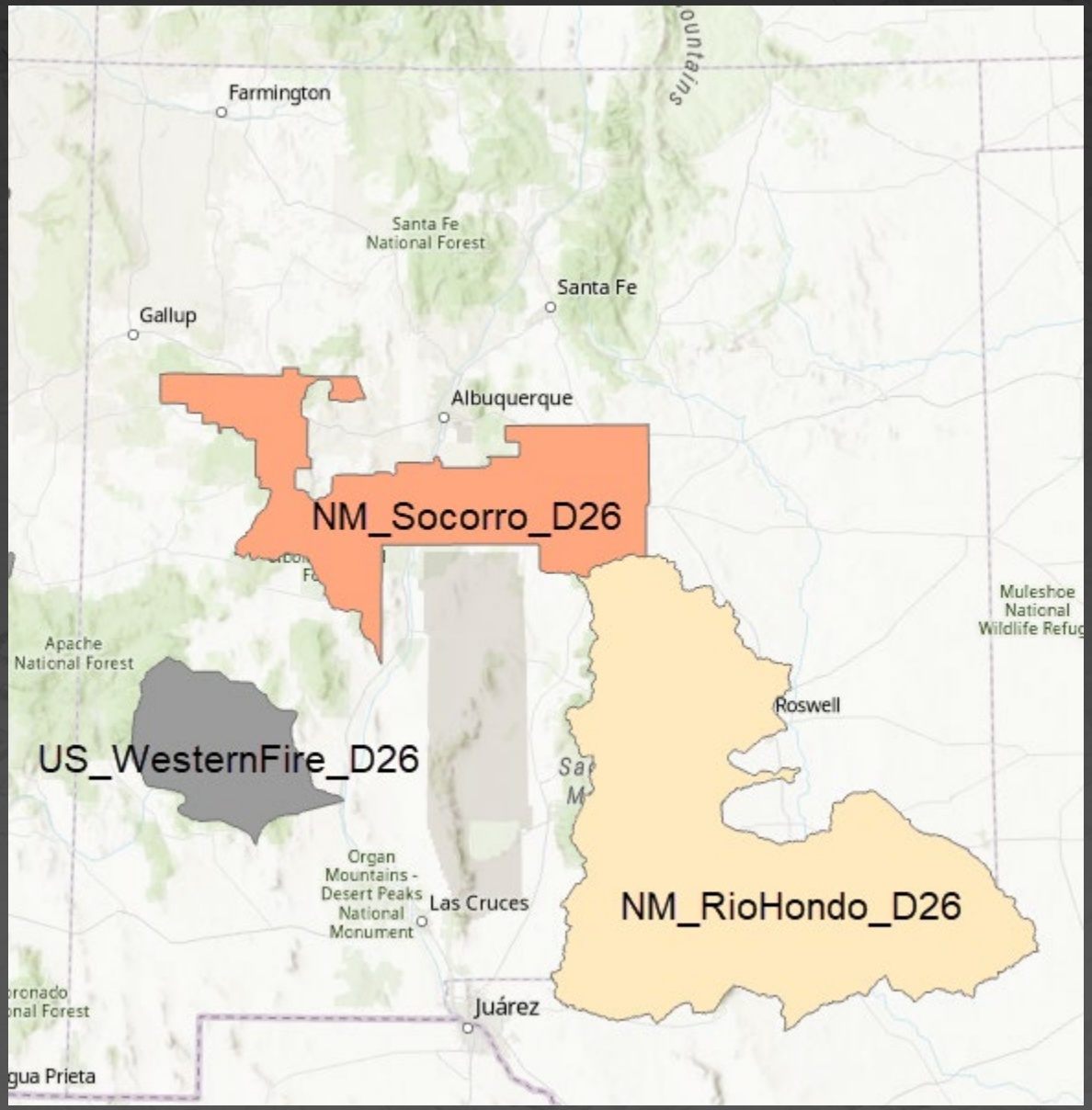
New Mexico 3DEP Projects



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Detecting Change with the next generation of 3DEP

Before and after the Eaton Fire, Los Angeles County, CA



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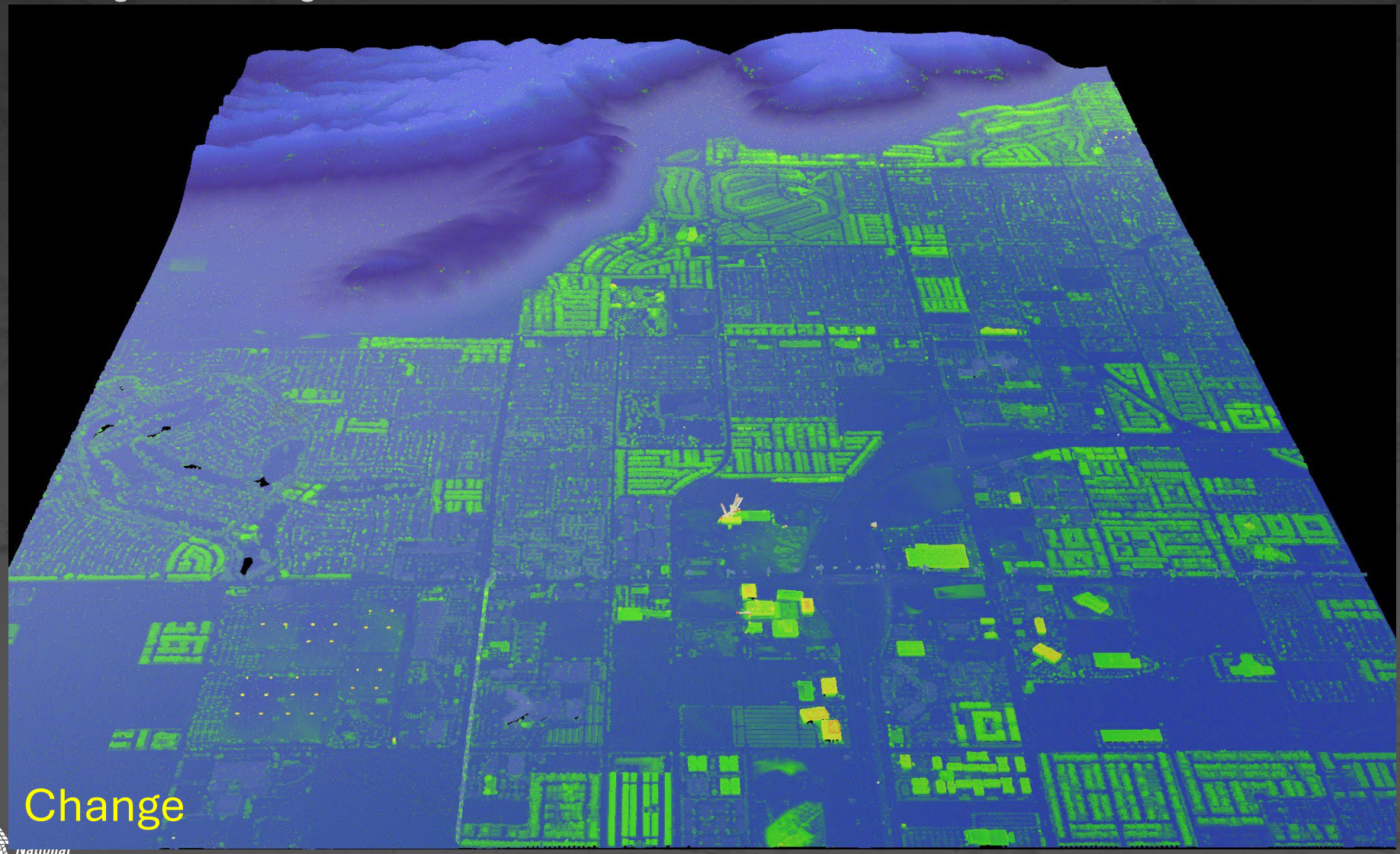
Detecting Change with the next generation of 3DEP

Land use change- Las Vegas, NV (2010-2022)



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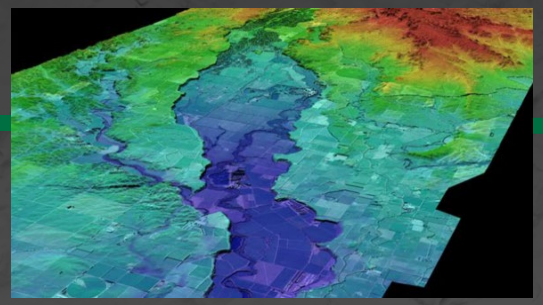
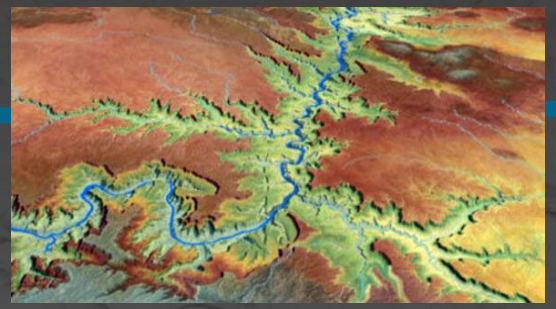
The 3D National Topography Model

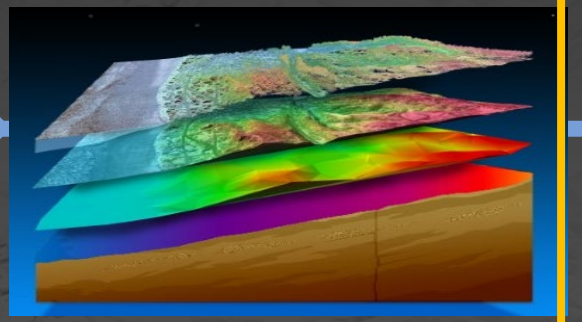
3DEP Baseline



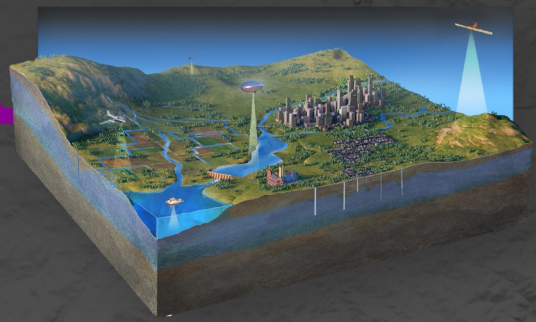
3DHP



Next gen 3DEP



3DNTM



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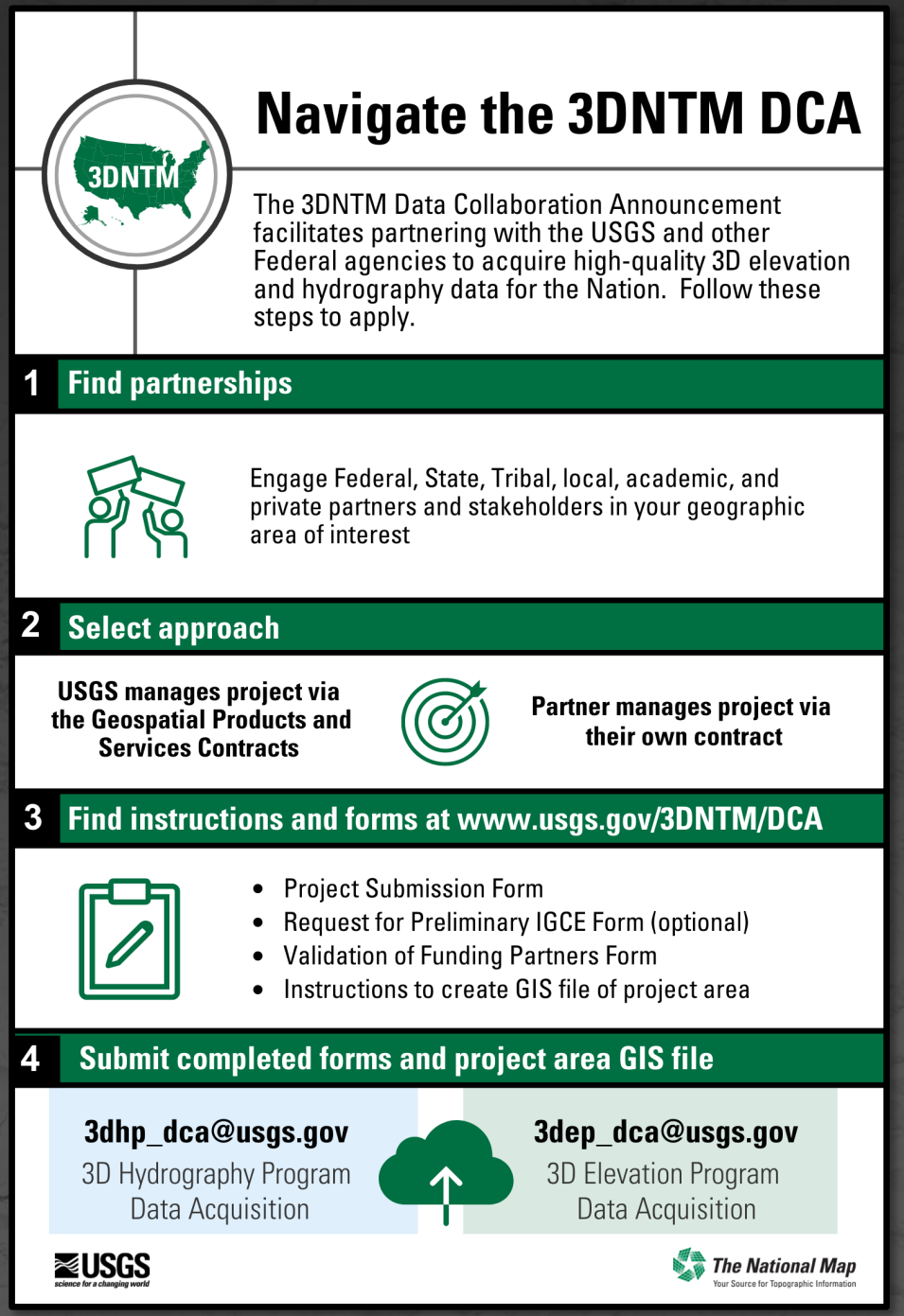
3DNTM Data Collaboration Announcement (DCA)



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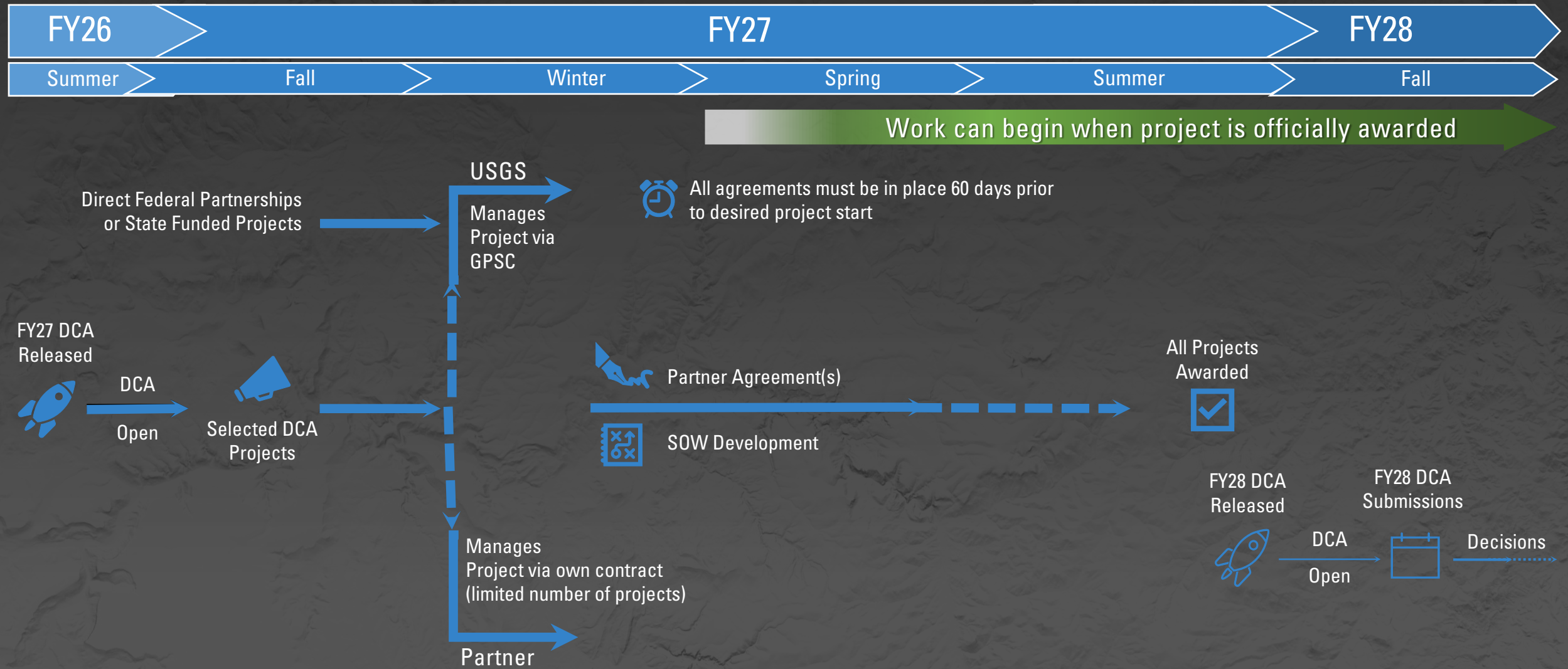
3DNTM DCA Timeline



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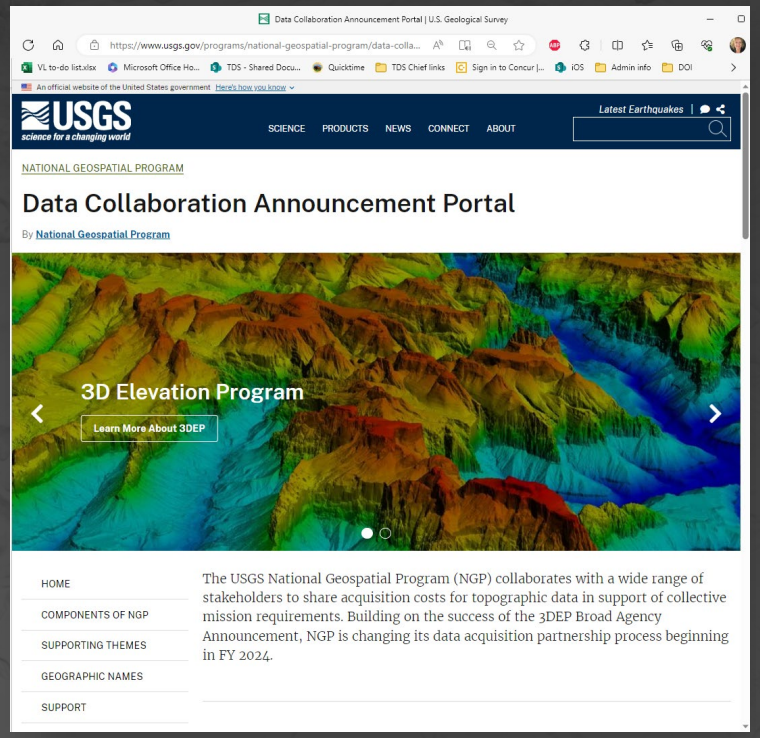
Deadlines are approximate. Final dates will be posted at usgs.gov/3DNTM/DCA

3DNTM Data Collaboration Announcement

DCA PORTAL contains all instructions and forms



WHAT YOU WILL SUBMIT



3DEP or 3DHP Project Submission Form (required)

IMPORTANT:
Hit tab to properly auto-populate the form



Validation of Funding Partners Form (required)



Request for Project Planning Estimate (optional)



GIS file of project area (required)

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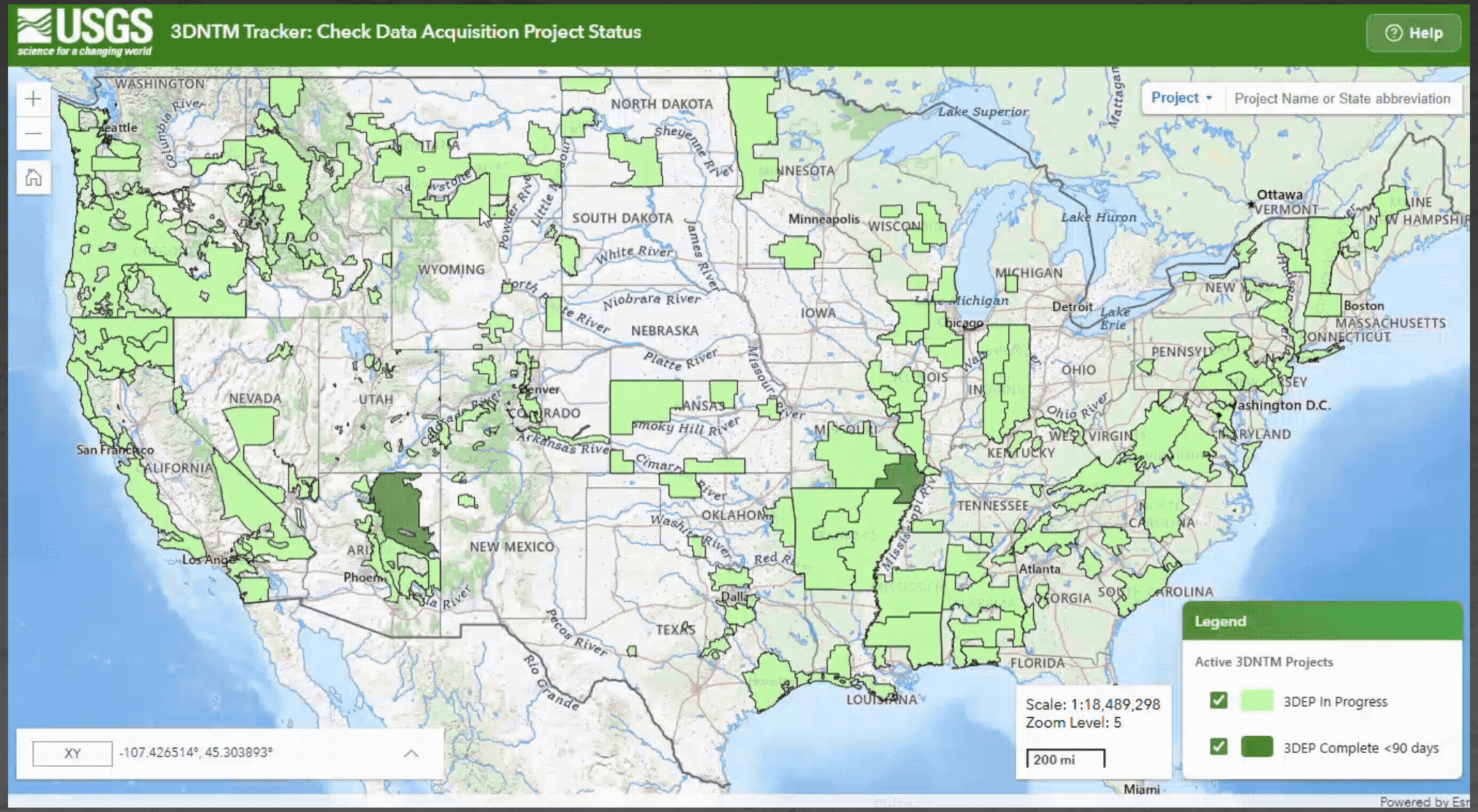
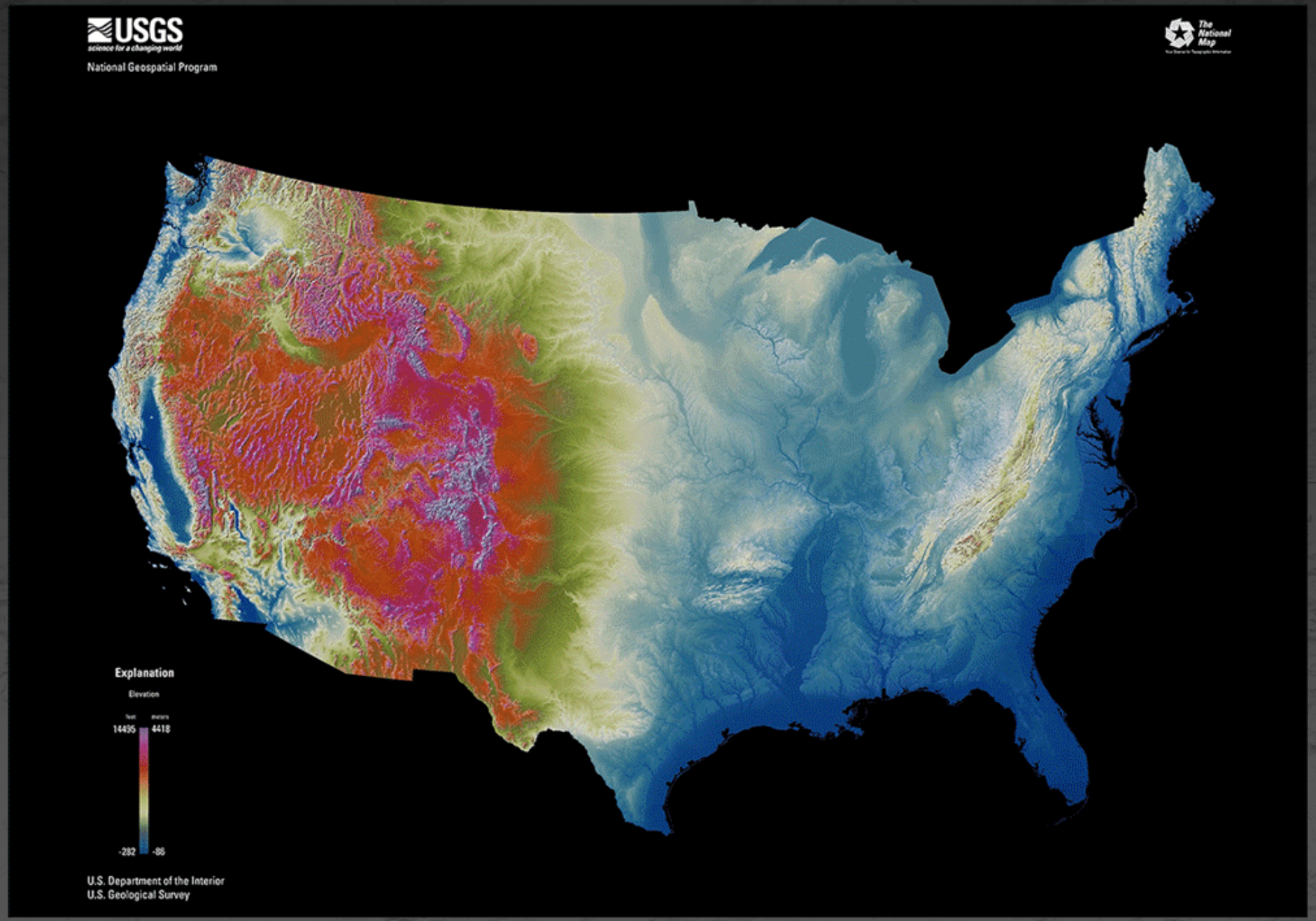
usgs.gov/3DNTM/DCA

3DNTM Project Status Tracker



- In-progress projects only
- Projects remain in tracker for 90 days after complete
- Popup window for quick overview
- More details in Project Dashboard

Cynthia Ritmiller
critmiller@usgs.gov
303-202-4550



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