

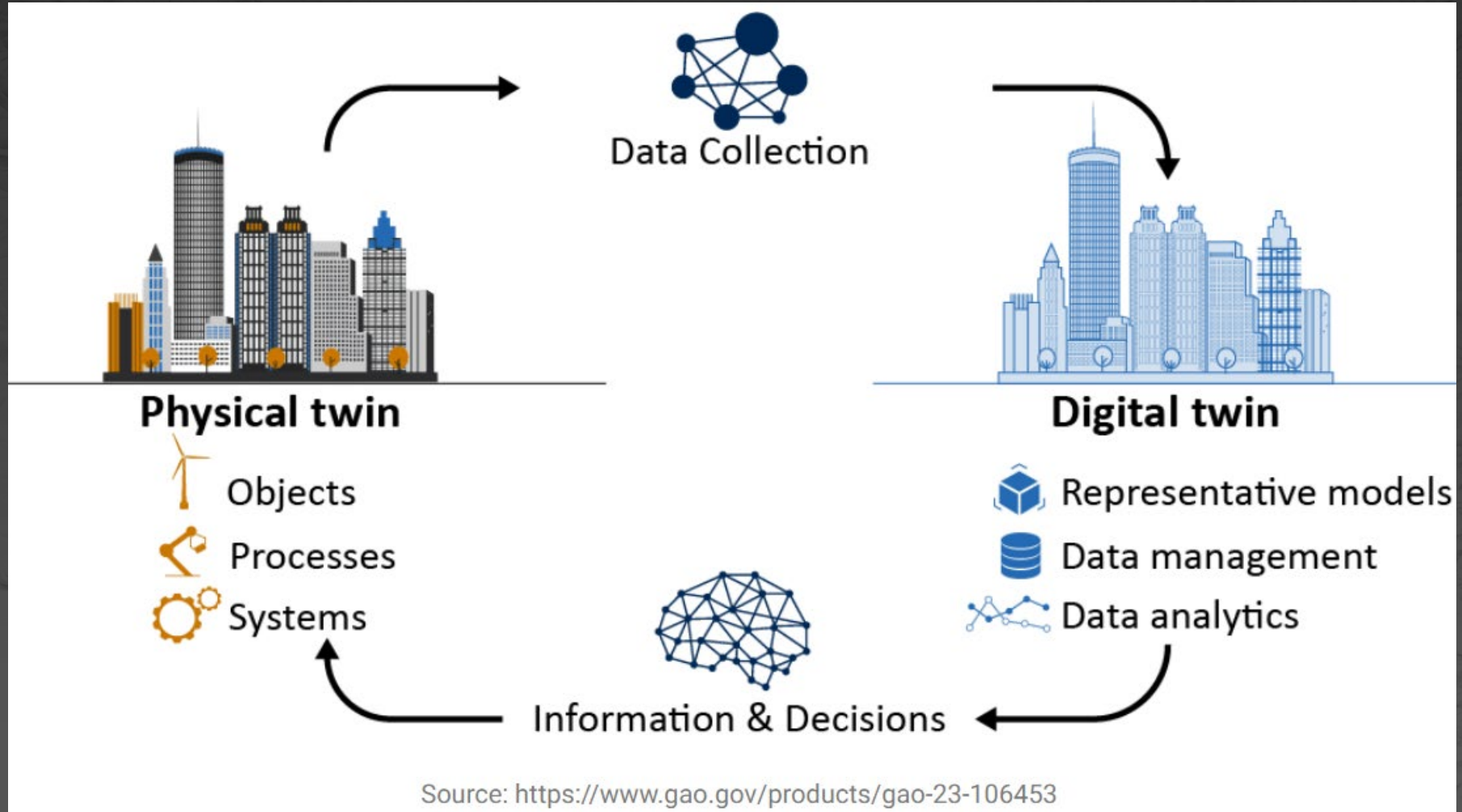
The USGS 3D National Topography Model

Cynthia Ritmiller
National Map Liaison

The 3D National Topography Model (3DNTM)



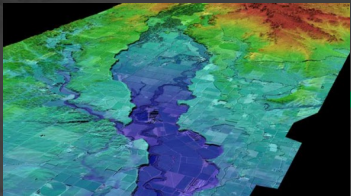
Creating a digital twin of the earth's topography



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

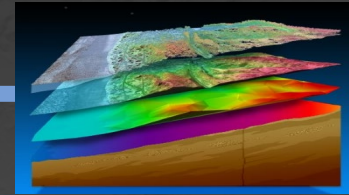
3DHP



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

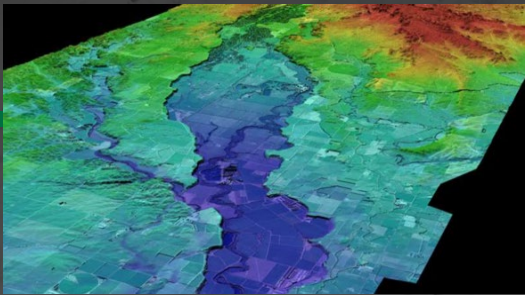


Research and develop a 3D data model to fully integrate 3DEP, 3DHP, and other data

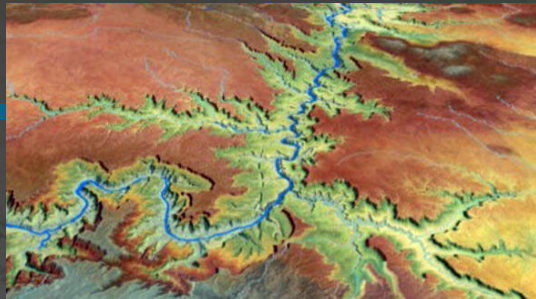
Early development stage

The 3D National Topography Model

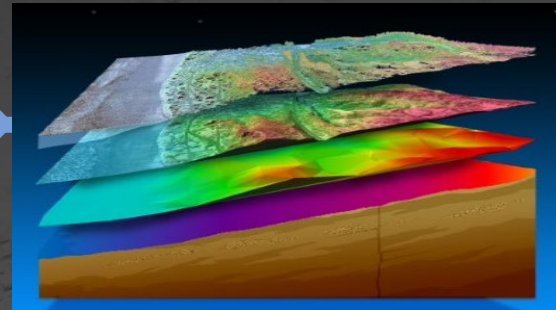
3DEP Baseline



3DHP



Next gen 3DEP



3DNTM





\$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

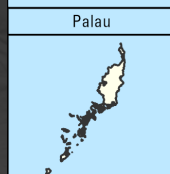


as of 09/30/2025

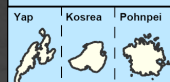
For more information:
National Geospatial Program usgs.gov/NGP
3D Elevation Program usgs.gov/3DEP

3D Elevation Program Data by Collection Year

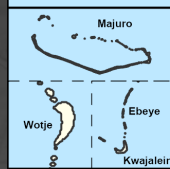
2004



Federated States
of Micronesia



Republic of the
Marshall Islands



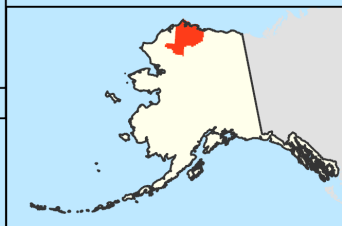
Commonwealth of the
Northern Mariana Islands



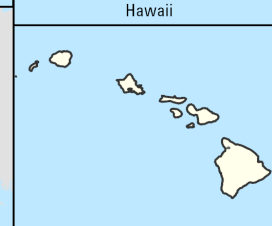
American Samoa



Alaska

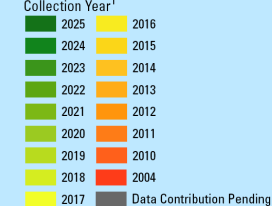


Hawaii



Explanation

Age of 3DEP
Collection Year¹



¹ Some areas may be restricted

CANADA

MEXICO

This map shows available and in-progress 3DEP data by most recent year of collection. 3DEP is completing the first-ever national baseline of consistent high-resolution elevation data - both bare earth and 3D point clouds. 3DEP baseline and next generation products inform critical decisions across our Nation that depend on 3D data, from immediate safety of life, property, and environment to long-term planning for infrastructure projects. Explore and access 3DEP data at 3DEP Lidar Explorer or The National Map.

3DEP Baseline:

- Quality level 2 or better lidar data (IfSAR in AK)²

²3D Point Clouds and Bare Earth DEMs as defined in the 3DEP Lidar Base Specification v1.2 or later and the 1-Meter Digital Elevation Model Specification, TM-11B7

Sources:
US Interagency Elevation Inventory, November 2025

Puerto Rico and U.S. Virgin Islands



U.S. Department of the Interior
U.S. Geological Survey



as of 12/4/2025

For more information:
National Geospatial Program usgs.gov/NGP
3D Elevation Program usgs.gov/3DEP

3D Elevation Program: FY25 Status of 3DEP Data

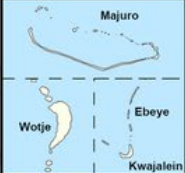
Palau



Federated States of Micronesia



Republic of the Marshall Islands



Commonwealth of the Northern Mariana Islands



Guam



American Samoa



Alaska



Hawaii



CANADA

MEXICO

This map shows the geographic extent of completion of the first-ever national baseline of consistent high-resolution elevation data - both bare earth and 3D point clouds - identified by the U.S. Interagency Elevation Inventory (USIEI) that meet 3DEP base level specification and are under award as of September 30, 2025. The USIEI is produced in partnership by the U.S. Geological Survey and the National Oceanic and Atmospheric Administration.

3DEP Baseline:

- Quality level 2 or better lidar data (IfSAR in AK)²

²3D Point Clouds and Bare Earth DEMs as defined in the 3DEP Lidar Base Specification v1.2 or later and the 1-Meter Digital Elevation Model Specification, TM-1187

Sources:
FY25 3DEP Data Collaboration Announcement
US Interagency Elevation Inventory, November 2025

Explanation

3DEP Baseline Data¹

Lidar

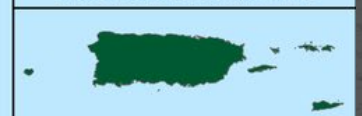
- Available or In-Progress
- Data Contribution Pending

IfSAR (Alaska)

- Available

¹Some areas may be restricted.

Puerto Rico and U.S. Virgin Islands



New Seamless 1-meter Digital Elevation Model



USGS lidar coverage in 2,279 individual projects

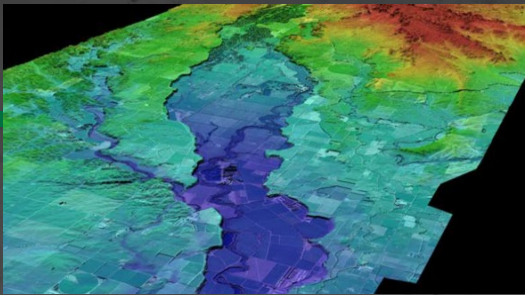


S1M over Rolla, MO

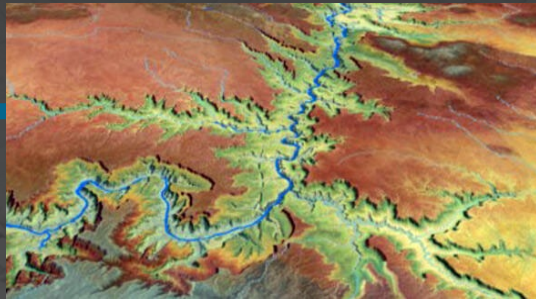


The 3D National Topography Model

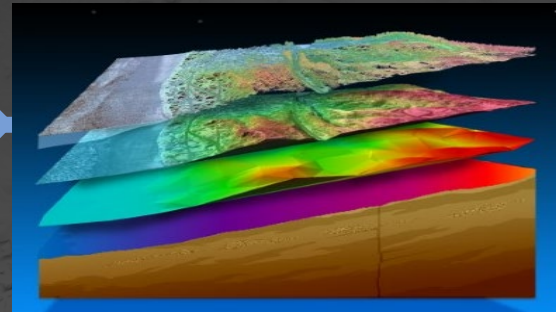
3DEP Baseline



3DHP



Next gen 3DEP

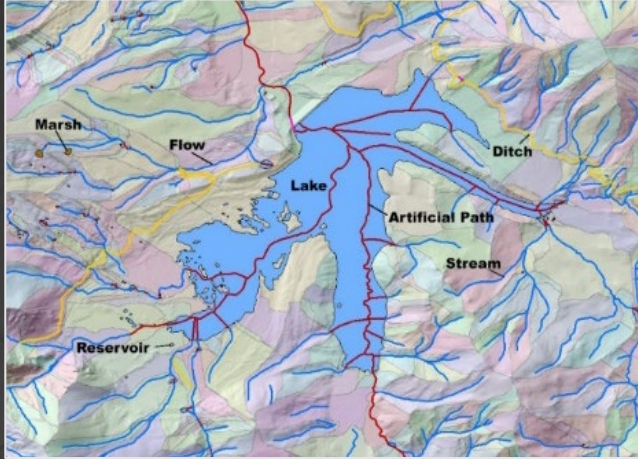


3DNTM

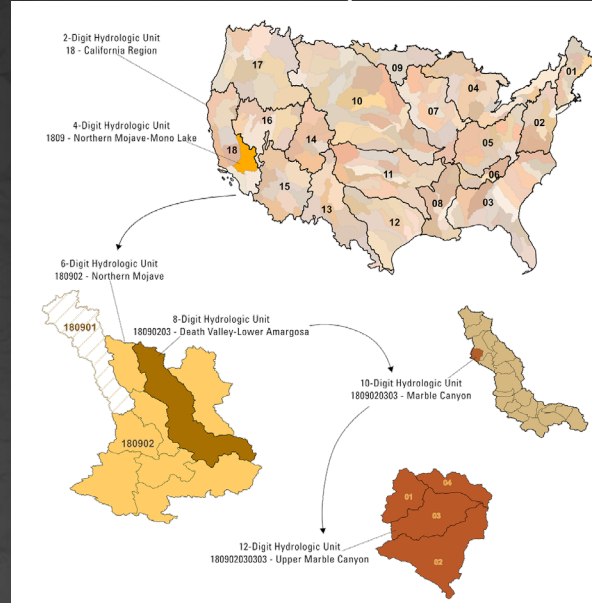


Hydrography data on The National Map

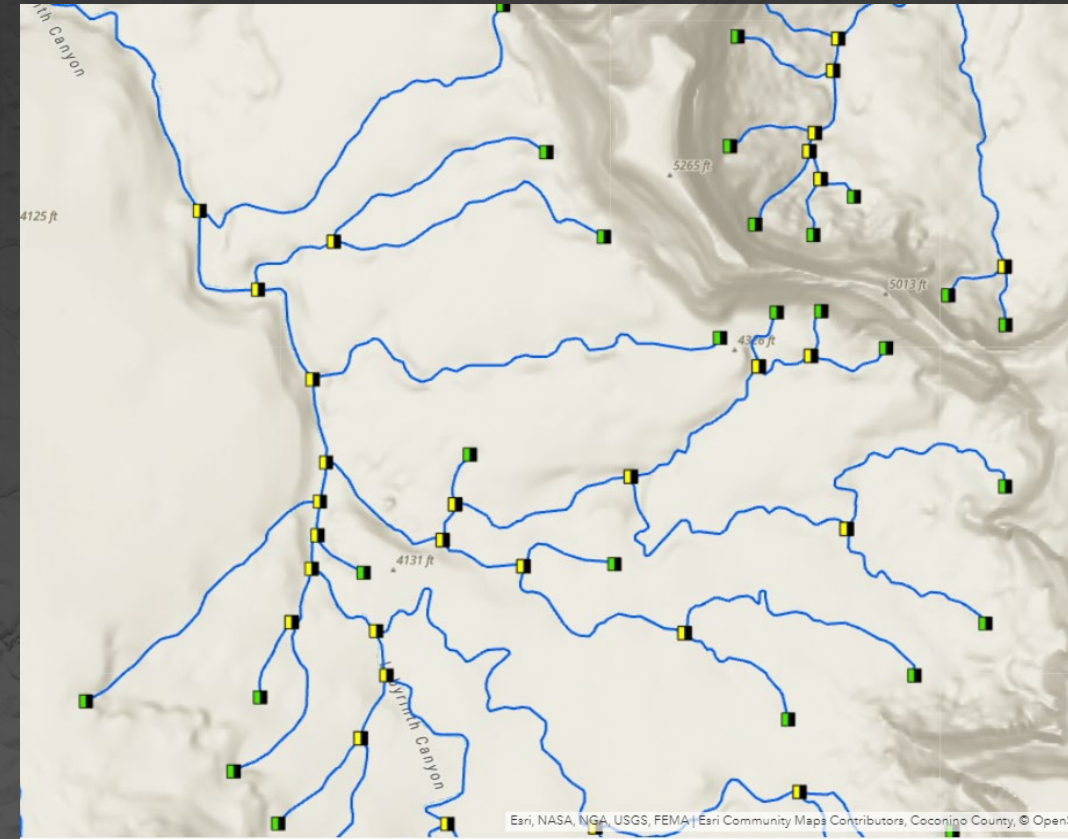
National Hydrography Dataset (NHD)



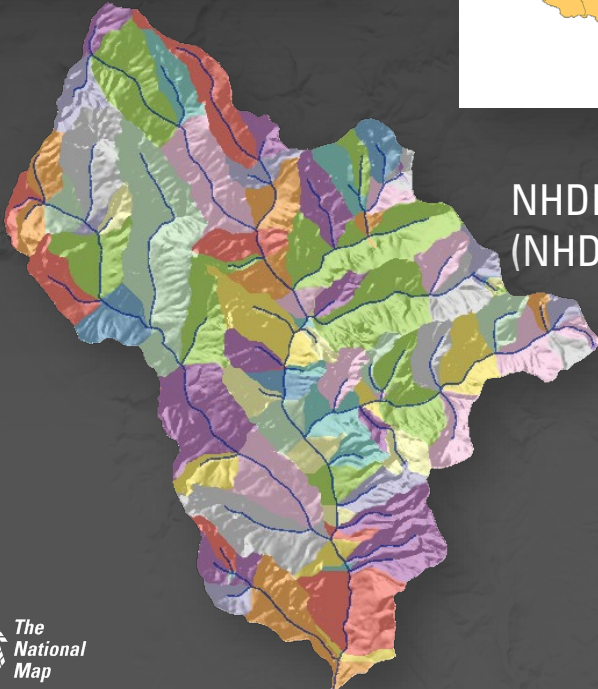
Watershed Boundary Dataset (WBD)



3D Hydrography Program (3DHP)



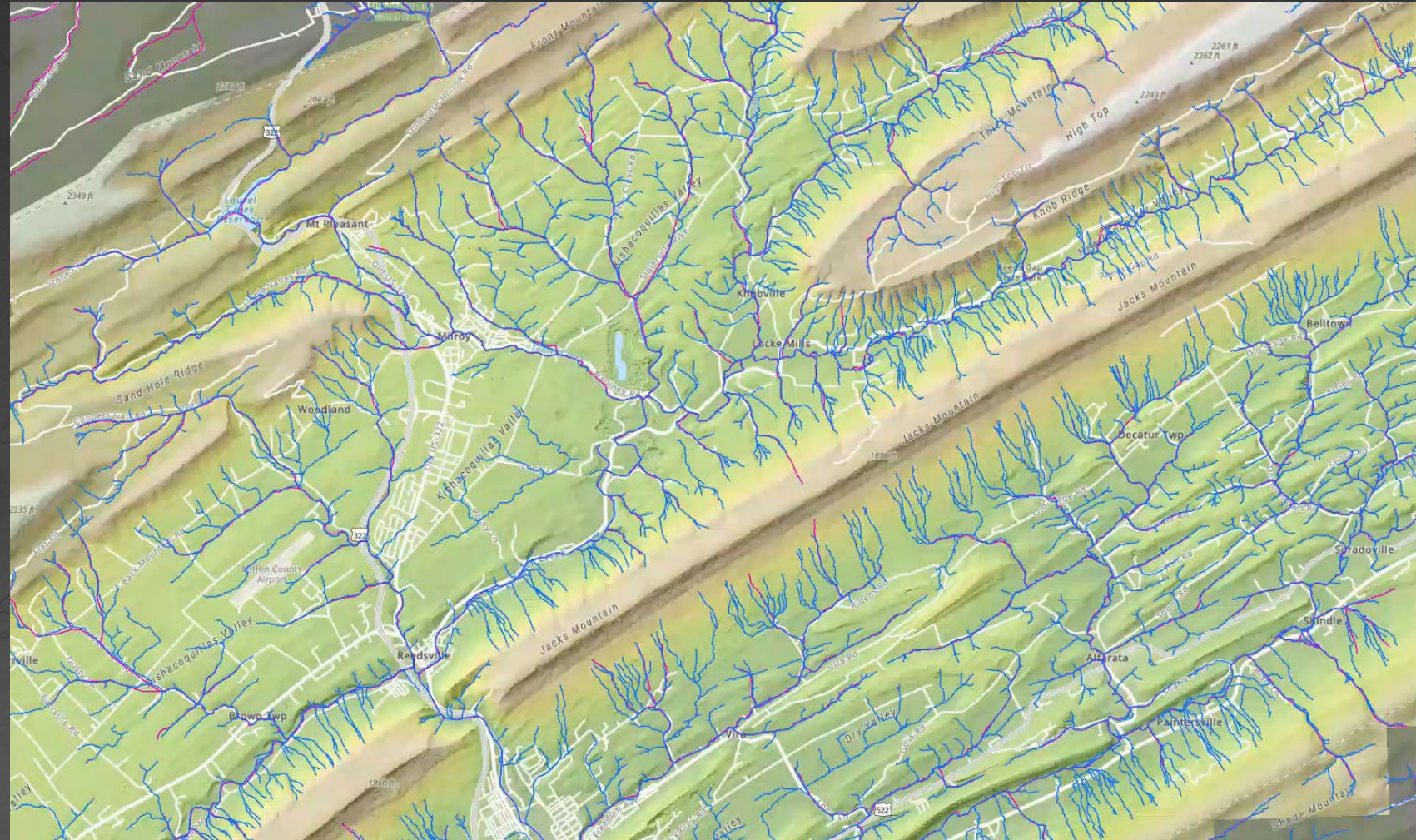
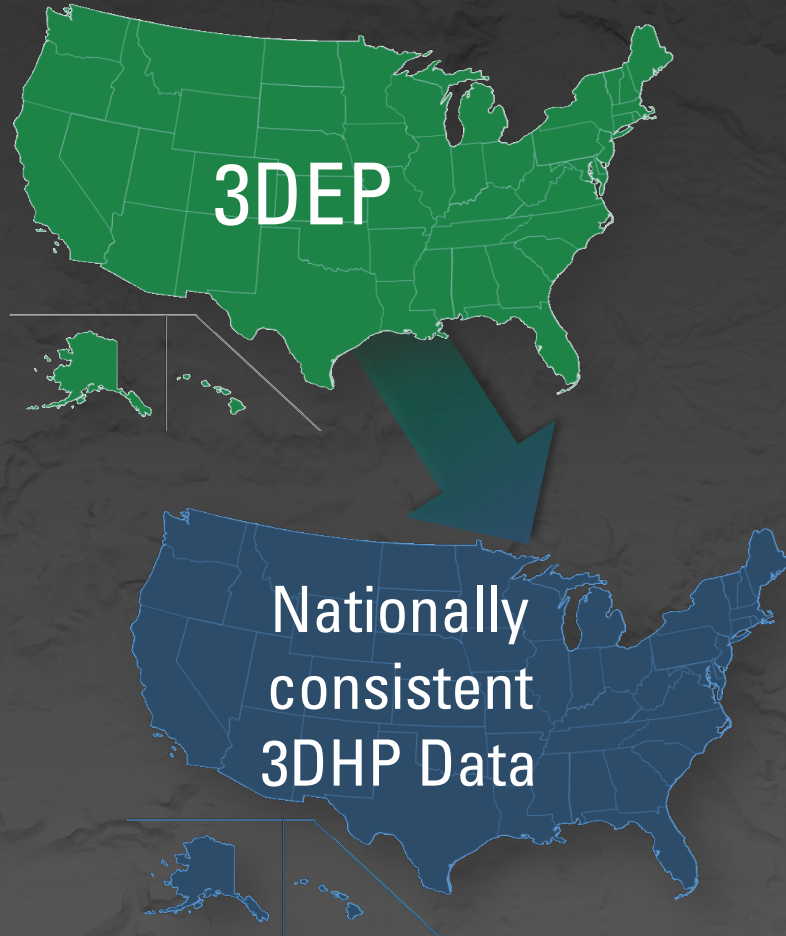
NHDPlus High Resolution (NHDPlus HR)



Static versions of NHD, WBD, and NHDPlus HR are available and can be found:

<https://www.usgs.gov/national-hydrography/access-national-hydrography-products>

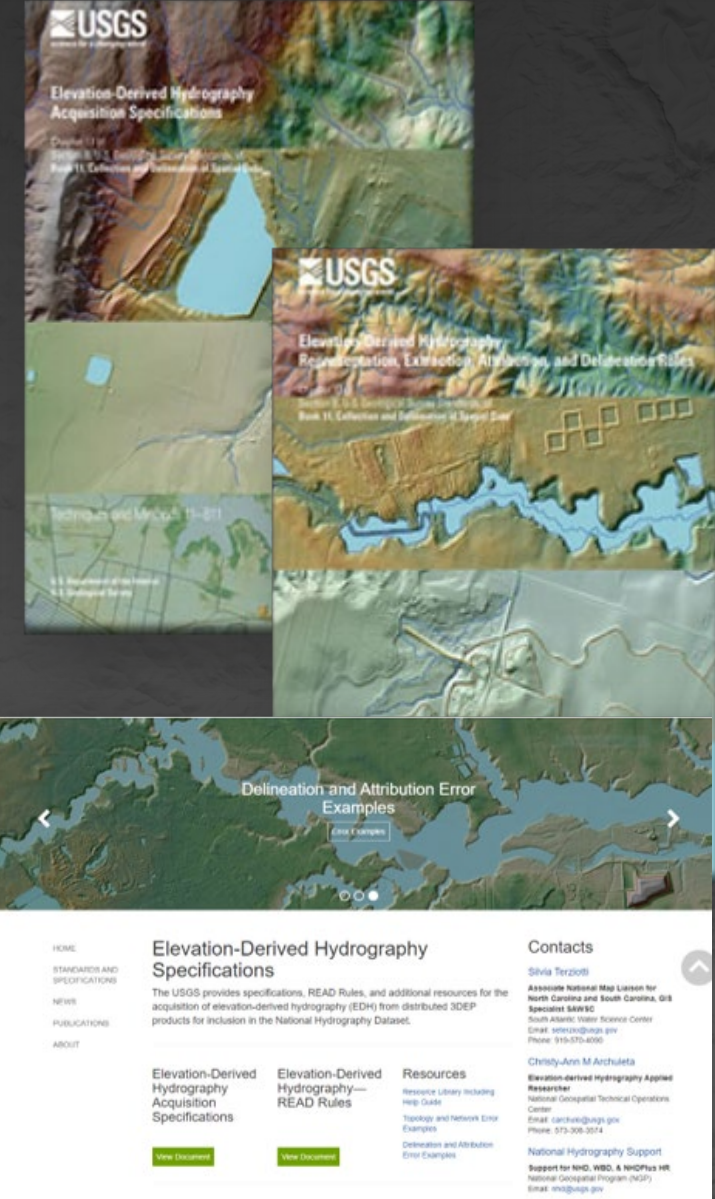
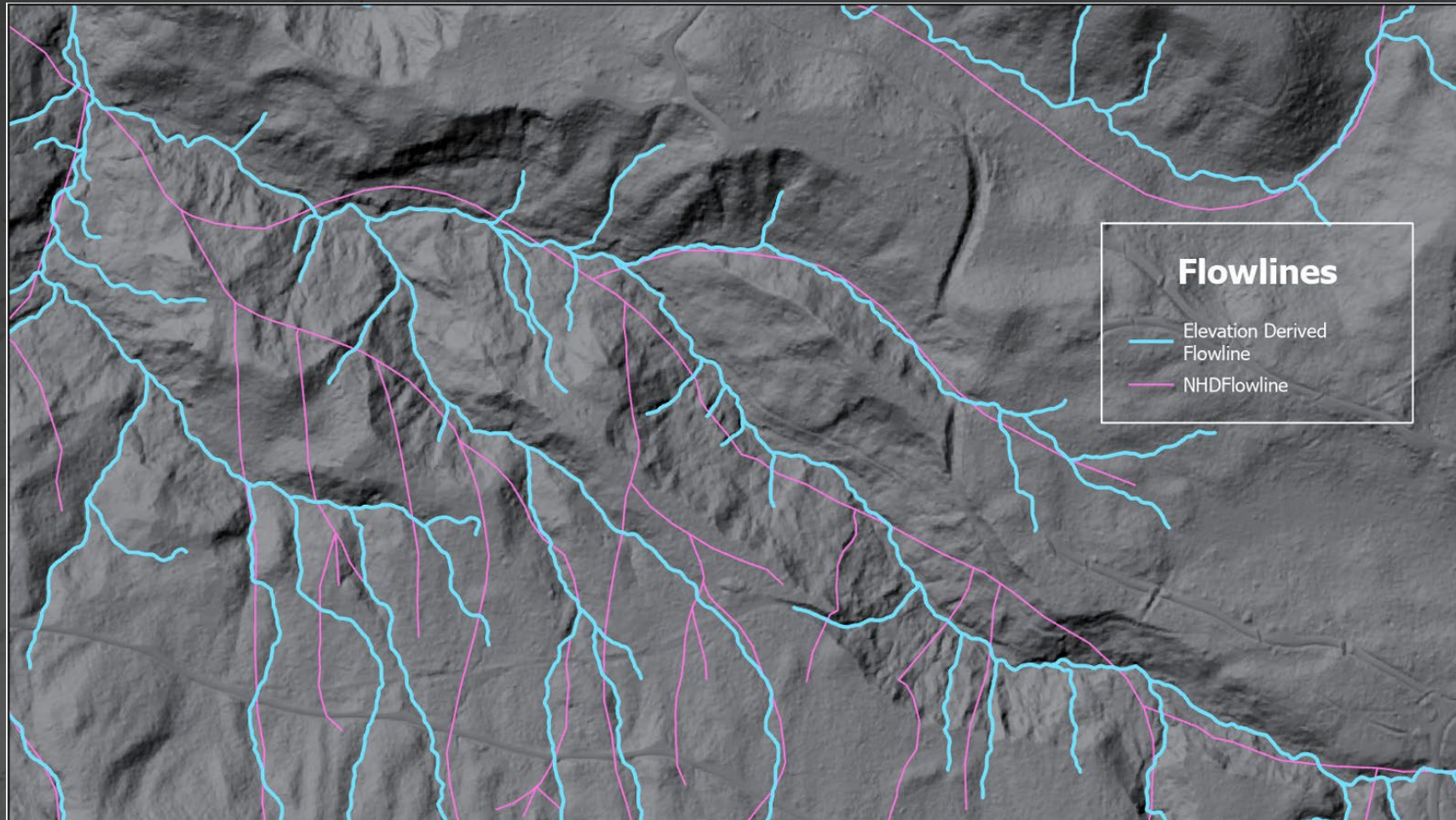
Introducing the 3D Hydrography Program (3DHP)

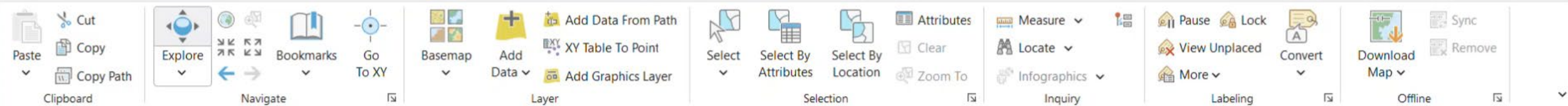


NHD vs. Hydrography derived from elevation in Pennsylvania

More accurate, more precise, more consistent

Data collected and validated to meet specifications

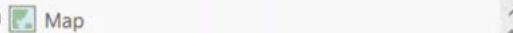


Contents ▼ 🔍 ✕

Search



Drawing Order

☒ Light Gray Reference☒ usgs_3dhp_all

◀ ☐ HydroLocation - Sink, Spring, Waterbody Out...

☐ Sink

Spring

- Waterbody Outlet

HydroLocation - Headwater, Terminus, Diver...

☒ Confluence

Divergence

Headwater

* Terminus

● Catchment Outlet

HydroLocation - Reach Code, External Conne...

featuretype

☐ Reachcode End

Reachcode Start

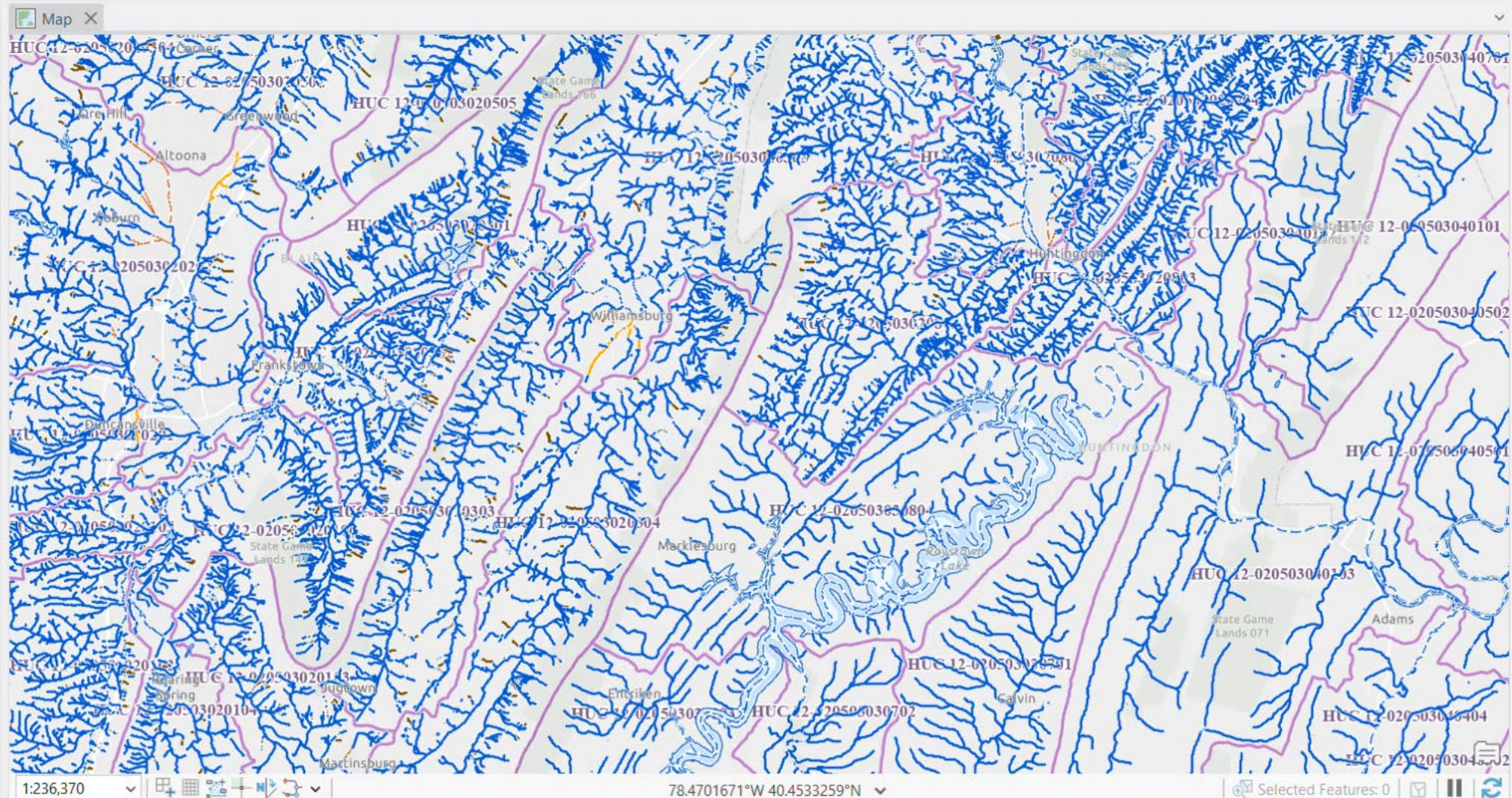
External Connection

☒ Flowline

— Canal

— Drainageway

--- Elevation Breaching Connector



The 3DHP Data Lifecycle

Planning



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



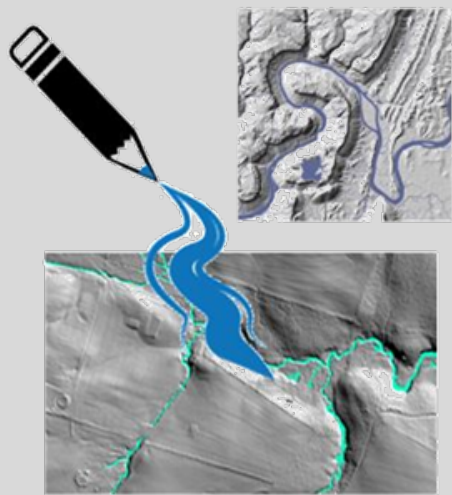
USGS and/or partners plan the project & award a task order



Acquisition



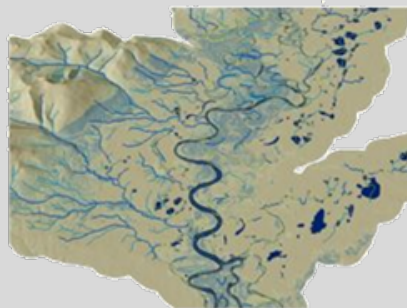
Contractors acquire and process data



Validation



USGS validates data & produces standard 3DHP data products

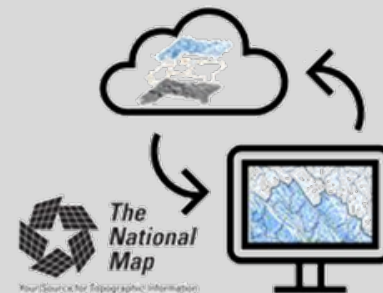


Over \$ 1B in annual benefits to the Nation if hydrography data needs are met (HRBS, 2016)

Publication



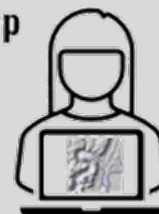
USGS makes 3DHP data publicly available on The National Map & via services in the Cloud



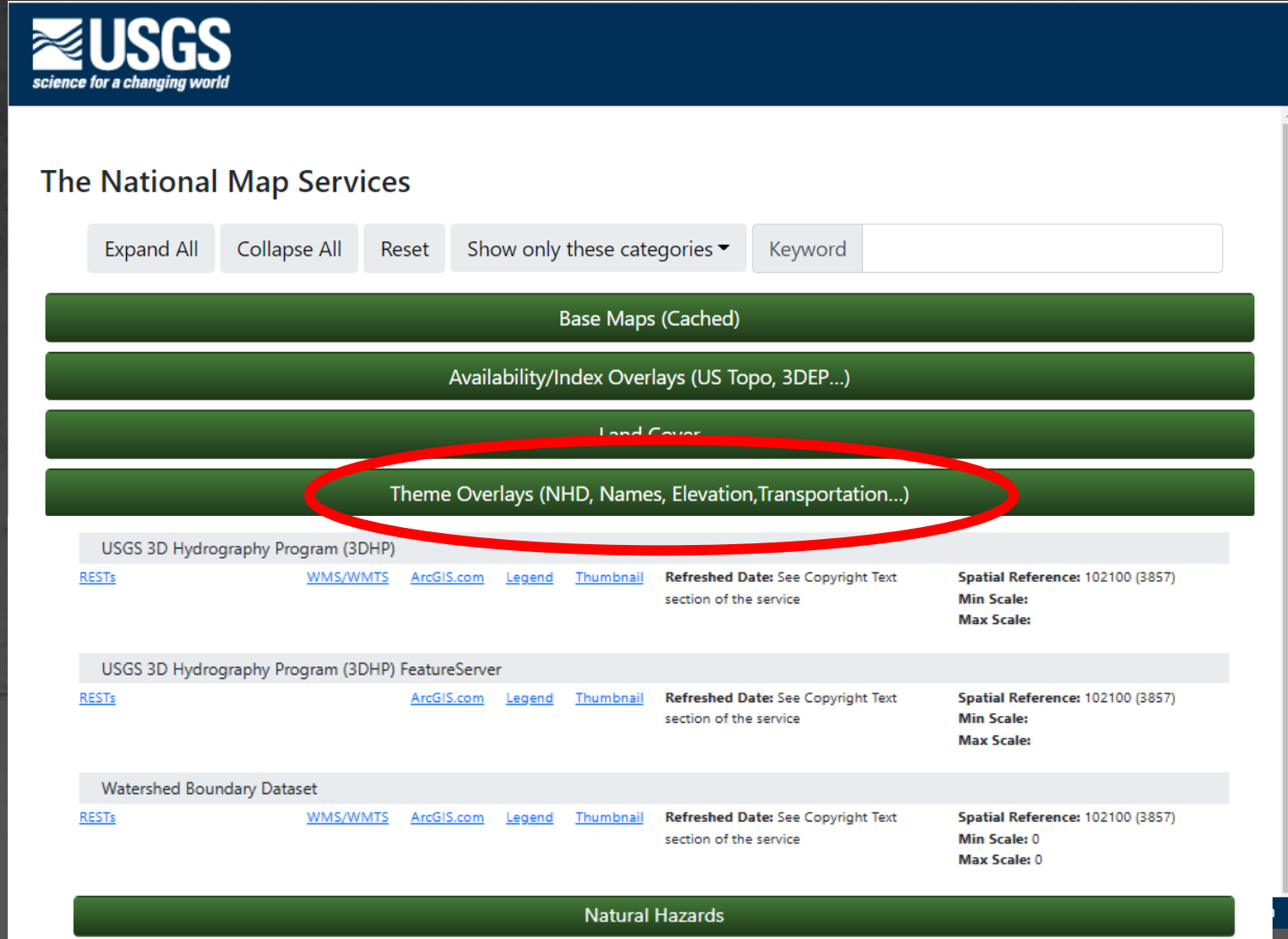
Access



Users can download analysis ready data or access via map services



The National Map Data Access via Services



The screenshot shows the USGS National Map Services interface. At the top is the USGS logo with the tagline "science for a changing world". Below the logo is the title "The National Map Services". A navigation bar contains buttons for "Expand All", "Collapse All", "Reset", a dropdown menu "Show only these categories", and a "Keyword" search field. Below the navigation bar are several category buttons: "Base Maps (Cached)", "Availability/Index Overlays (US Topo, 3DEP...)", "Land Cover", "Theme Overlays (NHD, Names, Elevation, Transportation...)" (which is circled in red), and "Natural Hazards". Below the "Theme Overlays" button, there are three service listings:

USGS 3D Hydrography Program (3DHP)					
RESTs	WMS/WMTS	ArcGIS.com	Legend	Thumbnail	Refreshed Date: See Copyright Text section of the service
					Spatial Reference: 102100 (3857)
					Min Scale:
					Max Scale:

USGS 3D Hydrography Program (3DHP) FeatureServer					
RESTs	WMS/WMTS	ArcGIS.com	Legend	Thumbnail	Refreshed Date: See Copyright Text section of the service
					Spatial Reference: 102100 (3857)
					Min Scale:
					Max Scale:

Watershed Boundary Dataset					
RESTs	WMS/WMTS	ArcGIS.com	Legend	Thumbnail	Refreshed Date: See Copyright Text section of the service
					Spatial Reference: 102100 (3857)
					Min Scale: 0
					Max Scale: 0

At the bottom of the screenshot is a button for "Natural Hazards".



Downloadable 3DHP Product



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

↻

⌵

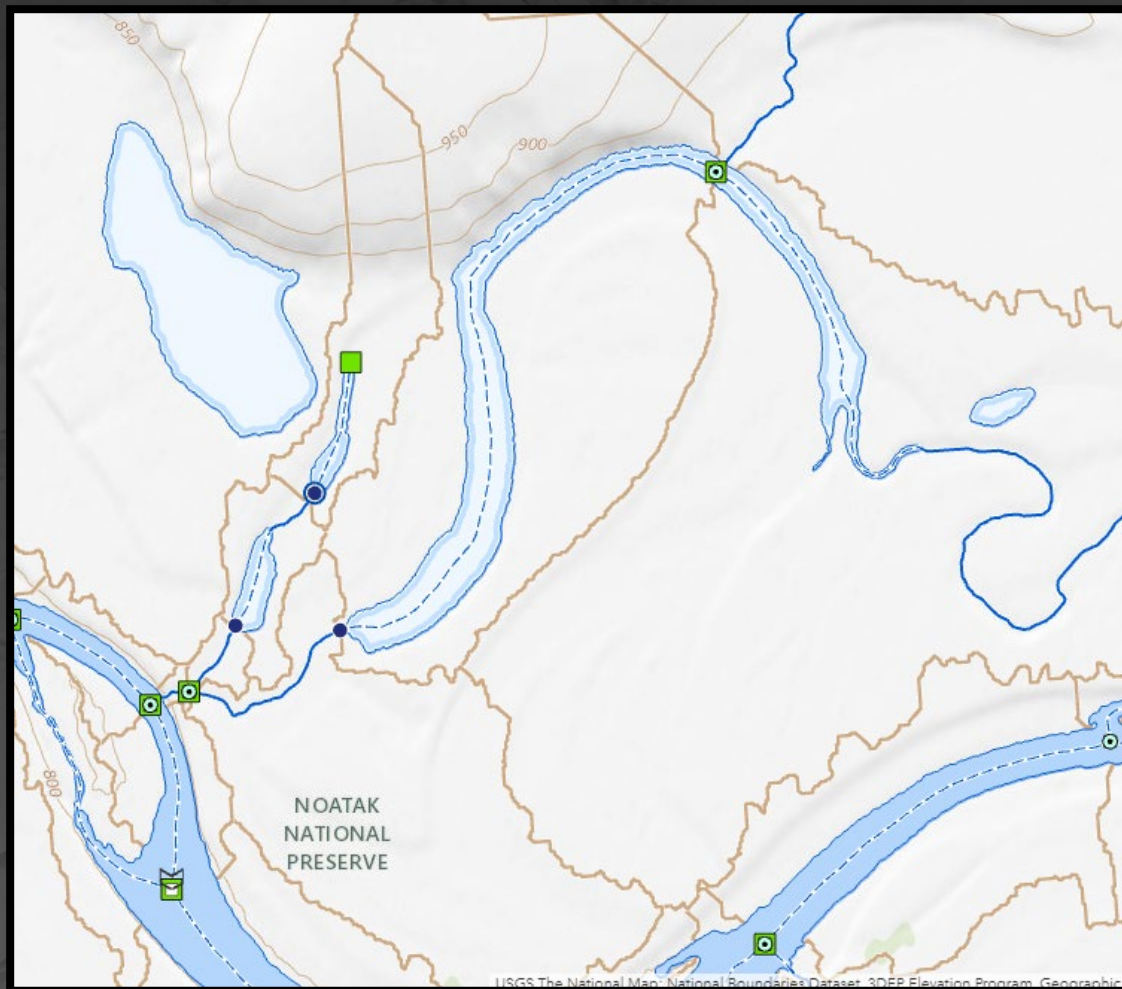
Title ▲	Summary	Date Modified ⬆
 3D Hydrography Program (3DHP) (Alaska) (published 20260123) FileGDB	The USGS 3D Hydrography Program (3DHP) datasets are an integrated, National, 3D-enabled hydrologic dataset derived from the USGS 3D Elevation Program (3DEP) data. For areas where Elevation-derived Hydrography (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



usgs.gov/3DHP/AccessData

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

3DHP Map Service



3DHP all

☒ Flowline

☒ HydroLocation

☒ Sink, Spring, Waterbody Outlet

- ☐ Sink
- ☐ Spring
- ☐ Waterbody Outlet

☒ Headwater, Terminus, Divergence, Confluence, Catchment Outlet

- ☐ Confluence
- ☐ Divergence
- ☐ Headwater
- ☐ Terminus
- ☐ Catchment Outlet

☒ Reach Code, External Connection

featuretype

- ☐ Reachcode End
- ☒ Reachcode Start
- ☐ External Connection

☒ Canal

☒ Drainageway

☒ Elevation Breaching Connector

☒ Hydro Unenforced Connector

☒ River

☒ Surface Connector

☒ Waterbody Connector

☒ Waterbody

- ☒ Canal
- ☒ Lake
- ☒ Ocean or Great Lake
- ☒ River

☐ DrainageArea

☒ Catchment



Flow Network Derivatives

Identify,
sequence and
measure

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

Network Flags

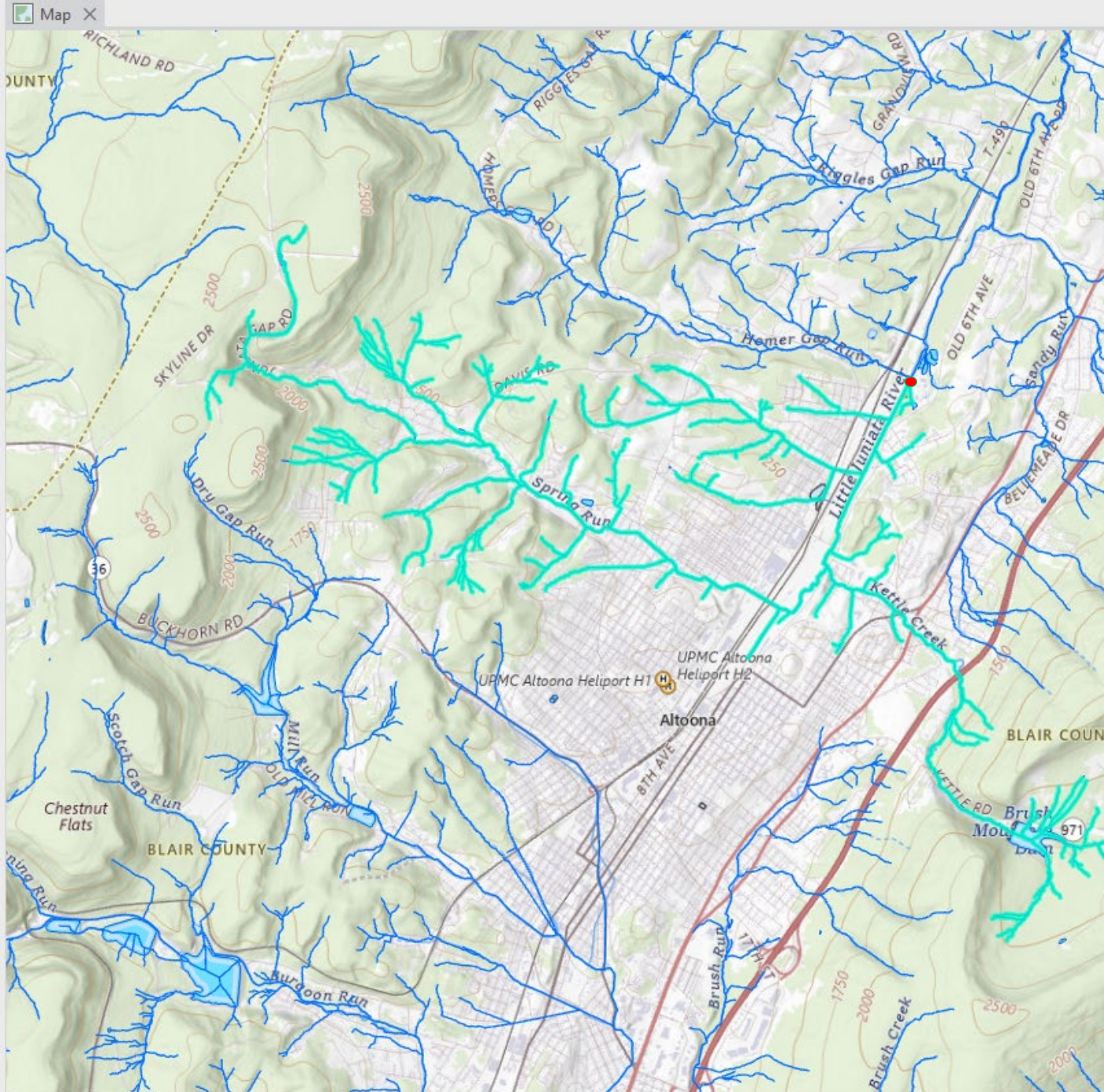
- Start Flag
- Terminal Flag
- Divergence
- Return Divergence

Hierarchy of flowlines

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

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





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

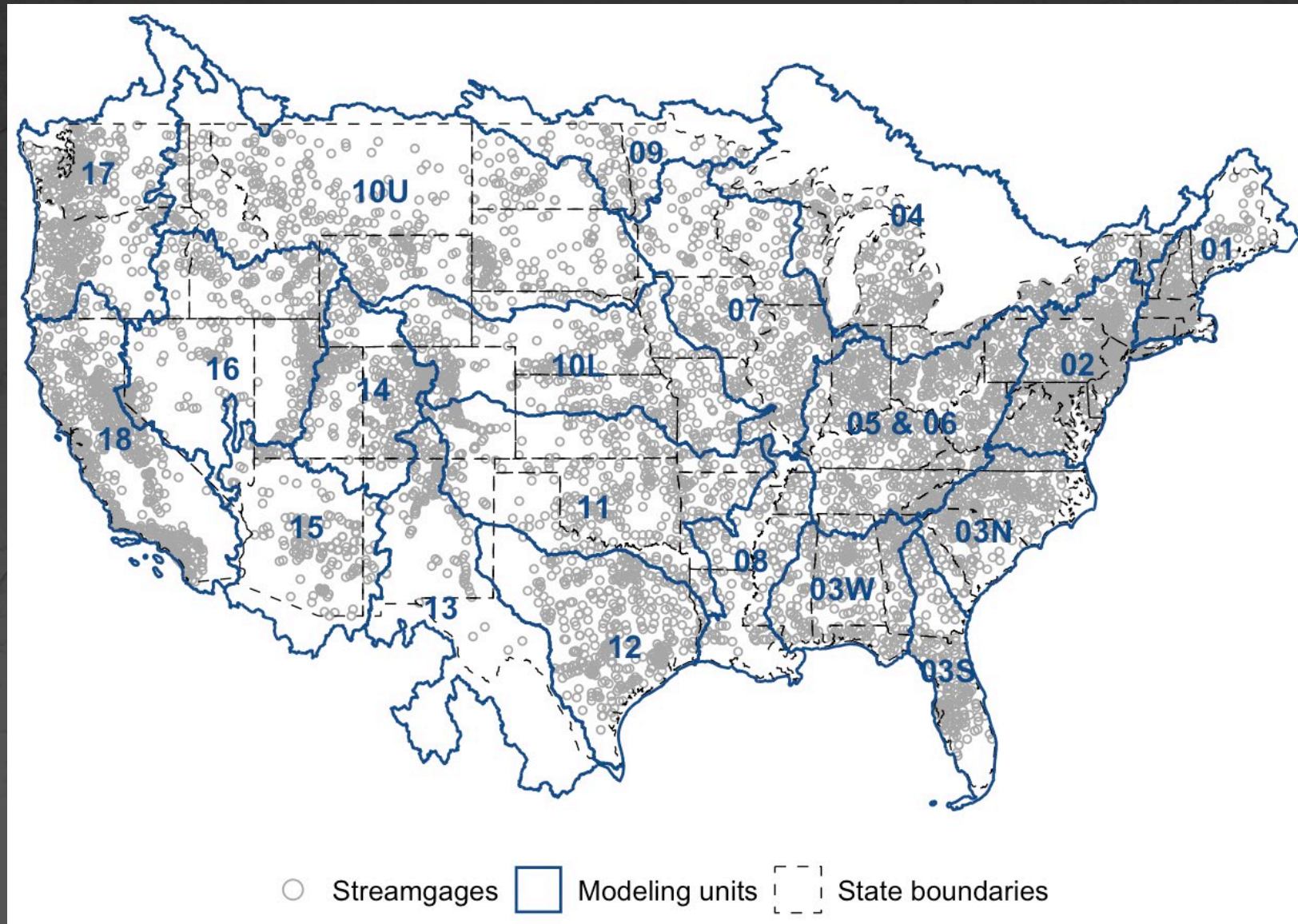
How it works: Breadth-first search (BFS) expansion. In each step we select features whose **DnHydroSequence** equals the current frontier's **HydroSequence**, add their **HydroSequence** values to the frontier, and repeat until no new features are found. This returns **all tributaries** upstream of the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

```
1 # ArcGIS Pro / ArcPy
2 # Trace ALL upstream segments from a starting HydroSequence in the 3DHP_all feature
  service.
3 # No XTools required.
4
5 import arcpy
6 from itertools import islice
7
8 # ----- USER SETTINGS -----
9 INPUT_LAYER = r"3DHP_all" # Layer name in the active map OR a full feature service layer
  URL (e.g., ".../FeatureServer/0")
10 START_HYDROSEQ = 33975 # Starting HydroSequence (as requested)
11 EXPORT_OUTPUT = r"" # Optional FGDB feature class for saving results, e.g.,
  r"C:\temp\upstream.gdb\H33975_upstream"
12 # -----
13
```

Message Copilot

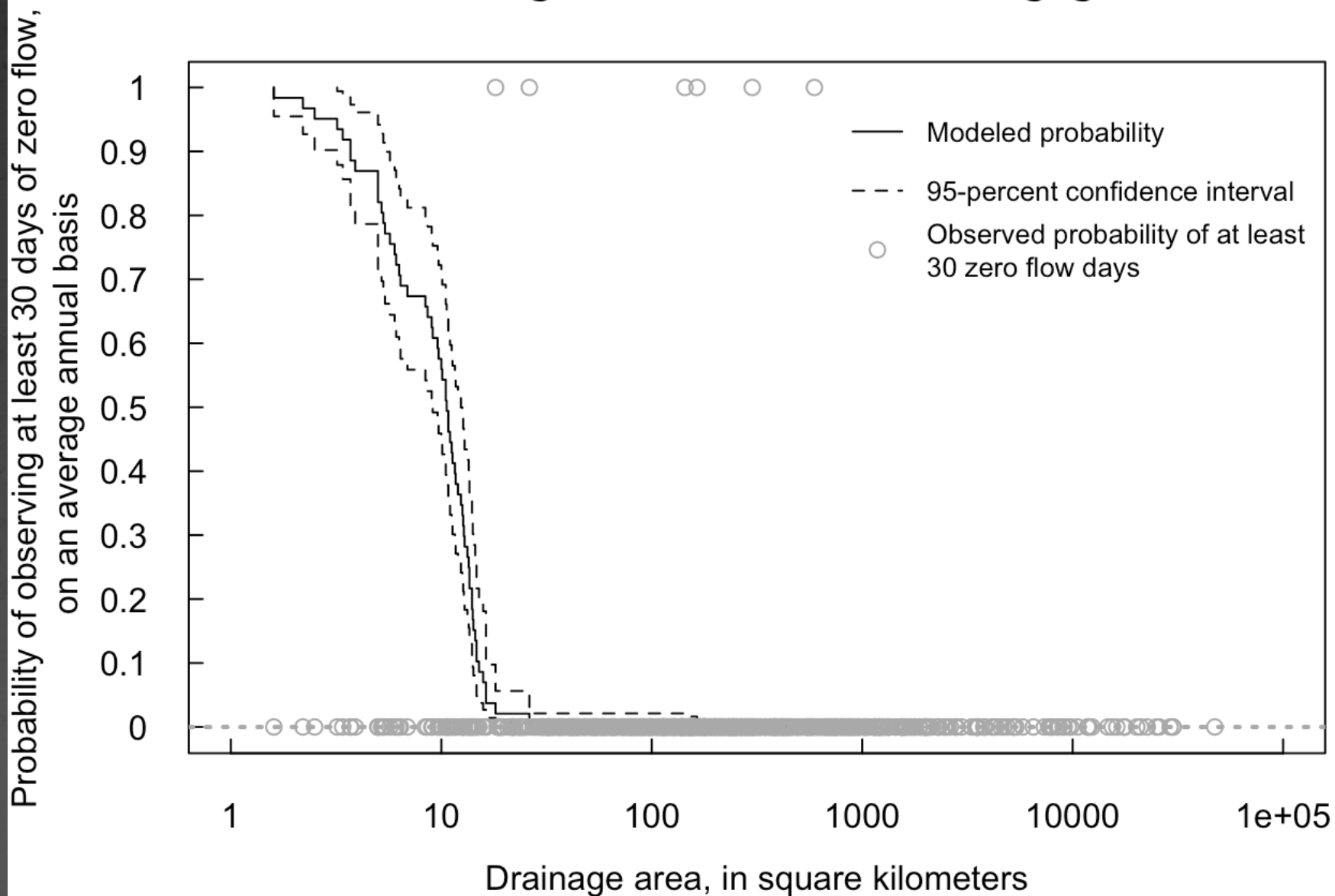


Probabilities of Stream Permanence



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

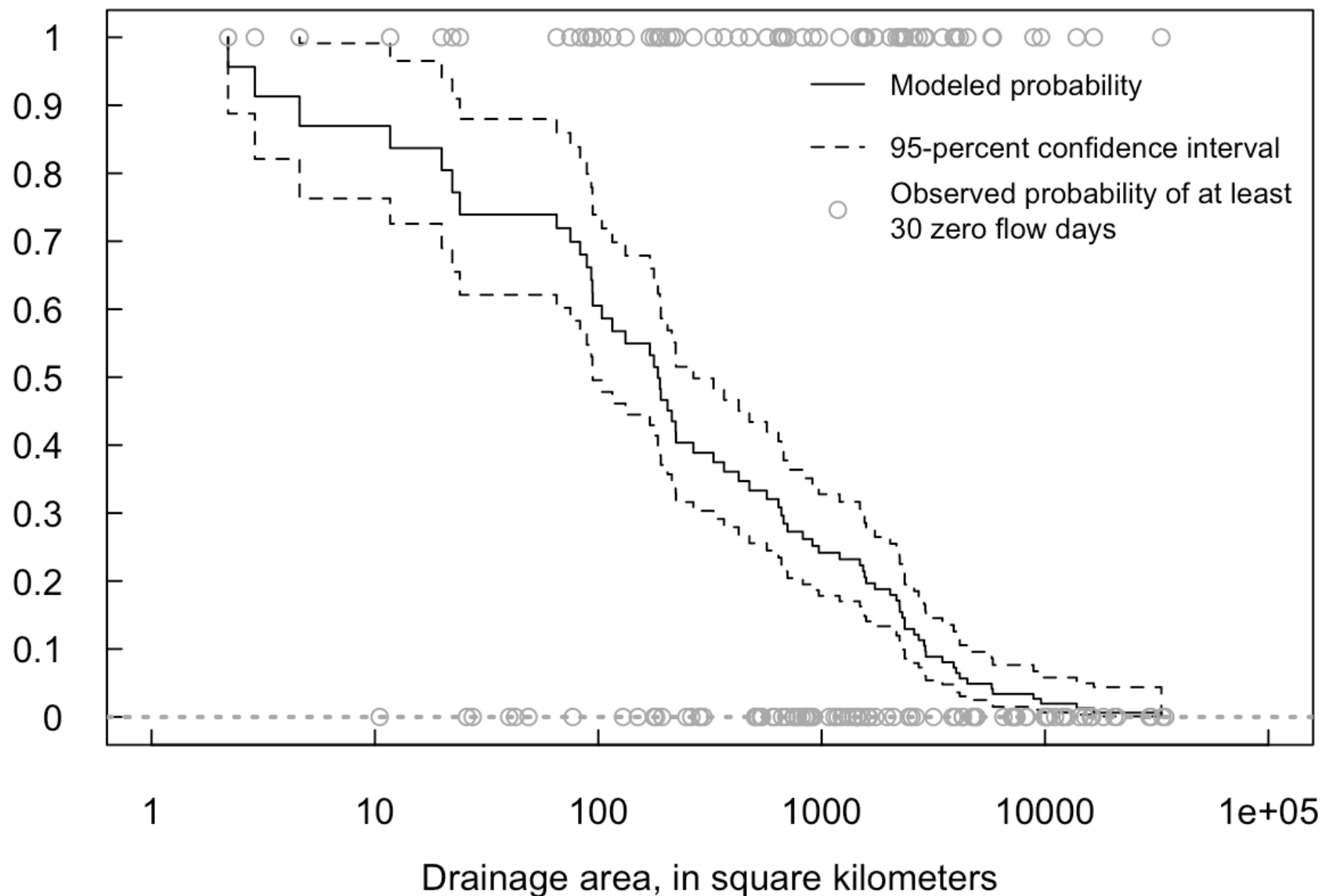
Modeling Unit 02 with 745 streamgages



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

Probability of observing at least 30 days of zero flow,
on an average annual basis

Modeling Unit 15 with 160 streamgages



Probabilities of Stream Permanence

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

	A	B	C	D	E	F	G
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		
30	2GNSIE	2H9950	0.791660874	1	0.521240286		



as of 9/1/2026

For more information:
National Geospatial Program usgs.gov/NGP
3D Hydrography Program usgs.gov/3DHP

3D Hydrography Program

FY26 Data Collaboration Announcement Project Submissions Accepted to Date

Commonwealth of the Northern Mariana Islands

Uracus

Maug

Asuncion

Agrihan

Pagan

Alamagan

Guguan

Sarigan

Anatahan

Farallon De Medinilla

Salipan

Tinian

Aguigan

Rota

Guam

Northwestern Hawaiian Islands

Hawaii

American Samoa

Tutuila

Aunu'u

Ofu

Olosega

Etena

Rose Atoll

Ta'u

3DHP Data:

Hydrography derived from 1m Digital Elevation Model (DEM) created from 3DEP QL2 or better lidar (5m DEM from IfSAR in AK)²

²Hydrography acquired to meet Elevation-Derived Hydrography specifications and READ rules v1.0 or later. TM-11B11 and -11B12.

Sources:

Hydrologic Units as defined by the Watershed Boundary Dataset (WBD)

Explanation

FY26 Partnerships (subject to change)

■ FY26 DCA Project Submissions Accepted (subject to change)

■ Partnerships In-Progress or Planned

■ Data Contribution Pending

3DHP Data¹

■ Available or In-Progress 3DHP Data

¹3DHP may be acquired from lower resolution DEM where 3DEP data is restricted.

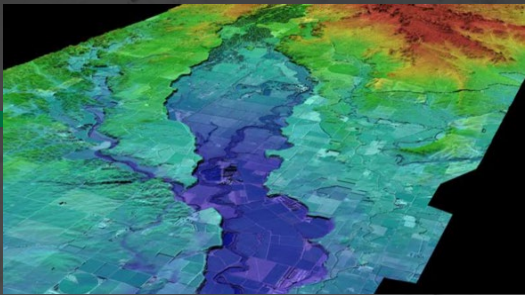
Puerto Rico and U.S. Virgin Islands



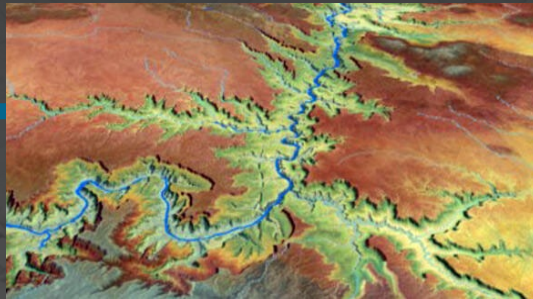
Map shows the geographic extent of the first-ever nationally consistent hydrography data acquired from high-resolution 3D Elevation Program (3DEP) data. FY26 projects are the result of ongoing Federal coordination via the 3DHP Working Group and the Alaska Mapping Initiative.

The 3D National Topography Model

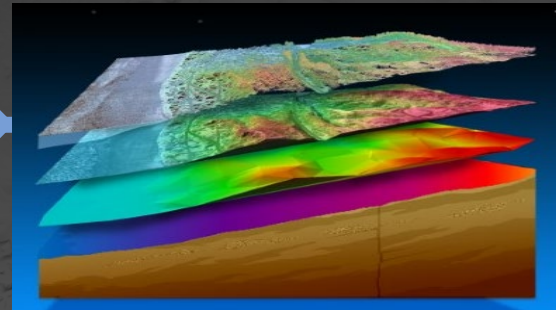
3DEP Baseline



3DHP



Next gen 3DEP



3DNTM

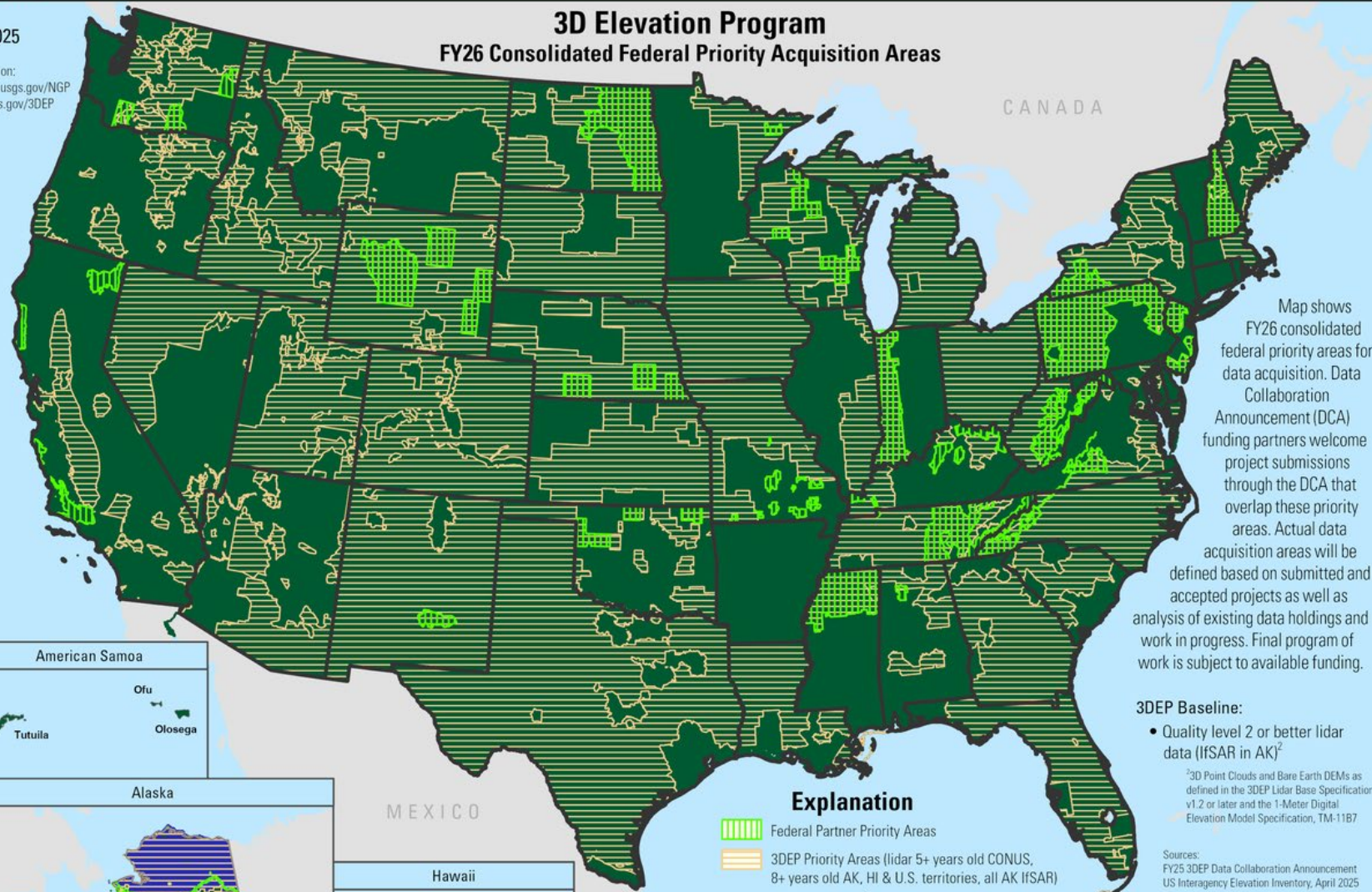
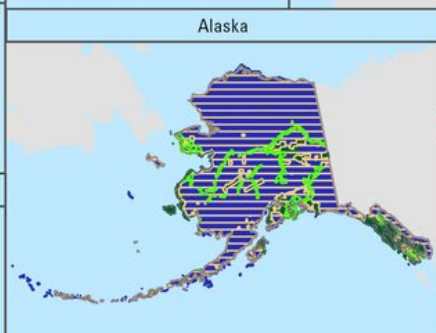


	3DEP Baseline		Next gen 3DEP	
Target Quality Level	QL2 / QL5 in AK	☆☆☆	☆☆☆	QL1 or QL2 as proposed by partners
Scope	Topographic data			Topographic and bathymetric data
Update frequency	8 years			5 years CONUS 8 years AK, HI, Territories
Annual costs	~ \$146M	\$	\$\$	~ \$259M
Annual benefits	\$690M		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

as of July 2025

For more information:
National Geospatial Program usgs.gov/NGP
3D Elevation Program usgs.gov/3DEP

3D Elevation Program FY26 Consolidated Federal Priority Acquisition Areas



Map shows FY26 consolidated federal priority areas for data acquisition. Data Collaboration Announcement (DCA) funding partners welcome project submissions through the DCA that overlap these priority areas. Actual data acquisition areas will be defined based on submitted and accepted projects as well as analysis of existing data holdings and work in progress. Final program of work is subject to available funding.

3DEP Baseline:

- Quality level 2 or better lidar data (IISAR in AK)²

²3D Point Clouds and Bare Earth DEMs as defined in the 3DEP Lidar Base Specification v1.2 or later and the 1-Meter Digital Elevation Model Specification, TM-11B7

Sources:
FY25 3DEP Data Collaboration Announcement
US Interagency Elevation Inventory, April 2025

Explanation

- Federal Partner Priority Areas
- 3DEP Priority Areas (lidar 5+ years old CONUS, 8+ years old AK, HI & U.S. territories, all AK IISAR)

3DEP Baseline Data¹

- Lidar Available or In-Progress
- IISAR (Alaska)
- No publicly available 3DEP

¹Some areas are subject to change, restricted, or pending contribution to 3DEP

Puerto Rico and U.S. Virgin Islands



Caribbean Sea

New Mexico 3DEP Projects



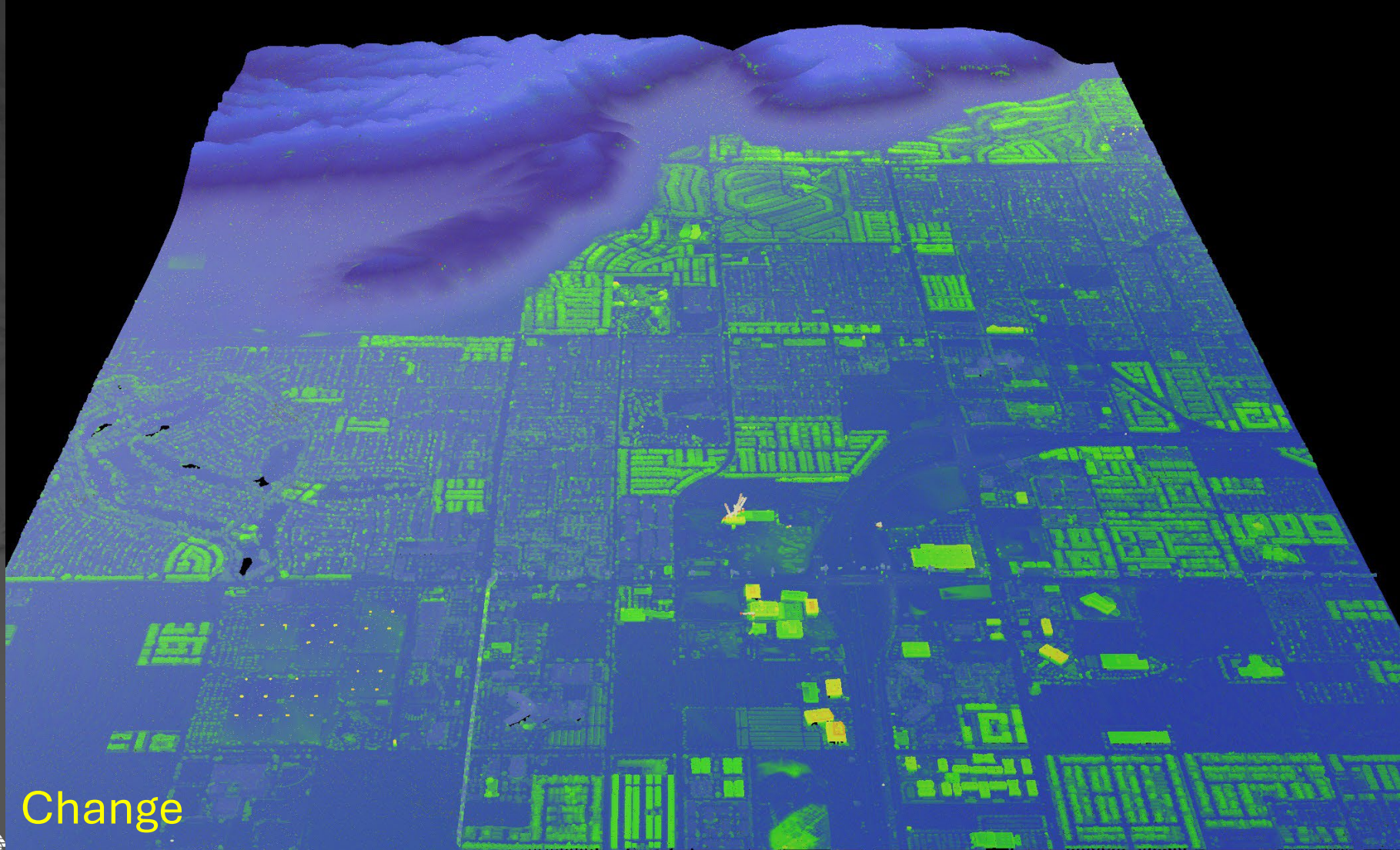
Detecting Change with the next generation of 3DEP

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



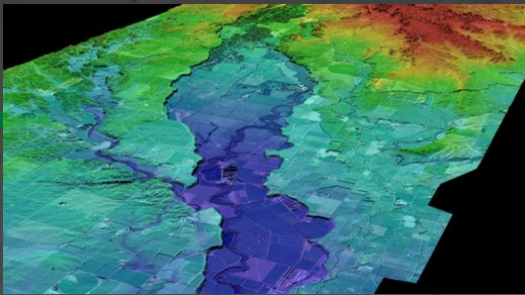
Detecting Change with the next generation of 3DEP

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

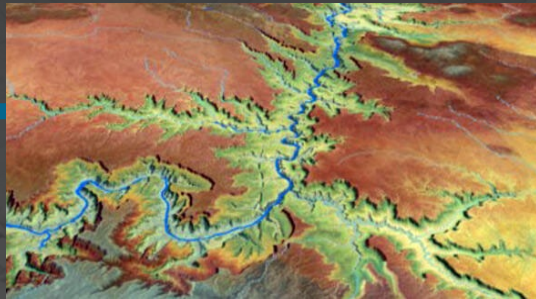


The 3D National Topography Model

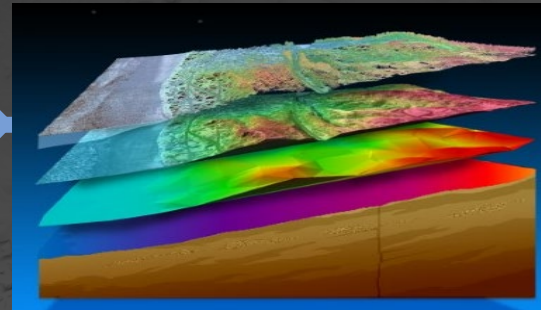
3DEP Baseline



3DHP



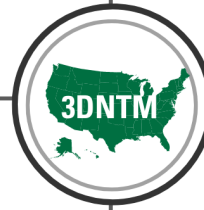
Next gen 3DEP



3DNTM



3DNTM Data Collaboration Announcement (DCA)



Navigate the 3DNTM DCA

The 3DNTM Data Collaboration Announcement facilitates partnering with the USGS and other Federal agencies to acquire high-quality 3D elevation and hydrography data for the Nation. Follow these steps to apply.

1 Find partnerships



Engage Federal, State, Tribal, local, academic, and private partners and stakeholders in your geographic area of interest

2 Select approach

USGS manages project via
the Geospatial Products and
Services Contracts



Partner manages project via
their own contract

3 Find instructions and forms at www.usgs.gov/3DNTM/DCA



- Project Submission Form
- Request for Preliminary IGCE Form (optional)
- Validation of Funding Partners Form
- Instructions to create GIS file of project area

4 Submit completed forms and project area GIS file

3dhp_dca@usgs.gov

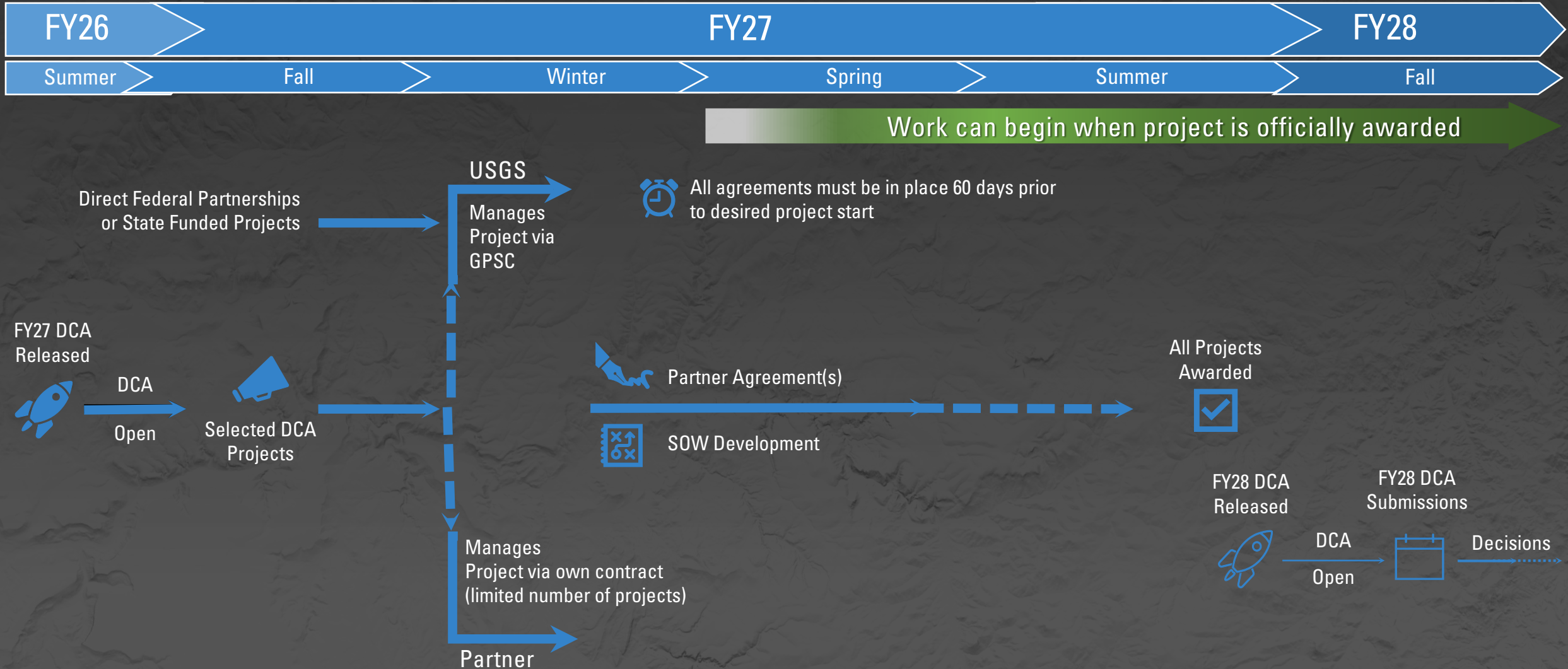
3D Hydrography Program
Data Acquisition



3dep_dca@usgs.gov

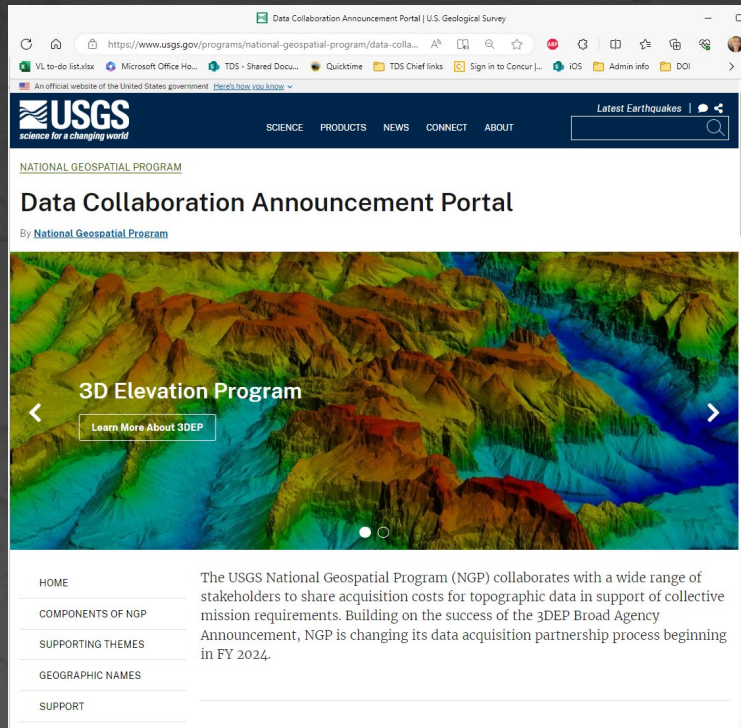
3D Elevation Program
Data Acquisition

3DNTM DCA Timeline



3DNTM Data Collaboration Announcement

DCA PORTAL contains all instructions and forms



WHAT YOU WILL SUBMIT

3DEP or 3DHP Project Submission Form (required)



Validation of Funding Partners Form (required)



Request for Project Planning Estimate (optional)

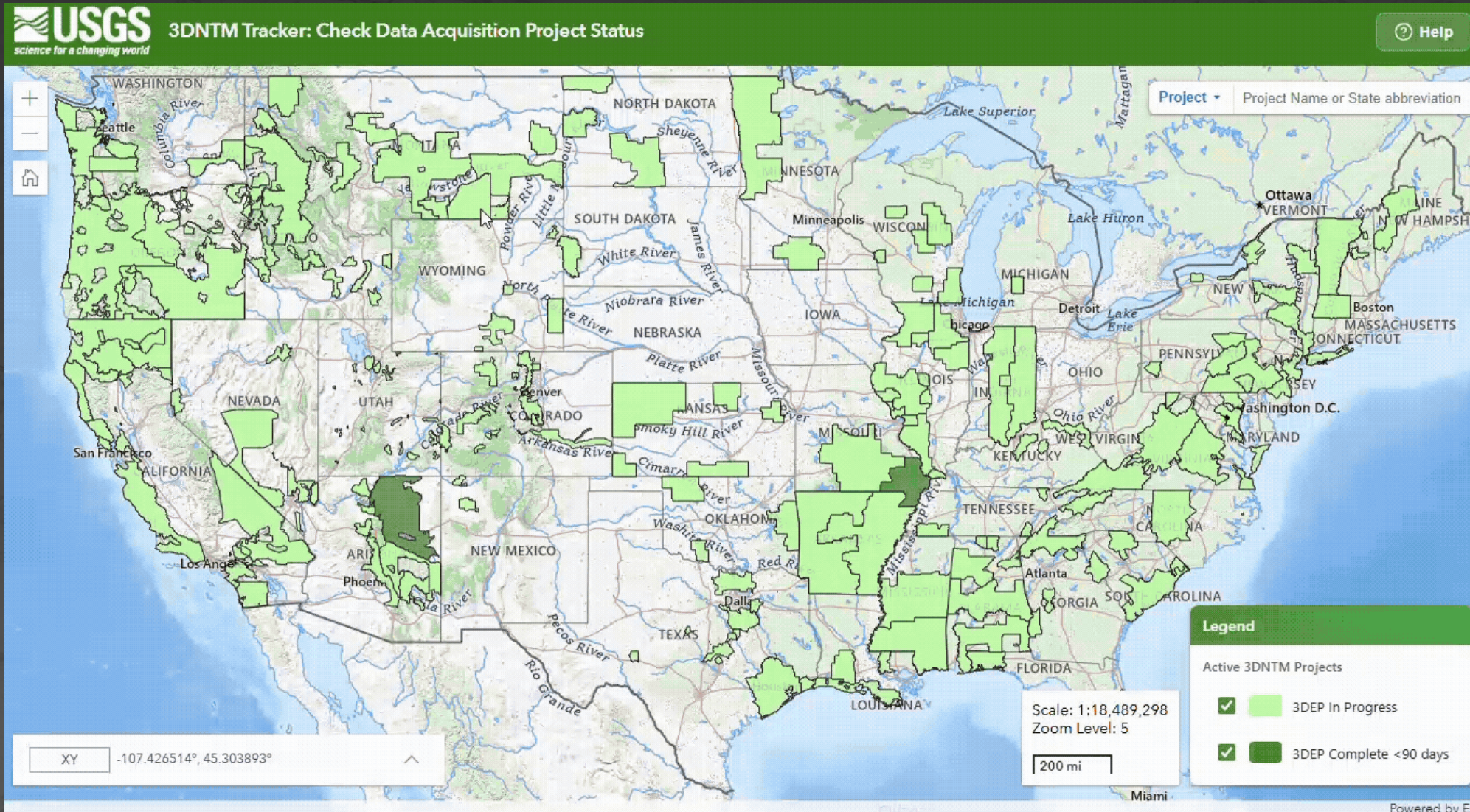


GIS file of project area (required)

IMPORTANT:
Hit tab to properly auto-populate the form



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

