

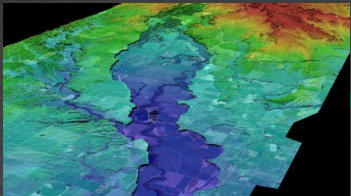
Dive into USGS Hydrography

Cynthia Ritmiller
National Map Liaison

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

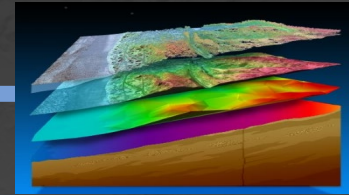
3DHP



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

New Seamless 1-meter Digital Elevation Model



USGS lidar coverage in 2,252 individual projects

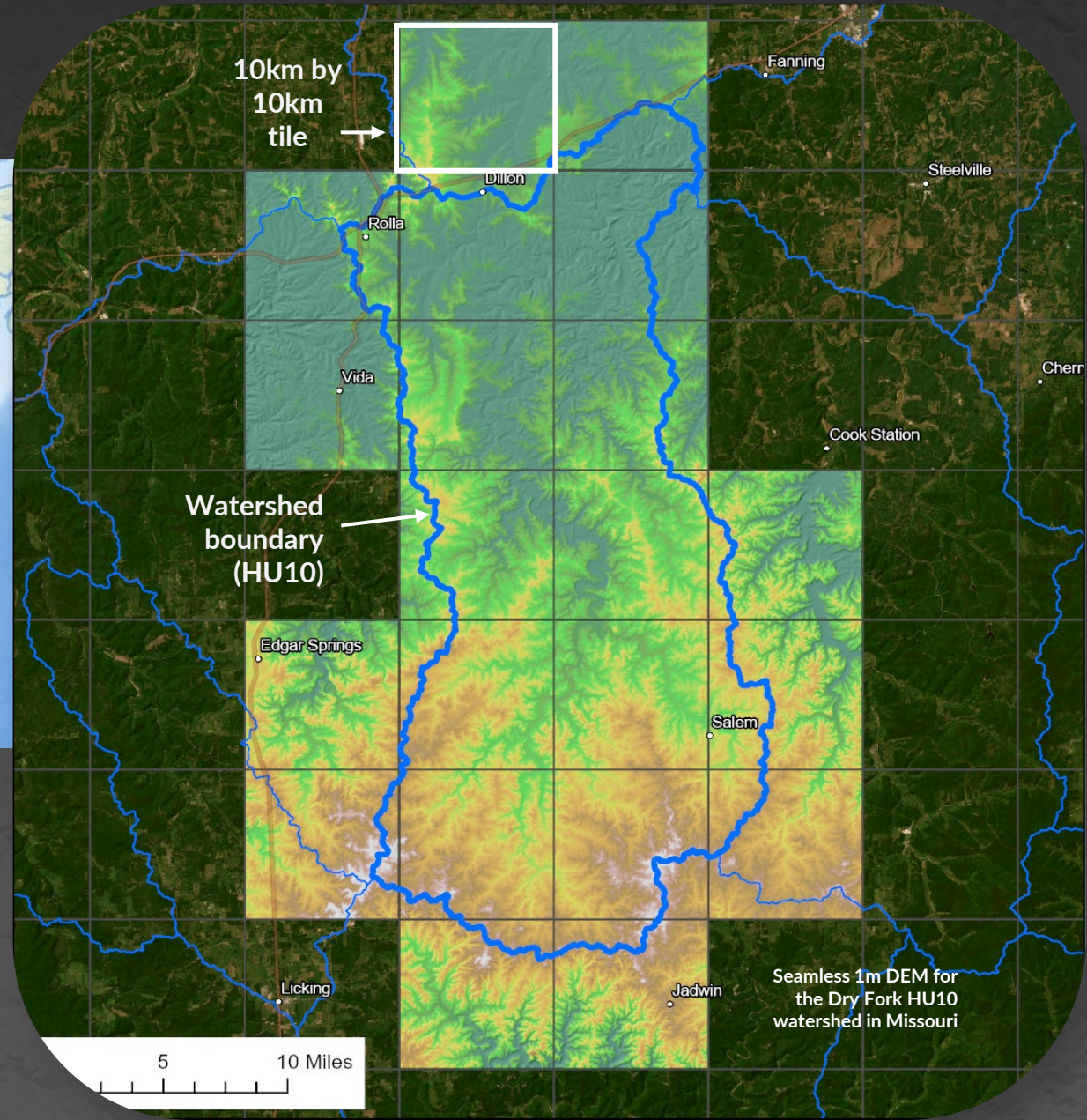


S1M over Rolla, MO

New Seamless 1-meter Digital Elevation Model



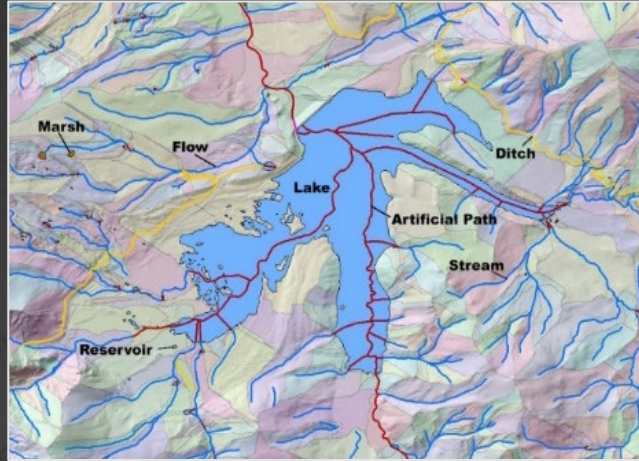
Seamless 1m DEM availability as of August 2026



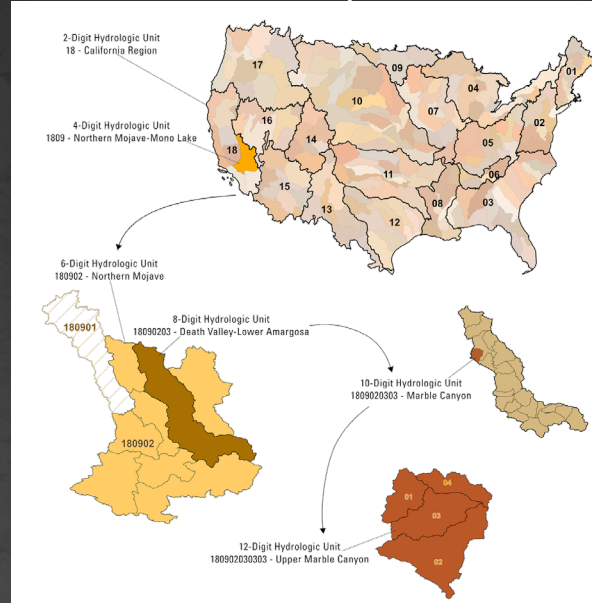
Seamless 1m DEM for
the Dry Fork HU10
watershed in Missouri

Hydrography data on The National Map

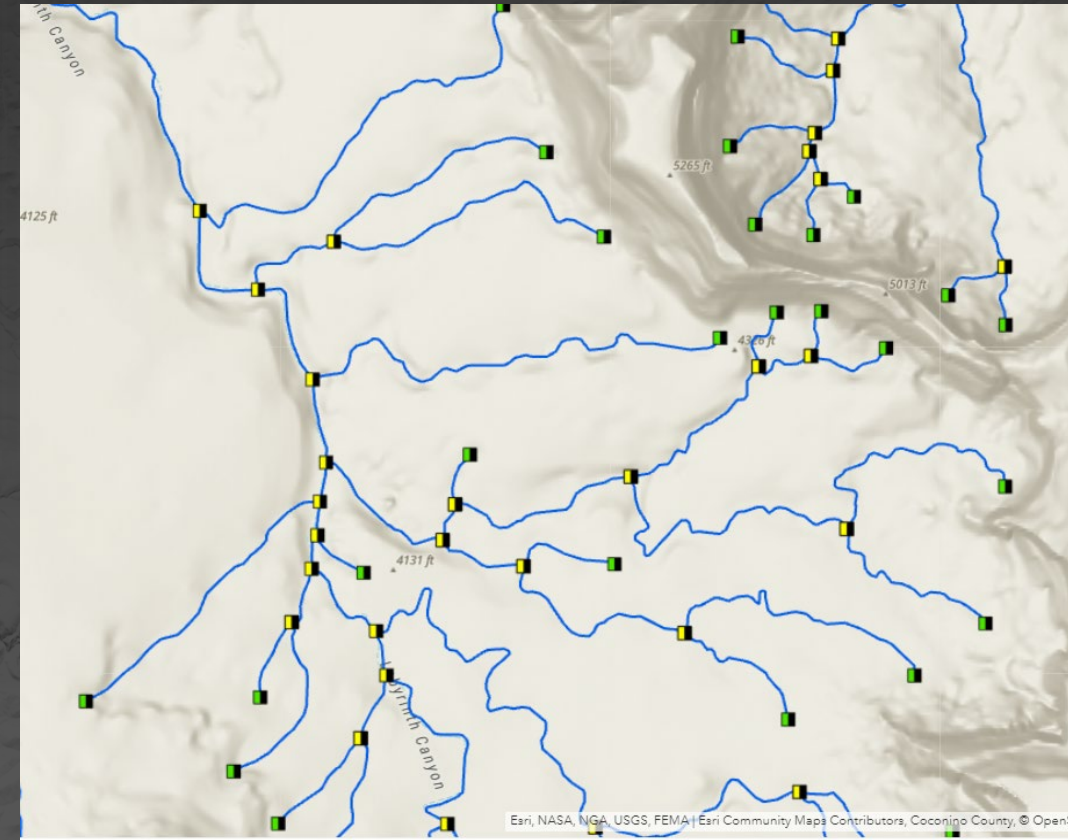
National Hydrography Dataset (NHD)



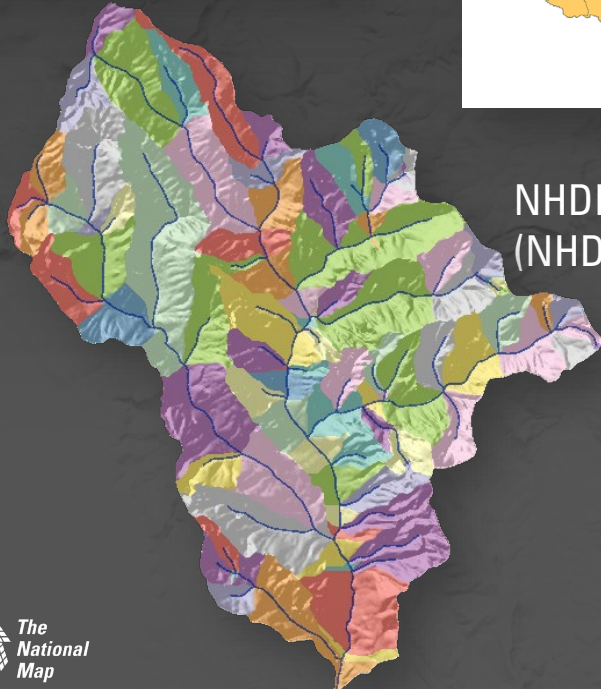
Watershed Boundary Dataset (WBD)



3D Hydrography Program (3DHP)



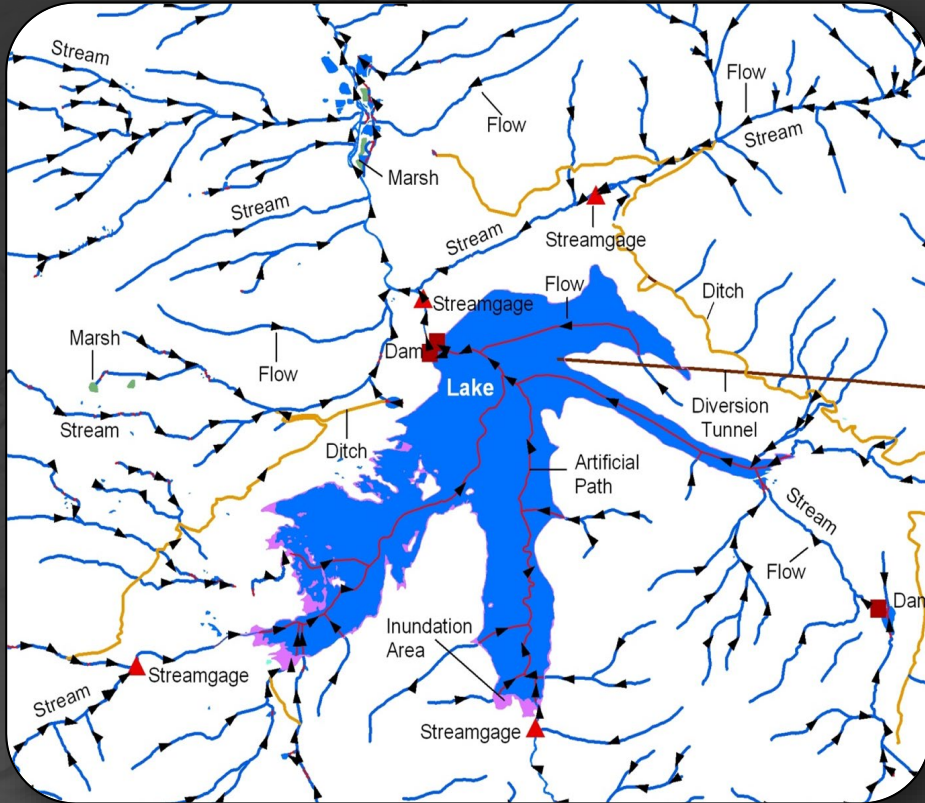
NHDPlus High Resolution (NHDPlus HR)



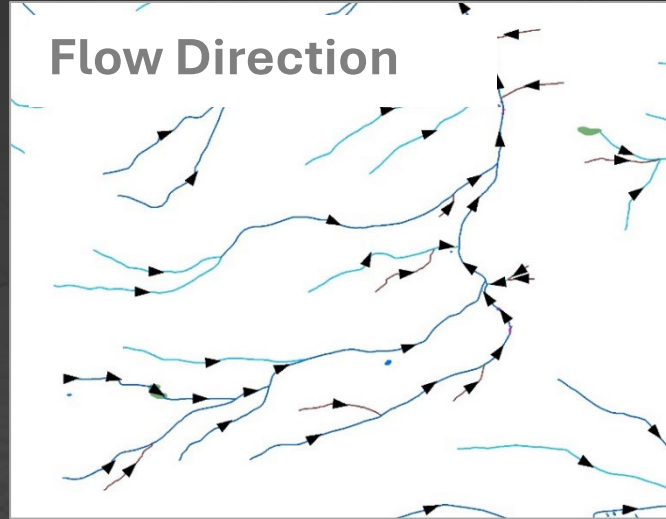
Static versions of NHD, WBD, and NHDPlus HR are available and can be found:

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

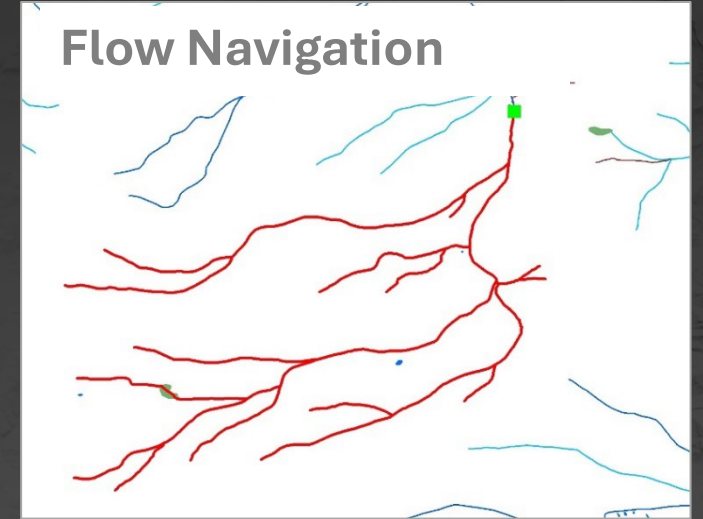
National Hydrography Dataset (NHD)



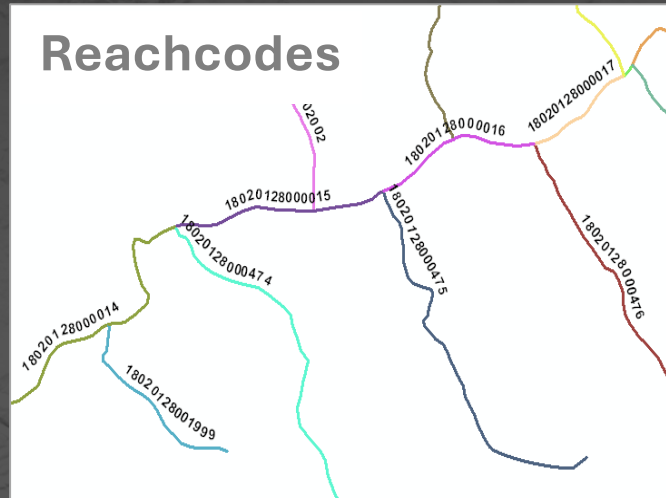
Flow Direction



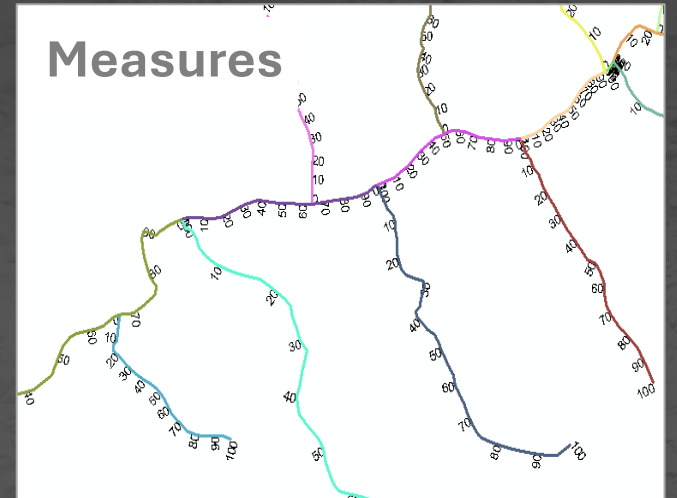
Flow Navigation



Reachcodes



Measures

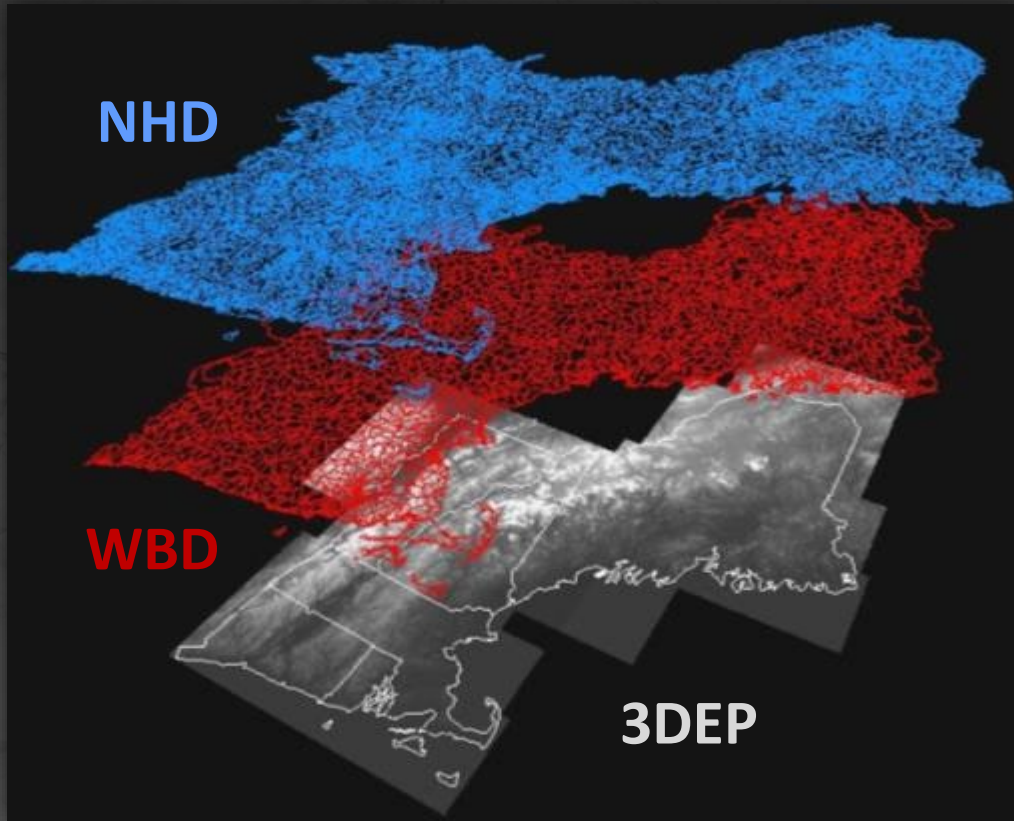


Watershed Boundary Dataset (WBD)

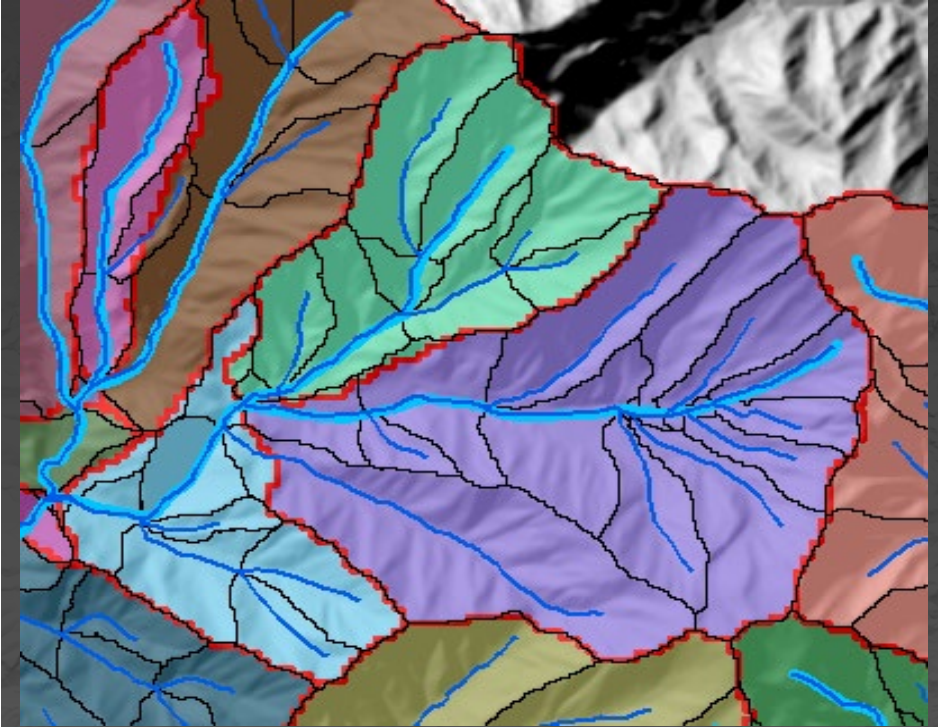
- Seamless baseline drainage area dataset for the Nation
- Boundaries defined by hydrographic and topographic criteria with no regard for administrative boundaries
- Delineated in a nested multi-level, hierarchical drainage system.
- Each level assigned a progressive 2-digit Hydrologic Unit (HU) code which describes where the unit is in the country and the “level” of the unit
- Complete for the US to HU12



NHDPlus High Resolution (NHDPlus HR)



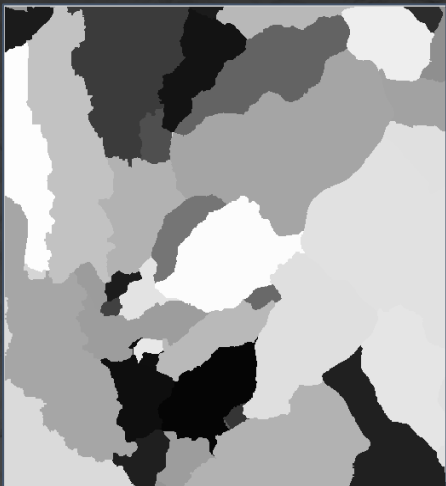
- NHDPlus_H_0903_GDB.gdb
 - Hydrography
 - HYDRO_NET
 - HYDRO_NET_Junctions
 - NHDArea
 - NHDFlowline
 - NHDLine
 - NHDPoint
 - NHDWaterbody
 - NHDPlus
 - NHDPlusBurnLineEvent
 - NHDPlusBurnWaterbody
 - NHDPlusCatchment
 - NHDPlusLandSea
 - NHDPlusSink
 - NHDPlusWall
 - WBD
 - NonContributingDrainageArea
 - NonContributingDrainageLine
 - NWISDrainageArea
 - NWISDrainageLine
 - WBDHU10
 - WBDHU12
 - WBDHU14
 - WBDHU16
 - WBDHU2
 - WBDHU4
 - WBDHU6
 - WBDHU8
 - WBDLine



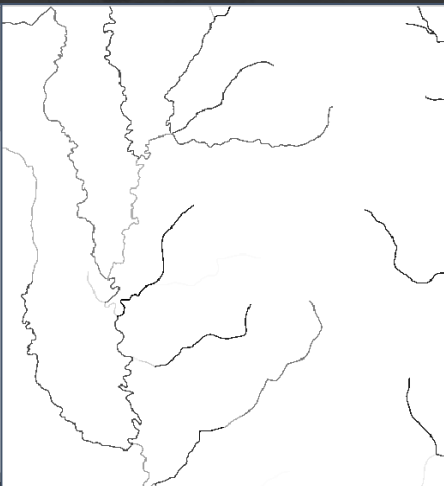
Plus, additional tables...

NHDPlus HR Rasters

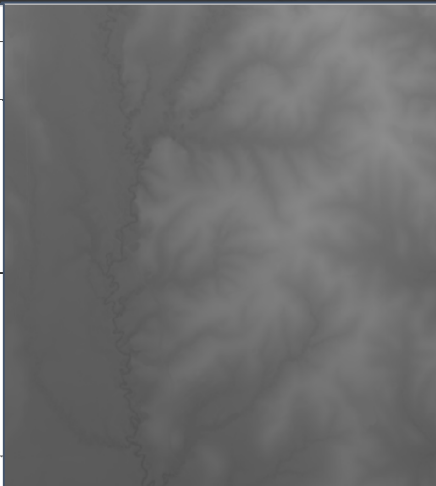
cat.tif



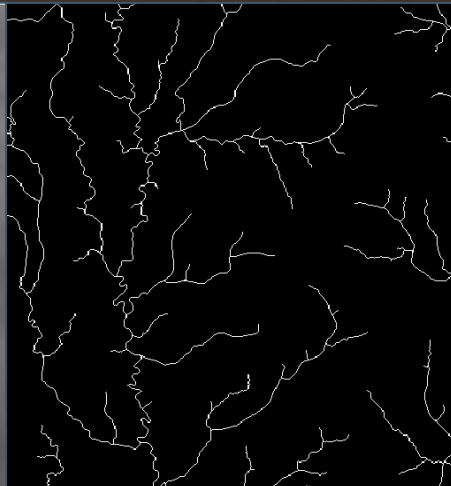
catseed.tif



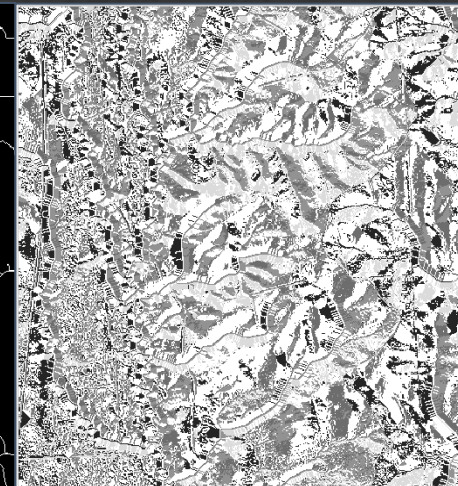
elev_cm.tif



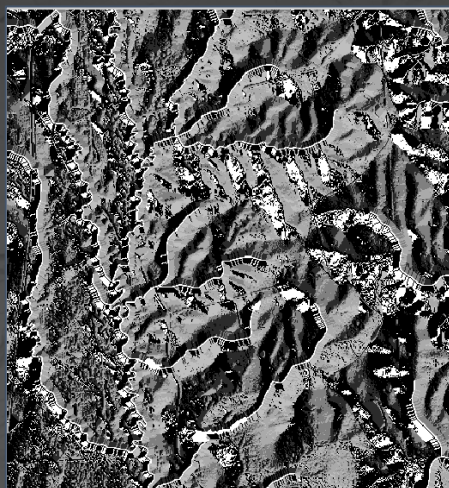
fac.tif



fdr.tif



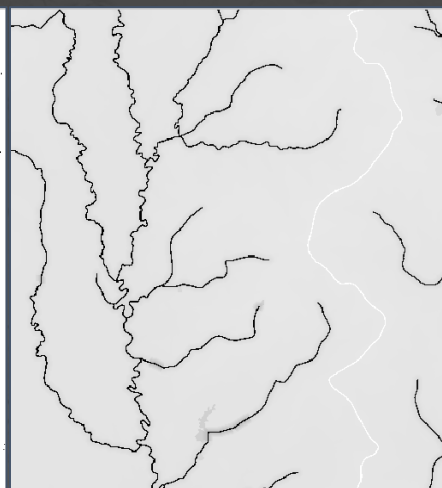
fdroverland.tif



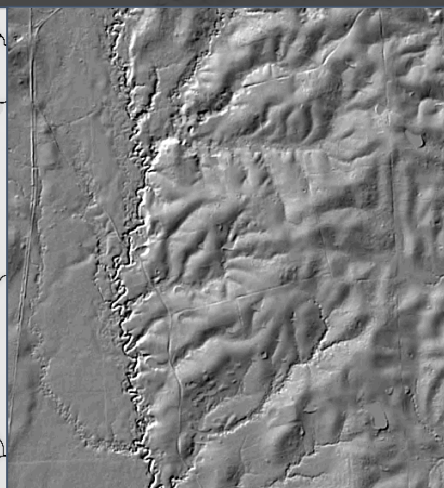
filldepth.tif



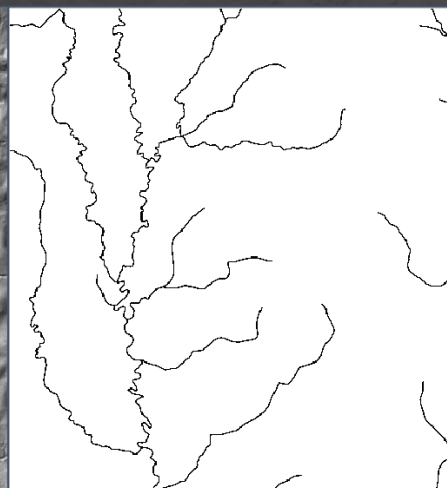
hydrodem.tif



shdrelief.jpg



swnet.tif



The 3DHP Data Lifecycle

Planning



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



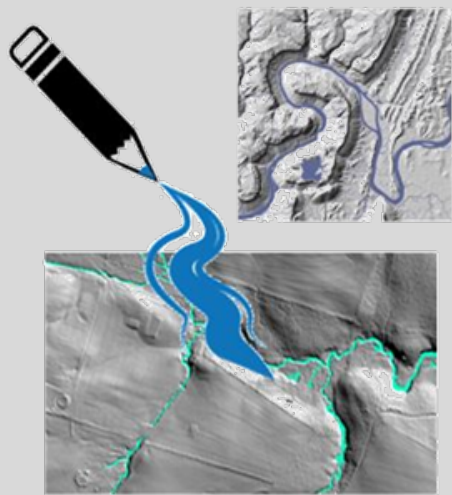
USGS and/or partners plan the project & award a task order



Acquisition



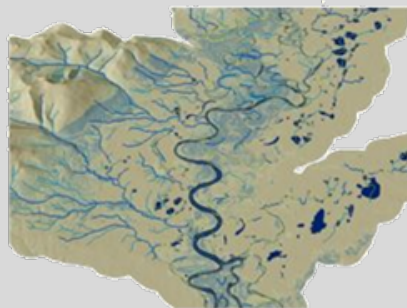
Contractors acquire and process data



Validation



USGS validates data & produces standard 3DHP data products

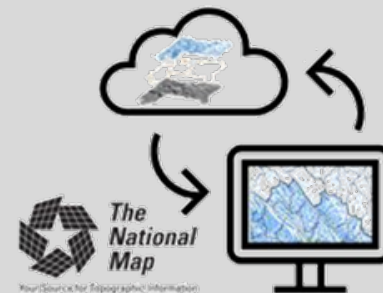


Over \$ 1B in annual benefits to the Nation if hydrography data needs are met (HRBS, 2016)

Publication



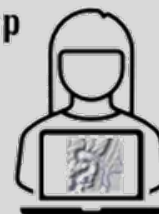
USGS makes 3DHP data publicly available on The National Map & via services in the Cloud



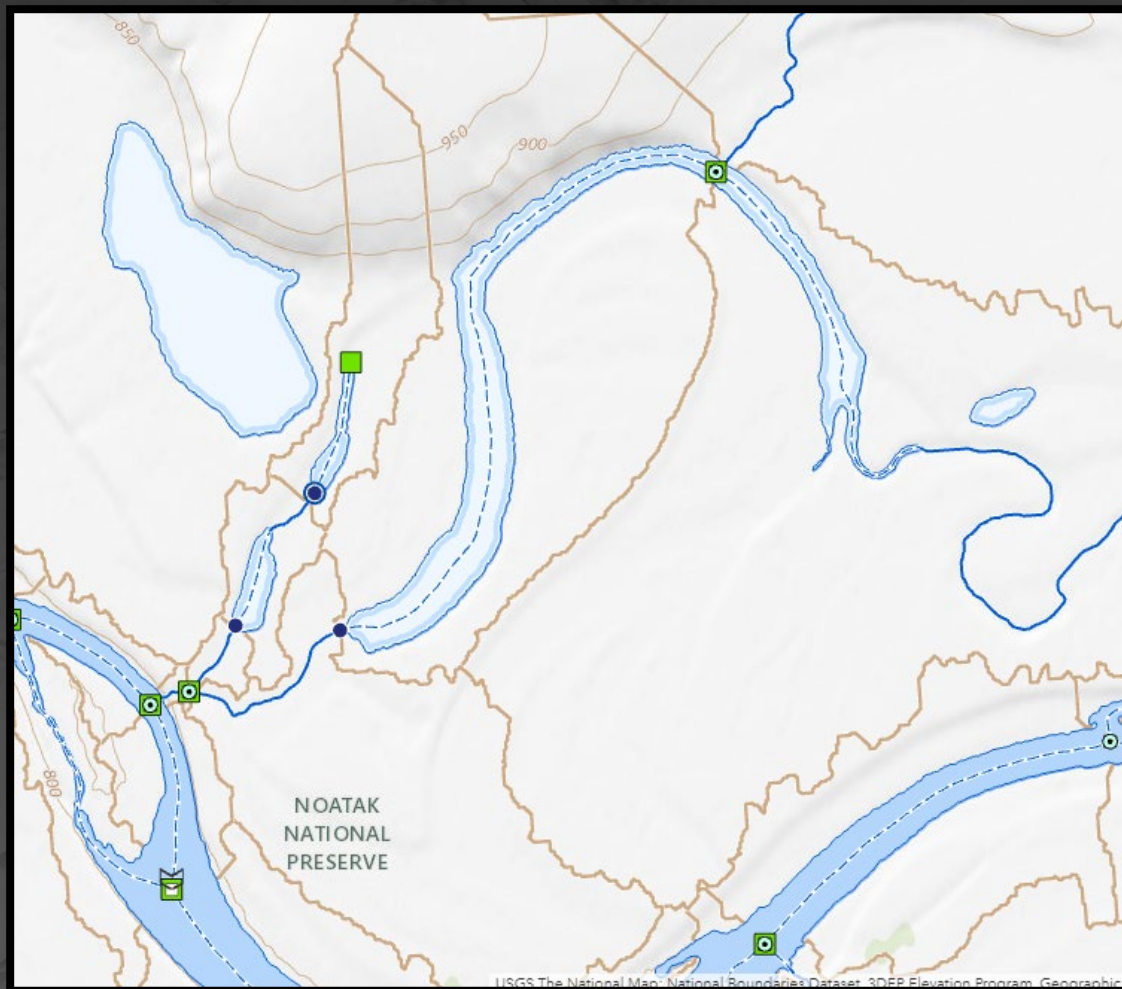
Access



Users can download analysis ready data or access via map services



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

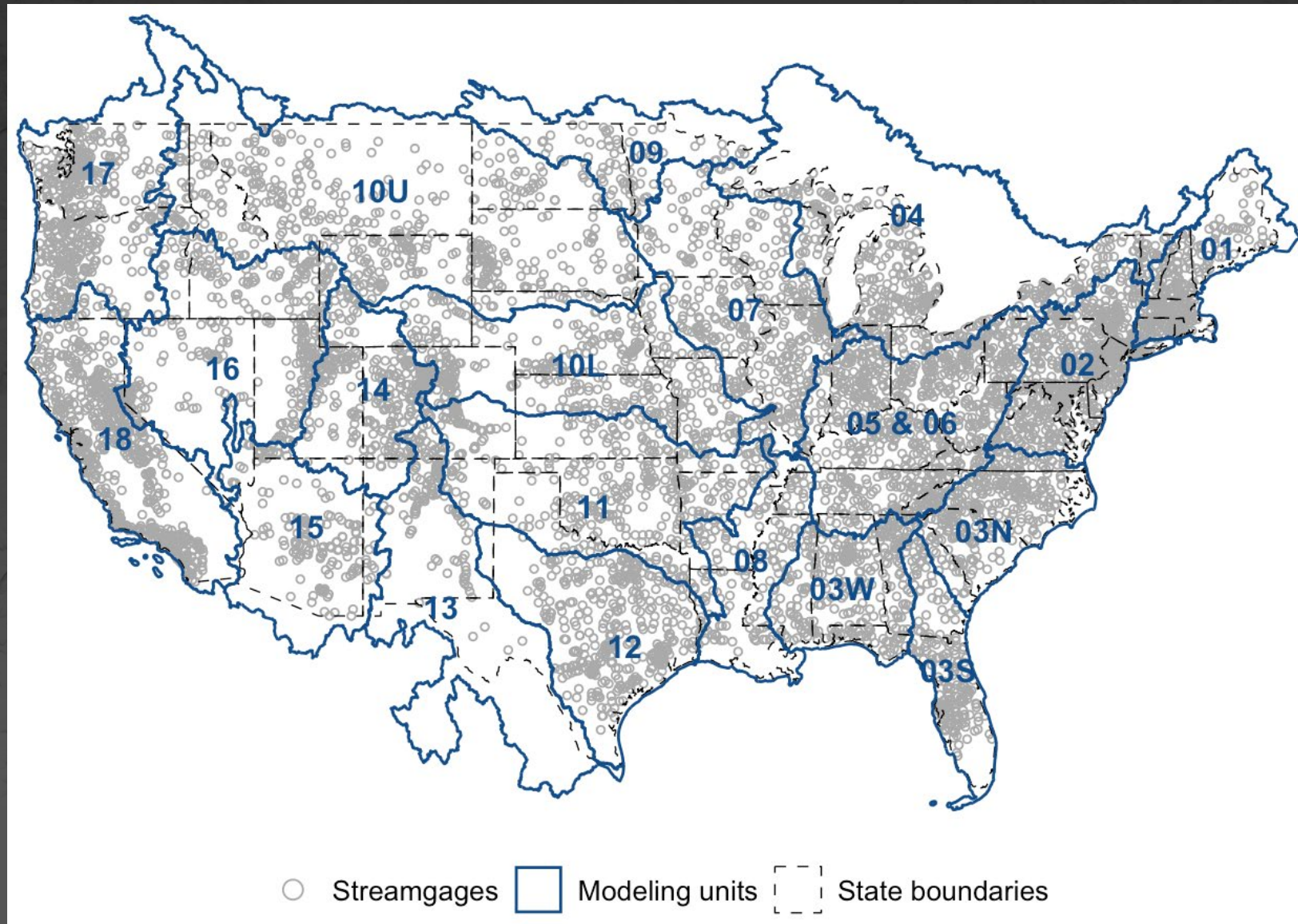
- Stream Level
- Level Path
- Stream Order
- Stream Calculator

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





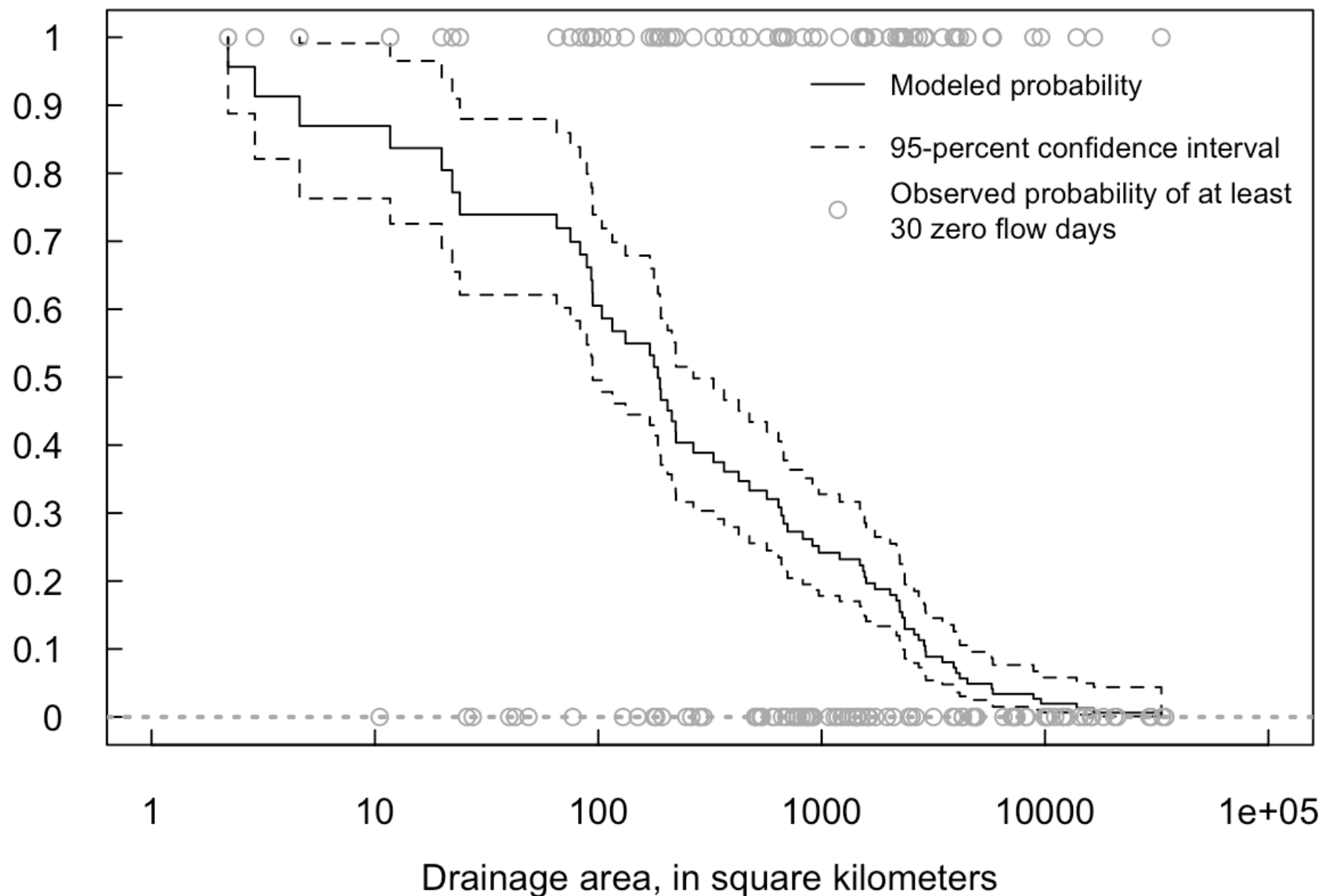
Probabilities of Stream Permanence



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



as of 4/20/2026

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

Salpian

Tinian

Aguijan

Rota

Guam

Northwestern Hawaiian Islands

Hawaii

American Samoa

Tutuila

Aunu'u

Ofu

Olosega

Ta'u

Etena

Rose Atoll

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.

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.

3DHP Data:

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

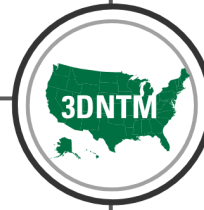
²Hydrography acquired to meet Elevation-Derived Hydrography specifications and READ rules v1.0 or later. TM-11B11 and -11B12.

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

Puerto Rico and U.S. Virgin Islands



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

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

