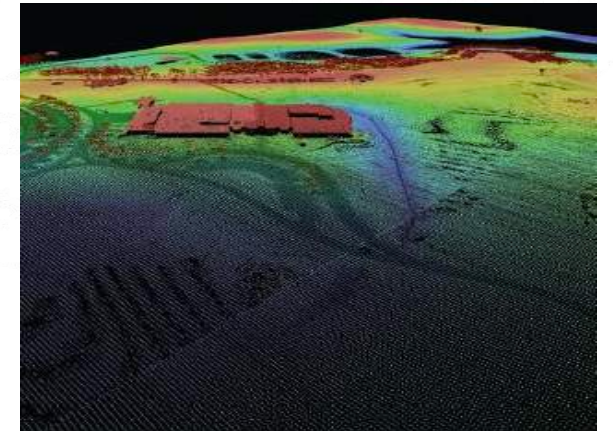
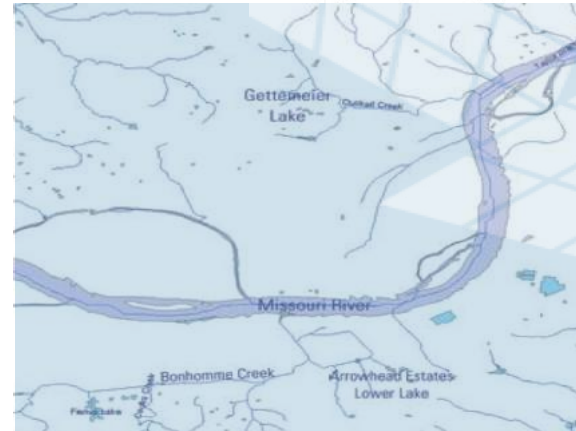
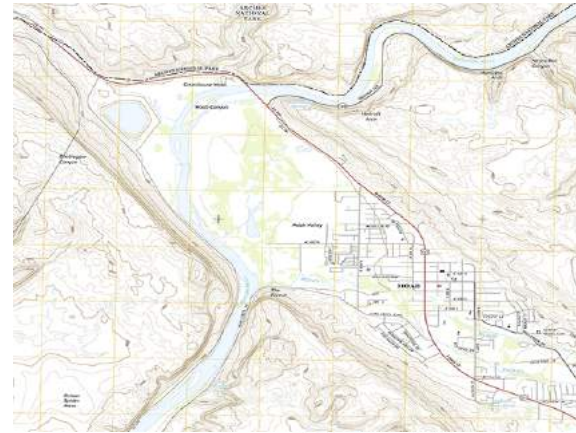




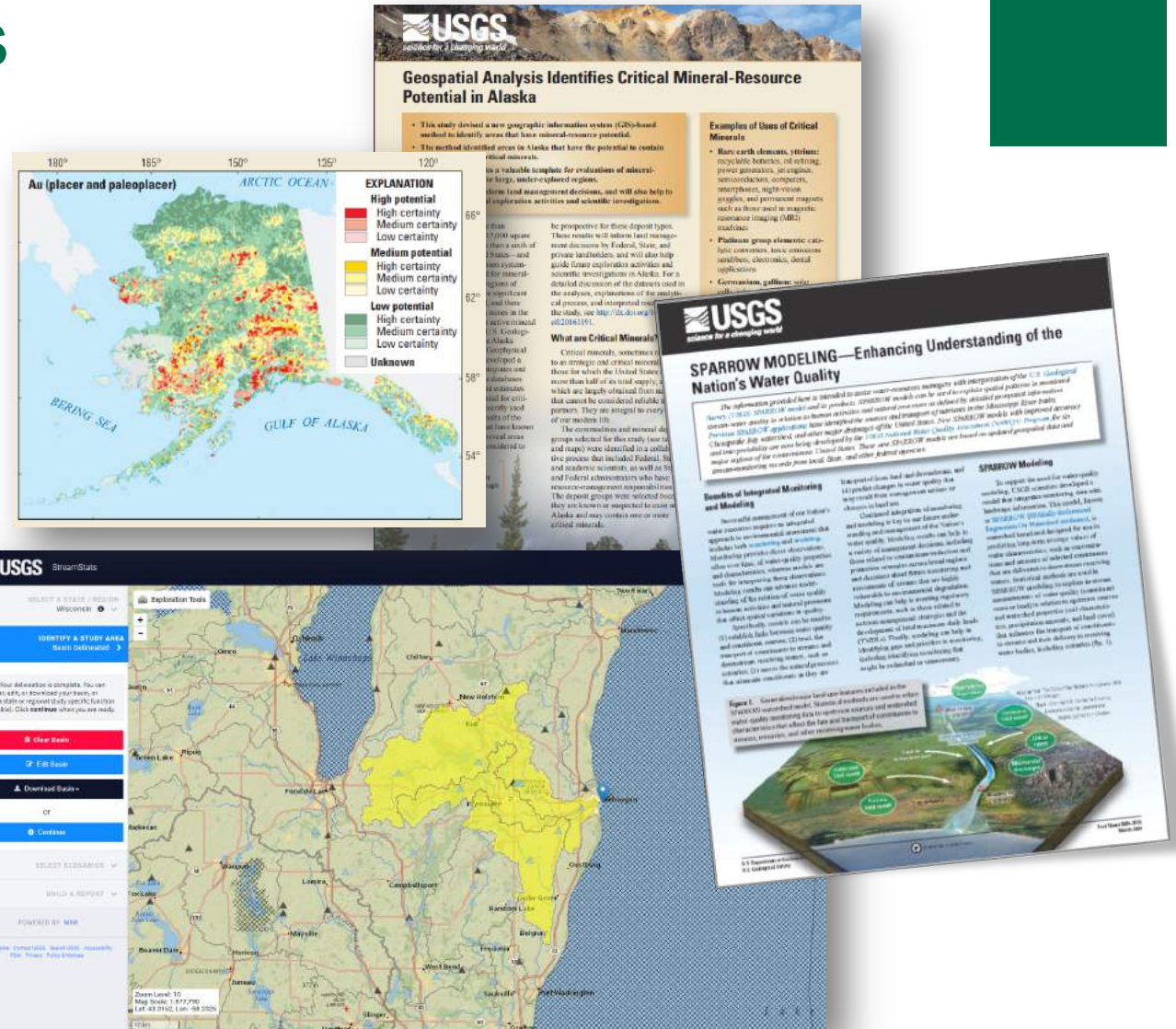
National Hydrography Datasets





National Hydrography Datasets Support Critical Applications

- Hydrography Requirements and Benefits Study documented 420 mission critical business uses with 23 Federal agencies, 50 states, 8 Tribal governments and 3 national associations
 - Ecological flows
 - Drought
 - Flooding
 - Spill response
 - Infrastructure engineering
 - Modeling and prediction
 - Watershed condition reporting and analysis
 - Resource reporting and analysis
 - Many more...
- Current Annual Benefits - \$538M,
Total Potential Annual Benefits - \$1.14B



National Hydrography and Watershed Boundary Datasets

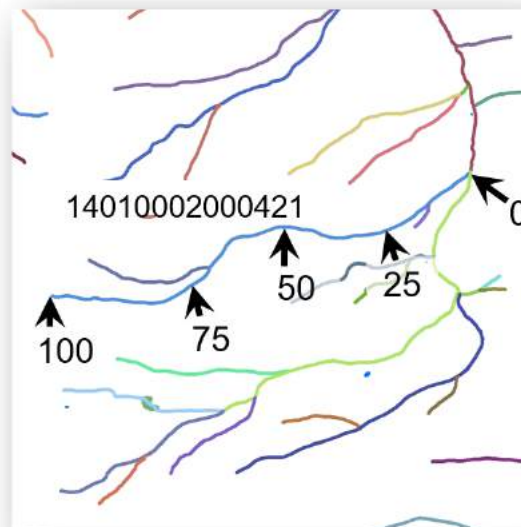
National Hydrography Dataset

- The **drainage network** with features such as rivers, streams, canals, lakes, ponds, and stream gages

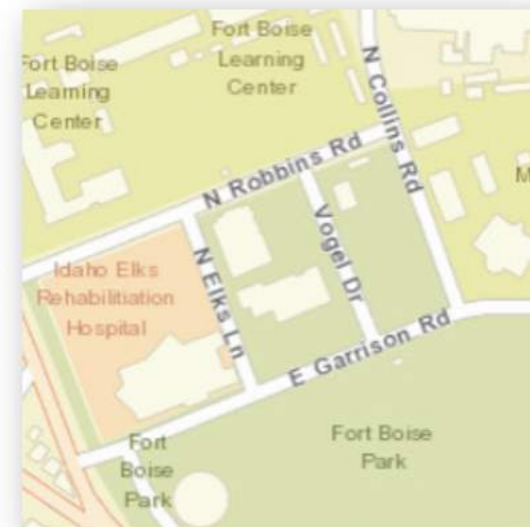
Watershed Boundary Dataset

- **Hydrologic units** at 8 scales of a nested hierarchy; defines all or part of the areal **extent of surface water drainage** to a point

NHD reach code and measure



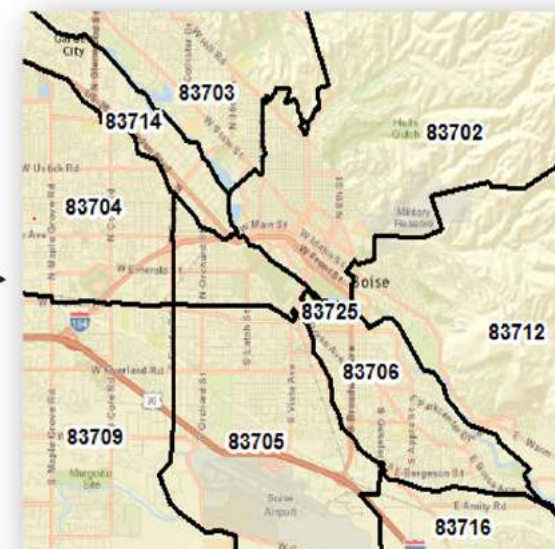
Street address



HU Codes



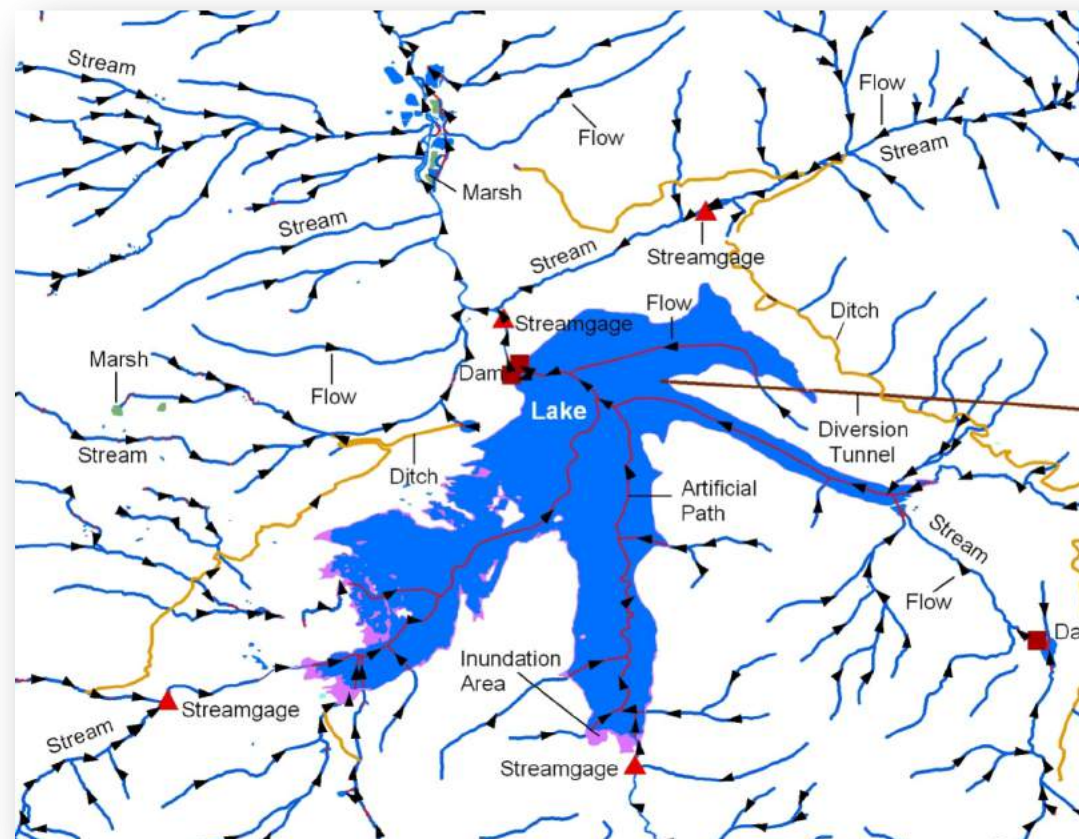
Zip Codes



National Hydrography Dataset

Water network for mapping and modeling

- National drainage network of streams and lakes, plus other hydro info, in a GIS format
- Currently 1:24K or better (1:63K – 1:24K in AK)
- Shapefile and GDB downloads, plus web-based map services



Watershed Boundary Dataset

Seamless system for indexing and reporting

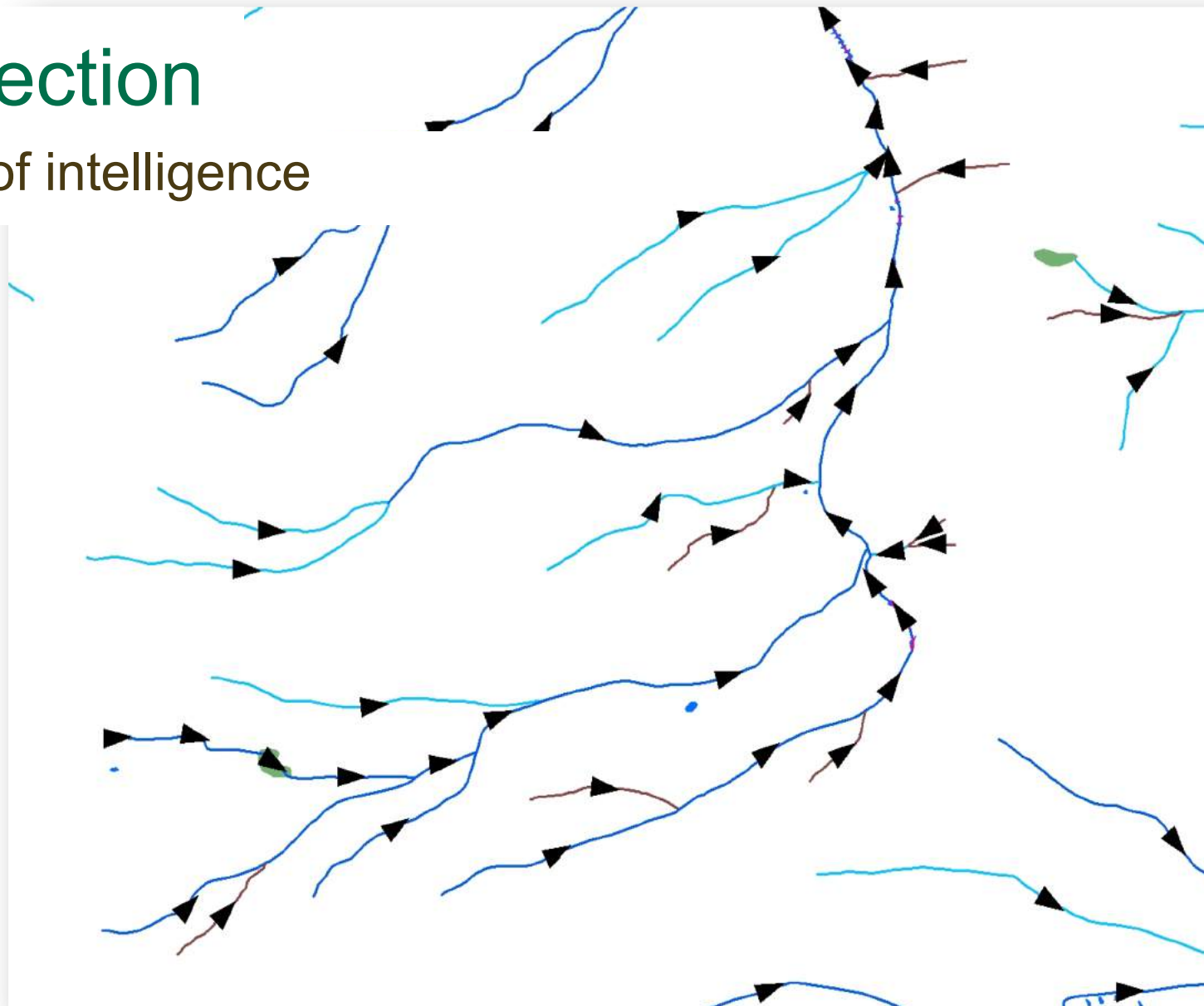
- Represent **all or part** of the **drainage area** to the outlet of the unit
- Boundaries defined by hydrographic and topographic criteria with no regard for administrative boundaries
- Delineated in a nested multi-level, hierarchical drainage system.
- Each level assigned a progressive 2-digit Hydrologic Unit Code (HUC) which describes where the unit is in the country and the “level” of the unit
- Complete for the US to HU12





Flow Direction

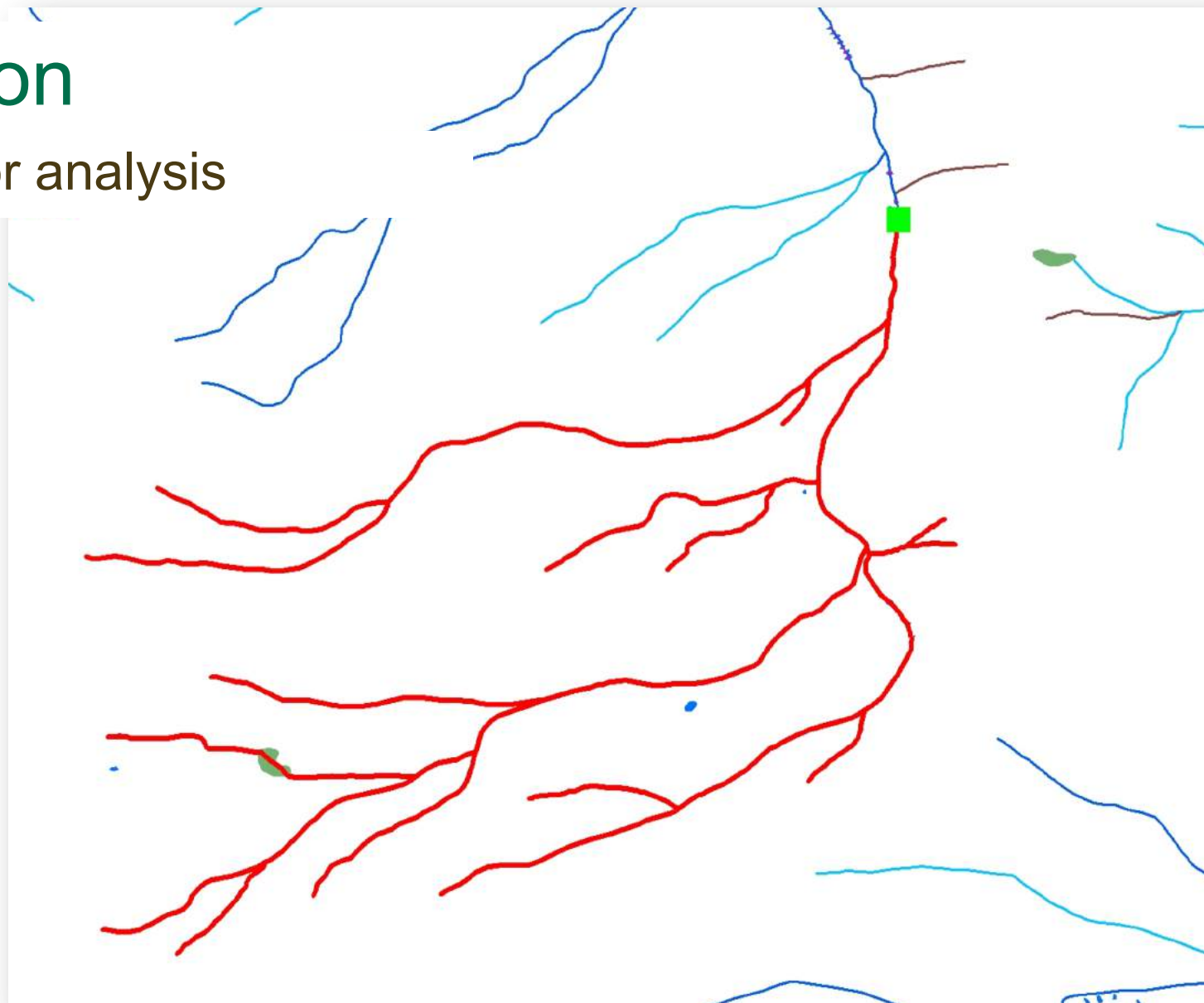
A key piece of intelligence



+

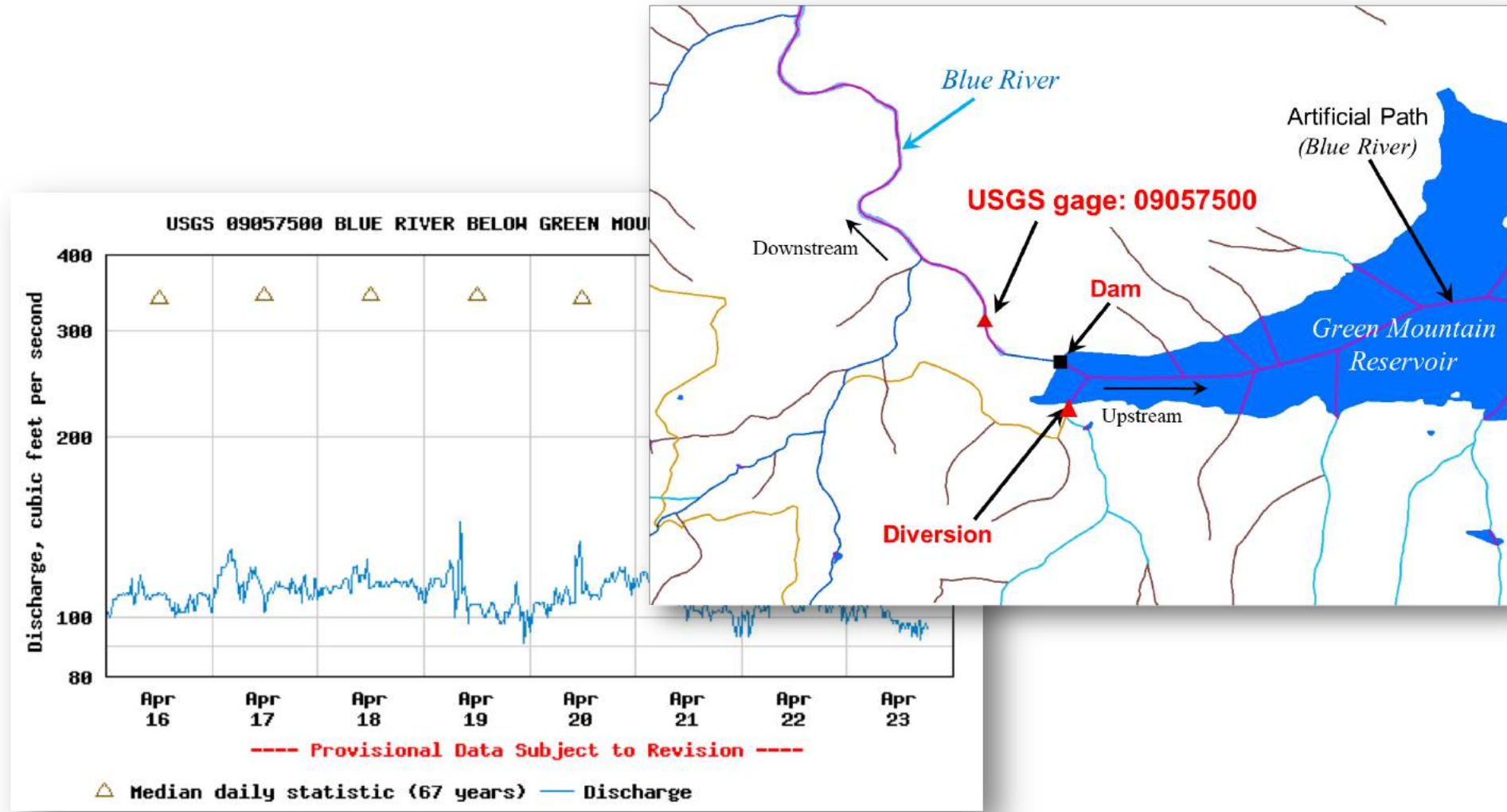
Navigation

The basis for analysis



+ Location Adds Context

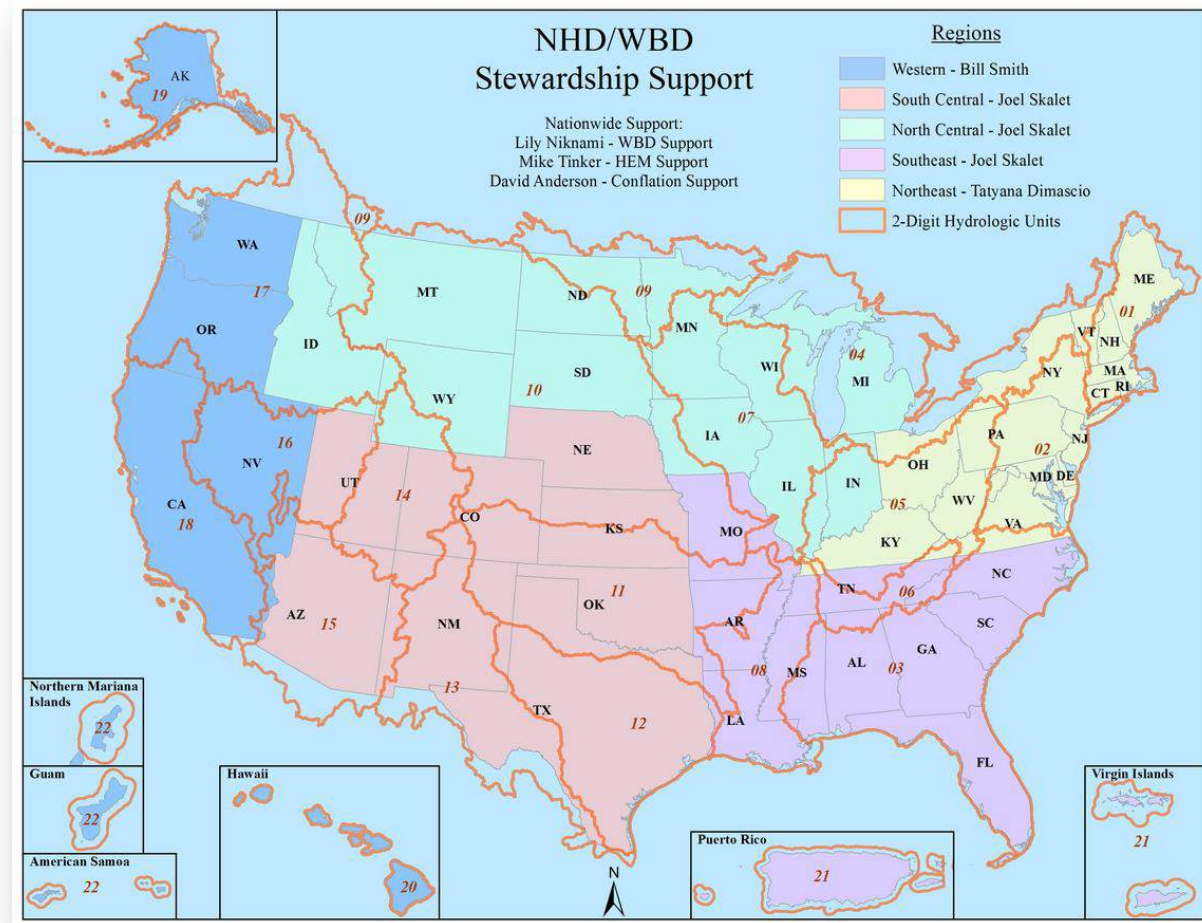
8



Stewardship

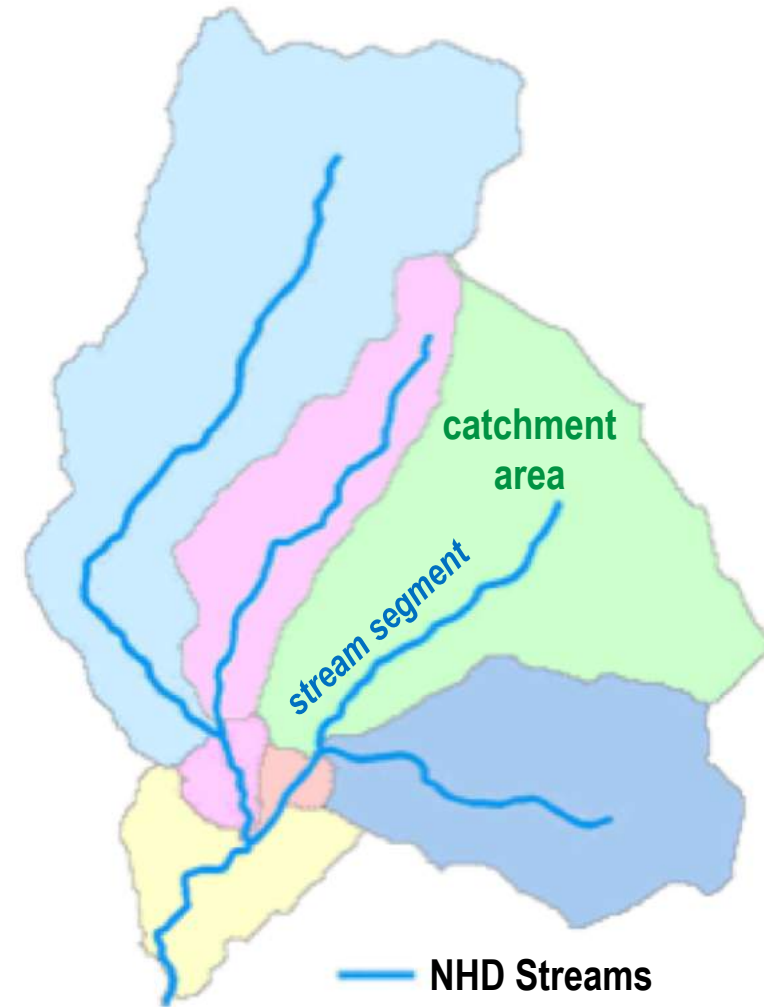
Collaborating to build and maintain datasets

- NHD maps 8.4 million miles stream of network, including 7.8 million waterbodies
- WBD contains over 130,000 nested hydrologic units
- Local user knowledge and expertise is crucial to accurate mapping
- NHD and WBD gain this local knowledge through a stewardship program
- Many states participate in the stewardship program – 41 states and Washington DC



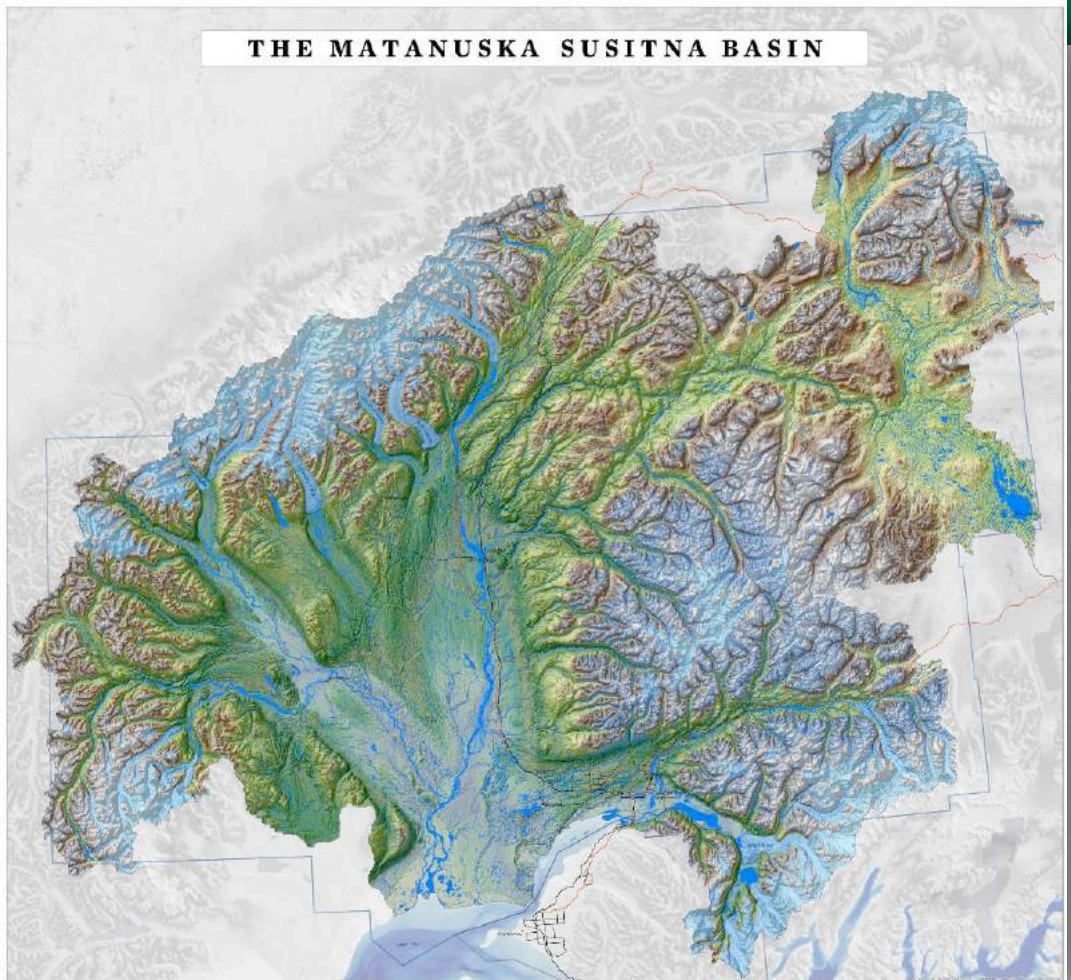
NHDPlus (v1 and v2)

- **Built** using 1:100,000 NHD, WBD, and 30 meter elevation data
- Provides a seamless elevation-based **catchment area** for each stream segment in NHD
- Includes **value-added attributes** for stream network navigation and analysis
- Includes **flow accumulation and direction** surfaces in raster format
- Enables **modeling** of water flow across the landscape, **linking terrestrial characteristics to the stream network**



Enables more complete understanding

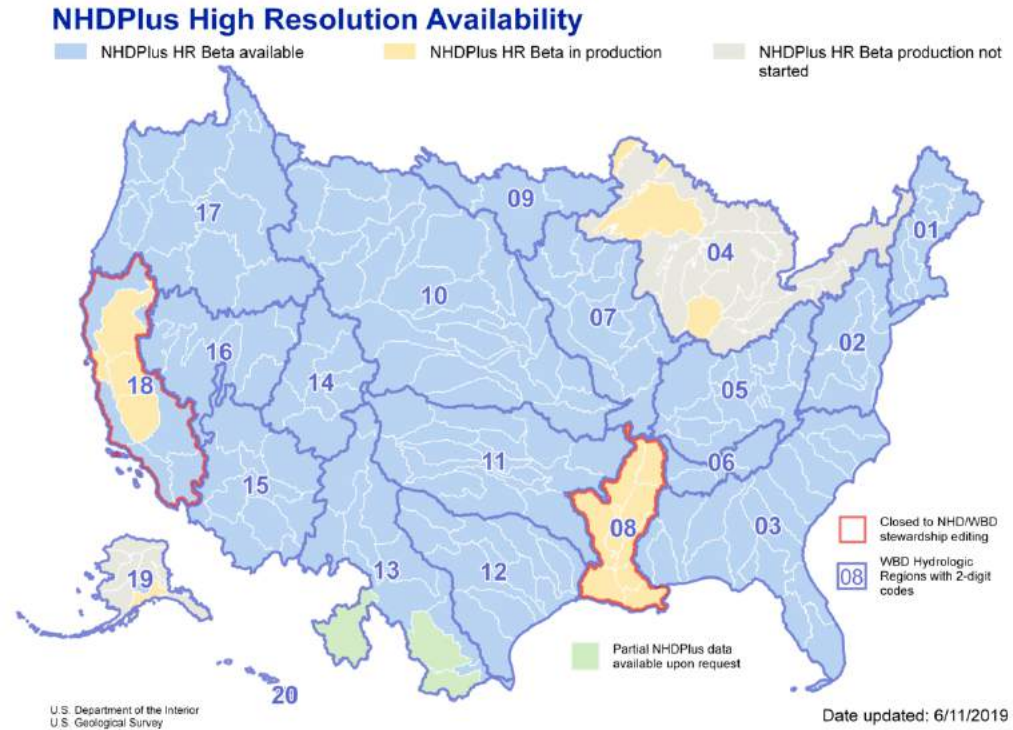
- Rivers reflect their watersheds
- Links terrestrial characteristics to the stream network to enable modeling of water flow across the landscape
- Provides ability to link other data to the network and the landscape to enable the discovery and sharing of limitless sources of information and development of consistent, and repeatable modeling results



Graphic: James DePasquale, The Nature Conservancy

+ NHDPlus High Resolution (NHDPlus HR)

- Provides functionality of NHDPlus with detail and accuracy of
 - High resolution 1:24,000 or better NHD
 - Nationally consistent WBD
 - 10 meter 3DEP elevation data
- Beta version will be completed in 2020 for CONUS, HI and territories, followed by AK in later years

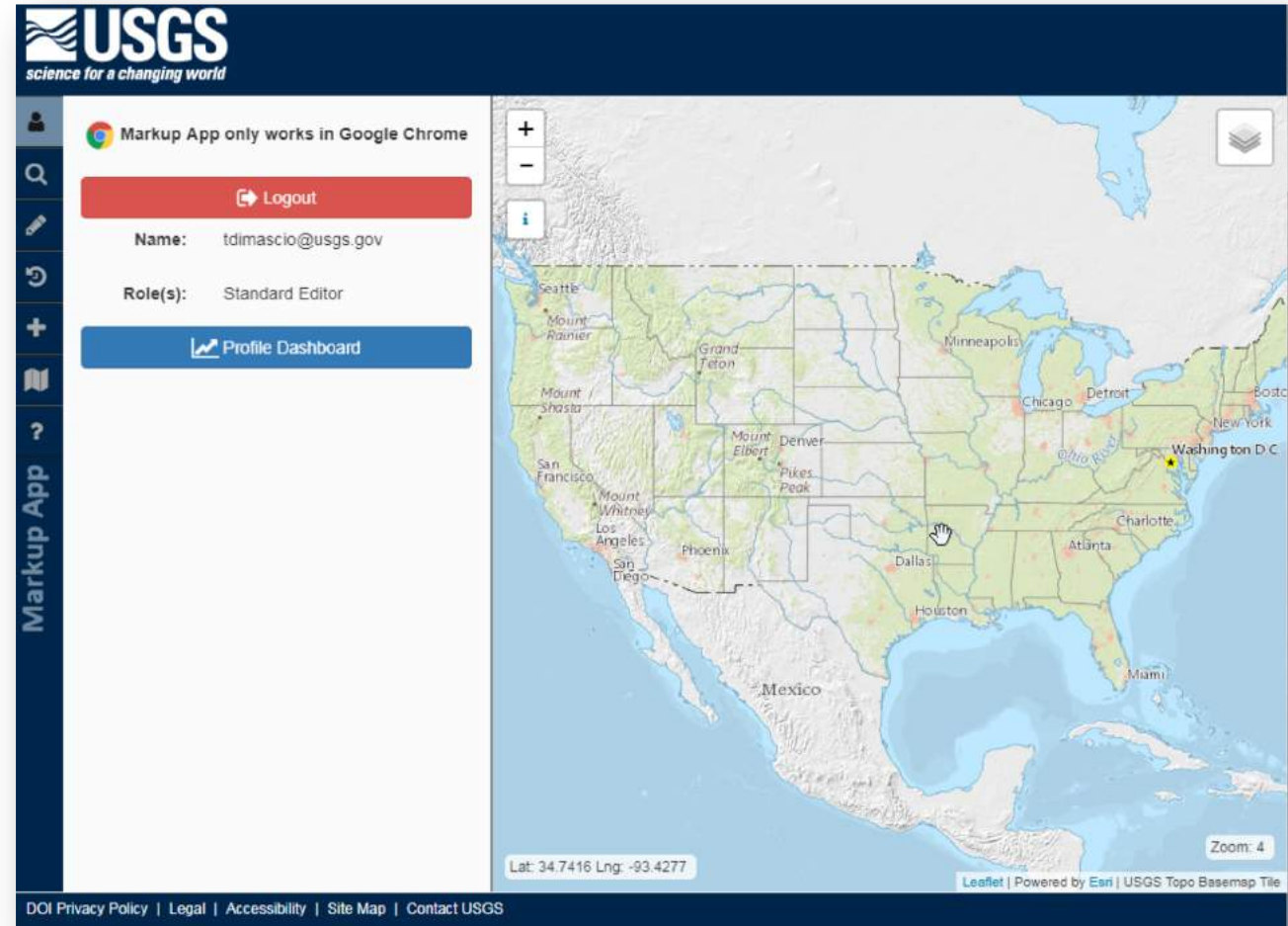


	IN USE TODAY: NHDPlus Medium Resolution	IN PROGRESS: NHDPlus High Resolution
Hydrography source	1:100,000-scale NHD	1:24,000-scale or better NHD
Elevation source	30 meter	10 meter
Number of features nationwide	2.7 million	26 million

NHDPlus HR Beta QC

Quality Control Volunteers needed

- We are seeking local experts to participate in Beta QC review
- Beta QC improves *not only* the NHDPlus HR, *but also* the NHD/WBD
- Please spread the word!
- For information about NHDPlus HR Beta QC and how to volunteer, see nhd.usgs.gov/NHDPlus_HR.html

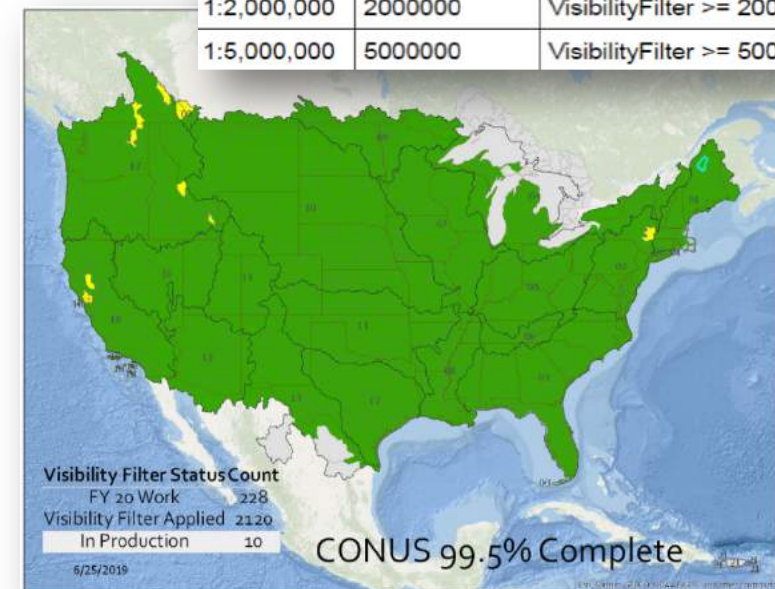


VisibilityFilter

- Definition: Represents appropriate use of individual features through scale
- Coded-values indicate that the feature is appropriate for use at approximately the defined scale and all larger scales
- Available for NHDFlowline, NHDWaterbody, NHDArea, and NHDLine feature classes
- Not yet developed for AK, HI or Territories



Scale	VisibilityFilter	Queries
<1:24,000	0	N/A
1:24,000	24000	VisibilityFilter >= 24000
1:50,000	50000	VisibilityFilter >= 50000
1:100,000	100000	VisibilityFilter >= 100000
1:250,000	250000	VisibilityFilter >= 250000
1:500,000	500000	VisibilityFilter >= 500000
1:1,000,000	1000000	VisibilityFilter >= 1000000
1:2,000,000	2000000	VisibilityFilter >= 2000000
1:5,000,000	5000000	VisibilityFilter >= 5000000



1:24K

1:562K

1:1.25M

1:2.5M

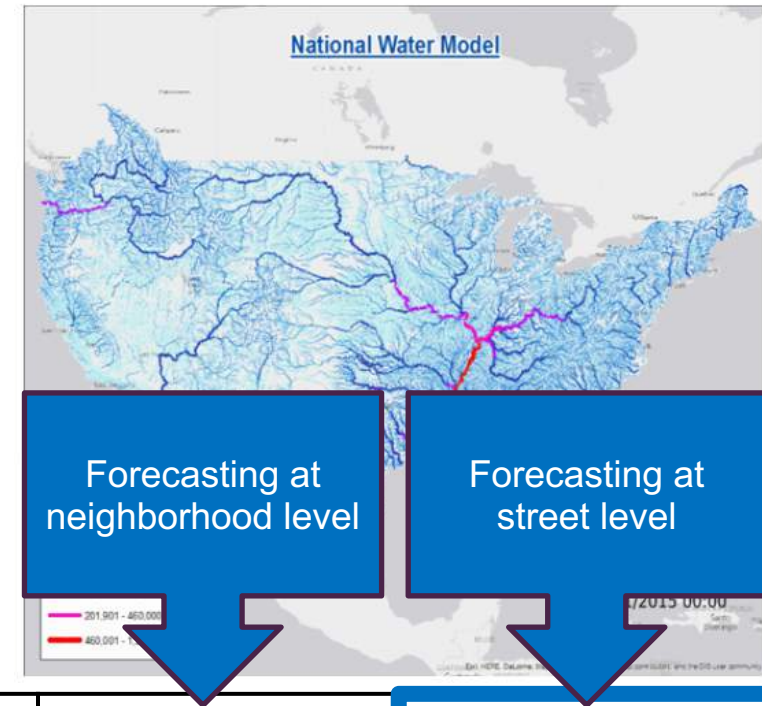
1:5M

+

Future

Hydrography derived from lidar

The Hydrography Requirements and Benefits Study indicates that the best way to meet most medium to long-term requirements is through fully integrating hydrography and elevation data by deriving hydrographic data from 3DEP data



Simulates conditions for 2.7 million stream reaches, representing *the biggest improvement in flood forecasting ever*

	IN USE TODAY: NHDPlus Medium Resolution	IN PROGRESS: NHDPlus High Resolution	FUTURE: Hydrography Derived from Lidar
Elevation source	30 meter	10 meter	1 meter
Hydrography source	1:100,000-scale NHD	1:24,000-scale or better NHD	1:5,000-scale or better derived from lidar
Number of features nationally	2.7 million	26 million	200-300 million

Water is among the defining issues of our times

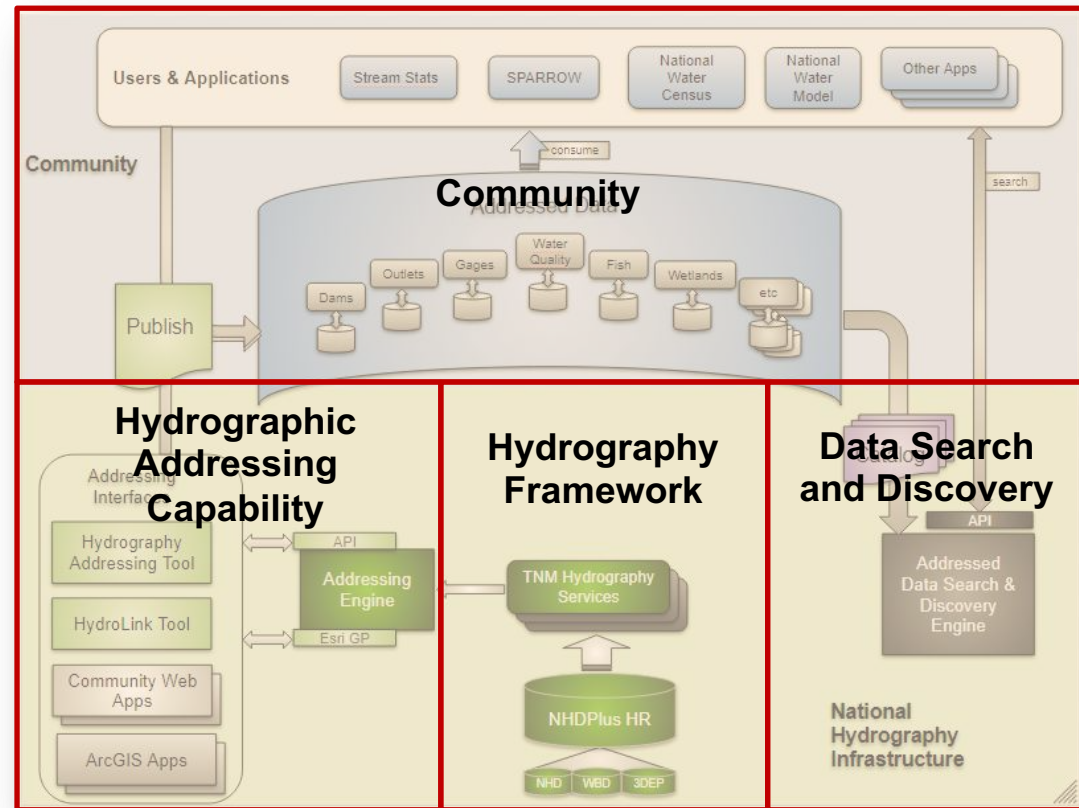
Too much, too little, poor quality

- Water crises are among the most probable and potentially impactful risks faced by society in the coming decade (World Economic Forum, 2014)
- A March 17, 2016 *New York Times* editorial summarizes that we as a nation have water-related “crises percolating all over, but lack the data necessary to make smart policy decisions”
- The Nation has no **common infrastructure** for managing water information collected by the nearly two dozen federal agencies and hundreds of state and local organizations with water in their mission



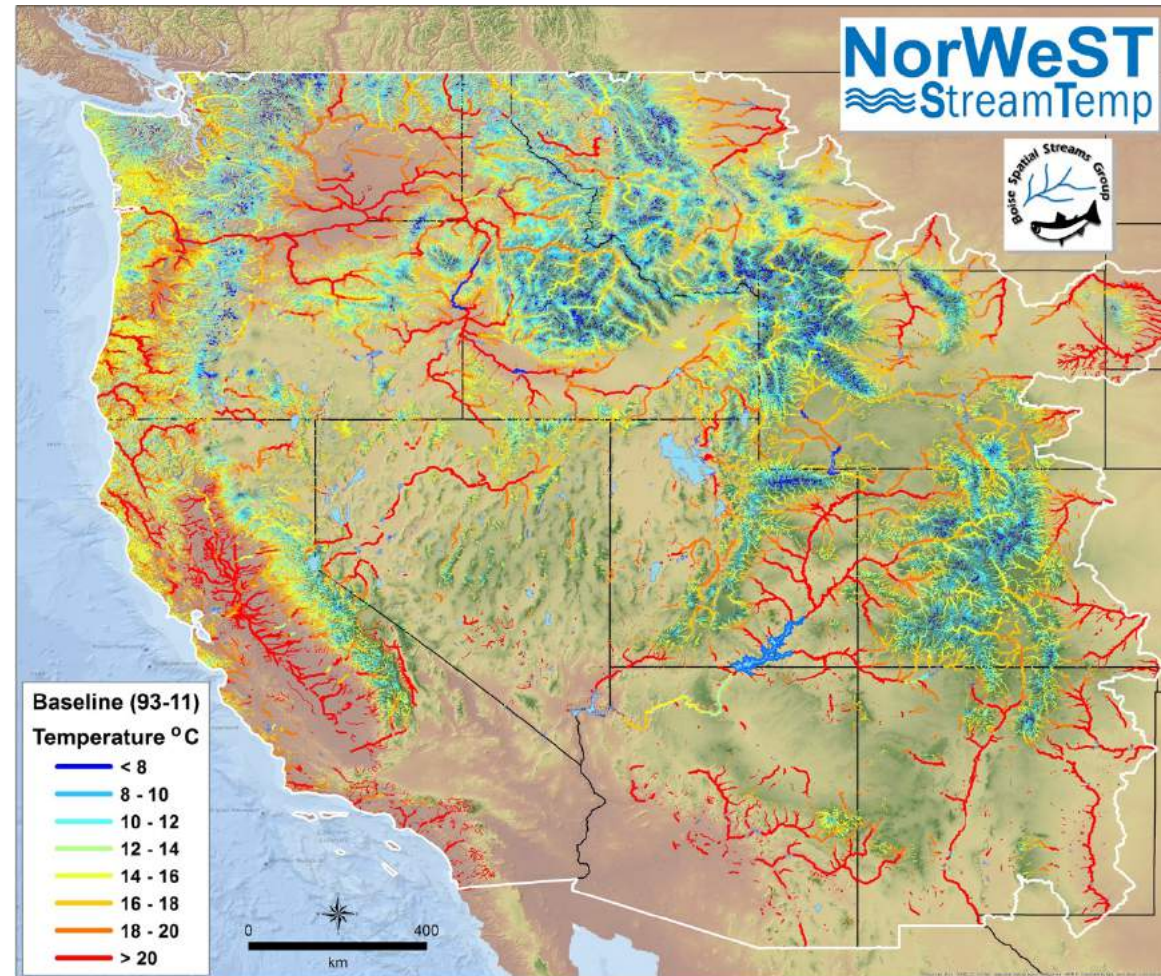
National Hydrography Infrastructure

- Combine foundational hydrography datasets with hydrographic addressing, catalog, and search engine functionality
- Provides the universal infrastructure for sharing and discovering limitless sources and types of water information
- Underpins interagency hydrologic observing systems and enable models that account for all the water in the water cycle – from the atmosphere to the oceans



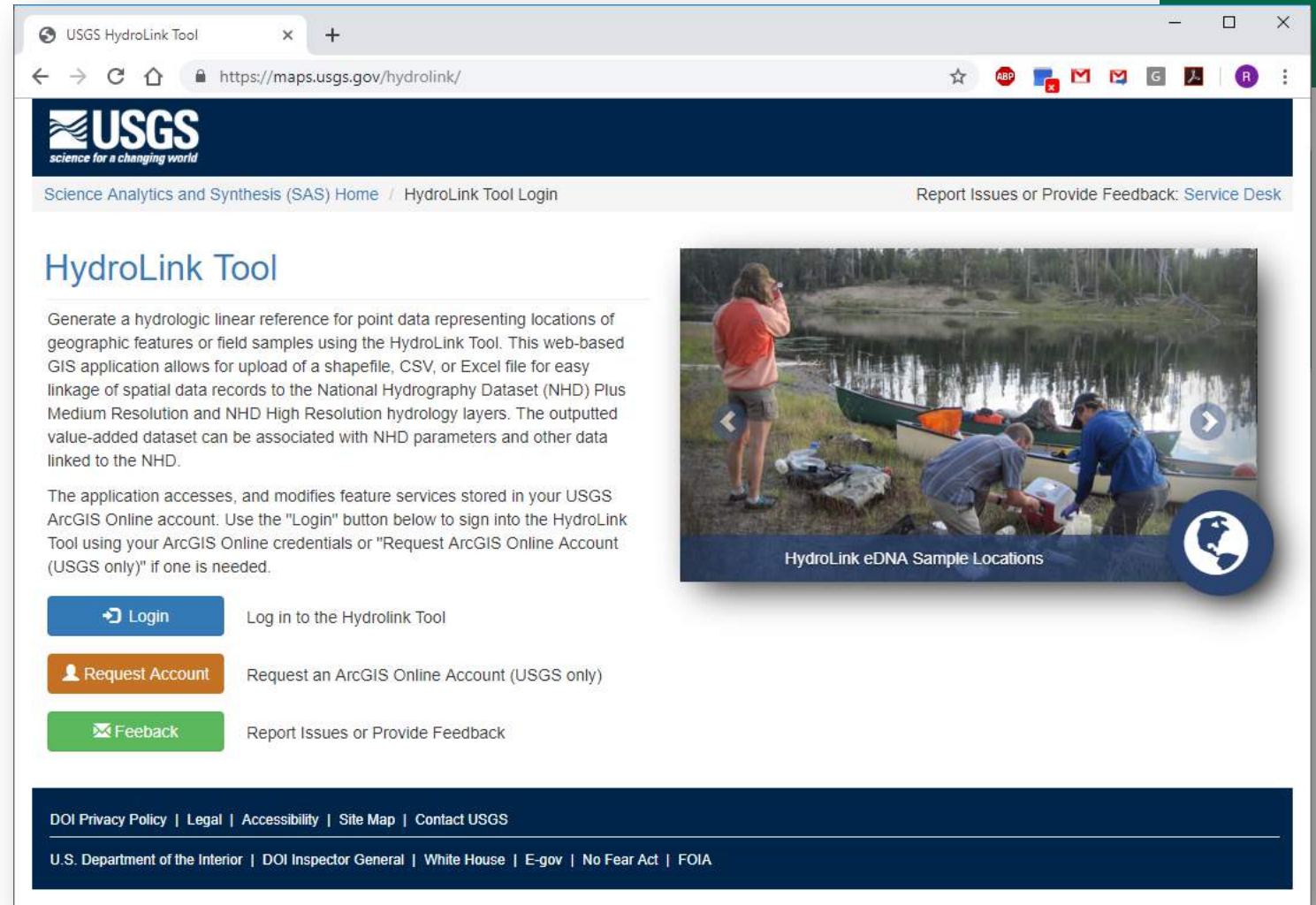
The Need for the National Hydrography Infrastructure

- Temperature database compiled from 100s of biologists and hydrologists working for >100 resource agencies and contains >150,000,000 hourly temperature recordings at >20,000 unique stream sites
- Data was scattered and not easily accessed, >12 person-years to compile for the Pacific Northwest, with more data collected since
- To collect from scratch would cost ~\$10M
- Huge investment in data that are valuable to a host of applications – NHI will make data like these easily accessible



Addressing Tools

- Desktop: Hydrologic Event Management (HEM) tools
- Web-based: HydroLink Tool links data to the NHDPlus V2 (100K network, not AK) and NHD – shows what's possible on the web
- Web-based: Hydrography Addressing Tool (in development) will provide advanced addressing capability
- HydroLink Tool training video now available



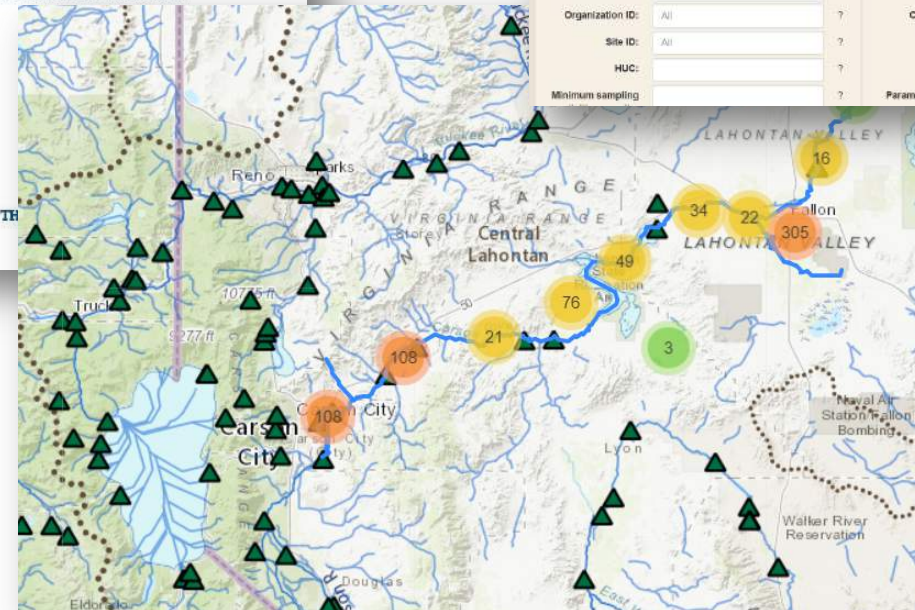
Catalog, Search, and Discover

- Addressed to the NHDPlus HR national hydrographic framework
- Cataloged and available for discovery by the community in their applications
- Leverage information from many sources for analysis, modeling, and visualization
- More addressed information can provide more context



INTERNET OF WATER: SHARING AND INTEGRATING WATER DATA FOR SUSTAINABILITY

A REPORT FROM THE ASPEN INSTITUTE
DIALOGUE SERIES ON WATER DATA



National Water Quality Monitoring Council
Working together for clean water

Water Quality Data

WQP Home | Download Data | How to use the WQP | National Results Coverage | About the WQP

[Reset form](#)

LOCATION

Place:

Country: ? Within miles of North:

State: ? Lat:

County: ? Long: East:

Point Location: ? Bounding Box: ?

Use my location

SITE PARAMETERS

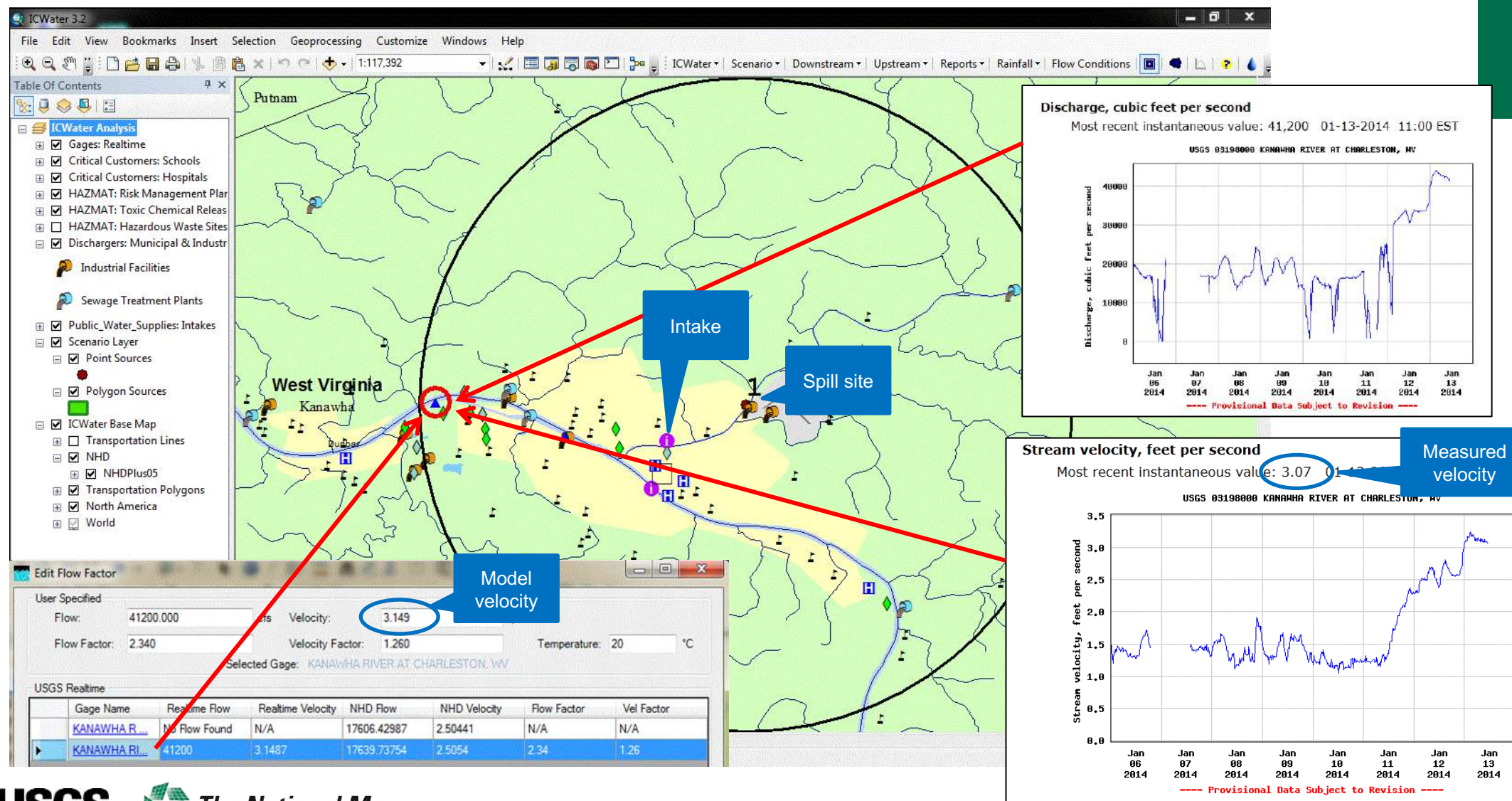
Site Type: ? Organization ID: ? Site ID: ? HUC: ? Minimum sampling: ?

SAMPLING PARAMETERS

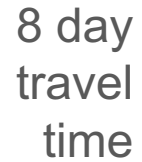
Sample Media: ? Characteristic Group: ? Characteristics: ? Project ID: ? Parameter Code: (NWIS ONLY) ?



ICWater QuickTrace – Cincinnati example



+



Water Quality Portal – Gold King Mine Spill

- USGS was asked to provide all historical water-quality data from NWIS downstream of spill
- Took a team of database and GIS experts about two weeks to compile
- Now with NHDPlus network query built into the Water Quality Portal, a similar request could be fulfilled in about two minutes

<https://cida.usgs.gov/nldi/huc12pp/140801040102/navigate/DD/wqp?distance=500>



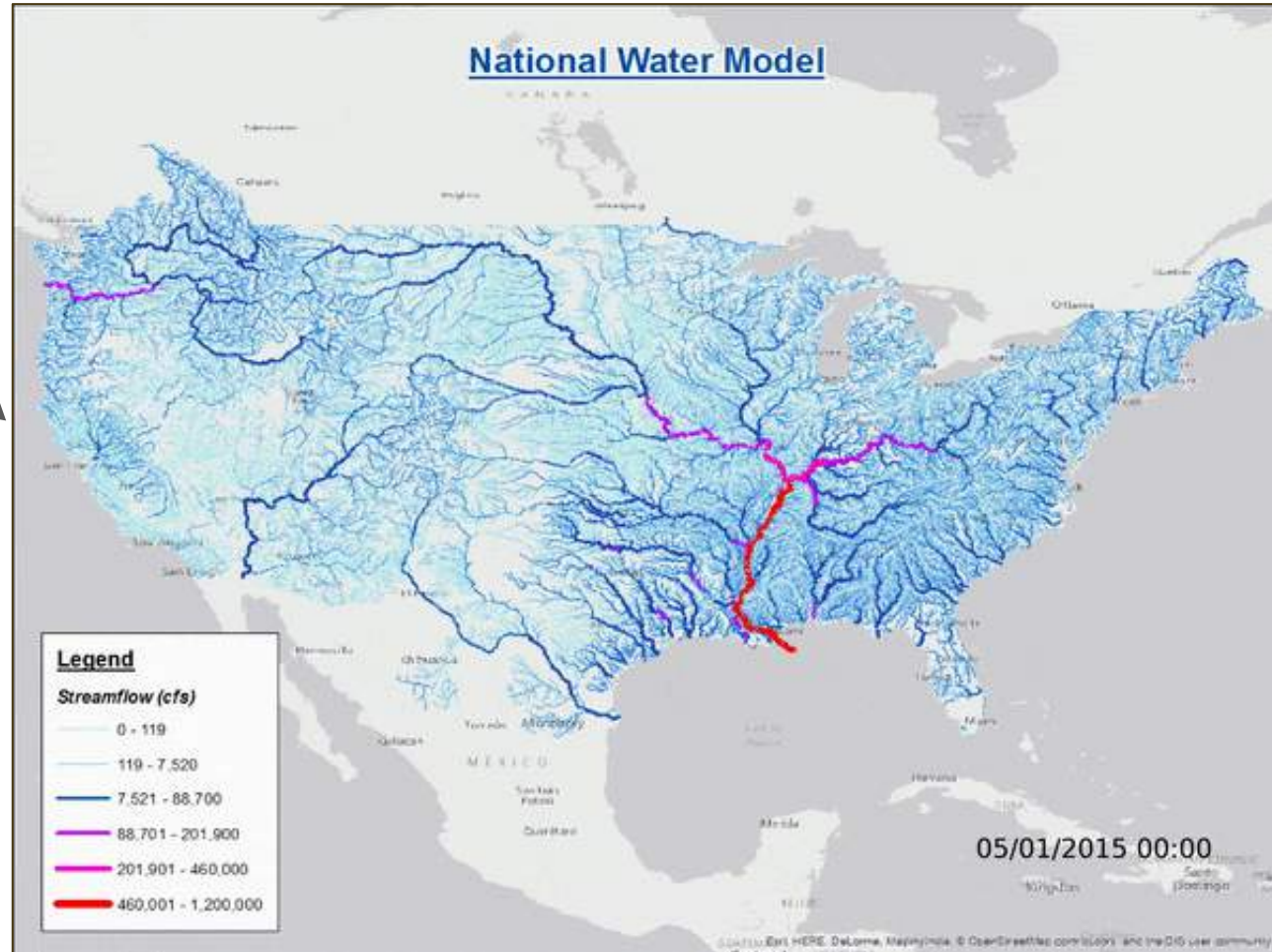
+ National Water Model

26

Current River Forecast Points (~3,600)



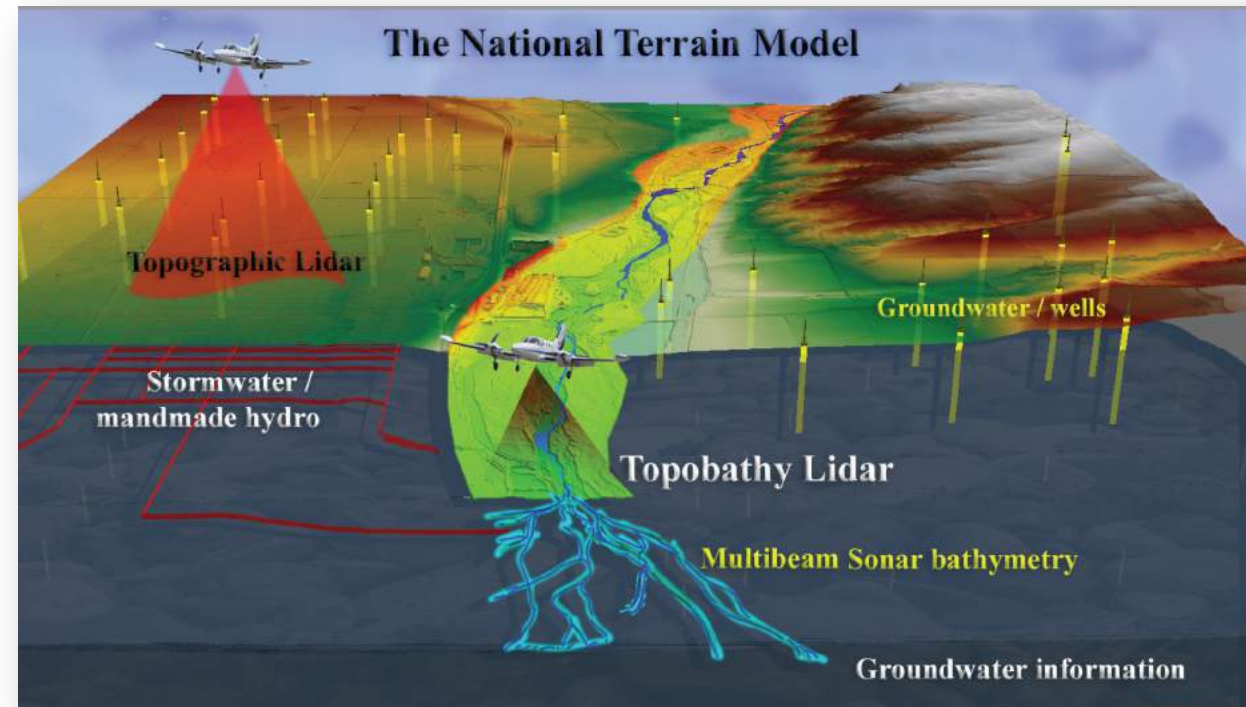
- Improves spatial detail of water prediction by over 700 times
- Fills in underserved areas
- Adds coastal areas



National Water Model simulation: Fernando Salas, NOAA-NWS

Next Generation – 3D National Terrain Model

- Derive hydrography from lidar to increase density of mapped features from 26 million to 200-300 million: enables flood forecasting and flood risk modeling in 3D, at the neighborhood level
- Develop the National Hydrography Infrastructure to underpin interagency hydrologic observing systems and enable models that account for all the water in the water cycle – from the atmosphere to the oceans
- Integrate inland bathymetry to extend the elevation surface under water bodies and replace estimated flow volume with volume calculated from a mapped surface
- Provide connection points to groundwater and manmade hydrographic features to allow better accounting of the hydrologic cycle
- Create a 3D topographic surface to support the 3D Nation concept of continuous elevation information from the peaks of our mountains to the depths of our oceans





Inland Bathymetry Workshop

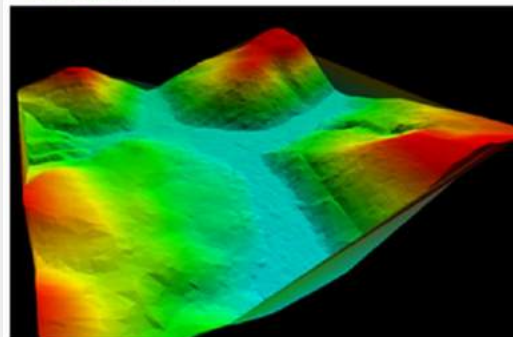
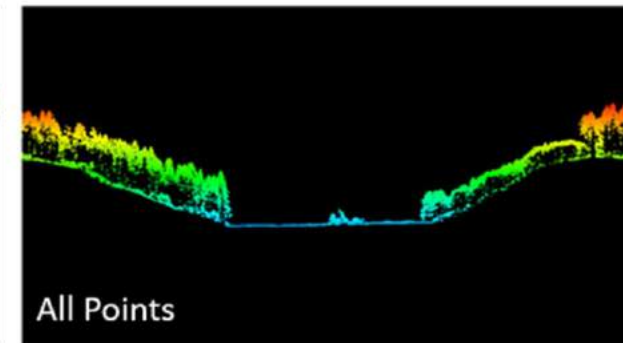
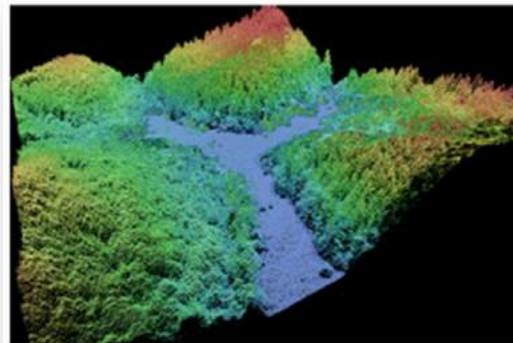
September 17-18, 2019

- Hosted by NOAA Office of Water Prediction and USGS National Geospatial Program
- National Water Center, Tuscaloosa, AL
- Goals of the workshop
 - Convene Federal scientists who are working with or interested in inland bathymetry to share perspectives and plans
 - Gather input to inform development plans of NGP for the next 1-3 years to advance the strategic vision of operationalizing inland bathymetry in the future
 - Begin to create a community of inland bathymetry users to continue the collaboration beyond the workshop
- Please contact Vicki Lukas (vlukas@usgs.gov) if you would like to be added to the distribution list



3D Elevation Program (3DEP)

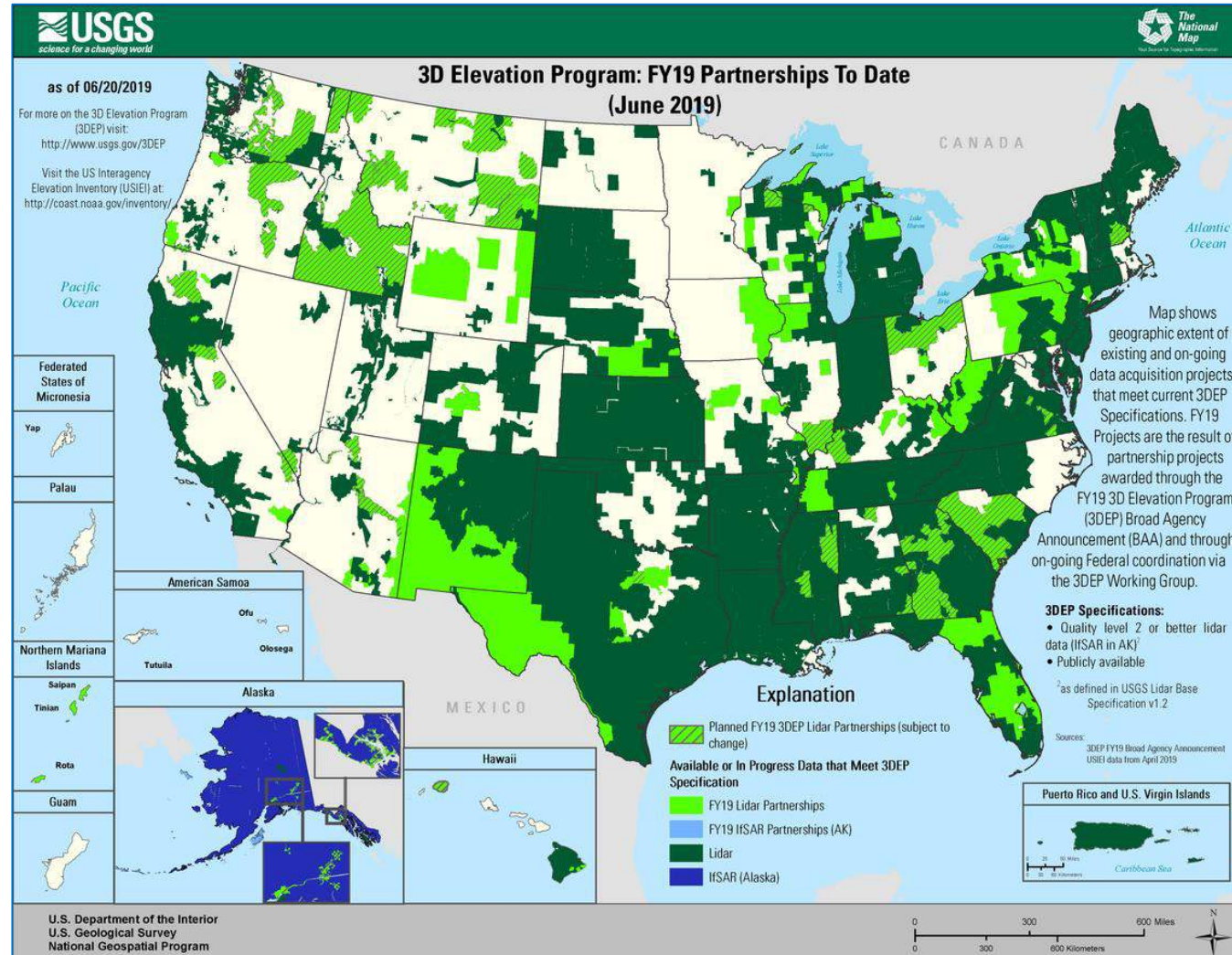
- Apply lidar technology to map bare earth and 3D data of natural and constructed features to enable more accurate understanding, modeling, and prediction
- Goal to complete acquisition of national lidar coverage with IfSAR in Alaska in 8 years
- Address the mission-critical requirements of 34 Federal agencies, 50 states, and other organizations documented in the National Enhanced Elevation Assessment
- ROI 5:1, conservative benefits of \$690 million/year with potential to generate \$13 billion/year
- Leverage the capability and capacity of private industry mapping firms
- Achieve a 25% cost efficiency gain by collecting data in larger projects
- Completely refresh national elevation data holdings with new products and services



+ 3D Elevation Program

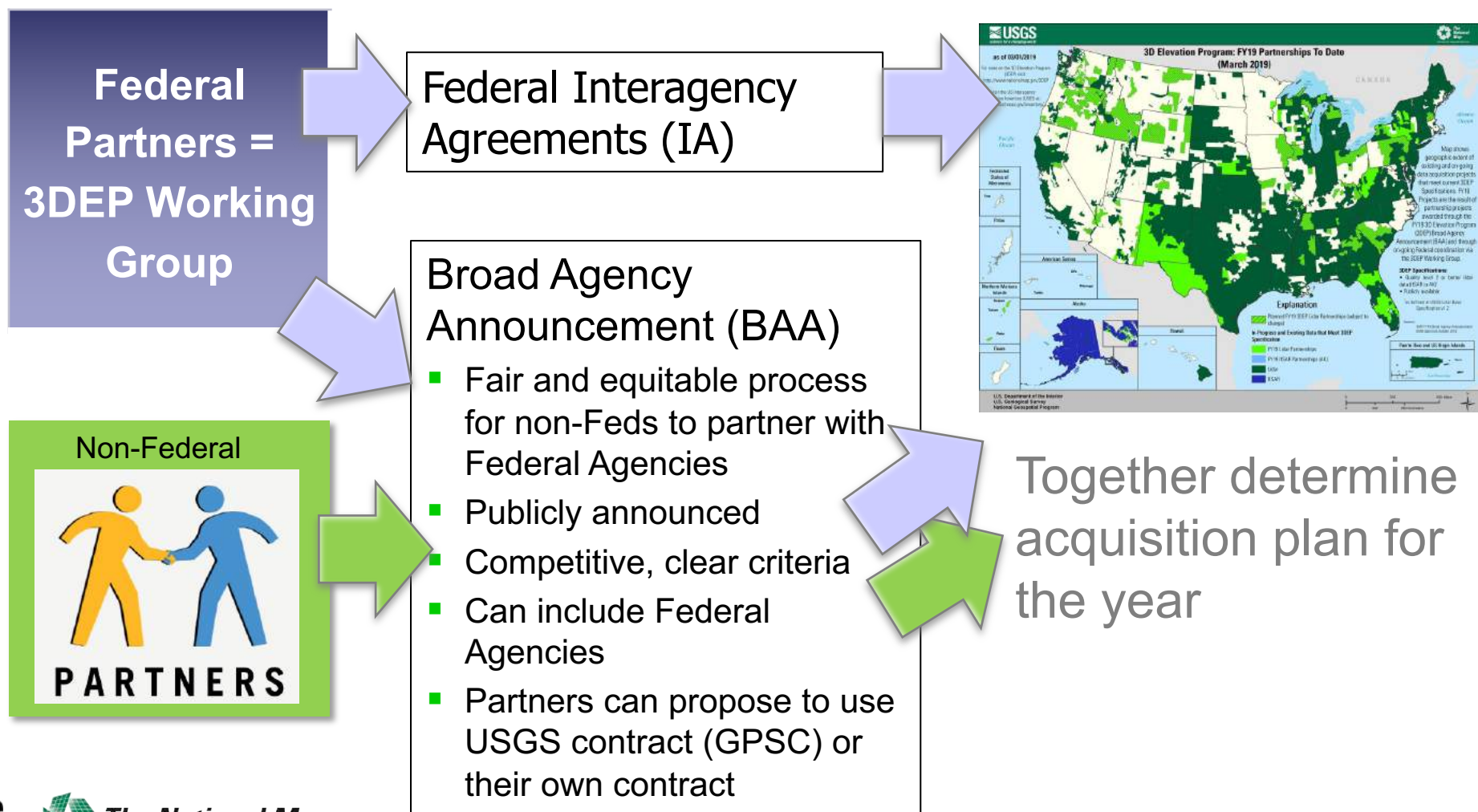
Current status

30



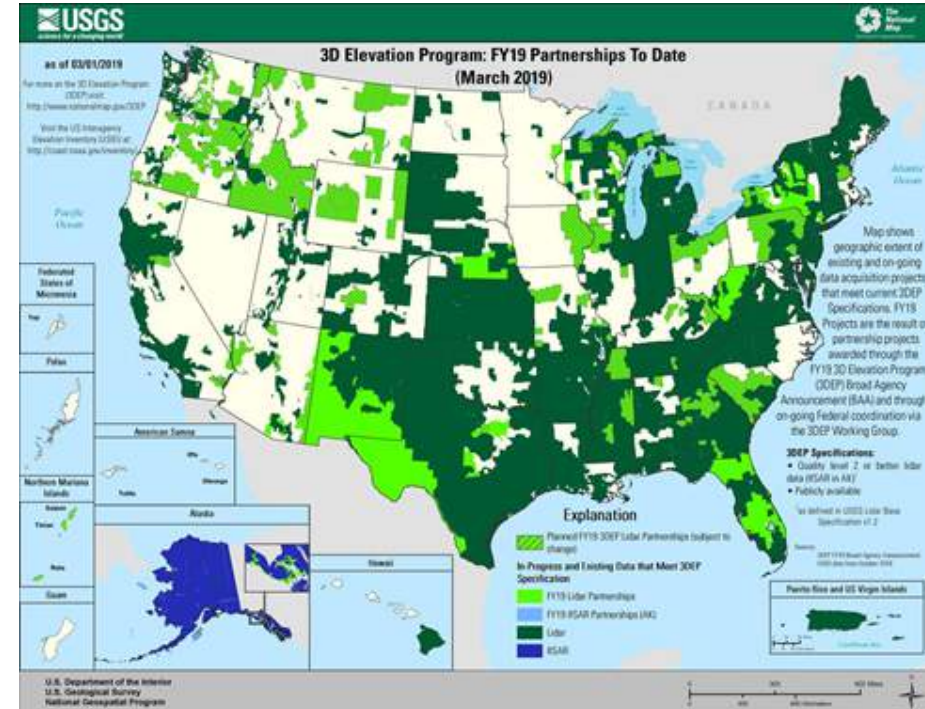
+ 3DEP Data Acquisition

3DEP is built on partnerships



3DEP Broad Agency Announcement

- Provides visibility and opportunity to the broadest stakeholder community possible through FedBizOpps.gov and grants.gov
- Federal, state and local governments, tribes, academic institutions, and private sector are eligible
- Partners may propose to use the USGS Geospatial Product and Services Contracts (GPSC) or their own contracting vehicles
- National Map Liaisons can assist partners with the process and coordinating partnerships
- 2020 BAA will open soon for new FY.
Webinar August 7 (register); BAA open late August



<https://nationalmap.gov/3DEP/index.html>

THANK YOU!

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