# CGIA Community Council Progress Report

Hydrography Workgroup	Report Date: March 21, 2024
Workgroup page*: http://cgia.org/cagiscouncil/workgroups/hydrography/	
Workgroup Chair: Jane Schafer-Kramer (jane.schafer-kramer@water.ca.gov)	
NHD pages on the CNRA Open Data site:	
https://data.cnra.ca.gov/dataset/national-hydrography-dataset-nhd and	
https://data.cnra.ca.gov/dataset/nhd-major-features	
NHD Stewardship Program page on the Department of Water Resources website:	
https://water.ca.gov/Programs/All-Programs/National-Hydrography-Dataset-Stewardship	

\*See the workgroup page for workgroup charter, members, contact information, and prior reports.

Members of this workgroup regularly interact as part of the ongoing work of the California Department of Water Resources (DWR) National Hydrography Dataset (NHD) Stewardship Program. Our primary partners are US Geological Survey, the **Geographical Information Center (GIC) at CSU Chico, and the Center for Geospatial Science and Technology (CGST) at CSU Northridge**. Past and current stewardship partners include CA Department of Fish and Wildlife, State Water Resources Control Board, Redwood National Park, <u>new partner</u> Lassen Volcanic National Park, Los Angeles County Public Works, the Marin County collaborators, and the US Forest Service. **New partners are always welcome.** 

# **Requests for Council Action**

None

# Status Update

# Planned Conference Presentations

Erik Fintel (Geographical Information Center (GIC) at CSU Chico) will present our approach to creating 3DHP data at the American Water Resources Association <u>Geospatial Water Technology Conference</u> in Orlando, FL in March 2024.

Joel Osuna-Williams (Center for Geospatial Science and Technology (CGST) at CSU Northridge) will teach a full-day workshop at <u>CalGIS 2024</u> in Visalia, March 18, The workshop will cover the basics of the National Hydrography Dataset, NHDPlus, the new 3D Hydrography Dataset, and linking your own data to the NHD using the Hydro Addressing Tool. Joel will give a presentation on our development of elevation derived hydrography tools for 3DHP data at CalGIS on March 20.

Joel and Erik have been accepted to present "Tools for the Next Generation of National Hydrography Data" at the Esri UC in July 2024 in San Diego.

# Elevation-Derived Hydrography Pilot Study

The Stewardship Team met in December and January with USGS technical staff to discuss not-yet-published requirements for elevation derived hydrography to be accepted into the 3DHP. Based on this new information, additional compliance tools have been developed and are being tested on the initial area of interest, the Los Angeles basin upper watersheds, and the newest area of interest, the Battle Creek subbasin in Shasta and Tehama Counties, including parts of Lassen National Forest, and Lassen Volcanic National Park.

# LA County Pilot

o 8 participating HUC10 watersheds

Participating HUC10 Watersheds:			
1807010602	1807010603		
1807010604	1807010605		
1807010606	1807010700		
1807020307	1809020804		

- o **~1,000 sq. km total area** 
  - $\circ$  wildland/forest area focus
  - $\circ$  dense urban areas excluded



# Battle Creek HU8 18020153

- $\circ$  956 sq km total area
- Wildland and agriculture
- o QL 1 lidar coverage

 In the figure below, the Battle Creek HU8 subbasin is outlined in yellow. County lines are red, HU8 subbasins are outlined in black. Green fill represents US Forest Service lands, and lavender fill represents Lassen Volcanic National Park lands.



The next areas of interest for testing the tools and workflow are along the far north coast and south coast.

# NHD is static; USGS is still working on final improvements to the Watershed Boundary Dataset (WBD)

The final version of the National Hydrography Dataset (NHD) for California was published on December 27, 2023, on the USGS website <a href="https://www.usgs.gov/national-hydrography/access-national-hydrography-products">https://www.usgs.gov/national-hydrography/access-national-hydrography-products</a>. Edits to NHD are no longer possible. The final version of the Watershed Boundary Dataset will be published on September 30, 2024. USGS will continue to host the static NHD and WBD on its website as legacy datasets for the duration of the 3DHP build-out and beyond. We cannot edit the data, and USGS has told us that corrections to the legacy data will be done in only very rare circumstances.

#### NHD derivative products have been updated on the CA Natural Resources Agency Open Data site:

https://data.cnra.ca.gov/dataset/national-hydrography-dataset-nhd . These include Major Rivers, Major Rivers and Creeks, and Major Lakes and Reservoirs, plus a NEW product: <u>CDEC Flow Stations with NHD Attributes</u>. California Data Exchange Center (CDEC) is managed by the Department of Water Resources. CDEC provides users access to hydrologic and climate information used to support real-time flood management and water supply needs in California. This file geodatabase contains two feature classes. CDEC flow gaging station locations (points) were added to the NHDPoint feature class of the National Hydrography Dataset by the California NHD stewardship team. One of the feature classes in this file geodatabase is a derivative of the NHDPoint feature class, containing only the CDEC flow station points with attributes from CDEC included. The other feature class represents the station points snapped to NHDFlowlines to aid in flow analysis.

#### Description

CDEC Flow Gaging stations were originally extracted from the California Data Exchange Center (CDEC) gaging stations dataset on 12/18/2020 by the Center for Geospatial Science and Technology (CGST) at CSU, Northridge (CSUN) in partnership with CA Department of Water Resources (CA DWR) and the Geographic Information Center (GIC) at CSU, Chico (CSUC). CDEC Gaging Stations with the sensor type of 20 (FLOW) were utilized for this work and were provided as an excel spreadsheet to join with the NHD Point Feature Class from the final static NHD Data download (12/27/2023) available from the USGS. The extracted CDEC flow stations spreadsheet was joined and associated with the NHD Point feature class by the common Permanent Identifier field ('Perm\_ID' in the CDEC spreadsheet and 'Permanent\_Identifer' in NHD). The joined data was exported into a separate NHD Point CDEC Flow Gaging Stations feature class. The exported joined feature class went through a Quality Assessment.

## The first release of the 3D Hydrography Program dataset happened in October as a map service at

https://apps.nationalmap.gov/services/.

REST: https://hydro.nationalmap.gov/arcgis/rest/services/3DHP\_all/MapServer .

Web Viewer:

https://www.arcgis.com/home/webmap/viewer.html?url=https://hydro.nationalmap.gov/arcgis/rest/services/3DHP\_all/MapServer&sourc e=sd

A feature service is expected in 2024. There is one HU 8 watershed in Alaska that has been built to the new specification, and the rest of the national extent is the NHD data converted to the 3DHP data model, but without z values. As new elevation-derived hydrography is accepted into 3DHP it will replace the NHD data for those extents. New 3DHP vector data will have z values. The build-out of the 3DHP is expected to take nine years, depending on federal funding.

The **NHD stream periodicity attributes** – perennial, Intermittent, ephemeral - will be replaced by a numerical value, based on the <u>USGS Probability of Streamflow Permanence (PROSPER) model</u>. USGS expects to have this applied to all flowline features in the 3DHP by sometime in 2025.

# 3D Hydrography Program Data Model

A screenshot of the 3DHP Map Service appears below. Some attributes from NHD Plus appear in the fields but are not yet populated. Mainstem ID replaces the NHD reach code. Mainstem IDs are designed to be compatible with the <u>Internet of Water's Geoconnex</u>. Geoconnex is a system for connecting water data from different data providers via geographic location. "This revolutionary water dataspecific search index links disjointed water data with structured metadata, enabling seamless organization and discovery of information by theme and location. Ultimately, Geoconnex will unlock a Google-like experience, helping save countless hours in water data searches for the benefit of water managers, researchers, and the public alike." <u>https://www.youtube.com/watch?v=7zKnSvoVL8w</u>

Some modifications to the data schema are anticipated. More information on this can be presented at a future meeting.

	▲ Flowline (1)	
	Flowline	
	Flowline - Flowline	
	shape_Length	3389.541092
1977/1	OBJECTID	29881458
	id3dhp	X4JF
	featuredate	9/14/2023
	mainstemid	https://geoconnex.us/usgs/mainstems/4375825
	gnisid	229017
	gnisidlabel	Moore Creek
Mountain	featuretype	1
(Elementary School	featuretypelabel	River
	lengthkm	2.655835
	waterbodyid3dhp	Null
	flowdirection	1
Haurit Batfir Inlan	flowdirectionlabel	Flow direction is in digitized direction, and z-values on vertices flow downslope
Moundain College	onsurface	1
	onsurfacelabel	Feature is on the land surface
	shape	Polyline
Veterants Heliothis	catchmentid3dhp	Null
	flowpathid3dhp	Null
Angwin	streamlevel	Null
	startflag	Null
	terminalflag	Null
	streamorder	Null
	streamcalculator	Null
	hydrosequence	Null
	dnhydrosequence	Null
	uphydrosequence	Null
	dnlevelpath	Null
	uplevelpath	Null
Sentinel	pathlength	Null
	arbolatesum	Null
	divergence	Null
	divergencelabel	Null
	rtrndivergence	Null

In addition to the vector and tabular datasets, the raster products for flow direction and flow accumulation will be included.

Overall, the data model is much simpler than the NHD data model in that there are many fewer FCode domains

# Recent Hydrography Videos from USGS:

## Transferring Deep Learning Knowledge for Scaling Up Hydrographic Feature Extraction <u>https://youtu.be/OR4YwQqpK10?si=bxyx7B\_Cunis75iK</u>

*Our Future in 3D: The 3D National Topography Model and the 3D Hydrography Program* <u>https://www.youtube.com/watch?v=4glCa1Z5\_fg</u>

3DHP v2023 Data Model and Database Contents https://youtu.be/VJRteEepH2c?si=MteqzBCXgqO41dQg

The video for the November 28, 2023, USGS Hydrography Community Call on "Strategies for improving the Washington State Hydrography Dataset (WASHD)" is now available. The video is on both YouTube and the USGS site; please see links below: <u>https://youtu.be/MKWasgYGzsY</u> <u>https://www.usgs.gov/media/videos/strategies-improving-washington-state-hydrography-dataset-washd</u>

Background on the 3DHP Program is available at <u>https://www.usgs.gov/national-hydrography/3d-national-topography-model-call-action-part-1-3d-hydrography-program</u>

## How 3DHP Data is Acquired

A major difference between NHD and 3DHP is in how the data is created and who is creating it. The NHD was created when USGS digitized the blue lines from paper topographic maps that were created from on-the-ground surveys in the mid-20<sup>th</sup> century. In the 2000's USGS sought help from the states to improve the features using tools and workflow developed and managed by USGS. Participation from the states and from federal partners such as US Forest Service and Bureau of Land Management was inconsistent, mostly due to lack of funding. The editing tools and workflows were challenging and time-consuming. In California, the data has been improved at the 1:24,000 scale over the past nine years, but there are still parts of the state where the features represent what was on maps from the mid-20<sup>th</sup> century.

The 3DHP hydro feature extraction process takes advantage of automation technology and high-quality elevation surface data that is now available. But USGS is not developing the tools and workflow for 3DHP. Instead, USGS has launched a **Data Collaboration Announcement** to accept proposals for cost-sharing between the state and regional collaborators to have private industry partners do the work under USGS' Geospatial Products and Services Contracts (GPSC). These proposals were due October 20, 2023 (for FY 2024 funding) but later submissions are being accepted. USGS also plans to share funds under Cooperative Agreements with organizations that will do the data creation work. The California stewardship partners will seek funds under the Cooperative Agreement approach when that becomes available, hopefully in the latter half of 2024. California is a very large state and there is an opportunity to get the 3DHP built out more quickly through collaboration and cost sharing via the GPSC along with the Cooperative Agreements. Anyone interested in learning more about this may contact Drew Decker, USGS National Map Liaison, at <u>ddecker@usgs.gov</u> and Jane Schafer-Kramer, Technical Lead for Hydrography Data Stewardship for CA <u>nhd\_stewardship@water.ca.gov</u>. The website for the FY24 Data Collaboration Announcement is <u>https://www.usgs.gov/programs/national-geospatial-program/data-collaboration-announcement-portal</u>

### **Ongoing Work**

**Our Interagency Agreements** with the Geographical Information Center at CSU-Chico and the Center for Geospatial Science and Technology at CSU-Northridge are supporting the development of tools and workflow to create 3DHP-compliant hydrography. Our stewardship team meets regularly to discuss the current pilot study, next steps, and longer-range plans.

Action	Key Date
Continue work on elevation-derived hydrography in areas TBD under current interagency	Q4 2026
agreements with CSU partners. This work is funded through December 2026.	
Complete elevation-derived hydrography pilot for Los Angeles County	Q1 2024
Outreach to Counties and Regional groups on the cost sharing opportunities for 3DHP	ongoing

#### **Other Notes**

The datasets may be downloaded from these linked cloud hosting sites: <u>Download the NHD by 8-digit Hydrologic Unit (HU8)</u> <u>Download the NHD by 4-digit Hydrologic Unit (HU4)</u> <u>Download the NHD by State</u>

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