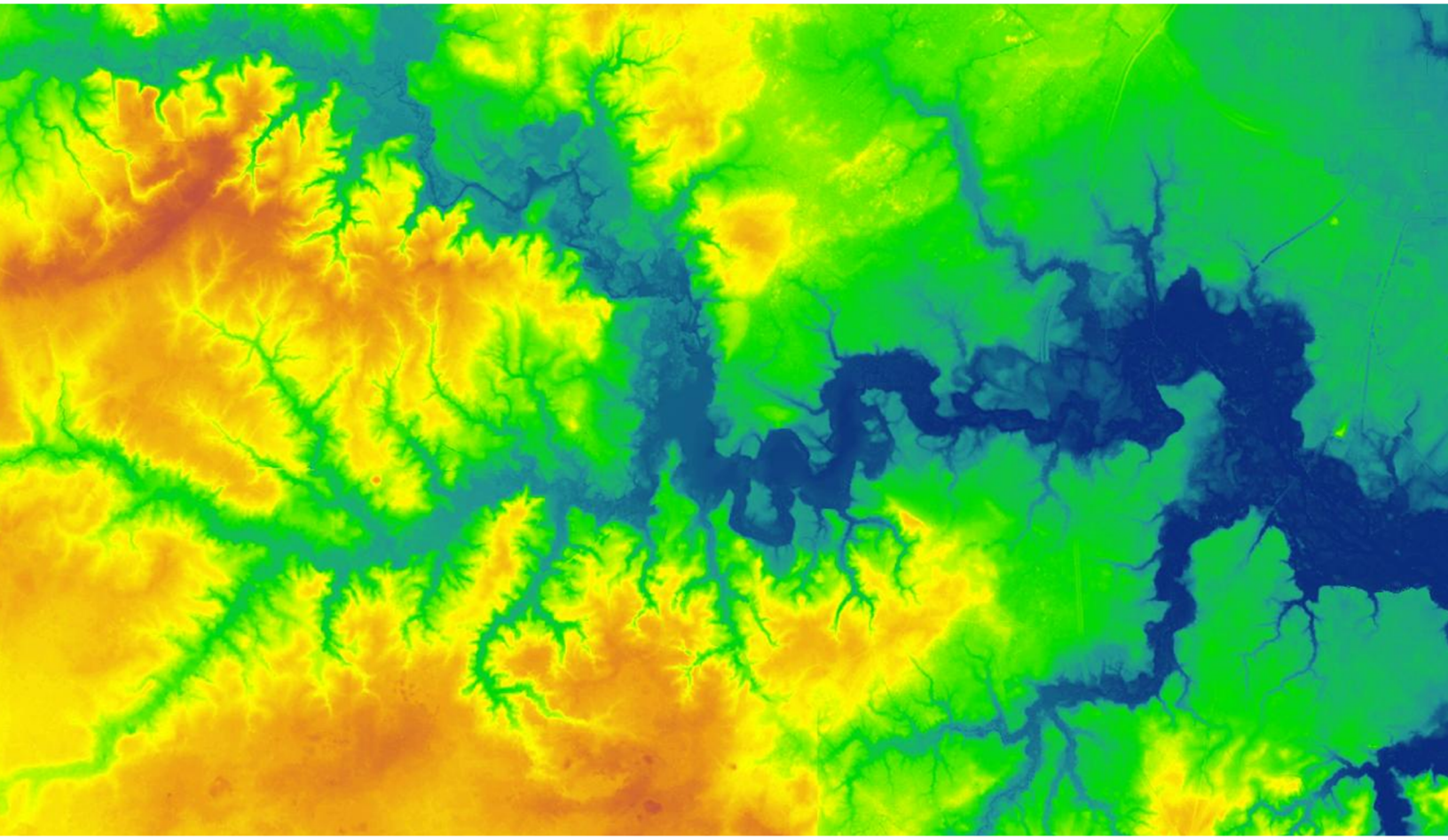
North Carolina Hydrography Working Group



Gap Analysis and

Unfunded Needs

Presented to:
The Statewide Mapping Advisory Committee
of the
North Carolina Geographic Information Coordinating Council

September 2023

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Hydrography Data in North Carolina

Hydrography datasets represent the water drainage network of North Carolina with features such as rivers, streams, canals, lakes, ponds, and coastline. These data can be used for a wide variety of purposes such as water quality protection, resource management, infrastructure planning, and cartographic display. Mapping of hydrography has advanced since the creation of the legacy 1:24,000 USGS National Hydrography Dataset (NHD) and the lidar derived NC hydrography created in 2007. Higher quality base data combined with more advanced data extraction techniques now produce more accurate hydrographic features.

Data Updates and Stewardship

The primary contributors to updated hydrography data in North Carolina are the Department of Environmental Quality Division of Water Resources (NCDEQ-DWR), North Carolina Department of Transportation (NCDOT) and the North Carolina Floodplain Mapping Program (NCFMP). Each found that the current 24K hydrography did not meet their needs. NCDEQ created the Headwater Streams Spatial Dataset (HSSD), a lidar-derived hydrographic dataset that is primarily a hydrographic model and includes representations of water flow beyond the on the ground stream network. Modeled streams most likely to be intermittent or perennial will be used in NCDOT's planning tool, Advancing Transportation through Linkages, Automation, and Screening (ATLAS). ATLAS is a project screening tool used by NCDOT that combines hundreds of data layers to facilitate transportation planning. NCDEQ and NCDOT will be the stewards of an updated NC Hydrography dataset. A more detailed description of each historic and current hydrography dataset can be found in the full gap analysis document.

Statement of Need

The Hydrography Working Group (HWG) was formed because the best available hydrography for the state (NHD) was not meeting the GIS user community's needs. The NC Hydrography (NC Hydro) dataset can be created by consuming the base linework of the ATLAS project and adding features necessary to meet stakeholder needs. NC Hydro must meet the business needs of the majority of stakeholders including geometric accuracy, completeness, and attribution.

Every two years, the National States Geographic Information Council (NSGIC) performs a Geospatial Maturity Assessment (GMA), a national review of statewide foundational datasets resulting in scores that allow states to assess progress toward mature, accurately maintained data. In 2021, North Carolina scored high on the GMA scorecard overall (A-), but the hydrography scored only a C+ because of the inadequacies of our hydrography, that include age, lack of maintenance funding, and lack of a stewardship agreement with the USGS.

Importance to North Carolina Users

Hydrography data is a critical dataset for planning, development, and resource protection. ATLAS was created to allow NCDOT to more accurately plan transportation project routes and budgets and to avoid and minimize impacts to natural resources. Previous datasets including the NHD were not as spatially accurate, and they lacked cartographic representations of real-world streams, or they contained

representations of streams that did not exist. Developers and planners rely on these datasets to make decisions about siting and budgets, and more accurate data leads to fewer unexpected and project altering discoveries during planning.

The resource management community extensively uses hydrography data. NCDEQ-DWR uses the dataset as a base for mapping stream classifications that report important resources such as drinking water supplies, high quality waters, and outstanding resource waters. The North Carolina Wildlife Resources Commission uses the data as the base for their mapping of trout, inland, and coastal fishing waters on their website used by anglers to find fishing opportunities. Local governments use the data to understand where water resources exist in the community and how those systems may be used for recreational and tourism, and how the systems may impact the community during flooding or storm events. Regional organizations use the data for resiliency plans that may include topics such as spill response, flooding, water availability and supply, non-point source pollution, and resilient community development.

Unmet Needs

The HWG collected needs from hydrography users in many sectors including local, state and federal government, the research and education community, surveyors, and the private sector. An extensive review of the ATLAS data and user needs produced the gaps outlined in this summary. For a detailed analysis of the gaps contained in this document, please refer to the full gap analysis document.

Because ATLAS hydrography is now the best available data for the state, the HWG is using the ATLAS Hydrography as a starting point for a more accurate hydrography dataset that would become NC Hydro. HWG Stakeholders have identified shortcomings in ATLAS Hydrography that must be addressed in order to meet the vision of NC Hydro. The HWG has identified the following needs and gaps between ATLAS data and NC Hydro specifications. The list below is not exhaustive of all potential gaps, and improvement work is ongoing, so some items may be incorporated into future ATLAS data releases.

Gap Analysis Summary

The following table summarizes the current gaps between ATLAS Hydrography, NC Hydro and EDH. The left column lists gaps, and the right two columns indicate whether the gap is necessary for NC Hydro or EDH. **ATLAS Hydrography Gaps**	**NC Hydro**	**EDH**
Polyline Issues		
Stream Segmentation		
Combine segments between confluences.	☒	☒
Reaches will be split where needed to represent breaks in DWR Assessment Units.	☒	☐
Smoothing		
Smooth rasterized lines for a cartographic appearance while maintaining accuracy within EDH specifications when possible.	☒	☒
Shorelines		
Develop both a shoreline feature in the polyline dataset (or a separate shoreline dataset)	☒	☐
Add polygon waterbody feature in the polygon dataset	☒	☒
Topology must be maintained between the two features	☒	☐
Waterbody Issues		
Waterbody size		
Add waterbodies that meet the minimum ¼ acre size to the dataset.	☒	☒
2D Rivers		
Add streams and rivers represented as polygons to match current EDH and Western NC Hydrography specifications.	☒	☒
Feature attributes and network connectivity		
Hanging Waterbodies		
Where preferential flow paths exist, connect hanging lake/ponds to the stream network with an attribution of modeled connector.	☒	☒
New waterbody must be mapped in between a hanging waterbody and the start of the network.		
Add waterbodies that meet the minimum ¼ acre size to the polygon dataset.	☒	☒
Add waterbody shorelines that meet the minimum ¼ acre size to the polyline/shoreline dataset.	☒	☐
Connect hanging lake/ponds to the stream network with an attribution of modeled connector.	☒	☒
Add artificial paths through the waterbody.	☒	☒
New waterbody is added upstream of most upstream feature in the network. This could be upstream of a pond or of the stream origin point.		
Add waterbodies that meet the minimum ¼ acre size to the polygon dataset.	☒	☒
Add waterbody shorelines that meet the minimum ¼ acre size to the polyline/shoreline dataset.	☒	☐
Connect hanging lake/ponds to the stream network with an attribution of modeled connector.	☒	☒

ATLAS Hydrography Gaps Continued	NC Hydro	EDH
Feature attributes and network connectivity		
New waterbody is added in line on an existing stream.		
Add waterbodies that meet the minimum ¼ acre size to the polygon dataset.	☒	☒
Add waterbody shorelines that meet the minimum ¼ acre size to the polyline/shoreline dataset.	☒	☐
Attribute stream segment as artificial path where it flows through the waterbody.	☒	☒
New waterbody is added that has no discernable overland connection to the network.		
Add waterbodies that meet the minimum ¼ acre size to the polygon dataset.	☒	☐
Add waterbody shorelines that meet the minimum ¼ acre size to the polyline/shoreline dataset.	☒	☐
A connector will not be added to the stream network unless a connection is confirmed through field or additional investigation.	☒	☐
Waterbody differentiation		
Split waterbody features to represent distinct rivers and lake features, and split complex lake features with multiple shoreline assessment units into distinct units.	☒	☐
Z Enabled Features		
Add Z values according to EDH READ rules	☐	☒
Water Boundary Dataset		
Stream connectivity		
Edit network to ensure stream network connectivity between 10-digit HUCS	☒	☒
Watershed Boundaries		
Create watershed boundaries to meet USGS WBD specifications	☒	☒
Attribute watershed boundaries and coordinate with USGS for attribution	☒	☒
Stewardship and Maintenance		
Roles		
Continue partnership between DWR and DOT.	☒	☐
Formalize roles and responsibilities.	☒	☐
Update and Maintenance		
Implement Enterprise GIS to serve data and formalize relationships with potential editors outside of DWR and DOT	☒	☐
Stewardship		
Maintain communication with USGS and look for opportunities to push NC Hydro to the national dataset.	☒	☐
NHD Specific Issues		
Data must match underlying 3DEP 1-meter DEM	☐	☒
Hydroflattened waterbodies	☐	☒
EDH attributes	☐	☒
Point feature class	☐	☒

Acronyms and Data Sources

Data Sources

Much of the text below require some background understanding of the data layers that will form the basis of NC Hydro. The HSSD is a model of water flow; the ATLAS dataset is a subset of the HSSD consisting of modeled intermittent and perennial streams as well as waterbodies greater than 2 acres. NC Hydro will build upon HSSD and ATLAS work and be the public facing NC Hydro dataset for general use.

HSSD: Headwater Stream Spatial Dataset

This is a model of surface water flow represented as preferential flow paths, some of which are labeled as having "at-least" intermittent flow regimes based on a suite of ecoregion based prediction models.

ATLAS: Advancing Transportation Through Linkage and Screening

ATLAS is an NCDOT planning application containing the intermittent and perennial modeled streams from HSSD as well as added attributes from state agencies.

NC Hydro: The proposed updated hydrography dataset which will build upon HSSD and ATLAS data.

NHD: The National Hydrography Dataset

A 24K representation of hydrography maintained by the US Geological Survey.

3DHP: 3D Hydrography Program

A new proposed national hydrography data model that will replace the NHD. This model is based on elevation derived hydrography (EDH).

3DNTM: 3D National Topography Model

To support a broad range of applications, 3DNTM integrates USGS elevation and hydrography datasets to model the Nation's topography in 3 dimensions.

Acronyms

3DEP – 3D Elevation Program

DCA: Data Collaboration Announcement

DWR – North Carolina Division of Water Resources

GICC- Geographic Information Coordinating Council

GIS -Geographic Information Systems

HWG- Hydrography Working Group

NCDCM: NC Division of Coastal Management

NCDEQ – North Carolina Department of Environmental Quality

NCDOT – North Carolina Department of Transportation

NCFMP - NC Floodplain Mapping Program

NCWRC: NC Wildlife Resources Commission

NEPA - National Environmental Policy Act

SMAC -Statewide Mapping Advisory Committee

RDBMS - Relational Database Management System

USACE: US Army Corps of Engineers

USGS – United States Geological Survey