North Carolina Geographic Information Coordinating Council

2022 Annual Report

June 2023

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Presented to:

Roy Cooper, Governor
Joint Legislative Commission on Governmental Operations

Contents

Executive Summary

The N. C. Geographic Information Coordinating Council (GICC) was established by the N.C. General Assembly in August 2001 and is supported by the N.C. Department of Information Technology (NCDIT). The N.C. Center for Geographic Information and Analysis (CGIA), within NCDIT's Government Data Analytics Center (GDAC), staffs the council.

N.C. General Statute (N.C.G.S.) §143B-1421(g) requires the council to report annually to the Governor and the Joint Legislative Commission on Governmental Operations. The council submits this report to share its strategic focus on data-driven collaboration, outline priorities and challenges, and update the Governor and the commission on its fiscal year 2021-2022 accomplishments.

Over its 30-year history, the GICC has coordinated groundbreaking geographic information systems (GIS) framework datasets and served as a model for other states' programs. Council coordination for important framework datasets such as orthophotography, seamless parcels, road networks, and addresses forms the backbone of spatial analytics that support state, local, and private initiatives. These mature datasets, supported by the work of the council, provide immense value to public and private programs.

The council coordinates to continuously improve data and services while supporting the citizens and governments in North Carolina. Geospatial data is a powerful tool for broadband expansion, regional planning, resource protection, and economic development, and the council continues to coordinate projects that support a healthy North Carolina economy, environment, and community. Support for Next Generation 911, a review of infrastructure data availability and security, and an update to AddressNC data are just a few examples of council-coordinated projects that support a resilient North Carolina.

The council's work involves not only data and analytic tools but also the state's GIS community. It is the dedicated GIS community that volunteers for council working groups and creates successful projects. Support for these GIS users includes a migration to cloud hosting for NC OneMap to ensure that GIS resources are always available and meet user needs. The GICC's leadership and forward thinking support a strong GIS community, and fiscal year 2021-2022 continued these successful efforts.

Introduction

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The council is the state's central point for geospatial collaboration and mapping and supports local and state geospatial programs and services. The council serves to improve the quality, access, and cost-effectiveness of geospatial resources for state, federal, local, academic, and private organizations while promoting the value of geographic information.

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About the Council

The council meets quarterly to consider policies, issues, and initiatives. Council meeting dates for fiscal year 2021-2022 were: August 11, 2021; November 3, 2021; February 23, 2022; and May 11, 2022. Alex Rankin of CESI Civil-Geotechnical-Surveying chaired the council during the August and November meetings. Hope Morgan of AECOM was named by Governor Cooper as chair of the council in November 2021 and served as GICC chair during the second half of the fiscal year.

Figure 1. GICC members are appointed by a range of organizations to represent the entire GIS community in North Carolina.

The council is composed of a broad set of stakeholders representing perspectives from local, state, and federal government, higher

education, and private business. The council's collaboration promotes better decision-making across all sectors in North Carolina. The council has three user-oriented standing committees: the Local Government Committee (LGC), the State Government GIS Users Committee (SGUC), and the Federal Interagency Committee (FIC). Two technical committees, the GIS Technical Advisory Committee (TAC) and the Statewide Mapping Advisory Committee (SMAC), address policy, guidance, and technical issues in collaboration with the user-oriented committees. Chairs of all five standing committees as well as the council chair and council representative from the Office of State Budget and Management compose the Management and Operations Committee (M&O), which handles the council's business between quarterly meetings. New committee chairs were appointed for the LGC, SGUC, and TAC this fiscal year. Alice Wilson with the City of New Bern stepped down as LGC Chair, and Natalie Walton-Corbett of the City of Greenville was elected to LGC Chair. Melanie Williams of the N.C. Department of Environmental Quality (DEQ) was named SGUC Chair. Matt Helms of Charlotte Water was appointed to replace the expiring term of Dean Grantham with DEQ. In addition to 36 council members, more than 50 individuals contribute to committees and ad-hoc working groups.

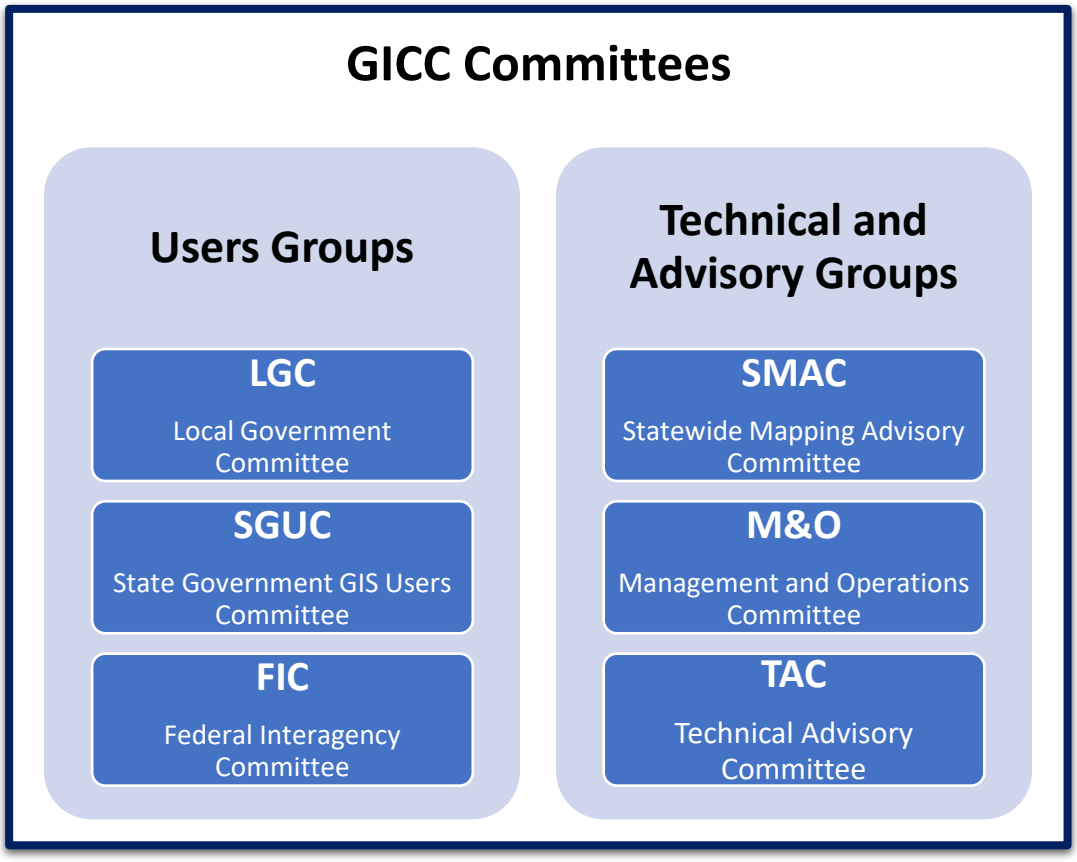

Figure 2. The GICC and its statutory committees.

Committee members, the state's GIS community, and the public use the council's website (it.nc.gov/gicc) and NC OneMap (nconemap.gov) website to keep current on initiatives, meetings, opportunities, and news about both entities.

What Is GIS?

Often, geographic information systems (GIS) are understood as maps, but what is missing from that simplified definition of GIS is the power of location-based, data-driven decision support. GIS is a network of feature locations, feature information, software, databases, servers, mobile collection devices, sensors, and analysis tools that support planning and decision-making.

GIS data forms the foundation for daily decisions and is used by experienced GIS analysts as well as the general public, who might not even realize they are using GIS data. Addresses and street centerlines may be the two datasets most often used by the public, yet the coordination involved in collecting addresses and roads from local governments into a standardized, regularly updated, statewide database that is then used to better route a car in a phone app is invisible to most parents trying to find the right park for soccer practice. When these datasets are not complete or accurate, online purchases get delivered to the wrong location, households are missed during the Census, and emergency responders take longer to find the correct home. Without GIS, many of the tools we use daily would not exist.

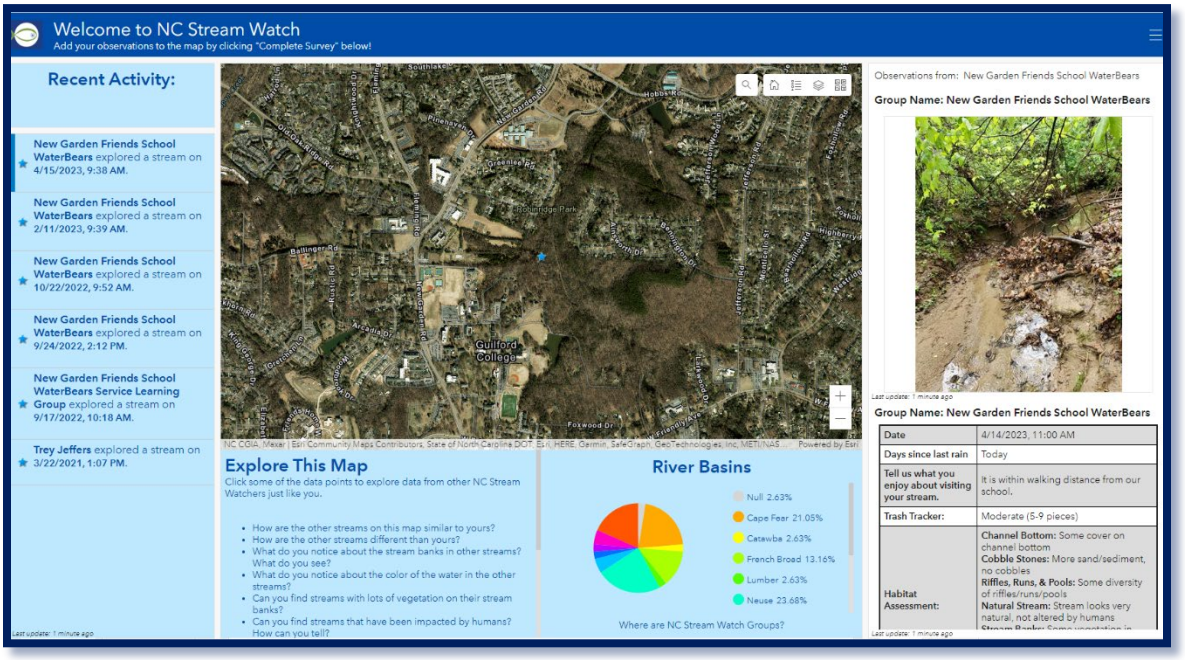

Figure 3. The NC Stream Watch project is an environmental education tool that encourages citizen scientists to learn about streams and share observations about stream conditions through an online application.

Because of the critical importance of GIS to government functions as well as the private sector's reliance on accurate, well-maintained data, the council must include a wide range of stakeholders in its committees and working groups to ensure that the geographic data produced in North Carolina meets the needs of our citizens. These local, state, federal, private sector, and education stakeholders drive the data-driven collaboration necessary to meet the needs of North Carolinians now and in the future.

FY21-22 Council Highlights

Introduction

Quarterly council meetings covered a range of topics during fiscal year 2021-2022. The council approved its goals and priorities for the 2021-2023 biennium at its first meeting, and these goals set the priorities for meetings during the fiscal year. The council continued its strong focus on supporting the development and maintenance of datasets that meet the business needs of the public, private, and educational sectors.

North Carolina as a National Geospatial Leader

North Carolina is a national leader in geospatial technology and expertise. Gary Thompson, vice chair of the council, serves as chair of the National Geospatial Advisory Committee (NGAC), a role that allows him to inform the council of federal initiatives, changes, and opportunities, as well as elevate North Carolina's interests to federal discussions. The National States Geographic Information Council (NSGIC) is an organization of state-level GIS coordinators from across the country. The purpose of NSGIC is to enhance collaboration among the states in pursuing geospatial issues and opportunities. NSGIC recognizes exemplary state projects through its Geospatial Excellence Awards. North Carolina's Next Generation 911 project team was awarded a 2021 Geospatial Excellence Catalyst award.

Figure 4. CGIA Assistant Director Matthew McLamb poses by North Carolina's NSGIC award for Next Generation 911.

In addition, North Carolina was one of only eight states to receive a grade of A- or above in NSGIC's 2021 Geospatial Maturity Assessment (GMA). NSGIC conducts the GMA every two years to assess national progress on a set of common data themes and other coordination activities such as Next Generation 911. The GMA's common grading system allows a comparison of state progress and allows states who struggle with certain geospatial datasets to learn from those like North Carolina that excel at most. NSGIC President Karen Rogers from the state of Wyoming provided the Council with a history of the GMA and highlighted North Carolina's successes nationally.

The 2021 GMA yielded a set of letter grades for 10 geospatial layers and coordination activities as shown in Figure 4. Overall, North Carolina received a grade of A-, which was the second highest grade received nationally. Only one state, Indiana, received an A. At the detailed level, geospatial investments in recent decades at both the state and the local government level resulted in a majority of A grades. Examples of the A grades include orthoimagery that the GICC and the N.C. 911 Board have championed, as well as cadastre (i.e., parcels), transportation, elevation, and addresses. North Carolina is recognized as a national leader in these data themes. It is worth noting that North Carolina's only C grade was a result of the dated hydrography dataset that has lacked maintenance investment and updated standards. This dataset is covered in more detail through this report, as it is a council priority for improvement.

North Carolina's Coordination Program received an A grade due in part to the statutory authorization for the GICC, GICC support staff appropriated positions, Geographic Information Officer state position, regular GICC meetings and activities, and NC OneMap data clearinghouse. These activities, state-funded positions, and engaged stakeholders demonstrate a commitment to excellence as well as strong community support for GIS in North Carolina. It also reflects substantial investments made through the legislature over the years.

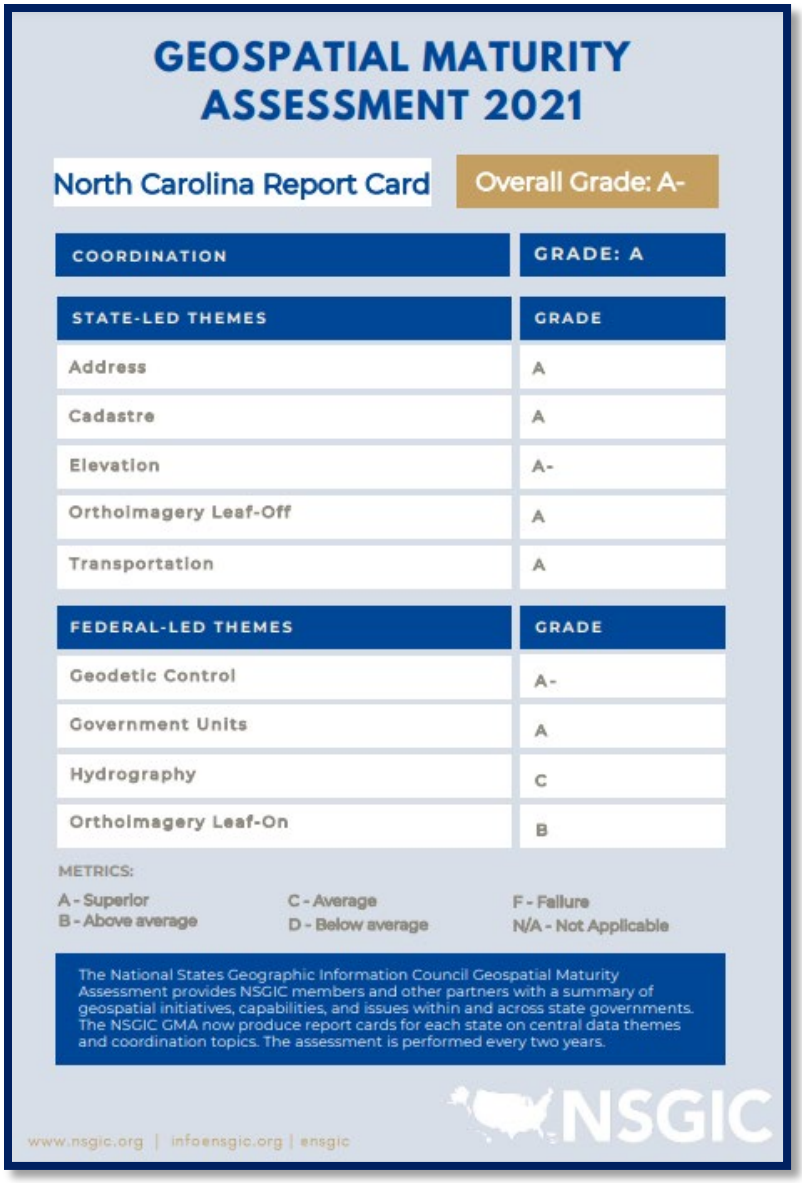

Figure 5. The NSGIC Geospatial Maturity Assessment grades for North Carolina demonstrate a strong geospatial program and a commitment to excellence.

2020 Census Coordination Efforts

While the 2020 U.S. Census collection effort has been completed, the task of communicating data release dates and information was a continuous effort of the Council through member Bob Coats, the Governor's Census Liaison. Coats provided quarterly updates and met with Council committees such as the LGC to prepare users for data releases and answer questions about the process. In August 2021, Census redistricting data was released. The short timeframe allowed for local governments to complete the redistricting process meant that communities needed to be prepared and know what data they would receive and how to use it. Coats' preparedness

and outreach efforts provided communities with the tools and information they needed to work quickly on the redistricting process.

Coats communicated changes to public use microdata areas (PUMAs), statistical geographic area partitions of at least 100,000 people that are used for distribution of census and American Community Survey data. He also updated the community on the process, requirements, and timeline for the Count Question Resolution (CQR) process. Through the CQR process, communities can challenge their total housing units and municipal boundaries if they believe the Census made an error. The process runs from January 2022 to June 2023, and the state's building footprint dataset, orthoimagery, and municipal boundary dataset are valuable tools for communities in this process.

Priority Framework Datasets

The GICC's newly adopted goals outlined four priority datasets: addresses, building footprints, municipal boundaries, and hydrography. Datasets become priorities when they serve a critical business need for multiple stakeholders on the council and when the existing data is not meeting the need or is not being maintained nor sufficiently funded. The council tasks working groups, typically managed by the SMAC, with developing standard data formats, business plans, or maintenance plans. Working groups meet to develop formal plans according to their task, and when approved by the SMAC, bring the plans to the full council for approval. Often, council members who bring an issue to the council table chair or participate as working group stakeholders. The council provides direction and insight into the need for these datasets, but it is the council member organizations themselves that typically obtain funding and do the work necessary to produce or update the datasets.

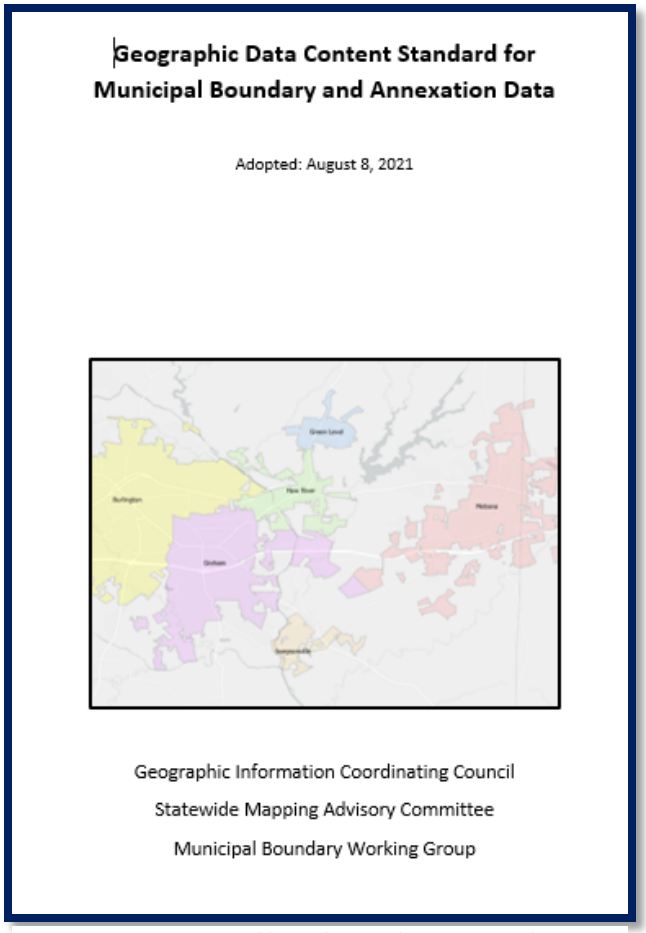

Figure 6. Municipal boundary and annexation data specifications.

During this fiscal year, two priority dataset schemas were approved. A schema is a standardized outline of how the data

should be stored and visualized. Schemas promote statewide uniformity and provide a guide for data producers regarding what important features and information to collect.

The Municipal Boundary Working Group (MBWG) presented its schema for a statewide municipal boundary layer to the council. North Carolina currently has no authoritative municipal boundary dataset, and the MBWG's work will promote a single source of information to be used by many stakeholders.

The council also approved the AddressNC Steering Committee's schema for a statewide address dataset update. First created in 2009 and last updated in 2014, the AddressNC dataset received legislative funding for an update in 2018. Seeing an opportunity to avoid duplication of efforts, the project plan incorporated data to be produced by the Next Generation 911 project rather than creating a separate dataset. The AddressNC schema provides a standardized addressing plan and will support important functions including Census, emergency response, and basic package delivery. By utilizing the continually updated Next Generation 911 data, maintenance is guaranteed.

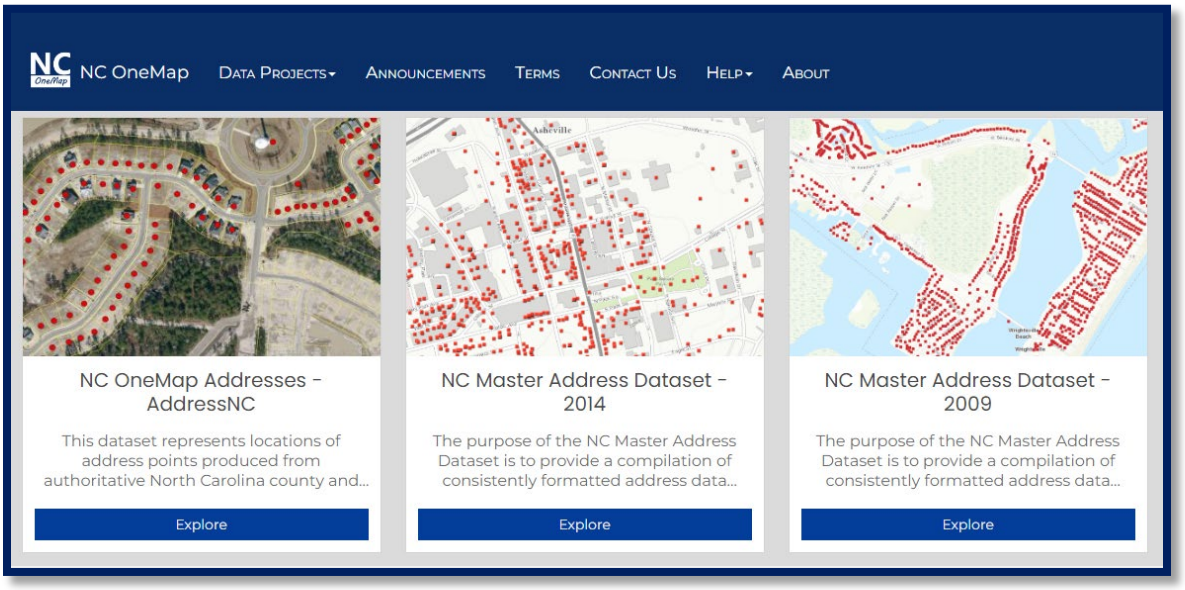

Figure 7. NC OneMap provides a portal to access historic and present NC Address layers.

The working groups for the two remaining priority datasets, building footprints and hydrography, provided updates to the council at the fall 2021 meeting. The Building Footprint Working Group (BFWG) presented its draft business plan at the May 2022 meeting to receive feedback from council members in order to finalize its work for the next meeting. Critically important to both emergency management and broadband expansion, the BFWG worked in record time to produce a business plan. Changing federal hydrography specifications and program plans required close coordination with federal partners at the U.S. Geological Survey

(USGS), and the Hydrography Working Group (HWG) spent considerable effort in understanding the new requirements and evaluating how North Carolina's dataset may contribute to a national layer.

Infrastructure: Exploring Opportunities

Infrastructure spatial data is important to many industries including economic development, emergency response, and transportation planning. In 2019, the GICC noted that existing statewide infrastructure data layers for water and sewer produced by the N.C. Rural Center were more than 20 years old, and there were no plans to update these data layers.

During three quarterly meetings, the council gathered information so that it could decide on a course of action. The council also learned about the benefits and challenges from data producers and data consumers with presentations from Duke Energy, the N.C. Department of Transportation (NCDOT), and N.C. Emergency Management (NCEM). Finally, the LGC polled its members to assess the current practices of utility geospatial data distribution by local utilities as well as learn about the use of non-disclosure agreements. These conversations revealed the following key points regarding infrastructure data sharing:

1) Data sharing practices vary widely across the state.
2) Data providers have an obligation to protect their infrastructure and networks from intentional (e.g., bad actors) and unintentional damage (e.g., construction activities, digging).
3) Many local governments lack written data sharing policies and could benefit from templates or examples of existing policies.

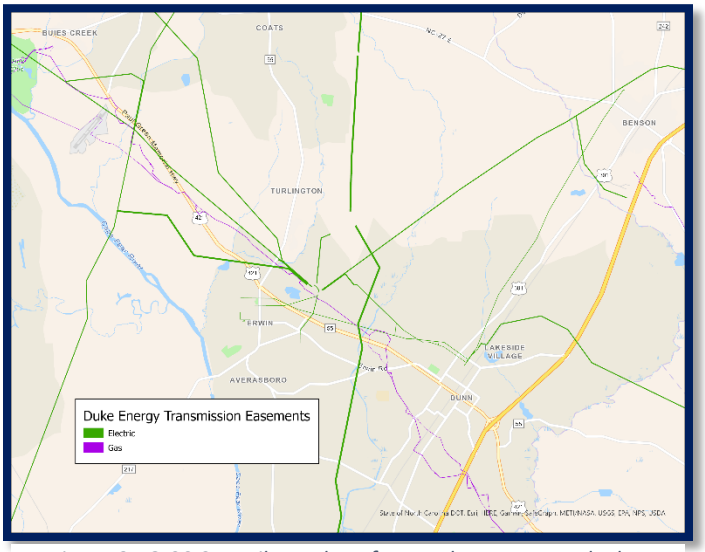

Figure 8. GICC Council members from Duke Energy worked to develop and share transmission easements through NC OneMap

4) Access to infrastructure data is critical to emergency response and transportation planning.

Based on these findings and council discussions, the council determined that additional investigation and documentation would assist both infrastructure data producers and consumers in understanding data sharing policies and best practices. The TAC chartered the Infrastructure Working Group (IWG) to undertake the task.

The availability and quality of infrastructure data has an impact on a wide range of disciplines, so the IWG gathered stakeholders from rural, developing, and metropolitan counties and cities as well as private developers, utilities, transportation professionals, and land managers. The IWG's information gathering process was inclusive of most committees of the GICC as the IWG actively sought use cases from the LGC, SGUC, and FIC. The LGC assisted in additional ways through member surveys to provide data-sharing information and examples of data-sharing agreements and data disclaimers.

The IWG reported frequently to the M&O, the GICC, and users' committees on progress and to seek feedback and support for the information gathering process. Five infrastructure categories were selected as needing investigation:


Electric


Water/Sewer


Stormwater


Natural Gas


Telecommunications

Infrastructure Working Group Tasks

- Document commonly produced infrastructure data layers for five infrastructure categories.
- Document data layers that can and cannot be shared.
- Investigate industry security concerns, regulations, policies, and best practices related to data sharing.
- Collect use cases from data producers and data consumers.
- Review existing data layer security practices and data consumer needs to identify potential layers that, if generalized, would address security concerns while still meeting consumer needs. (e.g., easements, buffers, service areas.). If layers are identified, investigate and document the feasibility of producing these layers.
- Collect example documents that data providers can use to document proper data handling and sharing.

Infrastructure Working Group: Select Preliminary Findings

Decisions regarding what data to share, how to share it, and how to communicate with those that need data are individual management decisions based on perceived risk, organizational risk tolerance, and an evaluation of other factors and circumstances that may outweigh risk factors. Every organization has unique factors that inform this decision.
Policies and practices regarding data sharing vary by industry and by provider. While industries have many resources devoted to assisting providers in evaluating physical and cybersecurity risk, in general, most industries do not provide explicit policies or recommendations on how to share spatial data representations of infrastructure.
The IWG did not focus on the subject of cybersecurity because the mechanisms currently utilized for sharing geospatial data do not provide a direct avenue for cyberattacks on utility networks and computer systems. However, the IWG did consider the relationship between cyberattacks and spatial data. Geospatial data shows a physical location that can be accessed if someone plans an attack, but an attacker must take the additional step of gaining access to a network or physical location.
Large private companies or populous cities with a tax base that can support dedicated and specialized utility staff have more resources to devote to data development, documentation, and sharing than smaller communities or private companies. This disparity leads to a difference in data availability and documentation that places smaller utilities at a higher risk than those with more resources.
Surveys of data providers showed that data quality is a factor in whether they share their data openly or by request only. Poor data quality can be a factor in making it more difficult to obtain data, while good data quality can be a factor in a decision to share data publicly.

The initial findings from the working group were presented as the group progressed through its task. A final report is expected to be delivered to the council in the next fiscal year.

Strategic Direction for the Council for Data-Driven Collaboration

Every two years, the council reviews its goals and priorities to plan its strategic direction for the coming two years. The council historically has not written a formal three-to-five-year strategic plan, but has relied on a biennial planning process to remain nimble and respond more quickly to pressing needs and user priorities. The council's priorities and goals are a mixture of long- and short-term projects, and this biennial process allows the members to more frequently assess progress, assign tasks, and define new goals or priorities.

The planning and prioritization process started at the beginning of 2021 and took place during three quarterly meetings with additional discussion at M&O meetings as the committee chairs brought feedback from their committee members to the wider council community. The final priorities were approved at the first quarterly GICC meeting of this fiscal year.

Goal 1. Improve, expand, and support statewide geospatial data and applications.

1.1. Promote free and open discovery of and access to geospatial data created and maintained by local governments.	
Need: *Accessible local data is essential for the success of most GICC initiatives.*	Next Generation 911 program achieved 100% i3 readiness.
	Compilation of draft municipal boundary dataset by the MBWG.
	95% of counties contributed to AddressNC.

1.2. Research solutions that maintain data sharing security to aid discovery and ease of access to geospatial data.	
Need: *Emergency response, planning, and development communities need a better understanding of security concerns for infrastructure data and better resources for how to request data and securely treat requested data.*	TAC and LGC researched federal, local, and public utility policies.
	Review of business needs and value vs. risk.
	Defined geospatial datasets produced by infrastructure providers.
	Collected disclaimers, non-disclosure agreements, and data-sharing agreements.

Goal 1 continued

1.3. Continue to support initiatives that compile and maintain statewide geospatial datasets that benefit the businesses and citizens of North Carolina.	
Need: *Continuously improve existing datasets and compile new datasets as needed by stakeholders.*	Municipal boundary schema adopted.
	AddressNC schema adopted.
	Federal/state coordination on hydrography standards.
	Draft business plan for building footprints completed
	Annual review of NC OneMap data availability.

1.4. Find solutions to make data sharing local-to-state more efficient to meet the needs of multiple statewide datasets and not place undue burden on local geospatial data managers.	
Need: *Eliminate duplication of efforts and streamline data request processes for local government data to promote efficiency*	N.C. roads and parcels have achieved full participation by local governments.
	MBWG developed a streamlined process for boundary approval and annexation submittal.
	Next Generation 911 data will directly supply addresses, eliminating duplication.

1.5. Request all state agencies to make the council's priority geospatial datasets discoverable and accessible through the NC OneMap Geospatial Portal.	
Need: *NC OneMap serves as a single portal for state GIS data discovery*	The SMAC annually reviews datasets for new data needs.
	Elevation contour began to be copied to the NC OneMap cloud from NCEM to configure for service.

1.6. Promote geospatial metadata for standard documentation.	
Need: *Metadata is essential to allow users to understand appropriate uses for data*	NC OneMap hosts the metadata standard, training materials, and help documents.

Goal 2. Collaborate and conduct outreach for more integration of geospatial data in information technology for expanded benefits in the geospatial community in North Carolina.

2.1. Identify opportunities to collaborate on GIS solutions in state departments and divisions not directly represented on the council to add value to state business processes.	
Need: *Maintain a diverse and inclusive community of active stakeholders.*	A review of bylaws in the last fiscal year resulted in changes that promoted the addition of new SGUC executive committee members from the State Board of Elections, state legislature, and N.C. Department of Natural and Cultural Resources.
	A representative from the State Board of Elections was also added to the GICC.

2.2 Identify opportunities to collaborate on geospatial data and technical solutions on a regional basis, engaging councils of government, educational institutions, metropolitan planning organizations, and rural planning organizations.	
Need: *Eliminate silos and increase resources by working on a regional basis.*	The LGC and GICC members communicate to provide education and support regionally as needed.

2.3 Reach out to jurisdictions with the least resources to find ways to add value with geospatial data and applications.	
Need: *Many small jurisdictions lack GIS capability or expertise.*	Education and outreach provided by the LGC targeted communities needing assistance with the Census CQR.
	Efforts to increase LGC membership will allow the GICC to communicate available resources to those in need.

Goal 2 Continued

2.4. Increase awareness and adoption of council initiatives and priorities through outreach and education.	
Need: *Increase participation in working groups and increase awareness of existing GIS resources to avoid duplication of effort*	Ongoing initiative- All committees and working group members have a charge to promote council initiatives within their organization and in their professional areas.
	Summaries of GICC meetings are sent to members soon after GICC meetings to allow them to distribute information to their organizations.
	The LGC changed the way it advertised quarterly meetings and doubled attendance.

Accomplishments 2021-2022

Collaboration for Data Governance and Consistency

Municipal Boundary Working Group Progress

The MBWG began in response to a request from N.C. Secretary of State Elaine Marshall to investigate methods to streamline annexation reporting. Municipalities are required to report annexations to the Office of the Secretary of State. Because annexations are still valid even if the local government fails to report them, the Secretary of State's office found that it did not have a complete and accurate accounting of all annexation records. To complicate matters, records submitted to the Boundary and Annexation Survey did not match those submitted to the state.

> ***§ 160A-29. Map of annexed area, copy of ordinance and election results recorded in the office of register of deeds.***
>
> *Whenever the limits of any municipal corporation are enlarged, in accordance with the provisions of this Article, it shall be the duty of the mayor of the city or town to cause an accurate map of such annexed territory, together with a copy of the ordinance duly certified, and the official results of the election, if conducted, to be recorded in the office of the register of deeds of the county or counties in which such territory is situated and in the office of the Secretary of State. The documents required to be filed with the Secretary of State under this section shall be filed not later than 30 days following the effective date of the annexation ordinance. All documents shall have an identifying number affixed thereto and shall conform in size in accordance with rules prescribed by the Secretary. Failure to file within 30 days shall not affect the validity of the annexation. Any annexation shall be reported as part of the Boundary and Annexation Survey of the United States Bureau of the Census*

Discussion within the GICC and MBWG revealed that multiple state agencies have business needs for boundary data and were individually asking for the same data from municipalities, thereby duplicating effort and causing local governments to respond to the same request repeatedly. The MBWG identified a need for a single authoritative statewide municipal boundary dataset that all who need boundary data can use. The vision for this dataset is based on the success of the seamless parcels program: locally maintained data shared through a common portal and shared statewide as a single resource.

Figure 9. Four different data layers contain four different versions of municipal boundaries. Review each circle to see how each layer differs.

The MBWG presented a schema for statewide municipal boundary and annexation layers to the council in August 2021. The working group also developed and tested a pilot website that facilitates data updates and annexation submissions. During the fiscal year, the working group has been reaching out to local communities to test the site and solicit feedback on performance. The working group hopes to review all the municipal boundaries and approve the

boundaries shown on the website, so the layer can be used as a single source of municipal boundary data. Outreach and education will ramp up in the 2022-2023 fiscal year.

New Building Footprint Working Group

The Building Footprint Working Group was tasked by the SMAC with developing a business plan for the maintenance of a statewide building footprint layer. During the first six months of 2022, the working group met frequently to review use cases and the existing dataset and outline common needs and goals. A draft business plan was presented at the May 2022 GICC meeting.

Building footprint data exists in North Carolina and was developed by NCEM from imagery collected prior to 2015. Most data used to produce the existing layer is over a decade old. The dataset is critical to emergency response efforts and was first used during Hurricane Matthew to estimate extensive wind and flooding damage that were used to justify the fastest federal disaster declaration in the Federal Emergency Management Agency's history. Also used in the N.C. Flood Inundation Mapping and Alert Network (FIMAN), the investment thus far has literally saved lives through early warnings. According to the 2020 U.S. Census, North Carolina's population has grown by 9.5% since the building footprint layer was first created, with new construction concentrated in urban areas.

Figure 10. This image from 2021 demonstrates the age of the existing building footprint dataset. New neighborhoods in the Triangle region were built after the initial dataset, and red building footprints are missing in these areas.

A business plan to define needs and funding was necessary to maintain this critical resource. The business plan identifies 17 organizations including state, federal, and local governments as well as private enterprises that benefit from this dataset. Each of their use cases was documented and includes time-sensitive needs such as broadband expansion, disaster relief

and recovery assistance, and election confidence and voter information. The Federal Communication Commission (FCC) Broadband Serviceable Location Fabric (Fabric) is a dataset of buildings where fixed broadband internet exists or is needed. The state has a limited time frame to submit challenges to the Fabric, and building footprints are crucial to identifying areas where the Fabric has missed North Carolina buildings in need of broadband.

The draft business plan recommends updating the building footprints dataset using N.C. Orthoimagery Program data collected during the most recent four-year cycle and then updating each part of the state flown by subsequent orthoimagery collections. Attribution of the new and changed buildings will require data from the Seamless Parcels Program, AddressNC, and county tax offices. Funding needs for an initial update followed by maintenance are outlined in the business plan. However, it is important to note that to date, no funding source has been allocated for regular maintenance of this dataset, yet this dataset is fundamental to core business needs and public safety.

AddressNC: Building Upon Next Generation 911

Address data is used by many important stakeholders including first responders, the U.S. Census, broadband expansion, and private delivery companies. Address data is closely tied to parcel and building footprint data, and the three datasets, when combined, form a solid and accurate foundation for stakeholder uses.

The approval of the AddressNC schema is the result of a multi-year effort of collaboration with Next Generation 911, stakeholders, and the original AddressNC stakeholders. In 2018, legislative funding was provided to update the dataset in preparation for the 2020 Census, but the effort was placed on hold because the GICC identified a more efficient and sustainable update model. The GICC saw an opportunity to continually update the dataset rather than rely on a one-time update as had occurred in the past. Address data is a continuously changing dataset, and updating it once or twice a decade leaves the data lacking information, especially in rapidly developing areas of the state. In keeping with the GICC's goals of collaboration and eliminating silos and duplication of efforts, the AddressNC steering committee developed a plan to maintain the AddressNC data using monthly updates from Next Generation 911.

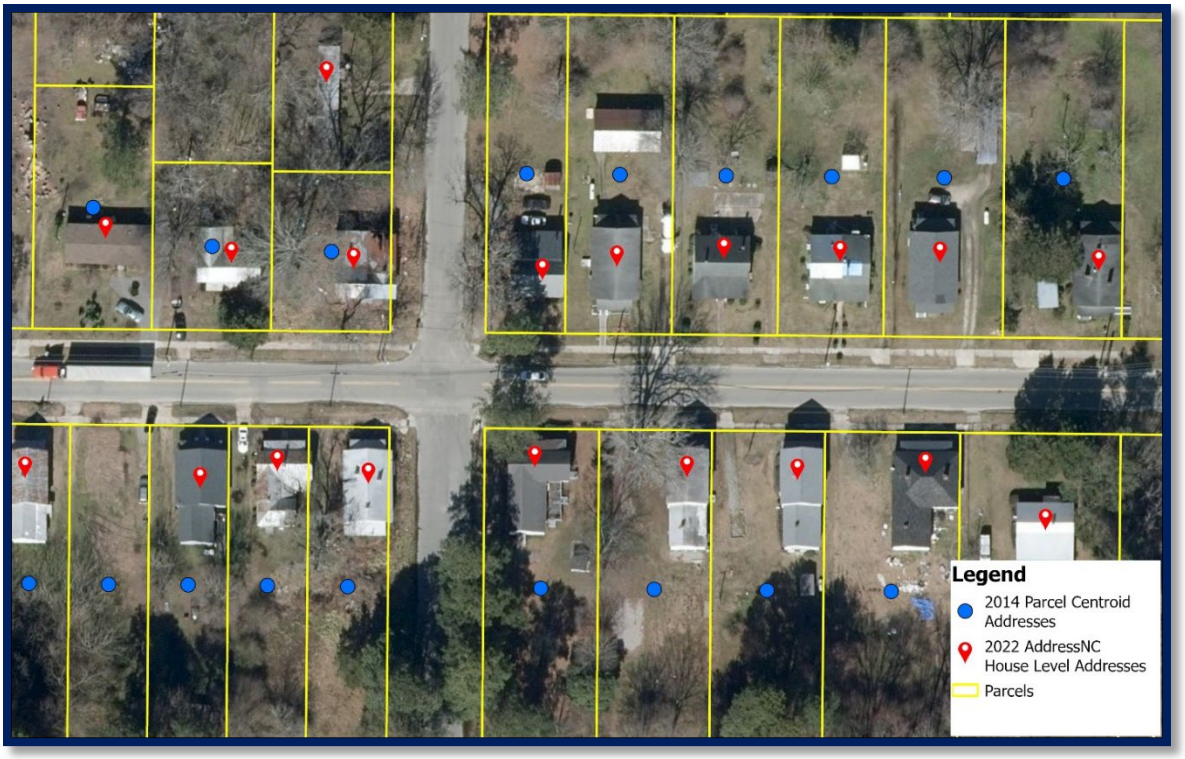

Figure 11. Parcel centroid addressing in the 2014 dataset, shown here in blue, has been updated to building level addressing in the current AddressNC dataset shown here in red.

Throughout fiscal year 21-22, the AddressNC team at CGIA developed update tools, data standardization tools, error reporting, and process workflows to support the project. As data became available through Next Generation 911, address points were added to the AddressNC database and quality checked for future publication. Ninety-five percent of the state was loaded into the system by the end of the fiscal year, and the remaining counties will be loaded by the end of 2022. The team worked closely with counties to assist them with their address data, while simultaneously providing outreach and updates to the GIS community about the upcoming data release and importance of data maintenance.

On the GMA, North Carolina received an A for the AddressNC dataset for its regular frequent updates, published standard compatible with the national standard, defined data steward, regular funding, and use in support of 911 activities.

Collaboration for Public Access to Geographic Information

NC OneMap Cloud Migration

NC OneMap is an award-winning GIS data clearinghouse used as an example of governmental excellence across the country. It is heavily used to discover and consume geospatial data. CGIA began a migration to the cloud in 2021 to provide elasticity and ensure a consistent experience during times of heavy use to protect this vital resource. The migration of services to Amazon

Web Services was completed during the fiscal year and provides a more stable platform while preserving all the benefits of NC OneMap.

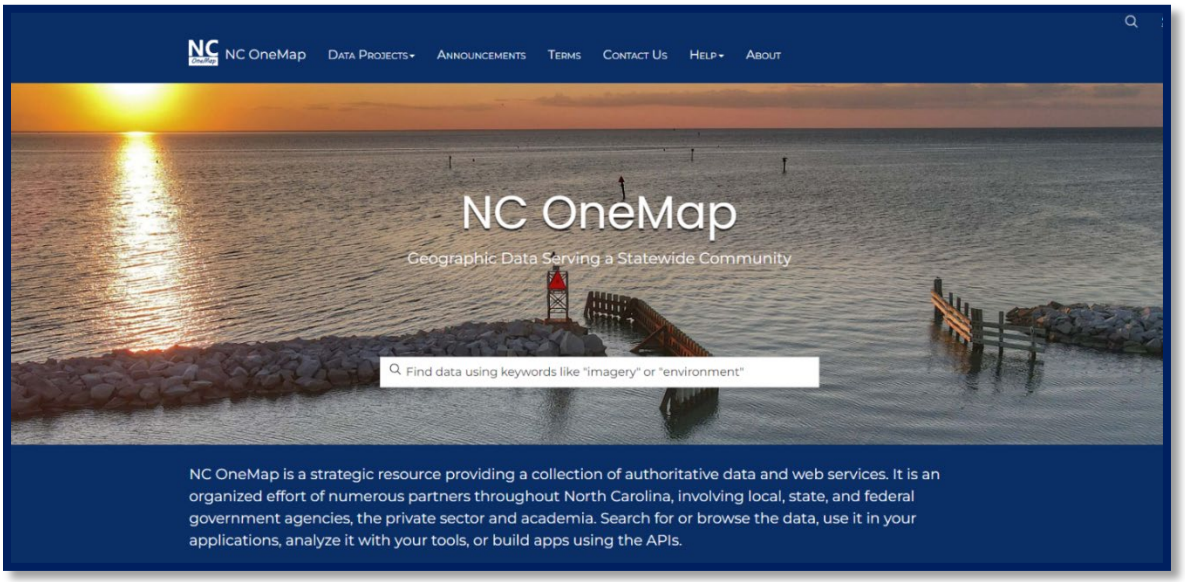

Figure 12. The award-winning NC OneMap serves as a portal for authoritative data sharing in North Carolina.

NC OneMap's resources are used across all levels of government, the private sector, and educational community. Standards for data quality, documentation, and distribution provide users with the confidence that the data discovered through NC OneMap is authoritative and trustworthy. The site provides information and resources for GICC initiatives such as AddressNC, Municipal Boundaries, Seamless Parcels, and Broadband.

Orthoimagery Program: A Success Story

The Statewide Orthoimagery program, funded by the N.C. 911 Board, delivers a consistent and current visual reference for emergency communications and serves as a foundational layer for most online mapping in the state. The program updates a quarter of the state's counties each year on a rotating basis with high-resolution, consistent, and accurate orthoimagery. The imagery is available to state, local, federal, and regional government agencies, as well as the private sector, the academic community, and private citizens as map services and downloadable files from NC OneMap.

In fiscal year 21-22, the images of the piedmont counties (phase 2) were collected in early 2021 and delivered in the last half of the same year. The northern mountains and piedmont project (phase 3) was collected in early 2022. The first delivery of imagery that includes the addition of a color infrared (CIR) product occurred in 2020, and the new product continues to be collected with each new phase. Because the internal cell structure of healthy plants reflects the near infrared wavelength, CIR imagery is useful in monitoring plant and crop health. The current orthoimagery program continues to provide a high-quality product to support emergency response and communications at a substantial savings from previous collection methods and serves as a model to other states. On the GMA, North Carolina received an A for orthoimagery due to its high-resolution imagery, CIR addition, stewardship, regular funding, and business plan.

Figure 13. Picture This: The 2021 Orthoimagery program captured this image of a large art installation on the N.C. Museum of Art grounds.

Intergovernmental Collaboration for Efficiency

Hydrography Working Group Collaboration

The Hydrography Working Group (HWG) has been working for many years to develop an updated hydrography dataset for North Carolina. The national authoritative dataset, the National Hydrography Dataset (NHD), will be replaced by the USGS by the 3D Hydrography Program (3DHP), an elevation derived hydrography dataset based on 3D Elevation Program data. North Carolina's vision of a local-to-state-to-federal data pathway was a focus of HWG work during fiscal year 21-22. The USGS reached out to states to provide feedback on the new program, and HWG submitted comments through a NSGIC-organized national review of the 3DHP. CGIA, through its membership in NSGIC, participated in focus groups and workshops to bring HWG concerns and needs to the attention of the USGS. HWG member Silvia Terziotti wrote the specifications for the 3DHP and serves as a valuable resource in helping the HWG understand the new program and data format. She facilitated a meeting between USGS National Geospatial Program Hydrography Management and Planning Lead Becci Anderson and

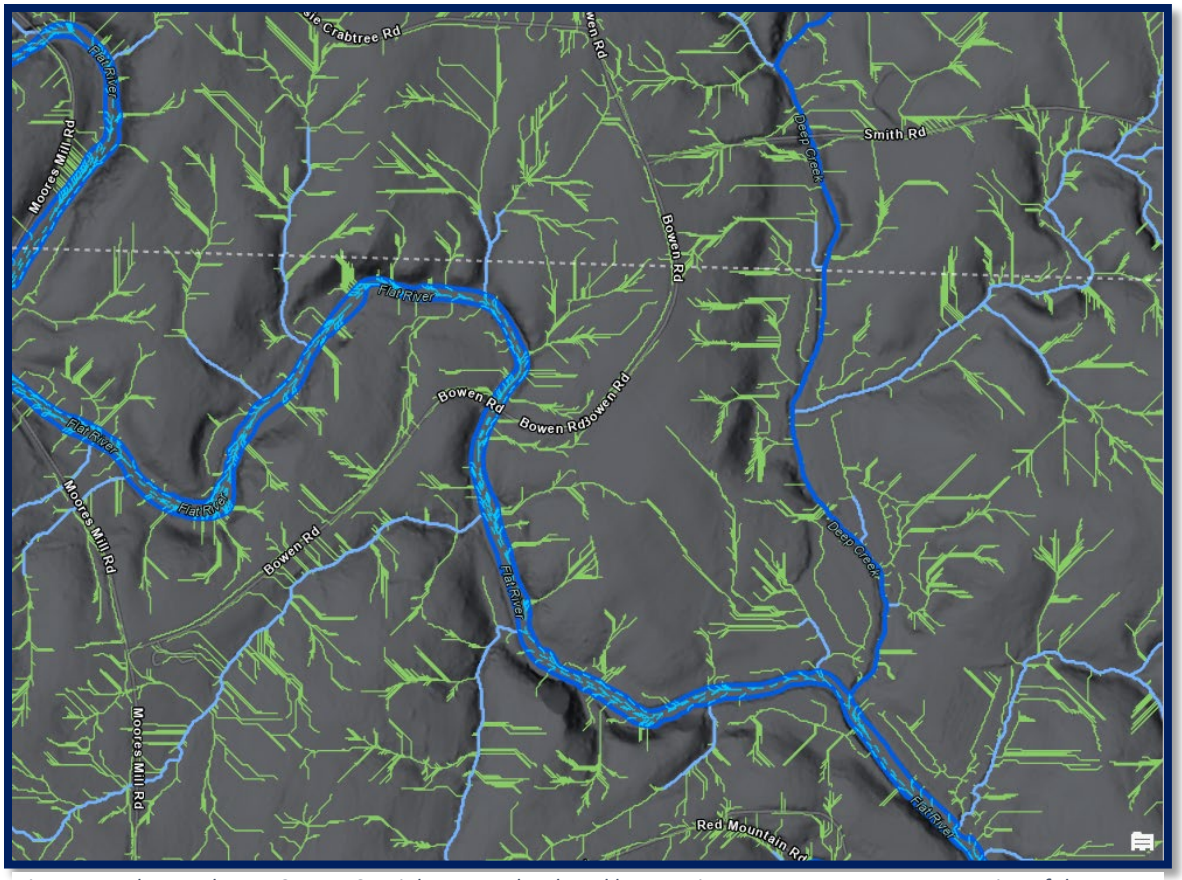

Figure 14. The Headwater Stream Spatial Dataset developed by DWR is a more accurate representation of the stream network, shown here in blue, and water preferential flow, shown here in green.

the HWG, so the group could ask direct questions about the new program and better understand if and how North Carolina's hydrography dataset might someday contribute to the federal dataset.

While the HWG concentrated on understanding federal data requirements, the N.C. Division of Water Resources (DWR) was developing hydrography data from the state's elevation data to support the NCDOT's ATLAS planning tool. This preliminary dataset, the Headwater Stream Spatial Dataset (HSSD), was completed in the summer of 2022, and the HWG is collecting user needs and developing a proposed schema to support stakeholder hydrography needs. The DWR dataset, while statewide and more extensive than anything created to date, will require significant work and investment to meet the needs of the wider stakeholder community. Initial funding to support ATLAS was provided by NCDOT, but funding to bring the dataset to a more widely useful format does not currently exist. GMA grades for framework datasets consider maintenance funding because accurate data must be maintained to remain useful. North Carolina's lack of regular funding contributed to it scoring in the bottom 24% of states graded during the GMA, a stark contrast to its performance in all other areas.

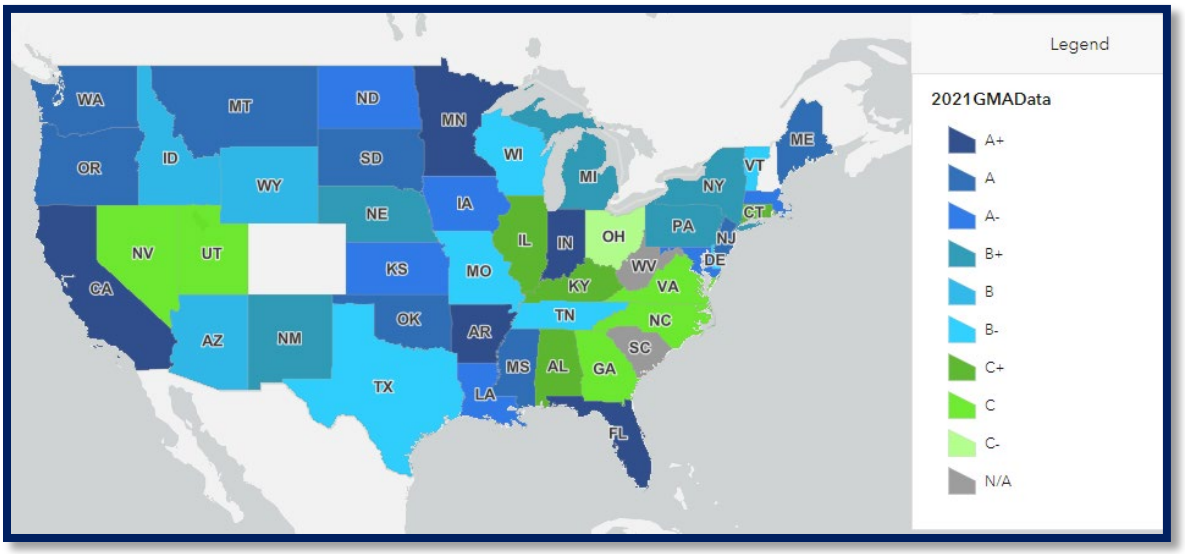

Figure 15. North Carolina ranks low in the nation for hydrography, but continued investment in the development of datasets like the HSSD can change our ranking.

Elevation Data

Elevation data, including high-quality updates of the coastal plain and bathymetric data for near shore areas of Pamlico Sound and the Outer Banks, was collected in 2020 by the USGS. Due to COVID-19, the data delivery was delayed and was released in sections during this fiscal year. The FIC and the Working Group for Orthoimagery and Elevation (part of the Statewide Mapping Advisory Committee) were updated on project progress for this important dataset and coordinated data distribution.

Light Detection and Ranging (LiDAR) data is a 3D scanning technique that uses light pulses to map elevation. Essential to the production of accurate flood risk models, the N.C. Floodplain Mapping Program has been using LiDAR data to more accurately depict flooding risk for residents and emergency response. This data is used during flooding events to warn residents of impending flooding and target evacuations. NCDOT uses the data to determine which roads may overtop during flooding. Through these applications, LiDAR data has saved lives.

In addition to its application to emergency response and early warning, LiDAR data is used by a range of stakeholders, including the development community and precision farming. The USGS conducted a study during this fiscal year to outline mission critical uses for LiDAR across the country. While the final report was released after the fiscal year ended, it should be mentioned that it included 275 pages of information outlining the users and their requirements for LiDAR data in North Carolina. To the basic map or application user, LiDAR data may not be an obvious

part of their user experience. However, this often-invisible dataset forms the backbone of mission critical activities and needs wider recognition of its benefits and value to users.

Figure 16. Example of LiDAR point data that has been colorized using N.C. orthophotography. In this 3D image, notice that LiDAR technology captures not only buildings and vegetation but also utilities such as power lines, shown in the left forefront. Data visualization by ESRI.

The newly collected LiDAR data provides a more accurate representation of the ground surface and features such as roads, buildings, and vegetation. North Carolina has approximately 80% of the state mapped with higher-quality LiDAR, leaving only the central Piedmont, including the Triangle and Triad, still to be mapped with higher-quality data. Due to the rapid development in these areas, it will be important to collect updated high-quality data, but an ongoing funding source is not available. Partnerships and funding sources will continue to be a focus as stakeholders seek to fill this data gap. North Carolina received an A- for the Elevation category in the GMA due to lack of regular funding and regular updates.

NOAA Land Cover Pilot

Through the FIC, the National Oceanic and Atmospheric Administration (NOAA) provided North Carolina with updates on a new high-resolution land cover and change product planned for U.S. coastal areas. A pilot of this program was conducted in Brunswick and New Hanover counties. The new tool is produced from National Agriculture Imagery Program (NAIP) imagery and supplemental data such as LiDAR. The 1-meter resolution product will contain six categories of land cover: impervious surface, bare, grass, shrub, forest, and water. The product has the

potential for applications in land cover change analysis and updated wetlands mapping. The state continues to coordinate with NOAA to monitor the progress of this program.

Sharing Information and Knowledge

Information sharing is central to coordination and avoidance of duplication of efforts. North Carolina has a thriving and talented GIS community, as demonstrated by its accomplishments and national reputation. In order to maintain this high-quality workforce and communicate effectively, the GICC's committees actively work to engage, inform, and assist GIS professionals.

State Government GIS Users Committee

The ESRI Enterprise License Agreement (ELA) is the primary mechanism used by state government agencies to access GIS software and applications. The ELA cost is apportioned to each agency based on the resources it uses, but this percentage-of-use funding model makes it very difficult for each agency to determine their exact yearly ELA cost during negotiations because a change in any other agency's order affects the percentage paid by all other agencies. At one time, the ELA was paid for by a single statewide fund, and the consensus among SGUC members is that GIS would be more widely implemented and effective if the current funding model were changed back to the prior model.

Figure 17: Training benefits state agencies through building new skills and fuller utilization of ELA resources.

The state realizes various benefits from the ELA, including a discounted price for software, complimentary passes to conferences for professional development, and training credits to be used for continuing education. These conference passes and training credits help state employees with a GIS professional certification maintain their certification. During the fiscal year, the SGUC organized seven group training classes using credits included in the ELA, training 100 employees from nine agencies.

Local Government Committee

The Local Government Committee is a vibrant community of GIS professionals from municipal, county, regional, private, non-governmental, and academic organizations. During the pandemic, participation in LGC general meetings began to fall, so the committee made it a goal to increase meeting participation. By changing the way the meeting invitations were delivered, the committee doubled to tripled meeting participation with more than 100 local government

professionals joining most meetings. This level of participation has been sustained, an indication that members are seeing a benefit from attending quarterly meetings.

State and National Participation

LGC members are active in many organizations within North Carolina, and the North Carolina Arc Users Group (NCAUG) provides multiple opportunities each year for the GIS community to share knowledge and ideas. CGIA, LGC, and working group members updated GIS professionals on GICC initiatives at NCAUG events, including the annual conference and government symposiums:

- The Road Ahead: Updates to North Carolina Framework Datasets
- Panel Discussion: Local Governments Form the Backbone of Statewide GIS Projects
- N.C. Statewide Orthoimagery Program, Color Infrared, and Next Steps
- Constructing the 2021 North Carolina Political Areas Dataset

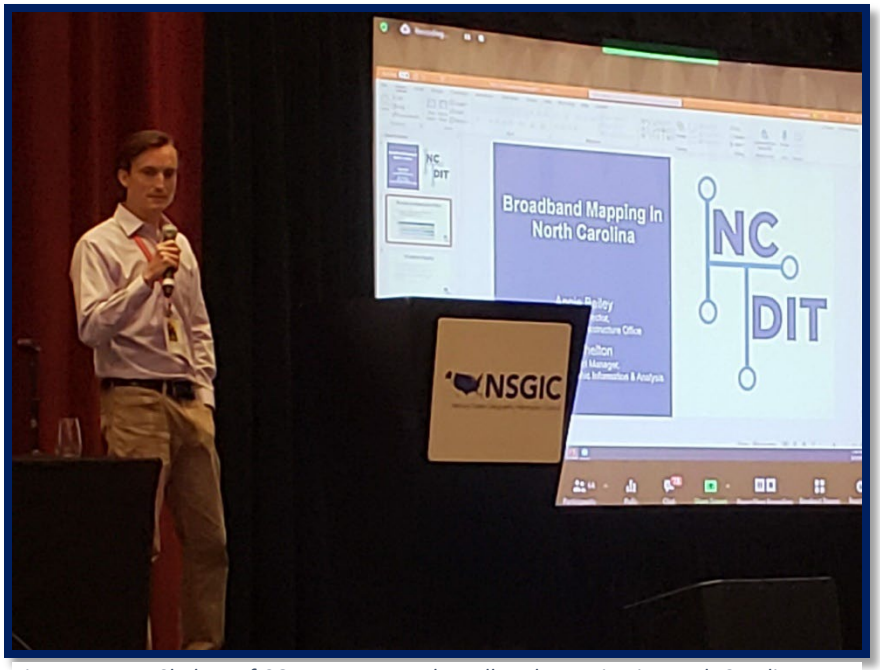

Figure 17. Ben Shelton of CGIA presents on broadband mapping in North Carolina at the national NSGIC conference.

In addition, CGIA staff represented the Council at the annual NSGIC conference, where Ben Shelton presented "North Carolina: Broadband Mapping," and the State of North Carolina Next Generation 911 Project Team was presented the 2021 Geospatial Excellence: Catalyst award.

Future Priorities

The council's priorities for the future remain centered around data-driven collaboration and continual improvement of access to data products. Fiscal year 2022-23 priorities cover adoption of new federal standards, Census support, emergency coordination, and improving access to data that will save time, money, and lives.

Data improvement

- Coordinate with local municipalities to approve municipal boundary data in a statewide authoritative source.
- Finalize a business plan for building footprints and create an implementation plan.
- Release AddressNC update data.

Community Coordination

- Update NC OneMap to enhance data access and GIS community engagement.
- Conduct regional outreach meetings to promote council initiatives and solicit feedback on new priorities.

Standards Development

- Develop standards for statewide hydrography and evaluate methods for more accurate stream data.
- Finalize new attribute standards for Seamless Parcels.
- Release preliminary infrastructure working group report and solicit feedback on data security and best practices for data sharing.
- Create a business plan for elevation data acquisition and maintenance.

For more information about the council, including the latest meeting information and contact information for council members and staff, please visit it.nc.gov/gicc.

NCGICC