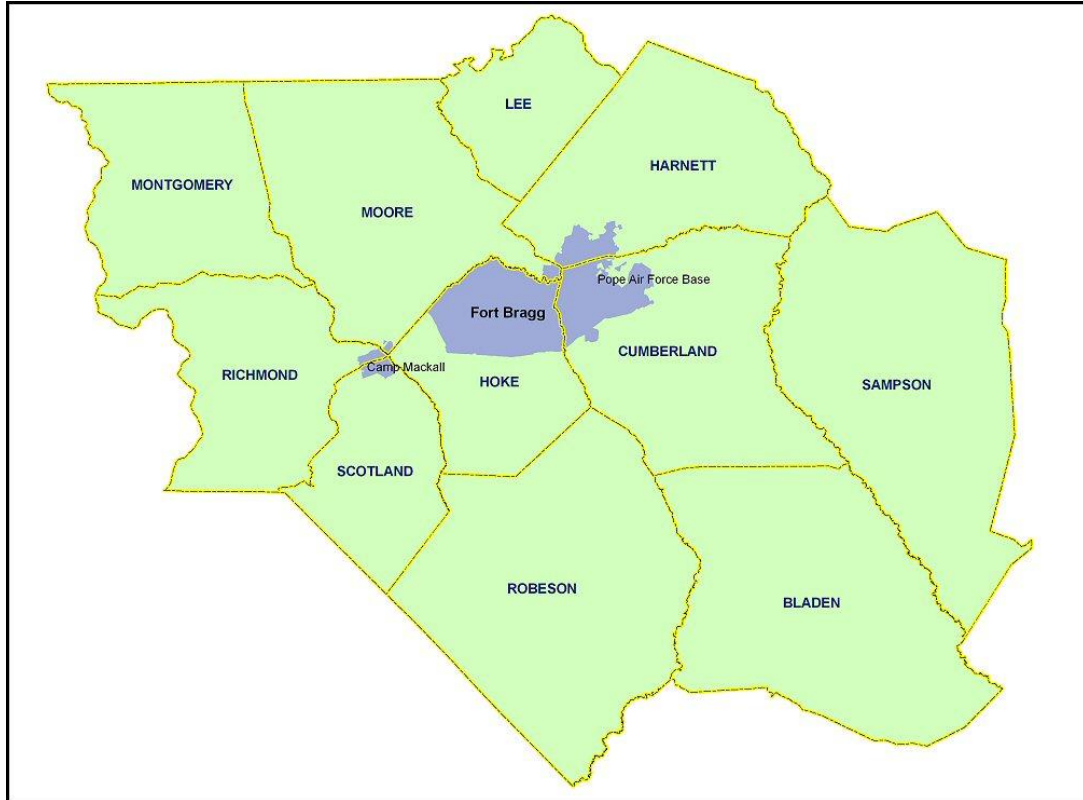


An Assessment of GIS

In the Fort Bragg Regional Alliance Region



Prepared by the NC Center for Geographic Information and Analysis,
Office of the State Chief Information Officer

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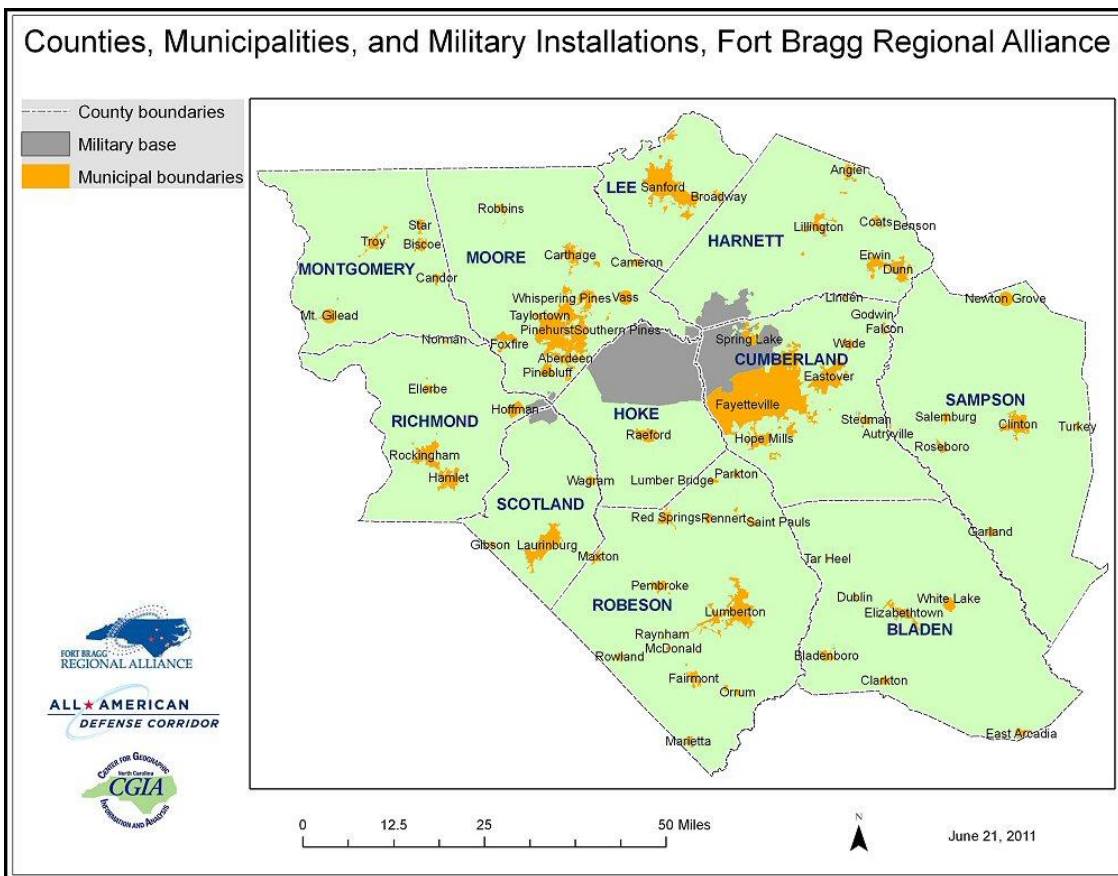
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An Assessment of GIS in the Fort Bragg Regional Alliance Region

A. Background

The Fort Bragg Regional Alliance has a vision for an effective, sustainable capacity for geospatial data and geographic information systems (GIS) throughout the 11-county region. The objectives are to (1) inform regional planning with geospatial datasets and analyses that are complete, consistent, current, and readily accessible by local, state, federal, nonprofit and private stakeholders, and (2) achieve improvements in local GIS datasets and capabilities to bring all eleven counties to a level that can effectively support local and regional decision making. The region is displayed in Map 1.

Map 1. Fort Bragg Regional Alliance, Jurisdictional Boundaries



Map 1. Fort Bragg Regional Alliance, Boundaries

B. Geospatial Data for Regional Planning

To address objective 1, CGIA reviewed county, state and federal GIS datasets, and, based on experience with service projects inside and outside of the region, identified the key datasets for regional planning and analysis. The geospatial datasets that are most valuable for regional planning and development may be organized as source data by custodian (produced and/or maintained by local governments, state, federal, and private organizations, B-1 through B-4) and datasets that are integrated (B-5) or derived (B-6) from source datasets. This sets the context for an assessment of GIS capabilities and opportunities in the region.

B.1. County and city datasets

The following geospatial datasets are particularly useful for planning and development, directly and as source datasets. In most cases these are maintained by counties or cities on a regular basis.

- a. Tax parcels
- b. Roads
- c. Municipal boundaries
- d. Extraterritorial jurisdiction (ETJ)
- e. Zoning districts
- f. Water and sewer infrastructure
- g. Districts for fire, public safety, schools, voting
- h. Aerial imagery (current and historic)
- i. Address points (and/or structure outlines with associated addresses)

Note that in the more urbanized parts of the region, other local datasets that may be valuable in planning include pedestrian, bicycle and transit routes.

B.2. State datasets

The following datasets are useful for regional planning and development and are maintained by state agencies, typically with statewide coverage.

- a. Aerial imagery (statewide 2010 orthoimagery and statewide National Agricultural Imagery Program 2010)
- b. Rivers and streams
- c. Watersheds
- d. State and federal highways
- e. Address points
- f. Building footprints
- g. Flood hazard areas
- h. Railways
- i. Geodetic control
- j. Elevation
- k. Natural Heritage areas
- l. Wildlife habitat
- m. Conservation lands (easements and ownership)
- n. Stormwater jurisdictions

- o. Drinking water assessment areas
- p. County boundaries
- q. Shoreline
- r. Land cover (imagery classified as vegetated, impervious, water, etc.)
- s. Economic characteristics
- t. Population characteristics
- u. Regional boundaries

B.3. Federal datasets

Several datasets maintained by federal agencies are applicable to regional planning and development. Most have statewide coverage, with the exception of detailed soil surveys that are developed and maintained on a county basis.

- a. Detailed soil surveys (all counties in the region)
- b. Land cover classification (2006 National Land Cover Database)
- c. Wetlands
- d. Population, housing and economic statistics
- e. Federal land ownership (including military installations and ranges)

B.4. Private datasets

Several datasets maintained by private businesses are applicable to regional planning and development. Public access and cost varies.

- a. Power utilities
- b. Telecommunications towers
- c. Business locations by type by employment
- d. Housing market information
- e. Demographic information customized for jurisdictions

B.5. Integrated datasets

From the local, state, and federal sources, the following datasets require processing to integrate into a regional compilation for planning and analysis.

- a. Tax parcels (geometry and selected attributes)
- b. Roads (primary, secondary and local)
- c. Municipal boundaries (from local sources; NC DOT has an annual compilation)
- d. ETJ (geometry)
- e. Zoning districts (reclassify districts into summary classes)
- f. Conservation lands (easements and ownership)
- g. Water and sewer infrastructure (geometry and selected attributes)

B.6. Derived datasets

From the local, state, and federal sources, the following datasets require processing to derive additional datasets that are valuable in regional planning and analysis.

- a. From parcels:
 - i. agricultural lands and voluntary agricultural districts
 - ii. dwelling units associated with parcels or building outlines or building points
 - iii. land use-existing (commercial, industrial, residential, etc.)

- iv. land use-future (based on plans, not current zoning)
- v. land use-zoned (based on current zoning districts)
- vi. patterns of development (e.g., parcels with structures, year built)
- vii. parcel size classification
- viii. dwelling unit density classification
- ix. public lands, public schools, hospitals, and other institutions
- b. From roads (select by road type for some analyses)
 - i. Road density
 - ii. Travel distance
 - iii. Transportation model results from Metropolitan Planning Organizations

B.7. Data quality factors

Geospatial data quality for regional planning purposes relates to the following factors:

- Positional accuracy (how well a dataset represents actual features on the earth)
- Resolution (pixel size in imagery or mapping scale for points, lines and polygons)
- Currency (when captured and how often)
- Completeness (full geographic coverage, attributes (fields) all have values, and data are documented with metadata)
- Consistency (reliably collected, processed and maintained using consistent methods and formats, and using state standards or standard practices where applicable)

If all eleven counties in the region were to have equally complete, current, and accurate geospatial datasets, a regional compilation could be developed using data integration techniques. The primary constraint and challenge is inconsistency in like datasets across counties. Objective 1 seeks “complete, consistent, current, and readily accessible” geospatial data, but all four values are difficult to achieve when multiple data custodians are involved. While local GIS operations in the region all use current technology, appropriate skills, accepted practices, and good judgment, the details of local geospatial data have evolved from a variety of origins, local operational preferences, and specific business needs. The solutions are either (1) significant investment in detailed data standards and data management practices or (2) investment in multi-county dataset integration and satisfaction with less data currency.

C. Local GIS Capacity in the Region

CGIA assessed the current situation through interviews and consultations with county GIS practitioners and regional data users, as well as drawing on experience with various technical services projects and the NC OneMap coordination framework. In addition to county and regional geospatial resources, North Carolina has tools and resources and initiatives that underpin the desired consistency, currency, and completeness of geospatial data in this region and other regions in the state.

C.1. Technology

All eleven counties in the region have adequate hardware, software, networks, and information technology systems in place to support GIS operations, though quality tends

to be somewhat higher in counties with higher populations. To enable practical access to geospatial data and applications among departments in dispersed county buildings, upgrades to IT infrastructure would be most beneficial in Robeson, Hoke, Bladen, Harnett, Lee, Montgomery, and Richmond counties. While IT upgrades and more enterprise-oriented systems in some counties would enhance productivity and better serve departments outside of GIS, technology is not a significant constraint to local GIS capabilities. Modern personal computers have fast processors, disk space is inexpensive, and GIS software licenses are within reach of all county budgets.

C.2. Staff and Organization

All eleven counties in the region have digital geospatial data and at least one specialist for developing and maintaining data. Improvements that would generate the most benefits in the region are related to human resources supported by funding. Given the adoption of GIS technology by all counties, staffing is by far the most important factor in effective local GIS operations.

The counties that support multiple GIS specialists realize more benefits for their county business operations. The county GIS operations that generate the most benefits employ a team of technicians who create and edit datasets (e.g. tax parcel boundaries, street centerlines, street addresses, building outlines, and zoning districts). The most capable county operations have a GIS coordinator and experienced analysts/project managers who can respond to requests and meet needs in numerous local government operations including 911 communications, emergency services, tax administration, public safety, public works, planning, economic development, elections, and schools. The county GIS operations that have the largest budgets have sufficient employees to regularly maintain both the geometry (points, lines and areas) and the key business data that are attached to map features including street address, land use, and an array of property tax information.

In the cases of Sampson and Scotland counties, GIS and planning operations in Clinton and Laurinburg, respectively, have been involved in managing geospatial databases and taking the lead on GIS coordination. The Laurinburg coordinator currently handles all GIS responsibilities for the city and Scotland County.

The number of full-time GIS practitioners by county ranges from one to ten. County business needs and resources vary. One perspective on business needs is to compare the number of tax parcels per square mile (more densely settled counties have more tax parcels and more associated street centerlines, addresses, and other geospatial features). The results, shown in Table 1, show a range of densities from the least dense (Bladen County with 37 tax parcels per square mile) to the most dense (Cumberland with 206 parcels per square mile). The last column in Table 1 displays resident population (representing a rough measure of county resources). Population ranges from just under 28,000 in Montgomery County to over 319,000 in Cumberland County.

Table 1. Number of Full-Time GIS Staff, Tax Parcels and Population

County	Number of GIS Staff*	Number of Tax Parcels	County Area in Square Miles	Tax Parcels Per Square Mile	County Population 2010**
Bladen	3	32,345	875	37	35,190
Cumberland	10	134,611	653	206	319,431
Harnett	4	62,969	595	106	114,678
Hoke	4	24,206	391	62	46,952
Lee	4	31,388	257	122	57,866
Montgomery	2	30,607	492	62	27,798
Moore	4	68,718	698	98	88,247
Richmond	4	32,063	474	68	46,639
Robeson	6	76,707	949	81	134,168
Sampson	3	49,493	945	52	63,431
Scotland (Laurinburg)	1	21,257	319	67	36,157

* Full-time or equivalent staff with GIS responsibilities based on interviews.

** Census 2010 total population by county, NC State Data Center.

C.3. GIS Responsibilities and Roles

County GIS operations have multiple responsibilities. Although GIS technology was established first in county tax administration for land records and tax assessment purposes, county operations have evolved to include street centerline maintenance, address assignment and maintenance, planning applications, and other base mapping responsibilities. See Table 2. Several of the counties have closely coordinated GIS responsibilities between 911 communications and tax mapping. All counties provide the public with web map viewers, and several have internal online map viewers. Some map viewers are developed and hosted by county staff, some are developed and hosted by contractors, and some have a combination of hosting and maintenance. For the relatively small staff sizes, the counties have taken on significant regular tasks.

To supplement permanent staff, most of the region's local GIS operations, larger and smaller, engage technical services through a contract(s) with any one of a number of private firms. In most cases, service providers develop and manage web map viewers and/or assist in database management.

Table 2. County GIS Responsibilities by Type

Responsibility of GIS Operations	Number of Counties
Web mapping (internal)	5
Manage a contractor for web mapping (external)	8
Tax mapping	11
Addressing	11
Master address database management	6
Street centerline maintenance	11
Operate computer aided dispatch	2
Manage a contractor for Computer aided dispatch	5
Land use, zoning, and other maps for planning	10
Manage a contractor for mapping, database, consultation	7

County GIS operations in the region serve multiple departments and functions. Tax administration, emergency management and 911 communications, planning, public works and economic development are the most common. See Table 3.

Table 3. County Departments or Functions Served by GIS

Departments/Functions Served by GIS Operations	Number of Counties
Tax administration	11
Planning	10
Public works	10
Health	7
911 communications	9
Emergency management	10
Public safety	8
Economic development	11
Board of Elections	6
School (districts)	2
Parks and recreation	3

C.4. Municipalities and GIS

Most municipalities in the region had either basic GIS capability or none at all. The exceptions were Fayetteville, Southern Pines, Pinehurst, Aberdeen, Whispering Pines, Dunn, Clinton, and Laurinburg where medium to high capability is associated with planning, 911 communications, or public works.

C.5. Data Sharing and Public Access

In all eleven counties, GIS operations provide public access through Internet mapping applications that feature tax parcels, base map layers, and aerial imagery. A local map viewer enables users to look up a property, display a map, and get tax information about the property of interest. Most counties rely on contractors for the development and maintenance of the map viewers. The web mapping sites were developed internally by two counties (Cumberland and Harnett) or developed by three different private service providers. One of the companies (Withers & Ravenel) developed web map viewers (called “ConnectGIS”) for 7 of the 11 counties. ESRI and Anderson and Associates each developed one map viewer. See Table 4.

Table 4. Online Map Viewers by County, Fort Bragg Regional Alliance, 2011

County	Go to:	Note
Bladen-map viewer	http://bladen.connectgis.com/Default/Default.aspx	Connect GIS
Cumberland-map viewer	http://expo.co.cumberland.nc.us/ http://152.31.99.8/website/community_gis/viewer.htm	County internal
Harnett-map viewer	http://gistools.harnett.org/Freeance/Client/PublicAccess1/index.html?appconfig=public1	County internal
Hoke-map viewer	http://hoke.connectgis.com/Default/Default.aspx	Connect GIS
Lee-map viewer	http://lee.connectgis.com/Default/Default.aspx	Connect GIS
Montgomery-map viewer	http://arcims.webgis.net/nc/montgomery/	Anderson & Associates
Moore-map viewer	http://mooregisweb.moorecountync.gov/connectgis/moore/	Connect GIS
Richmond-map viewer	http://gis.richmondnc.com/parcelviewer/	ESRI
Robeson-map viewer	http://www.gis.co.robesson.nc.us/ConnectGISWeb/Robeson/	Connect GIS
Sampson-map viewer	http://sampson.connectgis.com/Default/Default.aspx	Connect GIS
Scotland-map viewer	http://38.124.248.92/ConnectGIS_v6/Map.aspx	Connect GIS

The other key online application for counties in the region is a data download function, either an FTP site with zipped files or a download function accessible through a web map viewer. Eight of the counties have an online service for users to download geospatial datasets for use with their own desktop GIS tools. Richmond and Scotland counties have files available via FTP on request. Montgomery and Robeson counties do not have online download capability (digital files on CD are available on request). See Table 5.

In addition to online systems, GIS operations handle requests for custom datasets and maps that may include geospatial analysis. Counties may charge a fee for offline data handling to fill requests, with some discretion depending on the nature of a request.

Table 5. Online Data Download Services by County, Fort Bragg Regional Alliance, 2011

County	Go to:	Note
Bladen-data download	http://web2.mobile311.com/bladen/	Mobile 311; easy access
Cumberland-download	http://expo.co.cumberland.nc.us/disclaimer.html	County; easy access
Harnett-download	http://gisportal.harnett.org/Downloads/tabid/54/Default.aspx	County; easy access
Hoke-download	http://hoke.connectgis.com/Default/Default.aspx Advanced tool in map viewer to download visible layers Datasets offline by request; fees may apply.	Web viewer
Lee-download	http://174.37.23.217/Departments/GISStrategicServices/DownloadGISLayers.aspx	County; easiest access
Montgomery-download	None; datasets are available offline.	
Moore-download	http://www.co.moore.nc.us/index.php/en/data-download	County site
Richmond-download	FTP for datasets by request; no fees.	
Robeson-download	None: datasets offline by request; fees per dataset may apply.	
Sampson-download	http://sampson.connectgis.com/Default/Default.aspx Advanced tool in map viewer to download visible layers	Web viewer
Scotland-download	FTP for datasets by request. A handling fee per dataset may apply.	

C.6. Data Quantity and Quality

The key datasets noted in B.1 above are for the most part readily available in the eleven counties in the region. Observations are noted for each:

- a. Tax parcels – maintained by all counties; longstanding focus of local GIS
- b. Roads – maintained by all counties; essential for 911 communications
- c. Municipal boundaries – variable in completeness and currency
- d. Extraterritorial jurisdiction (ETJ) -- variable in completeness and currency
- e. Zoning districts --- variable in completeness and currency; mostly maintained by counties
- f. Water and sewer infrastructure – counties maintain with limited public access to data based on security concerns; 1997 statewide dataset has historic value, but higher resolution, more current local data supports facility management and planning
- g. Districts for fire, public safety, schools, voting – commonly maintained by counties for mapping and 911 communications
- h. Aerial imagery (current and historic) – 2010 is a statewide resource; county imagery from previous years is available for all counties
- i. Address points (and/or structure outlines with associated addresses) – not available in all counties, but becoming more common at the county level in support of 911 communications

Quality factors (B.7. above) include accuracy, resolution, completeness, currency, and consistency. The quality of county geospatial datasets maintained by counties in the region is generally very good and suitable for a range of local government operations within the county boundaries. Six of the counties noted that, if more staff time were available, more quality control and resolution of data issues (geometry and attributes and metadata) would save time when inconsistencies become apparent to data users. For the purposes of regional planning and needs for data integration across counties, data quality has shortcomings in terms of consistency.

Data accessibility in general is strong, but specific datasets and data fields are less widely available in downloadable datasets. This has an impact on derived datasets (B.6. above). CGIA assisted the Littlejohn Group in a housing analysis in the region that included a set of maps for each of five counties that displayed residential building location, year built, dwelling units by property, and assessed building value. Lee and Moore counties offered downloadable tax parcel boundaries with all of the attributes needed to create the desired set of maps. However, CGIA requested and obtained via email or FTP additional data items in tables that were joined to parcel boundaries from Harnett, Cumberland, and Hoke counties. In another example, CGIA assisted the Fort Bragg Regional Alliance in its working lands project that included maps of parcels used for agriculture and parcels in voluntary agricultural districts. CGIA requested additional data from all eleven counties. All counties with the exception of Bladen, Sampson and Scotland were able to furnish additional data with fields representing agricultural land use.

The table in Appendix A displays an example of the variability of published parcel attributes (fields) in the context of a potential standard set of attributes (those identified by the state's Working Group for Seamless Parcels in an effort to translate county maintained fields to a common set of fields). The published parcel attributes were in county parcel data sets downloaded or transferred "as is" without a request for a specific data table, so many of the fields in the desired scheme are missing values. Where values are present, there are many differences in field names, values, and codes from county to county.

In another example, CGIA compiled land use by parcel for seven counties to support the regional land use analysis by the LandDesign team. In some cases, additional tables related to land use were joined to parcels. As noted above, the attributes (fields) that included information about how a parcel is currently used (e.g., agricultural, commercial, industrial, residential, institutional, etc.) varied by county. Among the parcel dataset furnished by the seven counties in the land use modeling effort, the data from Moore, Harnett, Lee, Cumberland and Hoke counties had the most land use detail; the data from Richmond and Robeson counties had the least amount of detail. For all seven counties, classifying land use into a few general classes was challenging for three reasons: land use coding schemes varied county to county, data were not consistently documented with metadata, and code values were missing or apparently outdated in some cases. Land use fields in tax parcel datasets may not be updated as regularly as assessed value, addresses, and other fields that have more direct application in tax administration.

The requirements of Criterion's INDEX model for tax parcels went beyond typical requirements for local tax administration. For example, the model cannot use multi-part polygons. The Sandhills region is largely rural and has many multi-part polygons where large agricultural parcels are split by transportation rights-of-way or other factors. Multi-part polygons are more typical in rural areas than in densely settled areas. All of the counties had instances of multi-part polygons that required processing before going into the INDEX model.

All of the seven county parcel datasets had minor geometry repairs related to tiny polygons (typically caused by slight inconsistencies in adjacent parcel boundaries) and "bad intersections" of geometry. Again, the repairs were necessitated by the requirements of the INDEX model.

In some cases, stacked polygons (e.g., representing multiple ownership such as condominiums) in the same location or clusters of structure points (e.g. representing apartment units) complicated the data preparation for analysis. There is no easy solution that fits all situations across the region.

Regarding street centerlines from the counties, the data are more current and more detailed than a statewide collection by NC DOT. The local datasets had some inconsistency in terms of a continuous road network and/or representations of transportation rights-of-way. For the purposes of modeling, all county street centerline datasets required some processing to make centerlines all connected consistently. In some cases, rights-of-way (polygons or missing polygons) were in conflict with street centerlines. In some cases, large parcels contained parts of a road network with no rights-of-way mapped.

As noted above (B.7.) a remedy for inconsistent datasets from county to county are either (1) significant investment in detailed data standards and data management practices or (2) investment in multi-county dataset integration and satisfaction with less data currency.

D. Regional GIS Capacity

D.1. Regional Data Producers and Users

A dilemma in the Fort Bragg Regional Alliance region is that local governments (geospatial data producers of the most current, detailed geospatial data) do not derive significant benefits from regional geospatial datasets (compiled by data integrators for regional users). There are instances of local projects and issues that cross a county boundary, but local GIS coordinators confirmed that, for the most part, county jurisdiction and data needs end at the county line. When a county GIS coordinator requires data from a neighboring county (in the region or adjacent to the region alike), the coordinator calls the neighboring GIS coordinator directly for the latest data. This approach gives GIS coordinators confidence that they are obtaining the most complete

and current data from another county and renews contact for mutual assistance and consultation.

The primary beneficiaries of an integrated collection of local geospatial datasets are regional, state, federal and nonprofit organizations that develop plans, policies, and/or regulations, and make investments that may be cross-jurisdictional. In this region, the business needs for regional datasets are most prominent in the Fort Bragg Regional Alliance itself, Sustainable Sandhills, the Regional Land Use Advisory Commission (RLUAC), the US Fish & Wildlife Service, lead regional organizations, regional transportation planning organizations, and numerous state agencies.

D.2. Regional Data

The region achieved a regional GIS database (2002-2008) through federal and state funding and in-kind contributions from NC Department of Commerce, NC DOT, US Fish & Wildlife Service, and US Department of Defense. Counties participated by furnishing geospatial datasets, and Fort Bragg provided data and technical advice as well. However, the thrust behind the regional collection was (a) the Joint Land Use Study (2002) supported by NC Department of Commerce and Fort Bragg with technical services from CGIA, (b) a federally funded GIS position housed in the NC Department of Commerce through 2008, (c) a grant from US EPA to Sustainable Sandhills that included more data integration and analysis that generated a set of land suitability models and maps, (d) a grant from the Office of Economic Adjustment to the BRAC Regional Task Force that supported additional regional GIS analysis and mapping, and (e) funding from the NC DOT on behalf of the Interagency Leadership Team that supported additional data development, analysis and land suitability mapping.

The Sandhills GIS Internet map viewers (Sandhills GIS Association, viewers in operation circa 2006-2008) were used primarily by the RLUAC for parcel look-up and JLUS classification for the purpose of reviewing proposed local government actions (e.g., zoning change, subdivision). RLUAC uses the current map viewer on a regular basis. Other users of the web mapping interface were Sustainable Sandhills and the US Fish & Wildlife Service. The map viewer provides a quick reference map as well as a data download function (though datasets appear to be relatively out of date).

More commonly, organizations with GIS capability downloaded geospatial datasets from the regional collection for use with desktop GIS software. Examples include member organizations of the North Carolina Sandhills Conservation Partnership, the US Fish & Wildlife Service, NC Department of Commerce, and CGIA working on behalf of Sustainable Sandhills and the Fort Bragg Regional Alliance. None of the eleven county GIS coordinators used the Sandhills map viewers hosted by the Department of Commerce, including the current version https://edis.commerce.state.nc.us/sandhills_gis/resources.shtml. None of the eleven county GIS coordinators downloaded geospatial datasets from the Sandhills GIS download site. The common method for downloading data outside of a home county is direct contact and data transfer from one county GIS specialist to another as needed.

D.3. State Resources for the Region

For geospatial data resources, most of the key state data resources for planning and analysis purposes (B.2. above) are available for download as geospatial datasets, available as web map services, or linked to a cooperating data custodian from NC OneMap, a data clearinghouse and framework for data sharing (www.nconemap.gov) except where noted:

- a. Aerial imagery (statewide 2010 orthoimagery and statewide National Agricultural Imagery Program 2010)
- b. Rivers and streams
- c. Watersheds
- d. State and federal highways
- e. Address points
- f. Building footprints -- Geospatial & Technology Management Office*
- g. Flood hazard areas -- Geospatial & Technology Management Office*
- h. Railways
- i. Geodetic control
- j. Elevation
- k. Natural Heritage areas
- l. Wildlife habitat
- m. Conservation lands (easements and ownership)
- n. Stormwater jurisdictions
- o. Drinking water assessment areas
- p. County boundaries
- q. Shoreline
- r. Land cover (vegetation, impervious surfaces) – see also US Geological Survey**
- s. Economic characteristics – Economic Development Intelligence System***
- t. Population characteristics – see also EDIS***
- u. Regional boundaries

* <http://www.ncfloodmaps.com/>

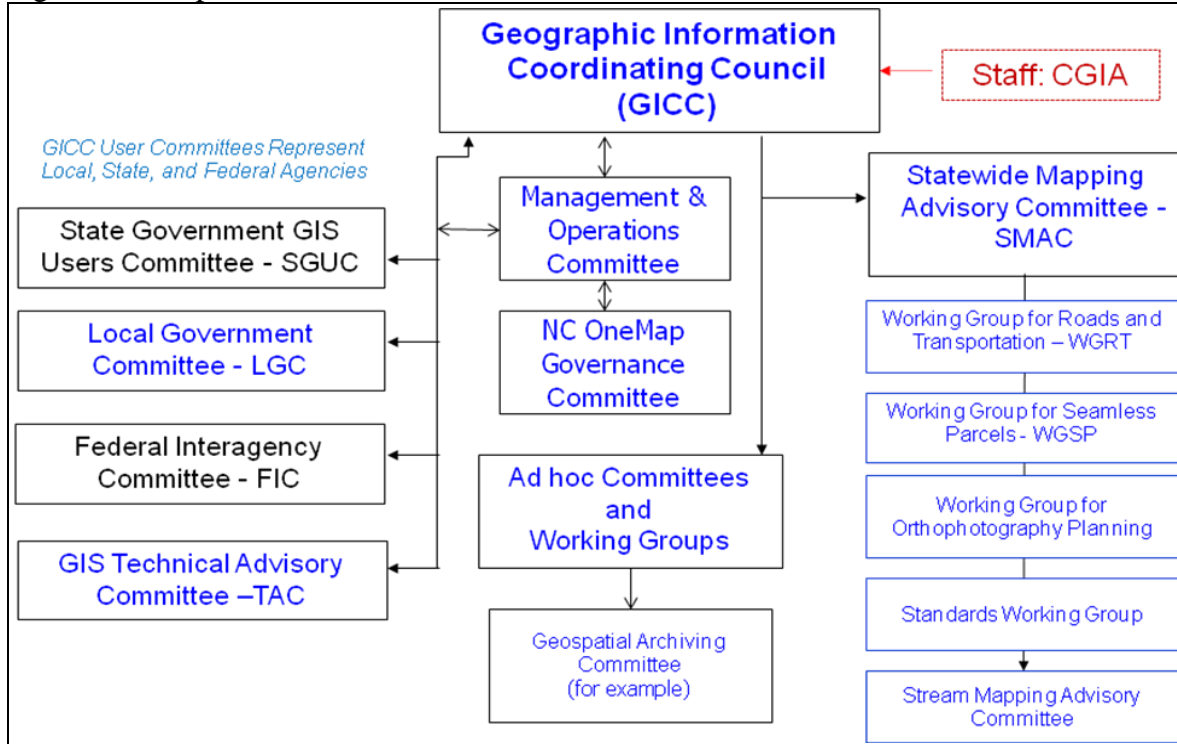
** <http://landcover.usgs.gov/>

*** <https://edis.commerce.state.nc.us/EDIS>

NC OneMap relies on collaborating state, local, regional and federal data producers and managers to make data accessible to the public. For the most part, data are complete, consistent and well documented. In some cases, the data are not as current or as high in resolution as local data.

For the objective of supporting planning with integrated, multi-county geospatial data, the state has an active coordination program with many opportunities for local and regional participation and influence. The coordination framework features the NC Geographic Information Coordinating Council and numerous standing committees and working groups with volunteer members from a range of public and private organizations. In the diagram below (Figure 1), the committees and working groups in blue font have local government participants. The Council works on policies and standards that support statewide consistency, completeness, and practical value for geospatial data and practices. CGIA is staff to the Council (www.ncgicc.com).

Figure 1. Geospatial Coordination Structure in North Carolina



D.4. Federal Resources for the Region

The key federal resources for planning and analysis purposes (B.3. above) are accessible through the websites noted.

- Detailed soil surveys (all counties in the region) – US Department of Agriculture, Soil Data Mart: <http://soildatamart.nrcs.usda.gov/>
- Land cover classification (2006 National Land Cover Database) – USGS: <http://landcover.usgs.gov/>
- Wetlands – US Fish & Wildlife Service, National Wetlands Inventory: <http://www.fws.gov/wetlands/>
- Population, housing and economic statistics – US Bureau of the Census: <http://2010.census.gov/2010census/data/> and the NC State Data Center: http://www.osbm.state.nc.us/ncosbm/facts_and_figures/state_data_center.shtml
- Federal land ownership (including military installations and ranges) – current, complete dataset is not available; the Federal Interagency Committee under the NC Geographic Information Coordinating Council is researching a solution. Fort Bragg is the local source for the boundaries of military installations in the region.

In terms of coordination and standardization, the Federal Geographic Data Committee is the focal point for federal standards and practices (www.fgdc.org).

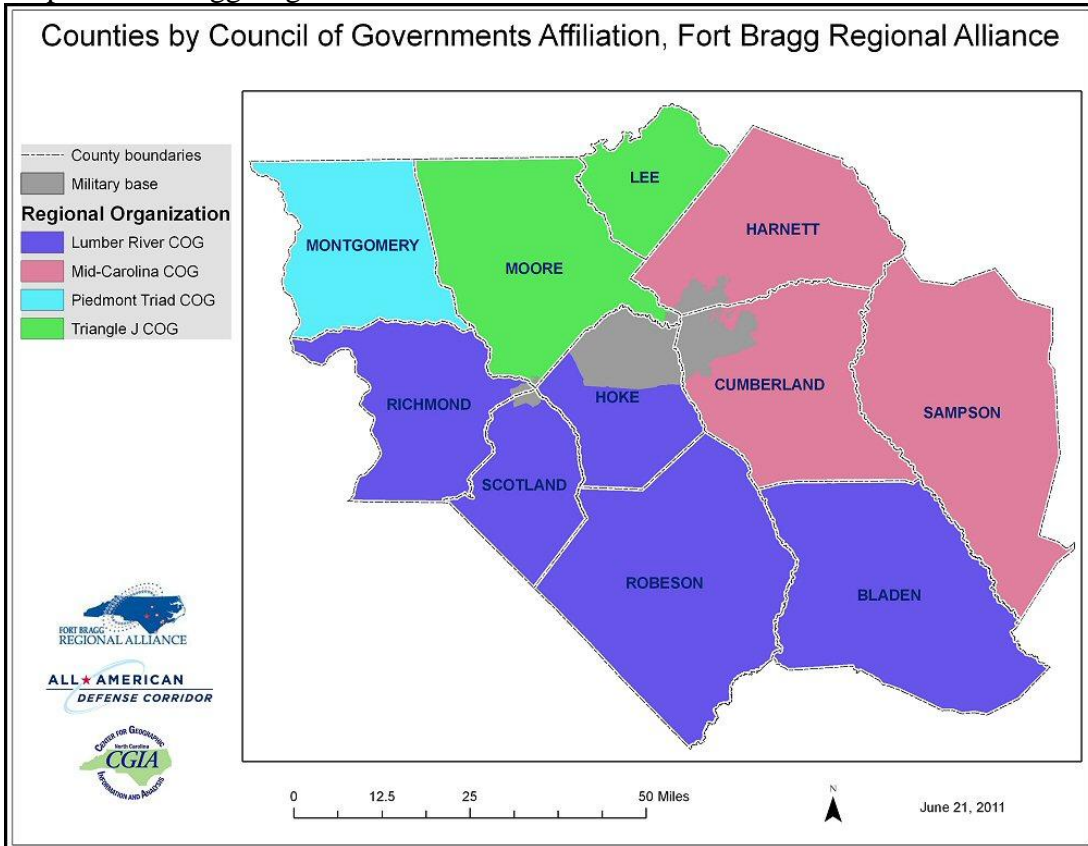
D.5. Private Datasets for the Region

Private utility geospatial datasets are rarely if ever accessible for public planning purposes. Constraints relate to legal and institutional issues that have yet to be resolved for non-emergency situations. Regarding telecommunications, the e-NC Authority has mapped broadband coverage areas and related institutions: (<http://www.e-nc.org/availability/mapping-and-tracking>). Regarding locations of employment and businesses, the NC Department of Commerce and its Economic Development Intelligence System has much business data to inform the planning process in the region: <https://edis.commerce.state.nc.us/EDIS>.

D.6. Regional Organizations Relating to the Eleven Counties

In addition to the Fort Bragg Regional Alliance, covering eleven counties, several other regional organizations are involved in regional planning. North Carolina has 17 COGs (Council of Governments), including four that relate to one or more of the eleven counties (Mid-Carolina, Triangle J., Lumber River, and Piedmont Triad). See Map 2.

Map 2. Fort Bragg Regional Alliance Counties and Associated Councils of Governments.

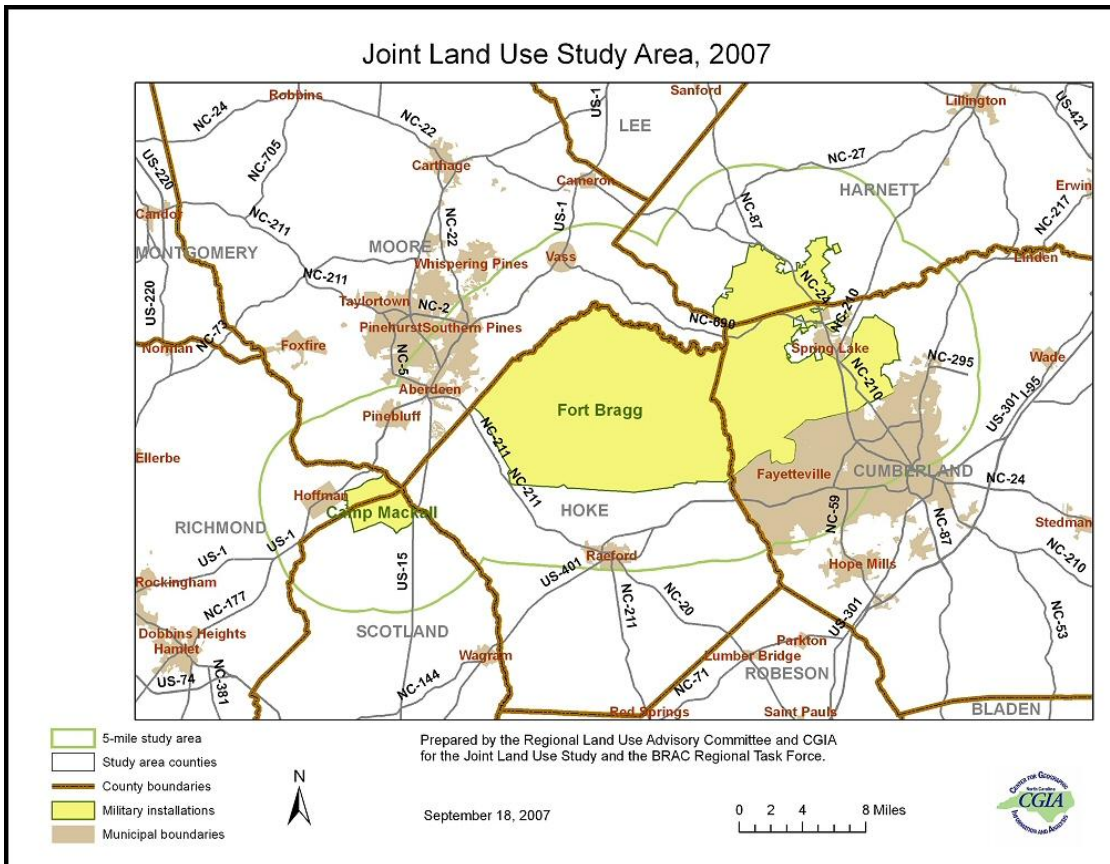


The NC Department of Commerce has a southeastern regional office of the Division of Community Planning in Fayetteville. The regional office covers 16 counties, including 10 of the 11 counties in the Fort Bragg Regional Alliance (all but Montgomery).

Nonprofit organizations with a regional focus are Sustainable Sandhills (relating to the same eleven counties), the Fort Bragg/Pope Air Force Base Regional Land Use Advisory Commission (focusing on a 5-mile study area around the military installations, relating to six of the counties (see Map 3).

Among the regional organizations noted above, GIS capabilities range from none to multiple full-time staff and may vary over time depending on projects and funding. No one organization has had a GIS person focused on the 11-county region since 2009.

Map 3. Joint Land Use Study Area, 2007.



Regarding GIS professional organizations specific to the region, counties participated in the Sandhills GIS Association for several years. The group was chaired by the Sandhills GIS coordinator in the NC Department of Commerce (Fayetteville Regional Office). Since 2009, in the absence of a coordinator, county GIS practitioners in the region have maintained informal relationships with occasional meetings to compare thoughts on technology, applications, software solutions, and common issues. In interviews for this report, county GIS representatives expressed a strong preference for continuing informal relationships and not resuming a formal organization.

A professional resource for GIS users in the region that was noted in interviews is the Carolina Urban and Regional Information Systems Association. This two-state chapter offers period training opportunities as well as meetings with technical sessions (www.carolinaurisa.org). Notable among other professional organizations that support coordination and good practices for GIS and related 911 communications in region are the NC Property Mappers Association (www.ncpropertymappers.org), the NC Local Government Information Systems Association (www.nclgisa.org), and the NC Chapters of the Association of Public-Safety Communications Officials (www.ncapco.org) and the National Emergency Number Association (www.ncnena.org).

E. Approaches to Regional Geospatial Data Sharing

There are at least three approaches to supporting and expanding regional capacity for geospatial data sharing and applications: fund a regional specialist, fund additional local specialists in one or more counties, or engage technical service providers from public and private organizations.

Approach 1. Fund a regional GIS specialist in the Division of Community Planning

Currently, the Fayetteville Regional Office of the NC Department of Commerce covers a 16-county region that includes 10 of the 11 counties in the region of the Fort Bragg Regional Alliance. The Department's Division of Community Planning (DCP) in Fayetteville consists of a Chief Planner (Monita McLaurin) and two Planners (one located in Wilmington). The office had a Senior Planner (Jeff Burdick) with GIS skills and experience. He assisted in the interviews for this report. Unfortunately, the Senior Planner position was eliminated in the Department budget for 2011-2012. DCP's central office in Raleigh has GIS expertise (Will Best) to support regional operations.

DCP adds value in planning and community development in smaller municipalities and more rural counties where local capacities for planning and analysis (and GIS) are limited. Studies and products typically relate to infrastructure, housing, land use, subdivision/unified development ordinances, and zoning ordinances. On occasion, DCP will receive a request for a feasibility study for a community project. The geospatial datasets that are most useful for planning and community development are county tax parcels, roads, water and sewer infrastructure, municipal boundaries, and extraterritorial jurisdictions. Other datasets may include population and housing statistics, natural features, land cover, soils, slope, conservation lands, and agricultural areas.

Based on information from DCP, a GIS specialist in the Fayetteville Regional Office would be an asset for the Fort Bragg Regional Alliance for three purposes.

1. DCP projects in support of municipalities in the region:
 - Assistance to local jurisdictions typically involves custom analysis and mapping to communicate opportunities, options, and best planning practices. This includes preparation of custom map documents, development of methods for deriving and integrating datasets, and

- communicating map options to staff planners. This would account for about 50 percent of a GIS specialist's time.
2. Regional projects in collaboration with Fort Bragg Regional Alliance and other regional organizations:
Projects organized by regional partners benefit from GIS analysis and data sharing in support of planning and community development. This includes data integration, adaptation of products from models and analyses, custom mapping, and communication with regional partners. This would account for about 25 percent of a GIS specialist's time.
 3. GIS coordination in the region and maintenance of a collection of geospatial data from the region:
GIS coordination includes communication with county and municipal GIS coordinators, periodic meetings and training sessions, as well annual collection of parcels, roads, municipal boundaries, extraterritorial jurisdictions, and conservation lands (at a minimum) and other selected datasets based on regional project needs (e.g., infrastructure). The annual collection requires data integration, documentation, and distribution to regional partners. This would account for about 25 percent of a GIS specialist's time.

Approach 2. Invest in local government GIS specialists

From a regional data integration perspective, Federal and/or North Carolina data standards are in place for the most basic (framework) geospatial data, but not with the level of detail that would make data seamless from county to county. Absent detailed content standards, county GIS operations do not have an incentive to match the specific data formats of neighboring counties for publication purposes. Consequently, a regional business need is difficult to satisfy. From a local business need perspective, GIS specialists have large and increasing responsibilities in serving local needs and adding value to a range of local services. In none of the eleven counties is there evidence that all potential benefits of geospatial data and technology are being realized.

An approach to creating more consistent local datasets and satisfying more local business needs is to fund a GIS specialist in one or more county GIS operations. For any and all of the counties, one additional employee skilled in GIS analysis would enable progress toward county enterprise GIS. Progress on current or new enterprise approaches would benefit a variety of county departments and be better suited to regional and statewide integration of data. Concerning regional business needs, having an additional GIS specialist would enable a county to afford time to collaborate with the NC Geographic Information Coordinating Council to implement detailed data standards, improve data consistency, assist with local quality control, prepare datasets for publication and data sharing, assist in regional projects, and assist in integrating local workflows and processes and datasets between GIS and 911 operations (relating to street centerlines, address points, address assignments, districts, boundaries, and imagery). The integration of data between GIS and 911 is increasingly important in the implementation of Next Generation 911 and achieving benefits relating to those widely used datasets.

Supporting one, several, or all counties with this type of direct investment in human resources depends on available funding and the emphasis of assistance. To be fair, consistent, and comprehensive and most effective from a regional perspective, all eleven counties would add a GIS specialist. With smaller investments, one approach would be to supplement local capabilities where only one to three people are currently handling all of the GIS responsibilities (Scotland, Montgomery, Bladen, and Sampson). Another strategy could be to supplement current GIS capabilities in the counties most closely related to the military mission (Cumberland, Harnett, Moore, and Hoke). A third strategy could be to add staff in the counties that have the highest ratios of resident population to GIS staff (Cumberland, Moore, Harnett, Robeson, Sampson and Scotland as shown in Table 1). Clearly, the most beneficial selection would be all 11 counties to support the quality of quantity of the most detailed data (from counties) and accomplish objectives for regional capability, consistency, completeness and currency.

Approach 3. Invest in technical services as needed for specific projects

This approach has been used in the region since 2009. Current resources in local government operations and regional organizations (nonprofit and federal) have been supplemented by contracted technical services to support specific projects. Technical services include collecting and integrating parcel datasets to meet project requirements. For example, CGIA created an 11-county parcel dataset with selected fields for analysis related to the Sustainable Sandhills Land Suitability Maps, derived new datasets from state and local sources, and converted datasets to grid format for modeling. The US Fish & Wildlife Service integrated habitat information for conservation planning, and supported specific regional projects to the benefit of multiple regional organizations. Most recently, CGIA classified land use from local parcel data, and processed local roads and parcels to meet topological and geometric requirements for inclusion in INDEX models developed by Criterion for the team managed by LandDesign in the regional Sustainable Growth Management Strategy project. This approach does not require ongoing database maintenance. Instead it relies on collection of the best available data “as is” and technical processing to integrate and derive project-specific datasets.

In terms of making progress on cross-jurisdictional data consistency, this approach does not afford the local GIS operations additional staff time to participate, but relies on current levels of participation (which vary by county).

F. Conclusion

This assessment of GIS capabilities in the Fort Bragg Regional Alliance highlights strengths and weaknesses as well as opportunities to better support objectives for regional planning and analysis. In terms of geospatial data and applications, CGIA concludes that available local, regional, state, federal and private geospatial resources play key roles in meeting local and regional planning and other business needs. The region has significant geospatial capacity that would generate more benefits with strategic supplements to local GIS operations.

CGIA identified three approaches to supplementing GIS capacity in the region, all of which depend on some level of funding to support human resources. Although a few of the counties would benefit from investments in network infrastructure to enable GIS to better serve multiple local departments, the primary constraint in each and every county in the region is staff time to cover a range of responsibilities. CGIA does not suggest that any one of the three approaches is ideal; each of has advantages and drawbacks and challenges to fund and manage. The most likely approach in the context of limited funds is number 3, a continuation of the current project-oriented approach.

One of the hardest questions to answer is “what is the cost effectiveness of a custom regional geospatial database that would contain periodic collections of local GIS datasets and regular integration and maintenance?” Such a collection has an inherent lack of currency for dynamic datasets like parcels, roads, and address points. Local GIS users do not download or view regional data, instead relying on GIS counterparts in other jurisdictions as needed. The number of users of an integrated regional collection appears to be small. The alternative approach is as-needed collection and integration of the best available data to meet specific project needs. The statewide analogy is the NC OneMap database for which dynamic local datasets are not collected and integrated; instead, NC OneMap offers online connections to local servers for display of web map services for local dynamic data.

For regional planners and analysts, CGIA identified benefits in maintenance of the Sandhills web map viewer at the NC Department of Commerce where regional data are displayed in the context of base maps. Featured project-related datasets include custom JLUS data, land suitability analysis, and the Green Growth Toolbox. While local GIS users do not use the application, it has great value to regional users.

CGIA would like to suggest that the current mode of informal meetings and communications among local GIS users in the region is adequate and preferred by the participants. In addition to the informal meetings, GIS users have access to the statewide coordination structure and professional organizations as additional means for communication, collaboration and professional development. CGIA would encourage GIS users, with the understanding that time is scarce, to participate in planning and policy related to geospatial standards and data development for mutual benefits to GIS users across the region and state.

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Jeff Brown

Coordination Program Manager

NC Center for Geographic Information and Analysis

Mail Service Center 20322

Raleigh, NC 27699-0322

919-754-6584

jeff.brown@nc.gov

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Appendix A. Cadastral Elements by County

Standard:	Proposed:		Elements by County:										
NC GICC Core Cadastral	WGSP Element	NOTES	Bladen	Cumberland	Harnett	Hoke	Lee	Montgomery	Moore	Richmond	Robeson	Sampson	Scotland
Parcel Outline (polygon)	GEOMETRY		Perimeter	Perimeter (0 value)								PERIMETE	Shape_len
Parcel Centroid	CENTR_USNG					PIN	PIN	PIN				PIN	
Parcel ID	PARNO	Parcel identifier is a key field for relating tables to geometry	PIN_1	NAD83_PIN	PIN	PIN	PIN	PIN	PIN	PIN2	PIN_NUMBE R	PIN	PIN
Parcel ID Alternate	ALTPID		OLD_PIN	NAD27_PIN	PID	PIN_1	PINID		LRK	RECNO		APN	PINID
	LastGeomEditDate	Last edits to geometry				p_create_d					DATECREA TE		
	LastPropertyEditDate	Last edits to attributes									DATECREA TE		
	GIS_Data_Currency	Dataset edition											
	CAMA_Data_Currency	Tabular database edition											
Owner Name	OWNNAME		Name1	OWNER_NAME	NAME	c_cid_nam1, c_cid_nam2	OWNER1, OWNER2	NAME	NAME,NAM E2	NAM1,NAM2		CURRENT_	NAME1,NAM E
Owner's Mailing Address	MAILADD	Mailing address may not be physical address of property	OwnerAddress	ST_NUM,ST_NAME,ST_SUFIX,CITY, STATE,ZIP	ADDR1, ADDR2, ADDR3, CITY, STATE, ZIP, ZIP4	c_addr_li1,c_addr_li2,c_ci d_city,c_cid_stat,c_cid_zi p	MAILADRNO ,MAILADRA DD,MAILAD RDIR,MAILA DRSTR,MAIL CITY,MAIL STATE,MAIL ZIP	MAILADDR, MAILCITY,M AILSTATE,M AILZIP	ADDRESS, CITY,STATE ,ZIP	ADRS,CITY		OWNER_AD	ADDRESS1, ADDRESS2, CITY,STATE ,ZIP
Parcel Street Address	SITEADD		PhysicalSt		PROPADDR SS		PROPADDR	PROPADDR					PHYSADDR
Subdivision Name		Convenient for selecting units in a subdivision	Neighborhood	SUB_NAME	SUBDIV		SUBDIV,SU BDNUM						
Land Area	DEED_ACRES	Deeded land area	DeedAcres		DEEDED_A CR	Acres			DEED_ACRES		DEEDEDAC RE		LANDUNIT
	CALC_ACRES	Calculated land area	MapAcres		TOTAL_ACR E	TOTAL_ACR E	ACRES		CALC_ACRES,TAX_ACR ES	CALACRES	CALCULATE D		ACRES
Source	SOURCERE	Source of			DBOOK,DPA	p_deed_bkp	BOOK,PAGE	DEEDBOOK, DEEDPAGE	DEED_PAG E,DEED_PAG E	DEED		BOOK_PAG, DEED_PAG	BOOKPAGE

Table Sources: NC Geographic Information Coordinating Council, Core Cadastral Standard;
NC Statewide Mapping Advisory Committee, Working Group for Seamless Parcels; county cadastral datasets 2010.