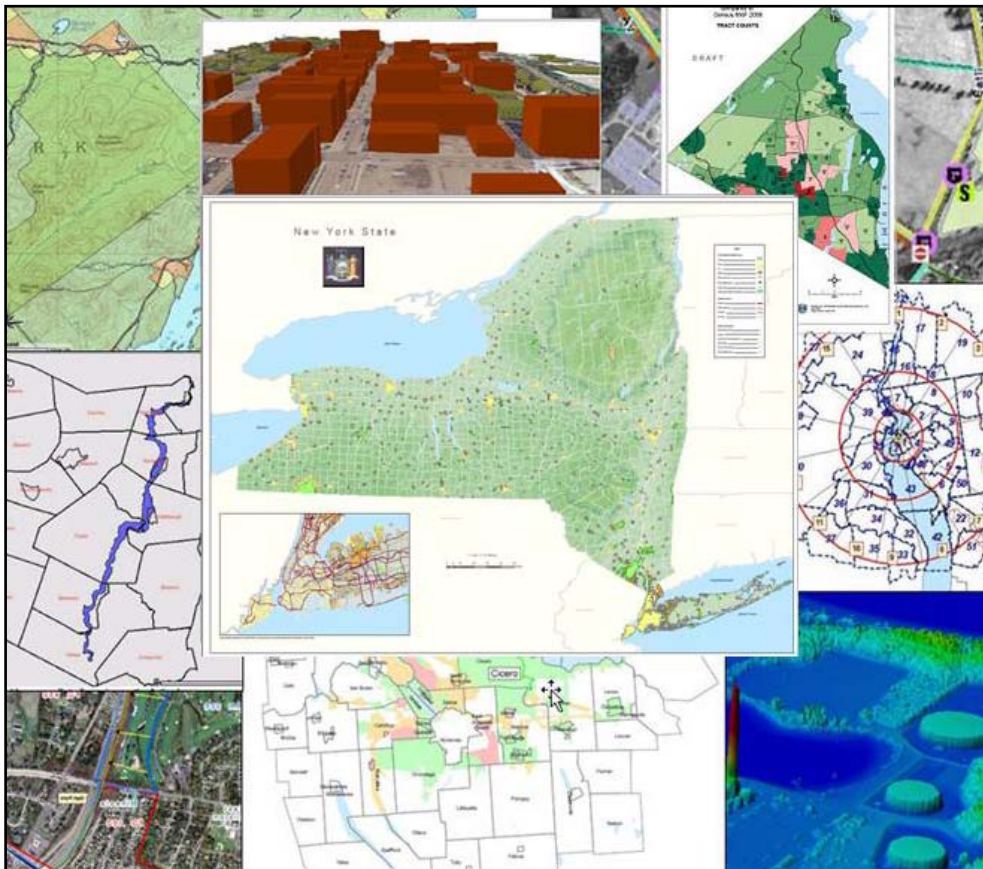


State of New York Geographic Information System (GIS) Strategic Plan



August, 2008



New York State Office of Cyber Security &
Critical Infrastructure Coordination
Director William F. Pelgrin

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The participation of the New York State GIS Association on this project is gratefully acknowledged.

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Executive Summary

What was done?

During the Fall of 2007 and through the Spring of 2008, New York conducted a statewide GIS strategic planning process. This process was overseen by the New York State GIS Coordinating Body and New York Office of Cyber Security and Critical Infrastructure Coordination (CSCIC) which houses the state's GIS coordination program. This work was funded by a United States Geological Survey (USGS), Federal Geographic Data Committee (FGDC), Cooperative Assistance Program (CAP) grant. The project proceeded through three phases:

1. **Information Gathering**, including: conducting six GIS stakeholder workshops throughout the state aimed at collecting direct stakeholder input into strengths and weaknesses and the priorities for improvement. Stakeholder workshops were conducted in the following regions of the state: New York City, Long Island, Hudson Valley, Capital District, North Country and Central/Western New York.
2. **Synthesis and Strategizing**, including: deliberations with both the Coordinating Body and CSCIC management aimed at identifying recommendations that would leverage existing strengths and address weaknesses.
3. **Plan Authoring and Approval**, including: drafting this document and initiating a consensus building process through the solicitation and incorporation of broad-based feedback on an initial draft of the plan.

What was found?

The following synthesizes major observations uncovered during the information gathering process:

- New York has **significant geospatial strengths** which include:
 - Mature, statewide GIS coordination program with broad stakeholder support for, and engagement in that program
 - Rich, statewide, core geospatial data assets
 - Widespread public sector data sharing through the Data Sharing Cooperative
 - National leadership for statewide aerial imagery program
 - National leadership in executing a multi-governmental program for the development and maintenance of streets and address data.
 - Strong geospatial educational programs
- Important **geospatial weaknesses** that should be addressed:
 - Gaps and weaknesses in some key data layers:
 - **Elevation:** statewide elevation data is inadequate for many required uses such as flood planning, prevention and response.
 - **Parcels:** although there is wide availability of county-based parcel information, the data are not consistent and it is very difficult to assemble parcels on a regional or statewide basis, in spite of huge demands for this data set.

- **County and municipal boundaries:** are not mapped accurately and this hinders the accuracy of other data layers such as parcels and other administrative boundaries (e.g. school districts)
- The utility of the **data sharing cooperative is undermined** by significant pockets of dated information and the overall usability of the web-site.
- Local governments require access to non-technical GIS information that would **support their efforts to programmatically build local GIS capacity**. Examples of the types of information that are required includes: return on investment (ROI) case studies and GIS best practices information.

What is recommended:

In order to leverage these strengths, address the gaps and weaknesses and to further extend New York's geospatial capabilities the plan recommends the following programmatic goals be pursued:

1. Continue to provide national leadership in the development and maintenance of the state's **core, basemap layers** of streets, addresses, and orthoimagery
2. **Strengthen the existing Data Sharing Cooperative:**
 - a. Through more active database stewardship
 - b. By improving the utility and usability of the web-site
 - c. By encouraging further participation and potentially broader membership
3. Further **focus CSCIC's statewide GIS coordination role** by:
 - a. Continuing to foster local government GIS capacity building efforts
 - b. By re-branding the statewide coordination elements of the overall CSCIC program
 - c. Further developing a statewide GIS enterprise architecture and web services delivery platform
 - d. Augmenting and strengthening existing GIS standards setting work
 - e. Expanding the number of end-user oriented data products that are provided
4. Formally pursue a program to improve the quality of **statewide elevation data**
5. Strengthen and **expand the existing statewide orthoimagery program** to include a wider variety of products such as elevation and oblique imagery
6. Formally pursue a program to develop a **statewide parcel data layer** including active outreach and coordination with the Office of Real Property Services (ORPS)
7. Develop a plan for systematically **improving the accuracy of the state's administrative boundary data** (i.e. county and local government boundaries) including active outreach and coordination with the Department of State.
8. To the extent possible, continue to **align geospatial programs to gubernatorial priorities**.

1 Introduction

During the second half of 2007 and the first half of 2008 New York State completed a GIS Strategic Planning process that has resulted in this document. As described below, this process was designed to be open and inclusive and this plan is directed at all GIS stakeholders, across all sectors and levels of government. The intent of this process was to look outside of the day-to-day practice of GIS and to both look back at what has been accomplished and ahead towards what remains to be done. Based on understanding what has worked in New York, and understanding what has worked less well, this plan presents a series of findings and recommendations aimed at guiding New York's further geospatial development for the next 5 years. Thus, this plan provides a baseline direction that can be reviewed, assessed, and updated by the Statewide GIS Coordinating Body via an annual review process.

2 Strategic Planning Methodology

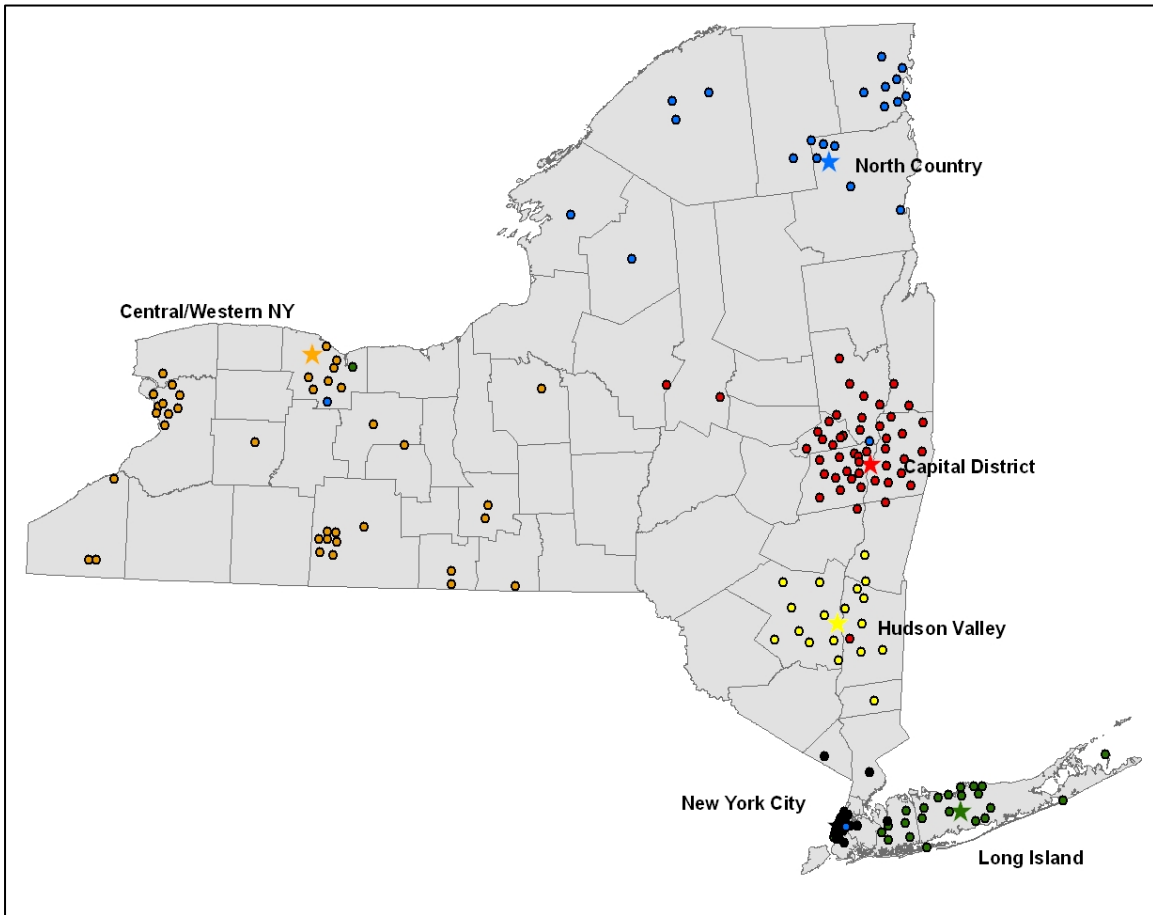
- Strategic Plan built around theme of:

How can the State best engage the geospatial community in cooperative strategies to maintain and share NSDI framework data?

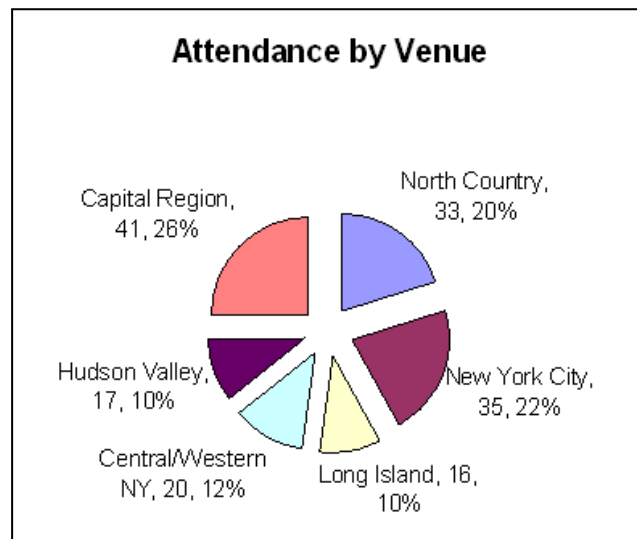
- Project funded through United States Geological Survey (USGS), Federal Geographic Data Committee (FGDC), Cooperative Assistance Program (CAP) grant
- Project/process overseen by New York Office for Cyber Security and Critical Infrastructure Coordination (CSCIC)
 - Cooperating partners: NYS GIS Coordinating Body and NYS GIS Association
- Project process consisted of:
 - Kickoff meeting to get direction from NYS GIS Coordinating Body
 - Six Regional Workshops:
 - **North Country:** Lake Placid, July 24, 2007
 - **New York City:** New York City, October 10, 2007
 - **Long Island:** Stony Brook, October 11, 2007
 - **Central/Western New York:** Greece, October 24, 2007
 - **Hudson Valley:** Highland, October 30, 2007
 - **Capital Region:** Albany, October 31, 2007

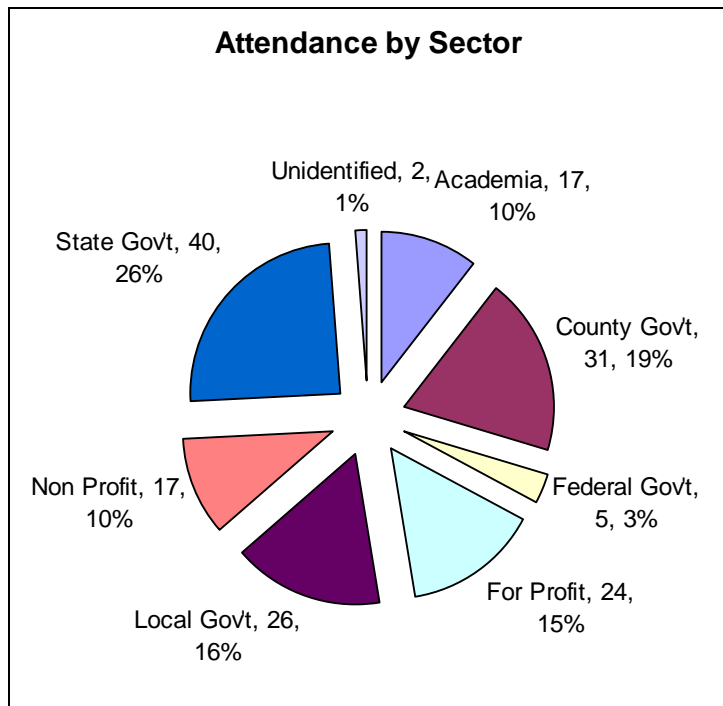
Six workshops were hosted in different regions of the state in an effort to maximize stakeholder participation. In total, 162 people attended these workshops from a variety of professional sectors. As the map below illustrates, the workshops were successful in generating participation from all regions of the state. The stars represent the location of

the workshops while the colored dots represent the location of people who attended each workshop.



The graphs below show the level of attendance at each workshop as well as how each GIS stakeholder sector was represented.





These sessions were designed to provide participants with an overview of the state’s strategic planning effort and how it will position the state to contribute to federal initiatives, including the emerging National Spatial Data Infrastructure (NSDI).

Most importantly, the workshops enabled New York GIS stakeholders to provide **direct input** on what is currently working well with respect to GIS in the state, what needs to be improved, and what might be done to enhance and extend GIS capabilities and effectiveness at all levels in New York.

Overall, stakeholder participation in the workshops was excellent and reflected their engagement with overall GIS coordination in New York. In addition, the quality of feedback and suggestions offered through this process greatly enriched this plan..

Once the workshops were completed, the planning process involved:

- Assembling preliminary findings and recommendations based on workshops
- Vetting recommendations with NYS GIS Coordinating Body
- Plan authoring by AppGeo
- Distribution of “Discussion Draft” of plan to stakeholder community:
 - Over 50 sets of comments were received on the draft plan.
 - All comments were reviewed by CSCIC and AppGeo and the majority of recommended edits and additions were incorporated into this document.
 - A significant number of comments took the form of “suggestions” for specific ways of implementing the recommendations. Many of these “implementation suggestions” were at a level of detail where they could not be included in the final document, but they have been cataloged by CSCIC and will be considered as the recommendations in the plan are implemented over time.
- Final review and approvals

- Review and approval by CSCIC executive management
- Review and approval by NYS GIS Coordinating Body

3 Current GIS Situation in New York

3.1 Who is the New York Geospatial Stakeholder Community?

- All levels of government, private sector, non-profit sector and academia
 - Represented by participation in the stakeholder workshops
- Important regional and geographic differences. The following provides high-level generalization about the distinct regional stakeholder characteristics as represented in workshops:
 - **North Country:** Smaller, more rural entities; Significant “have” vs. “have-not” issues; GIS startup is key interest area; Intergovernmental GIS data sharing is of particular interest in Adirondack Park management issues.
 - **New York City:** New York City has a uniquely developed robust GIS infrastructure; Even so, Intra-city GIS coordination remains a challenge; City repository focused on city operations; Non-City GIS users can be frustrated by availability of City data; Focus is on City’s requirements and lower level of attention on statewide efforts.
 - **Long Island:** Mature, well developed GIS infrastructures; Due to unique characteristics of the region – i.e. affluent populace, transportation challenges and distinct environmental issues such as groundwater and shoreline change – the focus of GIS is on Long Island based issues and there is a lower level of interaction on statewide issues.
 - **Central/Western New York:** Many strong, mature GIS programs, particularly at the county level; distinct cooperative spirit and identity as a “GIS community”; Issues of city/town/village coordination with county GIS programs are recognized as important; Interest and willingness to align with statewide outlook.
 - **Hudson Valley:** Many strong, mature GIS programs operating at the county and municipal levels of government; Programs tend to operate as autonomous entities with limited regional and statewide GIS program interaction; Land use and land management applications are prevalent as exemplified by New York City watershed lands which span nine Hudson Valley counties.
 - **Capital District:** State government orientation dominates the local GIS landscape; uniquely attuned to, and interested in statewide GIS issues and the operation of state level GIS programs; Many successful county and local government implementations that are focused on operational issues.
- Detailed notes from the workshops are found in **Appendix A**

3.2 Where are we now?

3.2.1 GIS Governance Evolution in New York

Roots

New York has a relatively mature GIS stakeholder community and there have been significant GIS efforts in New York dating to the mid-1980's. At the departmental level DOT, DEC and ORPS were early pioneers and departmental activity steadily grew into the mid-1990's.

Temporary GIS Council

In 1995, a Temporary GIS Council was formed expressly to look at opportunities for further GIS coordination in New York. The Temporary GIS Council was created to:

...examine various technical and public policy issues relating to GIS and geographic information systems and analysis; to identify the structure, functions and powers of a state-level geographic information systems coordinating body; and to examine the role a state-level body could play in assisting in the development and implementation of local government geographic information systems.

The Council was tasked with documenting GIS data and systems currently in use, potential users of GIS, potential use of GIS in economic development, and relevance of GIS to universities and the private sector. This report was also to address issue of records management, privacy and security and make recommendations on data standards, marketability, legal ramifications and potential fee collection.

The Council's report supported the notion that GIS had become a very valuable tool for supporting government systems in ways not possible with "conventional" information systems. The report also agreed with the conclusion of the CTG report on GIS, Sharing the Costs, Sharing the Benefits, "*that the central GIS issue facing New York is how to organize and sustain a collaborative effort across all levels of government and with the private sector that will harness this powerful tool to improve governmental services, drive down costs, and stimulate economic development.*"

1996 & 1997 Technology Policy Statements

The first GIS-related Technical Policy (i.e. a form of Executive Order) was released in September of 1996, and built upon the Temporary GIS Council Council's report and the Office of Real Property Services report and established the framework for the development of a permanent Statewide GIS Program¹.

¹ The 1996 and 1997 Technology Policy Statements were issued by then Governor George Pataki.

This policy created the GIS Coordinating Body and charged them with “developing a statewide policy to allow the transfer of digital data between State and Local Governments easily at little or no cost.”

The Governor’s second GIS Technical Policy, released in July of 1997, stated its purpose as “*Computerized geographic data that is created, collected, processed, disseminated, and stored by public agencies in New York State is a valuable information resource. This policy will facilitate the sharing of Geographic Information System (GIS) data and improve access to computerized geographic data across all levels of government.*”

These Technology Policy Statements initiated the formal statewide GIS Coordination program which was originally housed in the Office for Technology.

The GIS Coordinating Body

The Statewide GIS Coordinating Body’s longstanding mission statement relates that the Coordinating Body:

...coordinates, promotes and facilitates the development, effective use, and sharing of geographic information. It also removes barriers to implementing geographic information technology to improve the delivery of public services, protect the public and the environment, and enhance the business climate for the benefit of the State, its municipalities, businesses and citizens.

The Coordinating Body has 18 members with broad representation from all major GIS stakeholder sectors. The following lists membership representation:

- State government (4)
- Federal government (1)
- Local/County government (7)
- Academia (2)
- Non-profit (2)
- Private sector (2)

From the outset, the GIS Coordinating body formed work groups to address specific issues as they arose. Advisory groups made up of local and state government representatives as well as professionals from the private sector were tasked with providing input to the Coordinating Body on issues specifically affecting their sectors.

The major issues for the Coordinating Body include data access/data sharing, GIS leadership/centralization of efforts, addressing legal issues related to data sharing and privacy, and data coordination.

The GIS Data Sharing Cooperative

The NYS GIS Data Sharing Cooperative, made up of government and non-profit organizations, was established as a result of the Governor’s Technology Policy mandating GIS data sharing. All State agencies must participate in the Cooperative. Members of the Cooperative have executed “Data Sharing Agreements” in order to improve coordination efforts for data access and data sharing among these agencies. Two important aspects of the agreement are that data “creators” remain responsible for the

maintenance of their data sets but agree to share it at little or no cost and data “users” agree to send corrections/improvements back to the custodians of a particular data set to ensure incremental improvements to the accuracy of data.

Post- 9/11 Reorganization of the GIS Coordination Program Under the Office of Cyber Security and Critical Infrastructure Coordination

The Office of Cyber Security and Critical Infrastructure Coordination (CSCIC) was established in September 2002 as a result of the events of 9/11. The efforts of CSCIC were to focus on helping the State “*protect, detect, respond to and recover from cyber-based incidents that threaten the State's critical public and private assets.*” CSCIC leads the State's efforts in ensuring cyber readiness and critical infrastructure preparedness as well as coordinating the State’s GIS through collaborative workgroups with state agencies and private entities.

By establishing the GIS Data Clearinghouse as a centralized resource for GIS data related to the State’s critical infrastructure, CSCIC provided a means for more efficient GIS development and coordination through New York State. The clearinghouse site includes a data download portal, guidance documents, and GIS tools to promote efficient use of GIS resources.

The CSCIC recognizes the strong interdependency between mapping the State’s critical infrastructure and ensuring GIS coordination among disparate agencies. Lack of data coordination breeds the development of multiple data versions stored in multiple locations at unnecessary cost to local government agencies. The mission of the CSCIC will not only provide centralized access to critical data sets but will enable the incremental improvements to data quality with local input and updates to critical infrastructure data layers.

Thus, CSCIC maintains two complimentary and co-dependent programs:

1. Focused critical infrastructure database development and management
2. Oversight of the broader statewide GIS Coordination Program

The CSCIC GIS team is staffed with approximately 20 full-time GIS professionals to support the two missions.

There is broad GIS use within New York that goes well beyond the formal state coordination program house in CSCIC. The bullets below characterize this activity.

- GIS remains an integral part of **state government** with strong departmental efforts at:
 - Dept. of Cyber Security and Critical Infrastructure Coordination
 - Dept. of Transportation
 - Dept. of Environmental Conservation
 - Dept. of Health
 - Division of Criminal Justice Services
 - Dept. of State, Coastal Resource Center
 - Adirondack Park Agency
 - Dept. of Public Services

- New York Thruway Authority
- As well as many other smaller state agency initiatives
- Broad application of GIS in **county and local government**
 - Data Sharing Cooperative membership includes:
 - 58 counties
 - 239 local governments
 - Since not all GIS local government GIS operations are members of the Cooperative, actual local government utilization of GIS is even broader
- Wide use within the **private sector**
 - New York is home to industry leaders such as Pictometry and Pitney Bowes/MapInfo
 - Deployed by most utilities
 - Large in-state stable of GIS service providers
 - Routine use of data within the real estate and engineering communities
- Strong **academic** programs at both state and private institutions
 - Academic resources include New York being home to one of only three National Centers for Geographic Information and Analysis (NSCGIA) housed at SUNY Buffalo²
 - Infrastructure to provide training and a work force at a time when there is increased demand for geospatial specialists³
- Strong presence in the **private non-profit** sectors
 - 145 private non-profits are listed Data Sharing Cooperative members
- Bottom line: the ingredients for a successful coordination program and a platform on which to deploy “cooperative strategies for the sharing and maintenance of framework data” are in place.

² The other two NCGIA centers are located at the University of Maine, Orono and at the University of California, Santa Barbara.

³ Note that the U.S. Department of Labor has identified the geospatial industry as one of 15 “emerging” or “high growth” industries which house “in-demand” occupations. See the “Career Voyages” web-site’s geospatial page at: <http://www.careervoyages.gov/geospatialtechnology-main.cfm>

3.2.2 Relative to the National States Geographic Information Council (NSGIC) “9 Criteria for a Successful Statewide Program”

Criterion	Status	Status Description
1. A full-time, paid coordinator position is designated and has the authority to implement the state’s business and strategic plans.	MEETS	There is a paid Director of Coordination program within CSCIC.
2. A clearly defined authority exists for statewide coordination of geospatial information technologies and data production.	MEETS	GIS Coordination mandated via gubernatorial Technology Policy Directives in 1996-1997.
3. The statewide coordination office has a formal relationship with the state’s Chief Information Office (CIO).	PARTIALLY MEETS	While the New York GIS Coordination Program does not maintain a formal reporting relationship with the state CIO there are several conscious, informal coordination channels. These include the CSCIC CIO reporting into the Director of the Coordination Program thus providing coordination via the State CIO Council which CSCIC participates in. In addition, the GIS Coordination program Director performs purchase review on behalf of the State CIO for any significant GIS purchases by state government.
4. A champion (politician, or executive decision-maker) is aware and involved in the process of geospatial coordination.	MEETS	The New York Coordination Program has had key political and executive champions throughout its history. The current CSCIC Director, Will Pelgrin, is an active political champion for the advancement of geospatial activities and is strengthening relationships within the current administration.
5. Responsibilities for developing the National Spatial Data Infrastructure (NSDI) and a State Clearinghouse are assigned.	MEETS	The Coordination Program situated within CSCIC has formal responsibility for maintaining the New York State Geospatial Clearinghouse.
6. The ability exists to work and coordinate with local governments , academia, and the private sector.	MEETS	There is active coordination between CSCIC’s GIS program and other stakeholders such as state agencies, local and county government, academia, non-profits and the private sector. All of these sectors are represented on the GIS Coordinating Body.
7. Sustainable funding sources exist to meet project needs.	PARTIALLY MEETS	The CSCIC GIS program has sustainable funding for core operations, and ongoing programs such as the statewide orthoimagery program. It is anticipated that some new funding recommendations will be made to carry out the vision and programs contained in this plan.

8. GIS Coordinators have the authority to enter into contracts and become capable of receiving and expending funds.	MEETS	The CSCIC GIS program is part of a state agency and has the authority to enter into contracts, and to receive and expend funds.
9. The Federal government works through the statewide coordinating authority.	PARTIALLY MEETS	There are active attempts to maintain strong geospatial coordination with the federal government. However, there is room for improvement from both the state and federal perspective and there are examples of state agencies and programs that work independently with the federal government on geospatial matters.

3.3 Geospatial Strengths, Weaknesses & Opportunities

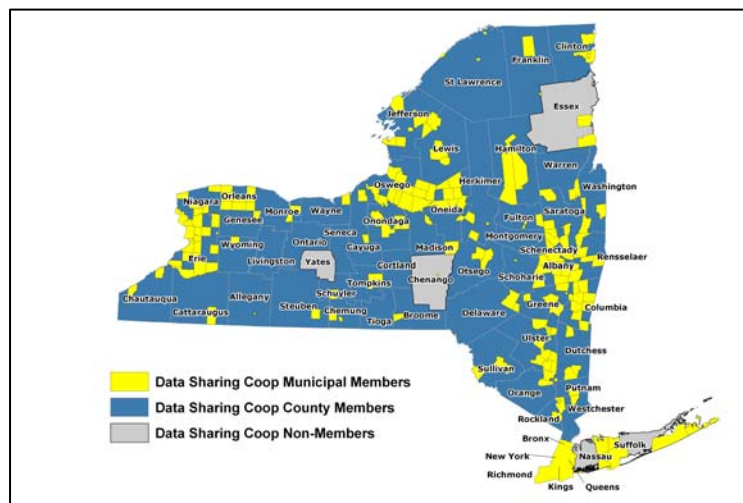
The following sections provide an overview of the strengths, weaknesses and opportunities for further geospatial development in New York that were gleaned from the stakeholder sessions conducted as part of this project. Several of these observations imply potential solutions to challenges or means of capitalizing on opportunities. The details of those suggestions are found later in the document as programmatic goals (see section 4.2).

3.3.1 Strengths

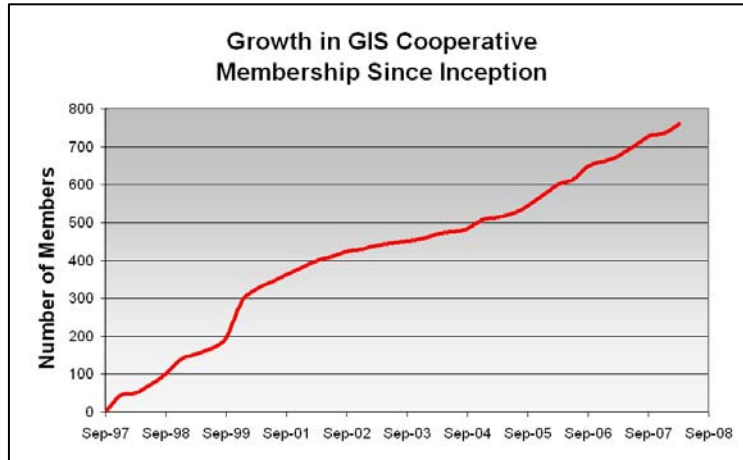
- **Mature coordination program with sustainable funding**
 - 20 full-time staff at CSCIC
 - Active outreach and support to local government GIS efforts including hosting of educational meetings/seminars
 - CSCIC sponsored “help desk” services that are widely used and praised
- **Solid foundation for all 7 NSDI framework data sets⁴**
 - Ongoing incremental improvement on several layers. For example, the NYSDEC working in conjunction with the USGS has made recent improvements to the hydrography data set.
 - Some additional opportunities for improvement, particularly on the data sets that are maintained by local government and flow to state government (e.g. parcels).
- **National leader with statewide orthoimagery program**
 - Mature program is universally viewed as a success
 - After Spring 2008 flying season, all parts of the state will have been flown at least twice
 - Great interest in initial web services access to orthos

⁴ The seven NSDI framework data layers include: geodetic control, cadastral, orthoimagery, elevation, hydrography, administrative units, and transportation. See details at: <http://www.fgdc.gov/framework>

- Innovative state, local government and private sector partnership for statewide **streets and addresses**
 - Relationship with commercial street data vendor⁵ for maintenance of statewide streets and addresses and the incorporation of authoritative edits provided by state and local government partners
 - Web-based Map Maintenance and Notification Tool (MMNT) for **distributed, collaborative editing of street and address data sets** by local government partners
 - Additional workflows allowing counties to provide batch updates of street data sets.
- National leader with **geodetic data** availability
 - NYSDOT maintains a web clearinghouse for all statewide survey data
 - NYSDOT has created a publicly available RTK GPS network
- New York has recognized the importance of **statewide data sharing** and has established numerous efforts to facilitate the free flow of digital data. Most notable of these efforts is the **Data Sharing Cooperative**. While there remain opportunities to improve the Cooperative it has successfully:
 - Initiated large scale data sharing (see images below showing current local government membership in the Cooperative as well as the growth in Cooperative membership).
 - Based on data for the first 10 months of 2007, CSCIC estimates that there will be over 3,000,000 individual data downloads from the Clearinghouse web-site.
 - Established uniform data sharing agreements with appropriate terms and conditions and protections for participants



⁵ From 2002-2007 New York contracted with TeleAtlas. In 2008, New York conducted a new procurement for the maintenance of streets and addresses.



- New York has a well organized and effective GIS professional organization in the **New York State GIS Association (NYSGISA)**. The Association’s mission involves providing assistance, education and coordination that will help guide GIS development, implementation and maintenance in New York. The Association provides a valuable partner to state government efforts in organizing the New York GIS stakeholder community and advocating for GIS progress. In addition, the NYSGISA is better positioned than state government to tackle issues such as commenting on legislation.
- New York is home to several academic institutions with **strong geospatial educational programs** that are capable of providing the geospatial workforce necessary for strong GIS programs at all levels of government and in the private sector. Examples of such programs are found at several New York University, Cornell, City University of New York, Hunter College and several campuses of the State University of New York, including SUNY Buffalo which is a member of the National Center for Geographic Information and Analysis (NCGIA) consortium (along with the University of Maine and the University of California, Santa Barbara).

3.3.2 Weaknesses

- While the availability of orthoimagery **web services** was viewed as a strength, the **performance** of these services is a current weakness. NY needs to consider an “industrial strength” web serving platform/solution. In informal tests of the web services using ArcGIS ArcView and a T1 connection to the internet from Boston, it took approximately 15-30 seconds for the web-services to deliver the appropriate orthoimagery data (e.g. to refresh the screen following a zoom or pan operation).

By comparison, displaying the orthoimagery using NY State Interactive Mapping Gateway Viewer (which is hosted by CSCIC), screen refreshes took approximately 9-

11 seconds. The identical imagery is also available via Google Maps⁶ which delivers a consistent 3-5 second screen refresh.

- There is an existing lack of readily available general information on county and local government GIS programs. During the workshops, local government personnel indicated a strong interest in having access to **information that would help “make the case” for investments in geospatial technology**. Information on the following would be most useful:
 - Funding and ROI case studies
 - Best practices for governance and staffing models
 - Best practices for data management
 - Use cases that document the benefits of specific data sets such as elevation
- **Usability of the existing GIS Clearinghouse web-site**. While all agreed it was a rich source of information, several stakeholders described issues and challenges in finding what they were looking for and it appears that the bar for the “GIS literacy” necessary to navigate the site is set relatively high.
- Data Sharing Cooperative members in several stakeholder sessions acknowledged their own weakness in regularly updating the holdings of the Cooperative. As such, the **Cooperative contains significant pockets of dated information**. This lack of data currency limits the utility of the Cooperative. CSCIC acknowledges that this is an important issue and they received a grant from the FGDC to further automate the process notifying cooperative members of the need to refresh their data sets. Further effort may involve a periodic review of server metrics on update frequency by Cooperative members. Similarly, the cooperative could be administered to provide better notification to members when core data holdings are updated.
- There is significant **frustration within the private sector** that the current Data Sharing Cooperative model does not allow private sector membership. As such, the private sector is shut out from many of the data sets contained within the cooperative as data exchanges are limited to cooperative members.
- Statewide **elevation data** is weak and insufficient for many GIS applications and projects. In particular, the current data is inadequate to support improvements to FEMA FIRM maps. The best statewide elevation data is currently a 10 meter digital elevation model that is derived from the USGS topographic quadrangle sheets and is sufficient to generate 10 foot contours. There is increasing demand for statewide 2 foot contour data and several regions of the state have been able to create superior elevation data on a regional basis.
- Statewide **wetlands data** is weak and not useful to many GIS stakeholders. That said, there is no state government mandate – either by DEC or CSCIC – for the development and maintenance of more detailed wetlands data.

⁶ Google has obtained copies of the NY State orthophotos.

- Issues with the **accuracy and reliability of municipal and county boundaries** was documented at all six workshops. This is one of the key data weaknesses within the state as boundary data is a fundamental part of the base map and these lines should be coincident with many other feature types such as parcels and hydrography. Nearly all of the legal descriptions for Cities, Towns and Counties exist in the Laws of the State of New York, and in most cases, the descriptions of these boundaries can be retraced and/or monumented by surveying those legal descriptions. Many original monuments still exist even after 150-200 years. Such a project was recently completed when the New York/Massachusetts Preemption Line was re-surveyed. The core problem is that such re-surveying is costly and most local governments are not willing/able to spend the money to do the survey work. Given the numerous challenges that poor boundary mapping introduces into state and local GIS practice it may be time for New York to begin making an investment in the development of a high-quality and authoritative electronic rendition of all boundaries suitable for the 21st century. Given that the New York Department of State oversees boundary issues, it may be time for the GIS community to engage them in taking on this long term challenge.
- Complicating this issue is the fact that the precise legal description and/or surveys of historic boundaries such as counties are not known and/or recoverable.
- There is an inconsistent understanding and **lack of awareness about the Freedom of Information Law (FOIL)** and as a result the digital geospatial data distribution practices of counties and local governments vary widely. While this can cause some confusion and frustration when people are trying to obtain these types of public records, and there is no clear precedent to follow when a new county is establishing its data distribution practices. Ultimately the FOIL statute itself contains language that guides the process and it also sets up a process for both exemptions and challenges. Unless the law itself is altered to provide explicit guidance on geospatial data, this issue will be addressed on a case by case basis via the FOIL challenge process, and potentially litigation.

3.3.3 Opportunities

- The **New York Data Sharing Cooperative** remains a viable model for implementing the widespread data sharing that is integral to building a statewide geospatial data infrastructure. A decade after its formation, this report documents existing weaknesses and opportunities for improving and strengthening the Cooperative. As such, there is a significant strategic opportunity to infuse the cooperative with some additional attention and new energy to help it fulfill its promise as an effective and efficient mechanism for public sector statewide geospatial data exchange.
- There is **enormous demand for local parcel data** within state government agencies (see table below). Over a dozen state agencies have already expended effort to gather local parcel data for their own purposes. This demand creates an opportunity for a coordinated state government strategy, perhaps building on existing ORPS mandates, to assemble statewide parcel data for a variety of purposes.

Agency	Parcel Use
Criminal Justice	<ul style="list-style-type: none"> • Geocoding • Crime prevention analysis
DEC	<ul style="list-style-type: none"> • Property management • Abutters notification
DEC Water	<ul style="list-style-type: none"> • Natural resource modeling • Drought management
Fish and Wildlife	<ul style="list-style-type: none"> • Wetlands notification • Identifying land access for wildlife survey
NY Canal Corporation	<ul style="list-style-type: none"> • Management of activities in right-of-way • Abutter notification • Economic development opportunities
NY Thruway Authority	<ul style="list-style-type: none"> • Land holdings assessment • Land disbursement opportunities
NYS DOT	<ul style="list-style-type: none"> • Right of way assessment • Abutters determination
Public Health Research	<ul style="list-style-type: none"> • Land use mix assessment • Walkability determination
Secretary of State, Division of Coastal Resources	<ul style="list-style-type: none"> • Identification of non-point source pollution • Open space acquisition
State Museum	<ul style="list-style-type: none"> • Identifying owners of oil and gas wells
State Parks	<ul style="list-style-type: none"> • Open space land acquisition

- There are significant opportunities to **leverage the ongoing success of the state’s orthoimagery program**. This program has successfully evolved to continue to offer a wider array of photogrammetry products, often via local buy-ups off of the state funded baseline. For example, the new 2007 contract allows for buy-ups for FEMA compliant **enhanced elevation data**. This new contract should provide further opportunities for region-by-region improvements to the relatively weak statewide elevation data. Other examples for future contracts might include:
 - 3D structure data
 - Photogrammetrically interpreted local wetlands data
 - Development of a “companion state contract” for **oblique imagery**
- The current orthoimagery program has been extremely successful in leveraging funding from a variety of sources to pay for a variety of buy-ups. State, federal, county and local government funding have all contributed to a variety of buy-ups

under the current program. For example, Federal money from the NGA/USGS's 133 Urban Areas Program has helped fund more frequent and higher resolution orthoimagery for the New York City, Buffalo and Albany regions.

Several state agencies indicated a strong interest in products that could be derived from the statewide orthoimagery program, for example better elevation data. Similarly, some non-profits as well as private sector firms identified potential interests in contributing funding to develop buy-up products. Thus, there is a significant opportunity to potentially tap other funding sources to help pay for enhanced photogrammetric products through **broader based funding consortia**. For example, it is possible to envision a funding consortia made up of a state agency (e.g. the Adirondack Park Agency), a private non-profit (e.g. The Nature Conservancy⁷), and county government covering the buy-up for improved elevation data within the park. Other consortia, in other parts of the state might involve utility and other private sector funding sources.

- The Data Clearinghouse has had an historic focus on delivering raw data for download. There are now many opportunities for CSCIC to deliver data in new ways, such as **web services** and also to provide additional derivative data products. The initial deployment of an orthoimagery web service, via the USGS EROS Data Center, is an excellent example of this. Over time, the orthoimagery web service can be supplemented and more and more data sets might be made available as consumable web services in addition to being available for download. Similarly, in addition to serving additional themes of data, there is an opportunity to support addition types of web services such as KML/KMZ services which could be consumed by end users who use freely available mapping clients such as Google Maps or Google Earth.

Also, there are several data sets that are posted on the CSCIC web-site in “raw data” form. The stakeholder community identified several **derivative data products** (i.e. the result of secondary data processing) that would be useful to have direct access to in addition to the raw data:

- 10 foot contours derived from the statewide 10 meter digital elevation model
- Streamlined major roads derived from the statewide roads data set

In addition, CSCIC might consider making further raw data products more readily available for download, for instance:

- Mass points and breakline elevation data used to control the orthoimagery (which are currently available “upon request”)
- State government-wide **data warehousing and the deployment of web services** offer significant opportunities to reduce redundant data storage between state agencies. This holds particularly true for large data sets such orthoimagery, or data sets such as parcels that change frequently and are derived from numerous local

⁷ The Nature Conservancy indicated a potential willingness to contribute funding towards regional elevation data at the Albany Stakeholder Meeting.

government sources. Such an approach would facilitate both inter-governmental and intra-governmental data exchange and utilization.

- New York has made a good start at addressing GIS data standards via the Coordinating Body's Standards & Data Coordination Work Group. The current outlook is to create minimal standards that are focused on enhancing data exchange and can be more easily adopted on a voluntary basis. The recently released parcel standard provides a good example of this approach. There appears to be an interest and willingness within the stakeholder community to see stronger guidance on **GIS standards**. Rather than being reluctant to adopt standards, many GIS stakeholders expressed an interest in gaining further guidance on standards to help with their own data management challenges. It was suggested that material such as "data templates" would be welcome as a starting place for newcomers that are commencing with data automation. As such, there is an opportunity to augment existing standards work.
- During the Spring of 2008 the newly created **Local Government Efficiency & Competitiveness Commission**⁸ released its initial report calling for local government reform and greater efficiency and competitiveness. While the report does not explicitly identify GIS, or even technology initiatives, there remains an opportunity to showcase examples of local governments cooperating to deliver GIS services in a manner consistent with the report's goals. For example, the report emphasizes opportunities for providing "shared services" on a regional basis. In some areas this is already being done with GIS services, for example:
 - Erie & Niagara counties share GIS technical infrastructure
 - Monroe & Erie counties deliver GIS web-sites on behalf of towns within the counties

In addition, the plan identifies opportunities for increased efficiency in several governmental activities that are rich in GIS applications such as assessing, emergency dispatch/911 and snow plowing. In addition, identifying opportunities for government consolidation and the provision of regional services is fundamentally a *geospatial activity* and there may be opportunities for the Commission itself to use GIS technology to identify regionalization and consolidation prospects.

CSCIC has participated in the Commission's meetings and will continue to monitor this activity and will continue to track examples such as the Erie/Niagara collaboration as relevant use cases.

⁸ See: <http://www.nyslocalgov.org>

4 Mission & Goals

4.1 Coordination Program Mission

The New York State Coordination Program's Mission Statement remains relevant and apt:

The NYS GIS Coordinating Body, operating under the auspices of the NYS Office of Cyber Security and Critical Infrastructure Coordination, coordinates, promotes and facilitates the development, effective use, and sharing of geographic information. It also removes barriers to implementing geographic information technology to improve the delivery of public services, protect the public and the environment, and enhance the business climate for the benefit of the State, its municipalities, businesses and citizens.

4.2 Programmatic Goals

4.2.1 Continued Commitment to the Data Sharing Cooperative Model

As described above, the Data Sharing Cooperative has both strengths and weaknesses. In many ways, participation in the Cooperative has plateaued and many of the current data holdings are aged. Nevertheless, the Data Sharing Cooperative Model remains both innovative and viable and directed attention to its weaknesses should yield improvements. The following outlines several programmatic activities that, if enacted, would strengthen and enhance the Data Sharing Cooperative.

4.2.1.1 Strengthen Data Sharing Cooperative via more active database stewardship

The existing Data Sharing Cooperative would be strengthened with further active stewardship by CSCIC. In spite of recent projects to automate notifications to Cooperative members, the stakeholder community reports that the current Cooperative can be of limited utility due to significant amounts of outdated data. Improvement might include:

- Review of the existing notification system to identify opportunities for improvement. Opportunities might include both reminders to cooperative members about the age of their postings as well as proactive notifications to members when data is updated.
- Review of server statistics on data updates to better understand current patterns and trends
- Development of tools and procedures, both automated and human, aimed at encouraging cooperative members to perform regular updates and to properly fulfill their cooperative membership responsibilities
- Examination of new technologies such as automated replication that would simplify and further automate the update process

- Identify willing and technologically enabled counties to perform pilot projects
- Consideration of creating incentives and/or “enforcement mechanisms” that will help encourage members of the cooperative to fulfill their responsibilities. For example:
 - Membership in the cooperative and having current data holdings posted to the cooperative could be a prerequisite for participation in orthoimagery buy-ups.
 - Development of incentives to encourage members to post the full data content of their holdings

4.2.1.2 Strengthen Data Sharing Cooperative by improving the web-site

The stakeholder community also identified some challenges in navigating the existing web-site to identify data sets. In general, there are so many holdings that it can be tedious and confusing to find what one is looking for. In addition, there is no easy way to identify all data sets that are available on a statewide basis.

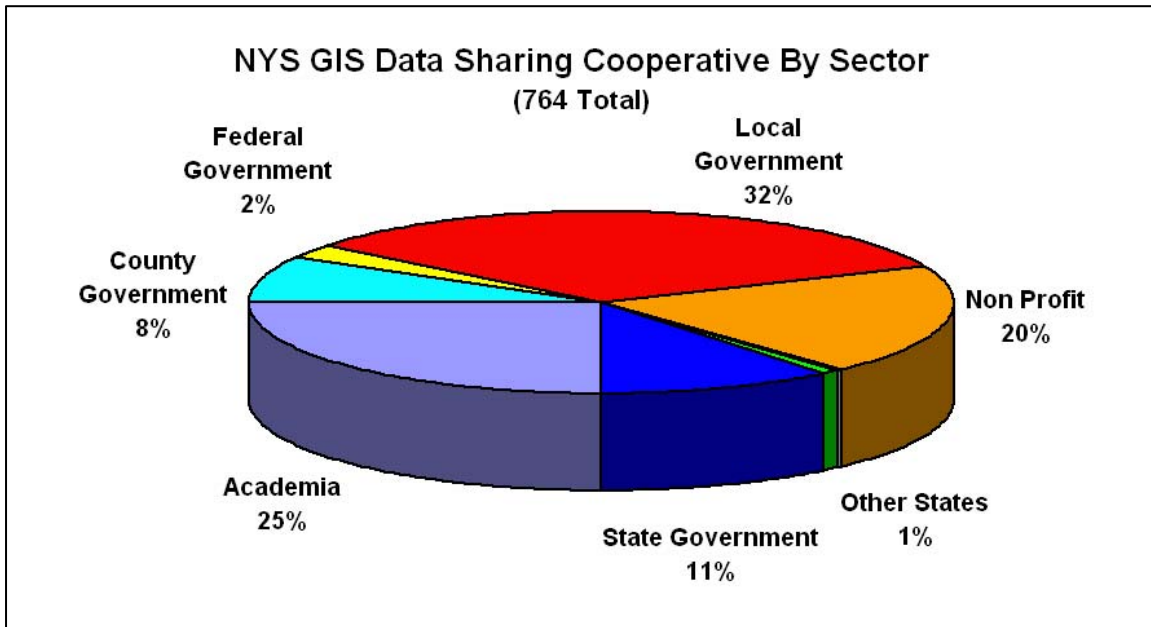
- The Clearinghouse web-site could be strengthened by reducing the amount of GIS literacy necessary to effectively navigate it and to augment the database driven data searches with friendlier indexes of the most commonly sought data.
- The “Outreach” section of the web-site could be further built-out to house the types of use case and best practices information described below as part of the local government capacity building efforts. For example, a “Local Government GIS Resources” area of the web-site might be constructed.

4.2.1.3 Strengthen Data Sharing Cooperative by encouraging further participation and potentially broadening membership and data holdings

While there is broad participation in the Cooperative there remain some pockets of public entities that have not joined. The lack of further participation appears to be at least partly related to an inconsistent understanding of what membership in the Cooperative involves. In spite of some perceptions to the contrary, the Cooperative is currently limited only to public agencies and data exchange is only enabled *between Cooperative members*. In addition, to date, data residing in the Cooperative database has **never** been passed on to third-parties who have issued a Freedom of Information Law (FOIL) request to CSCIC. In the few instances where FOIL requests have been made, the requestors have been asked to contact the original data custodians (i.e., the Cooperative members), and this was not contested. Currently, CSCIC is supporting a Legislative Proposal that would formalize this practice and enable public entities that maintain “composite data holdings” such as the Cooperative to refer FOIL requestors to the data originators.

Specific actions for increasing participation and membership in Cooperative might include:

- CSCIC undertaking active recruitment of new Cooperative members. Active recruitment would involve engaging non-members and helping to educate them on the benefits of membership, as well as the protections that are afforded to members. The chart below shows the current distribution of Cooperative members across sectors:



- Creating a series of incentives (or sanctions) that might encourage further participation in the Cooperative
 - For example, the previously mentioned linkage between Cooperative membership and an ability to participate in the orthoimagery buy-up program
- CSCIC undertaking an active initiative to reach out to neighboring states and Canadian provinces to make their data available through the data sharing cooperative, or alternatively providing guidance on how to obtain these data. As environmental and climate issues continue to examine regional impacts there will be increasing demand for access to data that goes beyond the border of New York. It makes sense for CSCIC to collect and make available to the stakeholder community the readily available material from neighboring governments.
- Re-examination of the current exclusion of the private sector as cooperative members. It is recommended that a workgroup of concerned private and public sector stakeholders be convened to examine this issue and to make recommendations to the Coordinating Body and CSCIC Director. While this issue has been re-examined periodically, the renewed focus on expanding the Data Sharing Cooperative holdings described above will continue to increase the private sector's interest in gaining access to this resource.

4.2.2 CSCIC's Delivery of Services

4.2.2.1 Support of local GIS capacity building efforts

CSCIC has a strong history of providing technical training and resources to the GIS stakeholder community in the form of a technical workshop program and through the highly successful GIS help desk. CSCIC should consider developing a companion program that provides non-technical resources that help support new and developing local GIS programs. Ultimately, much of the detailed data that the state is interested in originates and is managed at the local government level. As such, supporting local GIS capacity building can help the state meet its own data needs while also supporting local government's own interests. This would be a natural evolution of some of CSCIC's existing programs, for example the MMNT, and would leverage existing strengths. Developing this type of program might involve the following two elements:

- **Creation of a web-site clearinghouse that would catalog available funding, grants and programs** that are available to local governments to support geospatial activities.
- **Development of an educational program that would create non-technical materials and outreach programs to support local government efforts to build GIS capacity.** Information would include: practices as well as use cases that describe successful local GIS programs at various levels of government (e.g. funding models, governance models, success stories, cost/benefit material, etc.). Such efforts should help create more effective, autonomous local government GIS that are better positioned for the types of partnerships required for an effective NY-SDI.
- **Consideration of re-branding, or co-branding CSCIC's GIS program to better reflect its broad-based mandate.** As described earlier CSCIC oversees the state GIS coordination program as well as focused efforts to develop and manage critical infrastructure information. These two missions are co-dependent on one another and the coordination program management takes the majority of time. Unfortunately, the agency name does not reflect the coordination program mission and can lead to some identity issues, particularly for GIS newcomers (e.g. in the workshops some stakeholders were unclear about what the bounds of the CSCIC mission were). Most other state level coordination programs have successfully built GIS brands that are apart from any particular departmental or application mission. For example, in Massachusetts, while the statewide GIS coordination program resides in the Executive Office of Environmental Affairs, it has successfully leveraged the distinct "MassGIS" brand which reflects its statewide GIS outlook. In New York, giving the coordination program a clearer identity should help in local GIS education and capacity building efforts without impeding the critical infrastructure mission or the affiliation with the parent CSCIC agency.

4.2.2.2 Further develop enterprise architecture and web-services delivery

There are significant data management efficiencies and data viewing performance improvements to be gained if CSCIC develops a further capacity to serve out data sets. Such a serving capacity complements CSCIC's historic strength in providing data for

download. First, as more state agencies further commit to web-based GIS deployments there are further opportunities for a strong, single (or federated) GIS data repository to meet the needs of multiple state agencies. Such an approach would make it unnecessary for multiple agencies to store and manage large data sets such as the statewide orthoimagery which are now available for multiple years, and will continue to be developed over time. The raw data of the state's orthoimagery collection through 2006 represents over 2.3 terabytes and even in its most highly compressed format⁹ it is over 200 gigabytes. Second, efficiently serving out the state's data holdings would help the general public as well as local GIS efforts avoid the need to download and locally manage large data sets such as orthoimagery. Software programs such as ESRI's ArcView and Pitney-Bowes' MapInfo have the ability to consume GIS web services and combine that information with locally managed data, such as parcels.

In short, a web service architecture would involve the state publishing a data stream that both internal and external entities could "consume". The web service is exposed via an application programming interface (API) that defines a means of requesting information from the web services. In a GIS context, a web service request might specify the layer(s) to be displayed and the extent of the map needed. Once a properly formed request is made, the server responds by sending the information back to the client, whether that client is a web-site, a web browser or a PC running a thick, desktop GIS software program. Rather than needing to *obtain* the actual data set, users are able to request and display the bits of data they need, on demand and in real-time. Web services architectures have become increasingly common and there are many standards at both the general WWW level (e.g. SOAP or WSDL) and GIS level (e.g. WMS or WFS) that guide and facilitate the development of web services.

Currently, New York makes only an orthoimagery web service available. The services are published in both an open format via Open Geospatial Consortium (OGC) Web Map Service (WMS) and an ESRI ArcIMS format. These services are hosted by the USGS's EROS Data Center in South Dakota as part of an innovative pilot program. While New York is pleased with the results of the pilot, the stakeholder community has made it clear that the reliability and performance of the services need improvement. Based on wide public exposure to high performance web mapping engines such as Google Maps, MapQuest and Yahoo! Maps it is reasonable to expect web services should be able to provide response times of less than 10 seconds, and ideally less than 5 seconds.

Given the challenges and expense of large scale, high performance data serving, New York is highly supportive of USGS efforts to provide this service to states (with USGS gaining its own benefits of obtaining access to these data). Ultimately, New York would like to serve more and more of its data layer holdings in this manner assuming that performance requirements can be met. Also, in light of data sets such as streets which change frequently, the current EROS serving capability would need to be enhanced to allow for quicker turnaround times for data refreshes, and ultimately the potential ability for New York to be able to actively push data onto the EROS servers directly.

⁹ Some detail is lost during the data compression process.

4.2.2.3 Augment existing GIS standards work

CSCIC, working with the Coordinating Body's Standards & Data Coordination Work Group should consider developing new statewide GIS data standards, covering additional data themes, and potentially additional levels of detail. Standards development should be consistent with the following guidance.

- Standards should remain voluntary, unless funding for standards adherence is provided. Absent funding, the state should examine other potential incentives that encourage standards adoption and compliance.
- Whenever possible, New York's standards should follow, or be adapted from existing, national or industry standards
- Standards development is complimentary to education and outreach mission as standards are perceived as a form of guidance to GIS newcomers
- Existing standards – such as the parcel standard for data exchange - could be augmented with data templates/schemas that provide further guidance on data content and structure

4.2.2.4 Develop and distribute further end-user oriented derivative data products

The CSCIC publicly available data holdings would be strengthened if further, secondary products derived from the raw data were developed and made available. A notable example would include developing 10 foot contours derived from the currently available statewide 10 meter digital elevation model (DEM). While stronger improvements to elevation data (see section 4.2.3.1), such as the development of statewide data capable of supporting 2 foot contours, would be highly desirable, such improvements will likely take several years to come into being. In the short term, derivative products from the available DEM will provide benefits to GIS stakeholders. Similarly, CSCIC should consider better advertising the availability of additional raw data products such as the mass points and breakline elevation data from the orthophoto program and/or the raw 4-band images.

4.2.3 Data that Generally Flow from State Government to Local Government

Four of the seven National Spatial Data Infrastructure (NSDI) “framework layers” are typically managed at the state level and generally flow from state government to county and local governments. These layers are:

- Geodetic control
- Hydrography
- Elevation
- Orthoimagery

Compared with other framework layers, in New York these four layers tend to have the following in common:

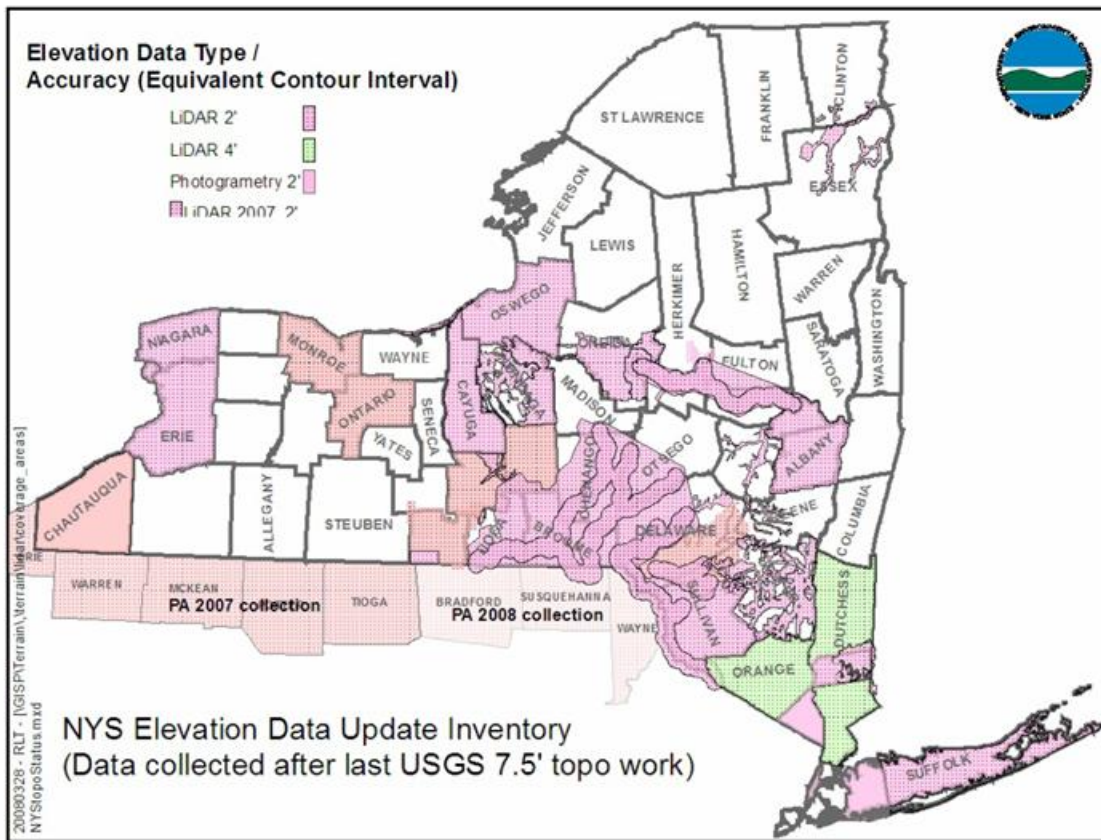
- Data already exist on a statewide basis

- Data are relatively uniform on a statewide basis
- Data are updated periodically as opposed to on an ongoing transactional basis
- There are significant economies of scale for data development

Of these layers, New York has a significant near term opportunity to leverage and strengthen the existing orthoimagery program.

4.2.3.1 Pursue a statewide program for improving elevation data quality

One of the most frequently mentioned statewide data deficiencies was elevation data. As described above, currently the best available *statewide* data source is a 10 meter digital elevation model that is adequate to produce 10 foot contours. Some individual counties and watersheds (see image below for status from May, 2007) have better elevation data which is typically suitable for producing 2 foot contours.



Enhanced elevation is valuable for numerous natural resource and public safety purposes such as accurate flood zone delineation, land development potential assessment and facility siting. While producing improved statewide elevation data would be an expensive undertaking, on par with the costs of a statewide orthoimagery mission, these data change much less frequently and this could be considered a one time investment.

4.2.3.2 Improve state data holdings by leveraging the existing orthoimagery program

As described earlier, although the statewide orthoimagery program uses state funding only for the production of orthoimagery products the state's contractual vehicles have allowed other governmental entities to contribute funds to buy expanded and/or improved deliverables. For example, local county funding has been used to increase the imagery resolution for contributing counties. In addition, the current contract now allows other government entities to purchase high quality elevation data that produces a FEMA compliant digital terrain model (DTM) to support flood zone mapping.

This highly-successful statewide program can be augmented by continuing to expand the menu of additional products that can be acquired via the "buy-up" process. Specific examples where there is stakeholder interest include:

- 3D structure features
- Photogrammetrically interpreted local wetlands data
- Oblique imagery

Oblique imagery complements orthoimagery by showing "birds-eye views" from the air, often with each area covered from several different angles (e.g. from the North, from the South, etc.). Oblique imagery is used extensively by public safety agencies and in the real estate assessment community as it helps users characterize structures and assess threats without needing to visit the site. Since there is currently no statewide program funding oblique imagery, and since the image capture and processing technologies are different, it is likely that an oblique imagery contract would be a separate but similar procurement vehicle that government entities could access. Such a contract would leverage the state's buying power on behalf of all government entities into more favorable pricing and licensing of oblique products.

Several stakeholders reported that there can be significant challenges in creating **funding consortia** whereby multiple entities collaborate to fund buy-ups. Nevertheless, such consortia provide a real opportunity for similarly interested parties – e.g. a county and municipalities within the county – to combine resources to develop a product neither might be able to afford alone. In addition, there may be an opportunity to engage non-governmental entities such as utilities or private non-profits to participate in funding consortia. As such, CSCIC should consider offering assistance to local governments that want to create funding consortia to support their buy-up efforts. This assistance might take the form of publishing successful use cases on buy-ups, sharing consortia agreements and assisting in "matchmaking". Such assistance would be consistent with the educational support of local GIS capacity building described above in section 4.2.2.1.

4.2.4 Data that Generally Flow from Local Government to State Government

Three of the seven National Spatial Data Infrastructure (NSDI) "framework layers" are typically managed at the local level and generally flow from county and local governments to the state government. These layers are:

- Streets and addresses

- Political and administrative boundaries
- Parcels

Compared with other framework layers, in New York these three layers tend to have the following in common:

- Data are generally managed by local government
- Significant improvements in both data content and availability are desirable
- Data change on an ongoing and often transactional basis

This last issue is a significant challenge in New York. Indeed, the successful statewide street and addressing program has developed several mechanisms, including the MMNT tool, for seeking and obtaining direct local input and involvement in the road updating process. The long-term vision for developing and maintaining parcels and streets GIS data in New York involves more tightly linking GIS data update activity with the fundamental local government business transactions – i.e. “road acceptance” and “deed recording” - that trigger the need for those changes. In other words, when a road is accepted, GIS data update should be part of the series of local government activities that occur in response to that transaction. While it will take some time to fully realize this vision, all nearer term incremental steps – including the expansion of local GIS capacity building (see section 4.2.2.1) described above - should be leading towards that outcome.

4.2.4.1 Proactive development of a statewide parcel data layer

In light of the large demand for parcel data across the stakeholder community and the fact that the Data Sharing Cooperative has not been able to gain universal membership from counties, there needs to be a focused effort to create a **statewide parcel data set**. These data need to continue to be owned and managed at the local level but they should be assembled and aggregated into a statewide resource. Doing this would provide several benefits:

- Statewide data would be available for use in the myriad applications that demand them
- Large efficiencies would be gained by avoiding redundant efforts to assemble and aggregate parcels from multiple counties. Over ten state agencies have been involved in independent efforts to collect parcel data.
- Parcel data serve as a substrate for numerous derivative layers such as protected open space, critical infrastructure, or land use. Statewide parcel availability would result in improved data accuracy for these derivative layers.
- Parcel data are also of fundamental interest at the local level for applications ranging from assessment to zoning to service area delineation. Efforts aimed at developing a statewide layer would serve to encourage the improvement of local parcel data quality and would also provide counties ready access to parcel data from neighboring counties.

A key element of this process will be developing a **considered strategy for engaging the NYS-ORPS**. Ultimately, ORPS is already intimately involved with counties and

activities such as developing tax mapping standards. ORPS was a pioneer in GIS development in New York and their participation in this type of initiative would be instrumental to success.

There is no doubt that this type of initiative would be a long-term effort that would require careful planning. Elements of the initiative would include, but not be limited to:

- Developing a NSGIC Business Plan for this effort which would provide implementation details and the business case
- Consideration of the existing parcel standards and the potential requirement for supplemental guidance
- Proceeding with the assembly of the statewide data layer on a county by county basis
 - Begin with willing participants such as those counties that already share their data via the cooperative
 - Develop a strategy (e.g. incentives, requirements, addressing FOIL concerns, etc.) for encouraging further participation from the less willing
- Develop/refine a strategy for timely update of the data

New York is not alone in this pursuit. Earlier in 2007, the National Research Council published a study titled National Land Parcel Data: A Vision for the Future¹⁰. This study further documents the universal importance of parcel data to a variety of activities and calls for the creation of a nationwide resource. Recognizing that statewide data layers are the first step toward realizing this broader vision, the study recommended that in order for states to receive geospatial funding or funding that is “directly associated with a property” (e.g. disaster assistance) from the federal government the state must participate in the federal initiative and make its parcel data available in the public domain.

4.2.4.2 Develop a plan for improving the accuracy of administrative boundaries

While issues with the accuracy of existing administrative boundary data are widely acknowledged, this is a complex and nuanced issue. There remain issues with the availability of some source data on boundary definitions as well as with recovering monuments in the field. As such, addressing this issue will be complex and expensive and will require a long-term commitment.

However, due to the importance of boundaries as a foundation component of base maps, it is important to characterize the challenges of the status quo as well as understanding how improvements could be made. Ultimately, many other data layers (e.g. parcels) need to be coincident with administrative boundaries and thus inaccuracies in the base may propagate through many other data sets. As such, it is recommended that CSCIC engage the Department of State to further characterize this issue by undertaking a study to fully describe the problems, issues and potential paths for progress. Ultimately, after enduring

¹⁰ See web-site at <http://www8.nationalacademies.org/cp/projectview.aspx?key=219> for a summary of the project and access to committee membership and other project details.

decades of inaccurate administrative boundary maps and data, New York requires an accurate, reliable and authoritative electronic map of all political sub-divisions suitable for the 21st century.

4.2.5 Policy Initiatives

4.2.5.1 Maintain alignment with gubernatorial priorities

The state's ongoing GIS efforts will be well served by continuing to look for opportunities where geospatial technology can support gubernatorial priorities. Indeed, several of the 2007 Governor's priorities such as:

- Economic revitalization of upstate New York
- Providing universal broadband access to New Yorkers
- Green energy
- Local government efficiency and competitiveness

have a high potential to benefit from geospatial technology involvement.

Indeed, the GIS Coordination program has already closely tracked the Commission on Local Govt. Efficiency & Competitiveness objectives and has participated in Commission meetings. Through this interaction the Commission has been made aware of local government efforts, notably in Erie and Niagara counties, to share geospatial technology infrastructure.

5 Requirements

5.1 Inventory of Existing Infrastructure & Suitability Assessment

New York has built a solid foundational data management and data sharing infrastructure. This infrastructure is adequate to support current functions, but as described below may need to be enhanced if some of these functions are expanded. The current infrastructure supports:

- Hosting of the Data Sharing Cooperative and GIS Clearinghouse web-sites which includes:
 - General, text-based information
 - On-line indexes of available data
 - On-line download of publicly available data
 - Secure download of data available to cooperative members
- Hosting of a limited number of on-line map viewers including the "New York State Interactive Mapping Gateway" for accessing the state's digital orthoimagery.
- New York has currently expanded its capacity by taking advantage of the USGS EROS Data Center where the state's orthoimagery is made available via Open GIS Consortium web services using USGS's infrastructure.

5.2 Data Requirements

The three largest statewide data requirements uncovered during this study are:

- **Parcels:** Currently, electronic parcels for almost the entire state exists, however, the data are not available in a uniform format, nor in a uniform schema. As such, significant effort would be required to collect, assemble and standardize the parcels to function as a statewide data set.
- **Improved elevation:** The best statewide data exist as a 10M digital elevation model that is sufficient for producing 10 ft. contours. Many GIS applications require elevation data at the 2 ft. contour level. Significant statewide funding would be required to create an elevation data set that could support statewide 2 ft. contours.
 - Absent statewide funding, there are opportunities to leverage the existing orthoimagery program to create improved elevation data on a county by county basis through local buy-ups. To date, improved elevation data has been produced for several counties and individual watersheds (see image in section 4.2.3.1). Entities that use the orthoimagery contract for these types of project are obliged to make their data publicly available.
- **Accuracy improvements for county and municipal boundaries:** Due to the fundamental nature of boundary information and the need for many other layers (e.g. parcels) to be properly registered to these base data, it is critical that state begin what will be a long term effort to improve the accuracy of these data. Most likely this effort will need to be closely coordinated with Department of State.

5.3 Technology Requirements

While CSCIC maintains state of the art geospatial technology that adequately serves the “CSCIC enterprise” as well as its web-facing presence, this technology is not adequate for serving the broader “state government enterprise” and a more ambitious web services presence. Technology covering the following two specific areas may be required:

1. High-performance web-services platform

As described earlier, New York’s initial foray into serving data via web services is through the USGS’s EROS Data Center. In addition, the user community has critiqued the performance of the current web services. If the state is not able to encourage USGS to provide continued hosting and at a higher level of performance, then the state will need to investigate the development and maintenance of its own web-services infrastructure. Such infrastructure is becoming increasingly common at the state level. For example the neighboring state of Massachusetts has been serving its full geospatial data assets as web services for several years. However, such serving remains a serious and challenging endeavor, especially with the imperative to provide reliable uptime and consistent, fast performance (e.g. map refreshes within 3-10 seconds). In other words, if the web services are to catch on and be used, then they need to be fast and reliable. Otherwise, people and organizations will not use them.

Key components of a web-services platform include:

- Web servers with direct access to the state's geospatial data servers
 - Scalable, redundant and clustered configurations may be required
- High bandwidth connection to the Internet to support significant traffic
 - Appropriate data and system security configurations
- Decisions on which types of service(s) to support; for example:
 - Open GIS Consortium (OGC)
 - KML/KMZ (readable from freely available viewers such as Google Earth)
 - Vendor proprietary formats (e.g. ESRI ArcXML or ArcGIS SOAP API)

2. Centralized repository for state agency data access

Currently, there are several state agencies that maintain their own strong GIS technology, including data servers. These data servers can redundantly house the contents of the Data Sharing Cooperative holdings and other statewide data sets such as streets and orthoimagery as well as their own agency-specific holdings. As data holdings increase over time, particularly for enormous data sets such as statewide orthoimagery this can lead to both redundant storage challenges as well as the expenditure of non-trivial amounts of labor to load these data holdings. These challenges will be repeated if resources such as statewide parcels are developed as these data change frequently and there would multi-agency efforts to keep “their versions” current. As such, it may be time for New York to consider the creation of strong, centralized repository whereby all agencies can gain access to the “best available” statewide data sets. When these data are updated, they can be updated in the repository once with all agencies gaining instantaneous access to the update.

As with the web services initiative, effectively deploying this type of technology is not easy and there are imperatives for high availability and high performance. Equally, the state has several choices and combinations of technology that could be used to institute such a repository, including but not limited to:

- Using the web services initiative described above as the data delivery mechanism
 - For example, the orthoimagery could be distributed via web services
- Supporting agency “direct connections” for desktop software
- Building a confederated repository that is a combination of numerous data servers, potentially in different locations
 - Exploiting new technologies aimed at specific data types such as the new class of “imagery servers”
- Capitalizing on geospatial data replication so that agency data servers can be automatically updated from a centralized, authoritative source

5.4 Human Resource Requirements

Due to the tight budget situation currently found in New York, it is most likely that the programs recommended in this plan will need to be carried out without a requirement for raising headcount.

5.5 Standards

There are two areas where attention to standards is required:

First the state needs to make some decisions about which **technology standards** to adopt and promote. For example, if a web services approach is taken, New York has the opportunity commit to the OGC standards, which as of April, 2008 includes the KML standard developed and popularized by Google's mapping applications. Or, will the state support both? Other relevant technical standards might include the metadata standards. Regardless of the standards selected, it is important that New York clearly articulate their commitment to a set of standards.

Second, the New York Coordination program has a long history of developing standards and promoting existing standards (e.g. there is an explicit "GIS Standards" section of the GIS Clearinghouse web-site and there is a "Standards & Data Coordination Work Group" under the Coordinating Body). Recently, the Coordinating Body put forth a modest standard for cadastral data aimed mainly at facilitating the efficient exchange of parcel data. These types of standard setting efforts should continue and potentially be expanded and enhanced to:

- Cover additional data themes
- Supplement existing standard (e.g. for parcels) with deeper levels of detail such as content standards, accuracy standards and potential a data schema standard

Appropriately, CSCIC and the Coordinating Body currently view their standards setting role as providing "guidance" to the user community. The idea is to provide voluntary standards that encompass common sense approaches for producing standard (i.e. uniform) and quality data products.

5.6 Organizational Needs

New York is committed to the existing organizational model embodied by the Data Sharing Cooperative. The sections below outline a series of activities and policies that should strengthen this current framework in order to make it function more efficiently and effectively.

5.6.1 Executive Support

Currently, there is strong executive support for GIS coordination with the parent CSCIC organization. The highest levels of CSCIC are aware of and engaged in GIS coordination in New York.

As GIS technology adoption has expanded, it has become increasingly important that GIS programs be aligned with the overall information technology policy and programs of the state. As such, there is a continued need for active coordination with cabinet level State Chief Information Officer (CIO). Currently, the head of the New York GIS Coordination Program also acts as CSCIC's CIO and he participates in agency CIO meetings convened by the State CIO.

Given the increased role of county-level data in providing a strong New York spatial data infrastructure, it is increasingly important that there be executive support at the county and local levels for GIS coordination. It is important that local officials understand what the Data Sharing Cooperative is and that they be engaged to encourage their counties to participate.

5.6.2 Coordination & Oversight Procedures

As described in the Programmatic Goals section there are strategic opportunities for strengthening the Data Sharing Cooperative through improved coordination and oversight procedures.

Principally, **further attention needs to be directed at encouraging members to meet their existing responsibilities.** This includes:

- More **active custodianship** of the Cooperative database by CSCIC. This may include systematic review of the database contents to identify aged records, as well as both automated and human reminders to cooperative members to perform data refreshes.
- Active effort to **increase the variety of data** (i.e. the number of different data layer themes) that are posted to the Cooperative. Again, this can be achieved through focused engagement of cooperative members to identify opportunities for expanding an organization's holdings, and then facilitating the transfer of the data.
- **Consideration of incentives** and, if necessary, sanctions to encourage the timely posting of an organization's holdings.
- **Structured examination of the web and download logs** to better understand user patterns and the behavior of the membership.

In addition to in-state coordination, the **federal government is an important coordinating partner.** While this strategic planning effort is funded by the federal government, it must be noted that, from the state's perspective, the *federal government could also do a better job* coordinating its geospatial programs that interface with the states. Coordination is a two-way street and as New York makes an earnest effort to be a better, collaborating partner, so too should the federal government. Many separate federal agencies – including US-EPA, US-DOT, DHS and US Census - interact with the state via a variety of programs with geospatial components. While each of these agencies has a legitimate “vertical” connection to a partner state agency, these federal agencies

should be encouraged to connect with the state's lead geospatial entity on matters pertaining to geospatial technology and data. Just as the states need to re-examine their internal coordination, the federal government has opportunities to examine and reform its state coordination activities.

5.6.3 Policy

Given that it is imperative to provide Cooperative members clear guidance on “what happens” to their data once it is loaded onto the Cooperative servers, it is important to be able to fully clarify how the Data Sharing Cooperative's holdings are considered under FOIL. Specifically, Cooperative members, and in particular *prospective* new members are concerned about whether copies of their data stored at CSCIC would be subject to FOIL requests aimed at CSCIC. To clarify this situation, CSCIC is strongly supportive of a legislative proposal that would formally enable CSCIC to “forward” data requests made under FOIL back to the primary data custodian (i.e. the city/town/county/agency that originally created and supplied the data set to the Cooperative).

5.6.4 Staffing

Current CSCIC staffing of the coordination program is adequate to maintain the administration of the Data Sharing Cooperative and to re-focus attention on making the cooperative work better. The current fiscal climate in New York precludes the near term possibility of adding staff to quickly carry out new initiatives.

5.6.5 Budget Requirements

Existing CSCIC funding to support the coordination program is adequate to maintain the administration of the Data Sharing Cooperative and to re-focus attention on making the cooperative work better.

However, additional budgetary resources may be required to commence new initiatives such as statewide parcel development, elevation data improvements or the deployment of an enterprise web-services architecture. While funding is necessary for such initiatives, in the current fiscal climate of budget reductions it is unlikely to be obtained in the near future. This will have the net effect of extending the time horizon over which the programmatic goals can be realized.

5.6.6 Outreach & Community Development

As described in the Programmatic Goals section there are strategic opportunities for strengthening the Data Sharing Cooperative by **expanding the membership of the Cooperative**. Indeed, the Cooperative is strongest when participation in it is as broad and widespread as possible. Expanding membership might involve:

- Improved **education and outreach** on what the cooperative involves, as there may be an inconsistent understanding of how the Cooperative works, what its benefits are, and what protections it affords members.
- Active effort to identify membership gaps and to **recruit new members**.

- Consideration of **new categories of membership** that might, under some circumstances, allow private sector participation without eroding protections currently offered to public sector members.

5.6.7 Assessing Risk

The approach presented in this plan was intentionally crafted to be a low risk strategy. Risk was minimized by:

- Building on the existing coordination framework
- Minimizing the need for significant new resources to execute the core objective of strengthening the Data Sharing Cooperative

While the funding risks were minimized for the Data Sharing Cooperative elements of the program, they remain for new initiatives such as statewide parcel development, elevation data improvements or the deployment of an enterprise web-services architecture.

6 Implementation Program

6.1 Lessons Learned

Two significant lessons learned stood out among the many insights gained through this process:

1. **While the Data Sharing Cooperative provides a solid organizational model, it needs ongoing nurturing and more active custodianship.** In short, there is only so much coordination and data sharing that can occur on a voluntary, loosely supervised basis. At some point, active efforts, and enabling technology are needed for the Cooperative to reach its full potential. In spite of the best intentions and a largely positive culture among the Cooperative membership, the geospatial community is busy performing projects and in some cases fighting for the survival of their programs. More active custodianship by CSCIC should help keep membership responsibilities on the front burner. In effect, stewardship of the Cooperative needs to evolve from a passive posture to a more active posture.
2. **Achieving a statewide parcel data resource will not happen without concerted effort.** In spite of the existence of electronic parcel data for well over 90% of New York, and in spite of enormous demand for the data, the state is not close to being able to achieve a statewide parcel data resource. Enormous barriers still exist for standardizing the format and content of the electronic records and for gaining universal acceptance of the need for parcel data sharing among the counties. Given these barriers it is fair to observe that the creation of statewide parcels will involve a sustained effort aimed at overcoming them. However, this study also documented that the unique, extremely broad, multi-agency utility of these data to state government makes it worth the effort and expense to overcome these barriers.

6.2 Prioritization of Recommendations

This plan contains a slate of several important initiatives that will advance geospatial programs in New York and will help foster cooperative strategies to maintain and share geospatial data (see section 4.2). At present, and given the current budgetary climate, there is not yet a funding commitment to execute any of these recommendations. That said, the Coordinating Body has endorsed all of these recommendations and has deliberated on their priority and this prioritization serves as advisement to the CSCIC Director who would allocate resources for implementing these recommendations.

Ultimately, new initiatives must complement the existing “core missions” of the coordination program which are being executed well. Fundamentally, CSCIC is providing invaluable and effective stewardship of streets, addresses and orthoimagery (and other layers) as well as coordination and management of the Data Sharing Cooperative. Any new activities cannot undermine this effectiveness and must include appropriate resources for carrying them out. The Coordinating Body fully endorsed this outlook.

The following presents the Coordinating Body’s prioritization of the recommendations that were made in the Programmatic Goals section of the document¹¹. While Section 4.2 presents these recommendations as an organized and comprehensive narrative, the text below paraphrases the essence of the recommendations and presents them in priority groupings¹²:

Highest Priority:

1. Formally pursue a program to develop a **statewide parcel data layer** including active outreach and coordination with the Office of Real Property Services (ORPS)
2. Further **focus CSCIC’s statewide GIS coordination role** by:
 - a. Continuing to foster local government GIS capacity building efforts
 - b. By re-branding the statewide coordination elements of the overall CSCIC program
 - c. Further developing a statewide GIS enterprise architecture and web services delivery platform
 - d. Augmenting and strengthening existing GIS standards setting work
 - e. Expanding the number of end-user oriented data products that are provided

High Priority:

3. Formally pursue a program to improve the quality of **statewide elevation data**

¹¹ The priority setting exercise was completed during the May, 2008 Coordinating Body meeting held in Skaneateles, NY.

¹² It should be noted that the last programmatic goal, “alignment with gubernatorial priorities” was not prioritized as part of this exercise. This was due to the fact that this programmatic goal would not be competing for resources and rather was considered a matter of smart policy and planning.

4. Develop a plan for systematically **improving the accuracy of the state's administrative boundary data** (i.e. county and local government boundaries) including active outreach and coordination with the Department of State.

Medium Priority:

5. Strengthen and **expand the existing statewide orthoimagery program** to include a wider variety of products such as elevation and oblique imagery
6. **Strengthen the existing Data Sharing Cooperative:**
 - f. Through more active database stewardship
 - g. By improving the utility and usability of the web-site
 - h. By encouraging further participation and potentially broader membership

6.3 Implementation of Sub-Projects

Based on the prioritization described the following four, distinct sub-projects are envisioned as cost effective steps for advancing the highest priority initiatives. These sub-projects were consciously conceived of as low-cost planning efforts to further define larger, long-term initiatives:

1. **Development of a strategy for developing statewide parcels, including engaging ORPS.** This project should be further defined and planned through the preparation of a Business Plan.
2. **Development of an enterprise web services architecture and multi-agency data repository.** This project should be further defined and planned through the preparation of a Business Plan.
3. **Development of a strategy for funding and developing improved statewide elevation data.** This project should be further defined and planned through the preparation of a Business Plan.
4. **Development of a CSCIC strategy for active custodianship of the Data Sharing Cooperative.** This project should be executed as an in-house initiative by CSCIC management.

6.4 Budget Plan

As described earlier, the current tightening fiscal climate in New York State makes it less realistic to expect that significant new funding for these types of initiatives will be available in near-term state budgets. Rather, near-term progress will most likely be made through incremental improvements in operations and the re-prioritized use of existing funding resources.

It should also be noted that the recommendations contained in this plan are intentionally provided at a high-level, with minimal detail. The goal was to catalog and prioritize the most important initiatives that need to be undertaken over the next 5 years. The next step in the overall strategic planning process will be to create Business Plans for the highest

priority recommendations that will require new expenditures (see section 6.2 above). Such Business Plans will be aimed at identifying the:

- Overall project approach
- Technical details of implementation
- Costs for implementation
- Funding strategy
- Benefits and business case for proceeding
- Expected return on investment

While new state funding may yet be an important part of achieving some of these recommendations there are several additional sources of resources that will likely become part of the overall funding plan. These include, but are not limited to:

- Pursuit of available **Federal funding** in the form of grants¹³
- Alignment with existing and emerging **programs that require GIS data and capabilities**. For instance, flood related programs could contribute to elevation data improvements.
- Pursuing the formation of **funding consortia with county and local government** entities that have similar interests.

6.5 Generating Support for the Program

This strategic planning process has been designed to be inclusive and transparent to increase the likelihood that there will be broad and widespread support for the programmatic goals. Several of the goals are ambitious and it is imperative that all stakeholder groups believe that this program will help their interests if they are to actively advocate for the plan. There are no illusions: this plan represents the *beginning* of the process, not the end. The hard work of further education and advocacy remains ahead.

6.6 Measuring Success & Recalibration

As described throughout, this plan is the result of an extensive and involved one year *planning process*. While this plan presents a 5-year outlook, it will be beneficial to revisit the plan periodically and to recalibrate priorities based on what has been achieved and new technological and political developments. Ultimately, strategic planning – particularly for technology – must be viewed as an ongoing effort and not a one-time exercise.

Based on the programmatic goals presented above, the following provides three key measurements for the success of this plan. It is realistic to expect that there is progress on these three fronts within one-year:

1. **Measurable improvements to the Data Sharing Cooperative:** Has the plan succeeded in catalyzing operational improvements that will make the Cooperative

¹³ This strategic planning effort was funded by a United States Geological Survey (USGS) Cooperative Assistance Program (CAP) grant.

- more effective? Are there new members? Are there new data holdings? Are existing holdings kept more current?
2. **Has ORPS been engaged in the development of a statewide parcel data set?**
The plan identifies that ORPS is a key partner in achieving this goal, and their active involvement is essential.
 3. **Is there a Business Plan for creating an Enterprise Web Services Architecture and a Multi-Agency State Government GIS Repository?** While this is acknowledged to be a worthwhile and achievable goal, it is a complex, long-term initiative due to both technological and organizational factors. Further detailed planning on this initiative is a necessary precursor to successful implementation of the goal.

7 Looking Ahead

It is now clear that GIS has become a fundamental part of state and local government and that the general public is increasingly aware of location based technologies and the importance of geospatial data. Geospatial technologies are at work every day helping to make New York a better and more efficient place to live, do business and to govern. This plan outlines a slate of many meaningful initiatives that will fill in gaps and advance New York's geospatial infrastructure. At the same time, it is clear that for the near and medium terms there will remain fiscal constraints that limit the state's ability to make significant new investments.

Nevertheless, this plan provides a five-year roadmap for advancement and several of the recommendations do not involve new spending. In addition, some of the more complex initiatives – such as developing statewide parcels – require some time so that more detailed planning can proceed. New York has now gone through the process of identifying and prioritizing geospatial objectives and is in a position to proceed incrementally as resources and other opportunities present themselves. Whether those opportunities involve capitalizing on cooperative funding with the federal government or further applying GIS technology to provide improvements in government efficiency, New York will be ready with a well formed vision and a slate of initiatives that are ready to go.