Information Management Needs Assessment

for

North Atlantic LCC

North Atlantic Landscape Conservation Cooperative

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EXECUTIVE SUMMARY

In 2012, the North Atlantic Landscape Conservation Cooperative (NALCC) embarked on an Information Management Needs Assessment with the goal of better understanding the information technology needs of its stakeholders. This effort included documenting the functional requirements of a system that would be able to support collaboration and coordination of conservation efforts among NALCC partners. The needs assessment study was supported through a grant from the Department of the Interior and the U.S. Fish and Wildlife Service aimed at enabling Landscape Conservation Cooperatives (LCC) to conduct science and undertake strategic conservation efforts across large geographic areas.

Although information management systems are key to supporting the primary functions of any LCC, the organizational structure of the LCCs creates particular challenges in designing a conceptual framework for such a system. Specifically:

1. By design, landscape conservation cooperatives (LCC) are collaborative enterprises composed of many discreet organizations working together in partnership. As such, there is no clear and sole organization (i.e., LCC member) that is an obvious candidate to "own" an information management resource.

2. Also by design, LCCs were formed to help address large and very broad issues that occur over wide areas and across political boundaries. This implies a need to manage a multitude of large data sets that may emanate from a variety of sources, including any of the LCC members.

With these challenges in mind, this study aims to characterize the specific business and technical information management system requirements of the NALCC. This study does not describe or recommend an elaborate technical infrastructure but rather identifies a practical, incremental approach for meeting the most pressing business requirements of the NALCC.

As the study articulates, it is clear that the benefits of a well-designed and effectively implemented Information Management System will be broad and varied ranging from improved conservation coordination, planning, and design to more efficient monitoring, research and partner communications. Interviews with NALCC member organizations revealed important information regarding existing information management resources and also identified the specific types of problems that people were using information technology to solve. For example, while all states within the NALCC region have developed State Wildlife Action Plans, the differences in approach and format make it difficult to aggregate them into a “Regional Wildlife Action Plan”. Using information technology to support the development and maintenance of a regional plan would allow states to view their own plans and priorities within the broader regional context. This type of regional view can lead to better conservation planning and coordination and an ability to more wisely allocate resources to the highest priority issues.

The **vision** put forth in this study was derived from the needs articulated by stakeholders and aims to represent *reasonable goals* that can be accomplished in *the near-term*. At its highest level, the vision calls for **establishing an information management system** that will support:

- The science and technical expertise needed to support conservation planning at landscape scales, and
- Strong collaboration among the membership in defining shared conservation goals

This vision also calls for an information management system with the following **characteristics**:

- Has the ability to provide a holistic, region-wide view across the entire NALCC region
- Is information rich and readily available to all partners
- Contains data and tools that facilitate planning to help deliver "conservation on the ground"

The study also presents three **overarching strategic goals** that identify high level objectives that should be pursued and which will move the NALCC closer to realizing the vision articulated above:

1. Design and create a regional information management system (IMS) capacity that is available to all partners
2. Populate the IMS with relevant, region-wide data and then actively steward those data to keep them current
3. Provide tools for accessing and portraying the data within the IMS to enable members to perform analysis and visualization

The needs assessment, by design, is focused on *identifying information management system needs* and does not aim to describe or design a specific architecture. The next step toward achieving the vision will be for the NALCC to consider these needs, establish priorities and secure the necessary funding to proceed toward designing a specific technical solution.

1 INTRODUCTION

The formation of landscape conservation cooperatives (LCC) is a relatively recent development dating to 2010. These cooperatives are an attempt to better address some of the most complex conservation challenges facing the planet such as climate change and large-scale habitat fragmentation. No single agency has the reach, purview or resources to tackle these types of issues alone and LCCs operate on the assumption that multiple agencies working together and in coordination have the best chance of making progress.

The LCC's perform two main functions[1]:

1. Provide the science and technical expertise needed to support conservation planning at landscape scales
2. Promote collaboration among their members in defining shared conservation goals

Information management systems (IMS) are key to supporting both of these goals. Today, many of the products from NALCC sponsored science are developed, stored and delivered through information technologies. Information resources and tools such as databases, web-sites and geospatial systems are key for delivering the data necessary for planning and decision making. Similarly, information technologies ranging from email to collaborative web-sites to social media and virtual conferencing are invaluable in connecting disparate organizations and enabling collaborative, multi-party planning.

While all LCCs are pursuing and utilizing information technologies, given the relative newness of the LCC concept a consensus best practice for information management systems has not yet emerged. Indeed, designing an information management system for any landscape conservation cooperative poses several challenges that emanate from the form of the LCCs themselves.

3. By design, landscape conservation cooperatives (LCC) are collaborative enterprises composed of many discreet organizations working together in partnership. As such, there is no clear and sole organization (i.e., LCC member) that is an obvious candidate to "own" an information management resource.
4. Also by design, LCCs were formed to help address large and very broad issues that occur over wide areas and across political boundaries. This implies a need to manage a multitude of large data sets that may emanate from a variety of sources, including any of the LCC's members.
5. As with all of government in the current fiscal climate, funding and resources for new initiatives is scarce. How then can large and diverse requirements be met with limited resources?

This study aims to characterize the specific information management system requirements - both technical and human - of the North Atlantic LCC (NALCC) and propose a conceptual framework for meeting those requirements while navigating the challenges described above. This study does not

[1] US Fish & Wildlife web-site describing LCCs: http://www.fws.gov/landscape-conservation/lcc.html

propose a grand vision and an elaborate technical infrastructure, rather this study aims to identify a practical, incremental approach for meeting the most pressing business requirements of the NALCC.

The following sections of this report aim to:

- Describe and characterize the **Current Situation** (Section 2) by highlighting the strengths and weaknesses of current IMS practices.
- Present a catalog of **Identified Needs** (Section 3) that include *use cases* that highlight information management systems requirements, as well as *functional requirements* and the *benefits* that can be expected from improved IMS practices.
- Present a cohesive **Vision** (Section 4) and approach for information management within the NALCC and a series of goals and recommendations that are necessary to achieve the vision.
- Provides **Implementation Guidance** (Section 5) that will assist the NALCC in further IMS planning and specific technology decision making should the recommendations presented herein be funded.

2 CURRENT SITUATION

2.1 STRENGTH, WEAKNESSES, OPPORTUNITIES & THREATS ANALYSIS

The NALCC has many **strengths** that make the implementation of an information management system a feasible goal and worthwhile investment. Many partners maintain varied and valuable datasets, products and systems that could be useful to other partners. Furthermore, the Northeast's existing culture of cooperation and existing practices of informal data sharing for support of habitat-focused projects sets the stage for a more formal system of sharing and collaboration. The NALCC is in a unique position to lead this endeavor with its understanding of regional activity and role in supporting communication and collaboration among partners. Some efforts are in fact already underway with a new NALCC staff person focused on regional data compilation, creation, and distribution. It is an **opportune** time to embark on the implementation of an IMS as it coincides with, and may benefit from related projects such as the re-design and re-launch of the NALCC website, the development of a common lexicon for State Wildlife Action Plans (SWAPs), and the availability of other related systems such as ScienceBase[2].

Despite these strengths and opportunities, the **challenges** are not small and there is much room for improvement with regard to current information sharing practices and collaboration amongst the NALCC partners. For example, partners report a lack of consistent data stewardship and clarity on authoritative data sources. This creates hurdles for those trying to obtain relevant "raw" data to support their research and analysis. This has also resulted in duplicative efforts and investments as organizations must create and re-create these data sets.

[2] https://www.sciencebase.gov/catalog/

As the plans for implementation proceeds, the NALCC must remain mindful of **concerns** and misunderstandings about the Information Management System project direction and be careful to avoid interfering with partners already involved in information technology projects and performing important analyses. While it will not be easy to design a system that can meet the varying needs of a diverse set of partners, consensus on the approach and content will be essential in order to ensure broad participation and support.

Further details on the strengths, weaknesses, opportunities and threats (*aka* "concerns") surrounding existing information management practices is found in Appendix 2.

3 IDENTIFIED NEEDS

3.1 USE CASES

This project involved conducting numerous interviews with staff from NALCC member organizations (see Appendix 1). These interviews uncovered important information regarding existing information management resources and also identified the specific types of problems that people were using, or hoped to use information management systems to solve. The following presents three use cases[3] that help to illustrate the *actual requirements* people have for information management systems, and how these systems would be put to use on a day-to-day basis. These examples also demonstrate some of the activities that NALCC partners are pursuing and some of the data and technology opportunities that exist as well as challenges that remain as impediments.

1. ***Providing the regional context:*** **Statewide Wildlife Action Plans (SWAP) are aggregated to create "Regional Wildlife Action Plan"**

Currently, all states within the NALCC region have State Wildlife Action Plans, however, while these plans are similar, they are different enough that assembling a regional resource is very difficult. Having such a region-wide SWAP as the composite of state plans would be valuable in several ways, for example:

- States could see their own plans within the regional context
- Cross state activities could be better planned/coordinated

Although states need to be able to create their plans to address the unique challenges and organizational frameworks of each state, there are many common elements that could be pursued in more standard ways across the states, such as:

- Identifying "species with greatest conservations need" (SGCN)
- Identifying the habitats used by SGCN species
- Articulating the management activities aimed at those species (e.g., invasive species removal, controlled burns, new acquisitions, *et al*)

[3] A use case is a "real world example" that helps in understanding the steps through a process and the interactions between humans and systems and/or systems to other systems.

With appropriate standardization (e.g., data standards, applying a common lexicon[4], etc.) these common elements could be pulled from individual SWAPs to produce the regional WAP with the new information management system for the NALCC providing the aggregation, storage and publication tools to make the regional WAP available to all partners. In addition to the technical aspects of building an infrastructure that can house and maintain a regional WAP, there are important organizational aspects that could be tested such as linking federal funding that supports SWAP work to requirements for utilizing the common lexicon and delivering SWAP end products in a standard format that can be aggregated at a regional level.

In many ways the creation of a regional WAP is an excellent test for the development of an NALCC IMS:

- There was broad interest across the NALCC membership in having access to SWAP information
- There is existing work in this direction that can be harvested/built upon, such as: the Regional Technical Committee's efforts to build a Regional Wildlife Action Plan database; the previously mentioned development of a common lexicon for SWAPs)
- This approach could be tested with a subset of willing states. Demonstrating the technical feasibility and showing the benefits does not require the participation of all states.
- The NALCC IMS should be capable of acting as a gateway, or "portal" to all the SWAP information for the region

2. *Assessing the effectiveness of management activities:* Planning for management activities at the "land parcel" or "refuge" level

Currently, many management decisions are made only at the land parcel or refuge level and of necessity are only made within the context of that parcel or facility. Nevertheless, many NALCC stakeholders articulated an interest in, and need to make such facility-based decisions within the *regional context.* Key questions about the regional context may include, but are not limited to:

- **Is this particular place important** as part of the regional landscape? If not, should we be pursuing the management activity at all?
- If it is important, **what are its vulnerabilities and stressors** (e.g., increasing water temperatures)? Are our management activities addressing the vulnerabilities?
- If we are pursuing these management activities, are they working? **Are we monitoring to validate our success, or acknowledge failure**? If we are failing, is it time to move on to activities that may be more successful?

A strong, regional IMS should be able to house and **provide data and maps to show the regional context that can help guide management priorities. This can be** especially important for larger land management organizations that have many facilities that may be competing for limited resources. In short, good, readily available regional data can help organizations prioritize their investments towards places that may make the most difference in addressing *both* local and regional challenges.

[4] The NALCC is currently pursuing the development of a "common lexicon" for SWAPs as a separate initiative.

3. ***Aligning priorities across organizations:*** **Private non-profit conservation planning to align with established governmental priorities**

Some members of the NALCC are non-governmental organizations such as private non-profits. A number of these organizations are national in nature and pursue their own conservation planning for their own facilities and make good faith efforts to align their decisions with known conservation priorities that may emanate from government. While this interest in alignment exists, it is can be very difficult to assemble and understand the multiple layers of governmental priorities that exist across states and between federal agencies.

Non-profit stakeholders articulated an interest in having the regional IMS contain consolidated information on "formal priorities" (e.g., species of interest; habitats of interest; ongoing priority management activities; etc.). Currently, the sheer difficulty of assembling information on priorities serves as an impediment to reviewing them as part of routine conservation planning. Thus, a widely available "conservation priorities database", made available through the regional IMS would be an extremely valuable tool in helping to align both governmental and non-profit management activities as well as new conservation investments with established priorities.

3.2 HIGH LEVEL BUSINESS & PLANNING NEEDS

The narrative use cases above illustrate the kinds of problems people currently face and the potential role that a regional information management system could play in solving those problems. This section, attempts to characterize the more generic "business requirements" that are illustrated by, and embedded within those use cases. As such, the bullets below represent a distillation of the **business requirements that a regional IMS must be designed to meet**:

- Create, store and manage a relevant, reliable information management system for **viewing local situations within regional context** to better support decisions and understand where to focus efforts and financial resources. Key “views” for a regional system will include:
    - **Reliable base line information** across the region (e.g., commercially available base map services such as those emanating from Esri, Google, Bing, National Geographic; state level aerial imagery; state level environmental resources, etc.)
    - Portrayal of **key decisions** made by, and **key priorities** established by partner organizations
    - **Inventory of ongoing projects** and scientific activities within the region and supported by the NALCC
- **Create consistent, relevant and usable data products from NALCC-sponsored activities** and make widely available for partner consumption. In short, when the NALCC invests in projects, useful data should be one of the deliverables.
- Support for **streamlined** development and execution of **data sharing agreements** between partners. In short, administrative barriers to data sharing should be reduced/eliminated.
    - The NALCC can develop and distribute guidance on the format and content of data sharing agreements

- Support the **collection, management and publication of documentation and metadata resources** that describe the contents and location of data sets that are of interest to the NALCC membership. The NALCC membership has key requirements to be able to discover, evaluate and obtain *existing* data resources that may be germane to planning and land management activities. Documentation and metadata may cover both physical data sets as well as application programming interfaces (API), web services and other technical means for accessing existing information.
- **Improved collaboration and coordination** with directly neighboring LCCs through data sharing, communication of priorities, and exploring the potential to develop technologies/systems that can interoperate across LCC boundaries. Neighboring cooperatives include:
    - Upper Midwest & Great Lakes (UMGLLCC - http://www.greatlakeslcc.org/)
    - South Atlantic (SALCC - http://www.southatlanticlcc.org/)
    - Appalachian (ALCC - http://www.applcc.org/)

  Options for encouraging inter-LCC coordination on IMS include:
    - Assembling appropriate "data management committees" that span LCCs and potentially build on the precedent of the existing National LCC Data Management Working Group
    - Recognizing that with the completion of this study the NALCC is ahead in the planning for its IMS and proactively sharing the NALCC approach and emerging best practices with neighboring LCCs

  While inter-LCC activity can lead to benefits, there are some risks that need to be considered and moderated:
    - Broadening membership to committees, or even attendance at meeting/on calls can make finding consensus more difficult and/or time consuming
    - Part of the overall notion behind LCCs is that each region has unique characteristics and challenges based on geography, and this could imply some unique elements of particular IMS solutions

3.3 FUNCTIONAL NEEDS

The two sections above describe the overall *business activities* that a strong IMS solution will support. The bullets below describe the finer grained **functional needs** that the IMS must deliver in order to enable the improved planning, collaboration and decision making that the business activities demand.

- Assembly and management of **region-wide data**
    - Ability to house and make available geospatial data sets covering the entire region
    - Assemble seamless region-wide data from multiple component data sets. For example, normalize and append statewide data sets into region-wide data sets.

Examples of data sets that may require this kind of appending include, but are not limited to:

- National Wetlands Inventory (NWI)
- Protected Areas (from states and/or PAD-US)
- Land cover
- Northeast terrestrial habitats
- Parcels

- Creation and assembly of **value-added products** from raw data such as
  - Often, multiple parties have the same requirements to process raw data to create and utilize derivative products. When these types of derivative products have practical use to a wider number of people/organizations this processing can be done once with the products being made broadly available to NALCC members.
  - Ability to perform extraction, interpretation, clipping, normalization, overlay analysis, etc. on existing data sets. The following provides examples of value added products mentioned by NALCC stakeholders:
    - Model results (e.g. climate change grids)
    - Processing multiple years of landcover data to identify landcover change
    - Processing LiDAR data to create contours or tree canopy data sets

- One of the most efficient ways to share data content across a wide number of collaborators is via **the publication of web and map services**. The NALCC IMS should be capable of publishing web services (and associated metadata on how to access those services) to third-parties. Current desktop and server geospatial technologies are capable of directly consuming web services and this obviates the need for a user to download data in order to have access to it.
- In addition to publishing web services, the NALCC IMS should have the ability to **consume map and web services from third parties**. For example, many states will publish map services for the orthoimagery. Having the ability to consume these services is extremely resource efficient as it foregoes the requirement to download and locally house the imagery, which for a statewide data set could run into the terabytes.
- **Searchable index of available resources** including third party data sets and available web services. NALCC members need access to understand what's available for the region and how to gain access to it. The following types of information should be available:
  - **Metadata** describing the content, quality and lineage of data sets
  - **Quality/utility assessment** describing the applicability of data to particular types of projects or analyses
  - Documentation on the location of **data repositories that allow download**
  - Information describing **studies and models** that have been completed for the NALCC region and their associate data products
  - Index of **web and map services** that provide data of interest and documentation on how to find and access these services (i.e., their "service end points")

- Ability to search for **collaborators/working groups based on species of interest**
- Guidance on the availability of standards and other tools that can assist NALCC members in choosing common approaches

- A portal/gateway that provides a description of, and **access to partner systems**. Many NALCC member organizations have existing systems, some of which are publicly available, or are available to "trusted partners." The NALCC IMS can provide a "front door" to help members identify these existing systems and when appropriate, gain access to them. The portal/gateway should provide a good abstract description of the system, as well as information describing what types of credentials are necessary to access various systems. When needed, the portal/gateway can provide instructions on how to get logins to these systems. Examples of third-party systems that NALCC stakeholders identified as needing access to include::
  - **Tracking and Reporting Actions for the Conservation of Species (TRACS[5])**. Wildlife TRACS is the tracking and reporting system for conservation and related actions funded by the US Fish and Wildlife Service (USFWS), Wildlife and Sport Fish Restoration (WSFR) Program. It is intended to replace the existing Federal Aid Information Management System (FAIMS) and is scheduled for release in January 2013. The TRACS system provides information on where grants and other funding sources are being applied, and the kind of work that is being undertaken. Seeing data on projects and expenditures is key to assessing the effectiveness of grants and other funding that is invested in conservation efforts.
  - **NatureServe Explorer**. An authoritative source for information on more than 70,000 plants, animals, and ecosystems of the United States and Canada. Explorer includes particularly in-depth coverage for rare and endangered species.
  - **The Avian Knowledge Network (AKN)**. The goal of the AKN is to understand the patterns and dynamics of bird populations across the Western Hemisphere.
  - **The Nature Conservancy Northeast Region Portfolios**. These products are a compilation of many studies and reports and produce key data sets including:
    - Regional protected lands
    - Ecological systems and habitats
    - Regionally compiled base information on landforms: hydrography, bedrock geology, elevation
  - **University of Massachusetts Amherst Designing Sustainable Landscapes Project**. The goal of this project is to assess the capability of current and future landscapes within the extent of the NALCC to provide integral ecosystems and suitable habitat for a suite of representative species, and provide guidance for strategic habitat conservation. This project has implemented several models that generated data that may be of broader interest.

[5] Wildlife TRACS website http://www.publictracs.us/

- **Regional Conservation Needs (RCN) Synthesis**. A synthesis of regional conservation information including ongoing and completed work from the RCN program and LCCs. This synthesis provides a framework for regional habitat classifications that can be aggregated.

- The information management system resources of the NALCC should be presented in an organized, friendly and unified fashion. The functional capabilities described above - i.e., services, value added products, data and systems - should be presented to users in a unified user interface that supports search. The new NALCC web-site provides this type of collaborative environment including mechanisms for shared workspaces to support collaboration and communication, two-way interaction and an ability to host the exchange of large files (e.g., via FTP).
- Eventually, after a foundation IMS is constructed, the NALCC has identified needs for **specific tools that can leverage the IMS infrastructure** and support its membership. Ideally these tools will be configurable and customizable to specific partners and use cases and will be available on a variety of platforms ranging from PCs to tablets to mobile devices such as smart phones. Example of tools:
  - Mobile application that could answer "what habitat am I currently within?" based on the GPS reading from the device
  - Customizable decision support tools (e.g. ability to build ad-hoc queries of data)
  - Input to and maintenance of databases in the field (i.e., ability to fill out a database form from a mobile device)
  - Interactive web map with access to a wide variety of regional data covering the full NALCC region

3.4 BENEFITS & JUSTIFICATION

The benefits of a well-designed and effectively implemented Information Management System will be broad and varied ranging from improved conservation coordination, planning, and design to more efficient monitoring, research and partner communications. Data technicians that can quickly access current and relevant data will perform more accurate data analysis and modeling. Local conservation organizations that view decisions within a regional, landscape context will make better decisions about conservation priorities. Managers that are better informed will direct conservation resources more effectively. While several of the benefits cited below describe the potential for tangible time and cost savings, many of the benefits will be realized through the enhanced ability to steer conservation actions and priorities.

- An IMS will **improve access to data and tools** for users with varying levels of technical expertise and management responsibilities and will support more efficient and consistent analysis and decision making.

- **Program managers and staff**: User-friendly access to simplified maps and viewers that allow data exploration and support decision making without requiring technical expertise.
- **GIS Users**: Improved access to assembled data and related metadata, tools and resources that support project analysis and contextualization.
- **GIS Professionals**: Improved access to both "raw" and assembled data and/or web services thus allowing GIS professionals to conduct their own, specific analyses on data rather than relying on data from reports. An IMS would also point professionals to other GIS resources and technical support for project analyses.

- **The time spent** searching for relevant data, identifying authoritative sources, and obtaining copies of data and metadata **will be significantly reduced**.
  - An effective IMS will provide a **searchable index of data**, resources, and potential collaborators through a variety of methods including text search, interactive map search, and "browsing" of data by topic thus making it easier for users to find and explore relevant data.
  - The **consumption of 3rd party map and web services** will ensure that content remains current and relevant by pointing to authoritative sources rather than relying on contributors to upload copies of data sets.
  - **Partner systems that complement NALCC data, tools, and services** (e.g. ScienceBase) will be leveraged to the greatest degree possible through direct links.
- The IMS will **support better decision making** by providing a relevant, reliable view of a local situations within a regional context. Decisions about where to prioritize efforts and resources can be "contextualized" thus ensuring that local efforts and decisions are harmonized and priorities are clearly communicated throughout the region.
- Current efforts to create or collect relevant data development/collection, conduct analysis, and develop tools are often duplicated by other partners due to lack of awareness about these resources. An IMS will reduce this redundancy by improving data sharing tools and enhancing overall awareness. By **reducing duplicative efforts, conservation funding can be put to more effective and efficient use**.
- The IMS will **enhance the ability to generate regional strategies** through the coordinated activity of states and regions. For example:
  - Support for development of a regional adaptation strategy through the building of a regional habitat management database
  - Via coordinated State Wildlife Action Plans (SWAPs) that can provide a regional view across the NALCC

4 VISION

The vision presented below and the associated strategic and programmatic goals were derived from the identified needs cataloged above in Section 3. The vision and goals do not aim to immediately meet *all* identified needs. Rather, they represent the *near term* priorities that can reasonably be accomplished first. Accomplishing these goals will lay the foundation for a broader and more robust information management system that can develop over time. As such, achieving these goals should address a large proportion of the most important identified needs.

The following three sub-sections are organized in the following manner:

- The **general vision** (Section 4.1) establishes a high-level picture of where the NALCC is heading to pursue information management system that will support conservation planning and promote collaboration across the membership
- The **strategic goals** (Section 4.2) represent specific objectives that should be pursued in order to realize the general vision
- For each strategic goal, there are a *series* of **programmatic goals** (Section 4.3) which represent specific recommendations and activities that should be pursued to help accomplish the associated strategic goal

4.1 PROPOSED VISION

The North Atlantic Landscape Conservation Cooperative will establish an information management system that supports its core functions of:

1. Providing the science and technical expertise needed to support conservation planning at landscape scales, and
2. Promoting collaboration among the membership in defining shared conservation goals

The NALCC's information management system should have the following characteristics:

- *Ability to provide a holistic, region-wide view across the entire NALCC region*
    - Enabling local activities to be *viewed* within the regional, landscape context
    - Providing a complete inventory of NALCC-sponsored activities and priorities
- *Is information rich and readily available to all partners*
    - Providing ready access to information helps streamline and inform planning and decision making
- *Contains data and tools that facilitate planning to help deliver "conservation on the ground"*
    - To preserve landscapes that support biodiversity

4.2 STRATEGIC GOALS

The following three overarching strategic goals identify high level objectives that could be pursued following the adoption of this plan. Achieving these goals will demonstrably move the NALCC closer to realizing the vision articulated above.

1. Design and **create a regional information management system capacity** that is available to all partners
2. **Populate the IMS with relevant, region-wide data** and then actively steward those data to keep them current. Minimum initial data sets include:
    - Existing **base map** information
    - Northeast **terrestrial habitat** information
    - Relevant **extracts from existing SWAPs** (e.g., SGCN habitats areas while respecting the sensitivity SGCN species occurrence data)
    - Geospatial location and project description **information on all NALCC-sponsored activities**
3. **Provide tools for accessing and portraying the data** within the IMS to enable members to, at a minimum:
    - *Consume web services* into their own systems
    - *Visualize the regional context* of local activities
    - *Access the location, extent and description all NALCC-sponsored activities*

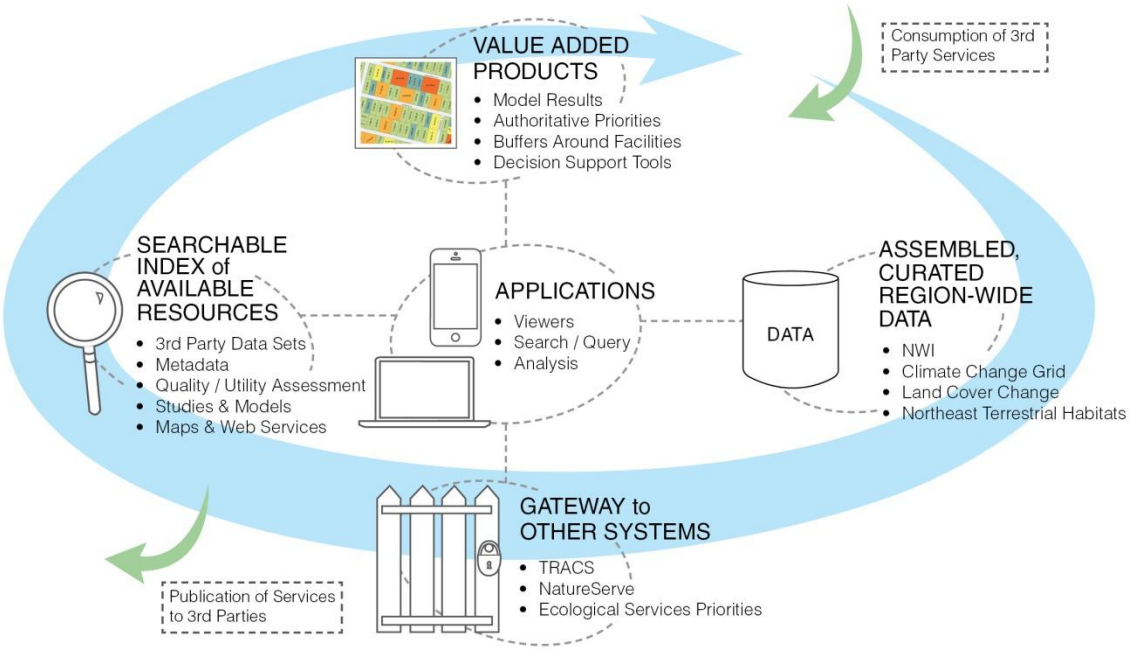
4.3 PROGRAMMATIC GOALS (RECOMMENDATIONS/OPTIONS)

The following provides specific recommendations for pursuing the finer grained activities that will lead to each of the three strategic goals being met.

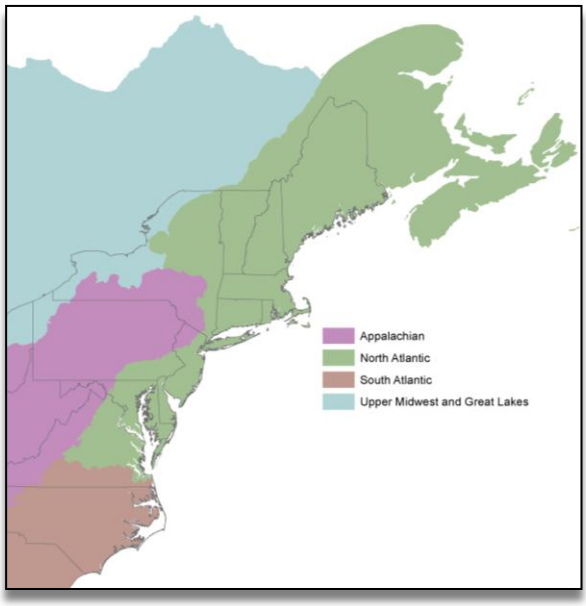
Strategic Goal #1: Design and create a regional information management capacity that is available to all partners

1. Formally initiate the **design of the information management system** at the next level of detail and while adhering to the "implementation guidance" that is provided below (in Section 5). The graphic below represents an initial *concept* for the components that would constitute the IMS. This conceptual view is based on the identified needs described above (Section 3). As such, this graphic represents an organizational framework for what was uncovered during the information gathering phase of this project.

NALCC Information Management System Components: Conceptual Framework



2. Identify and **engage with members who are willing and capable of potentially housing** the IMS. The fact that the NALCC is a cooperative and does not have a strong, dedicated physical plant with a dedicated information technology staff poses particular challenges for constructing an IMS. Most likely, a suitable member who can house the NALCC IMS on its own system must be identified. Alternatively, this function could be outsourced to a third-party.



3. Once the next level of detailed planning for the IMS is completed it will be possible to **identify a budget for constructing the initial phases of the system**. Once the budget is identified, **adequate funding for constructing the system** will need to be identified, and further some level of **sustainable funding will need to be allocated to maintain the system** and to curate the data contents.

Strategic Goal #2: **Populate the information management system with relevant, region-wide[6] data and then actively steward those data to keep them current.**

1. Perform a detailed inventory of data sets that are already available on a region-wide basis and may be housed within/accessed by the information management system (e.g., base map information; protected lands; land cover; etc.).

2. Identify work necessary to assemble regional data sets from existing state-based data sets (e.g., state-based land use; detailed, state-based wetlands, etc.).

3. Begin assembling region-wide data sets from existing data resources. In fact, this has already begun to some extent with the recent hiring of new Hadley-based NALCC staff person focused on regional data compilation, creation, and distribution.

4. Commence planning for region-wide data sets that do not yet exist, including:
    a. Inventory of NALCC sponsored activities
    b. Inventory of authoritative conservation priorities (i.e., formal priorities established by states and federal agencies)
    c. Relevant extracts from SWAPs (e.g., SGCN habitats areas while respecting the sensitivity SGCN species occurrence data, etc.)

5. Establish standards and procedures to identify data products that should be considered as deliverables from NALCC sponsored contracts. In short, when the NALCC spends money, geospatial data products should be delivered to the NALCC in a standard format. A flow of these deliverables over time will help keep the information management system database current and growing. Existing work on this topic[7] has begun at both the USFWS and LCC levels and this work should be consulted and refined for NALCC specific purposes.

Strategic Goal #3: Provide tools for accessing and portraying the data within the information management system to enable partners

1. Identify and plan the initial, priority set of tools for providing access to information management system data. Once planned, identify the budget to fund development of these tools. These tools include, but are not limited to:
    a. Web-based viewers that provide basic data access, query and visualization of region-wide data
    b. Consumable web services that provide portrayals of the data to third parties
    c. Data download capabilities

[6] The NALCC region includes the Northeastern United States as well as portions of the Maritime Provinces of Canada. See: http://www.fws.gov/northeast/science/pdf/NALCC_ALCC_Map.pdf

[7] See "U.S. Fish and Wildlife Service. 2012 Data Delivery Standards and Specification Template. USFWS, Pacific Southwest Region. Sacramento" and "Data Management Best Practices for Landscape Conservation Cooperatives Part 1: LCC Funded Science"

2. In addition to the "general tools" described above, the NALCC will also need more specialized and workflow-oriented tools. Thus, design and construction of prototypes/initial versions of focused web-based tools that access the data in the context of specific business requirements should also commence. Examples of specialized tools may include:
    a. Tool that portrays regional context for a user identified location
    b. Tool that provides access to the location and extent as well as reporting of funded NALCC activities to show where active conservation work is taking place

5 IMPLEMENTATION GUIDANCE

By design, this study is focused on identifying information management system ***needs*** and does not aim to design a specific architecture. Indeed, there are many ways to meet the identified needs and this kind of system *design* and *architecting* is what comes next (as suggested above in Section 4.3, as the first programmatic goal under strategic goal #1). The sections below present some technological principles that can be followed and suggest approaches that might result in the cost effective and iterative development of a comprehensive NALCC IMS over time.

5.1 PRINCIPLES & APPROACH

1. Keep the effort manageable

The NALCC is a collaborative that requires the support and cooperation of its members. It does not have a large staff, nor is there a dedicated physical plant and information technology infrastructure. As such, it is unreasonable to expect that the NALCC, by itself can plan, construct and manage a large, complex system. Rather, the NALCC **should be focused on identifying how to meet the most acute needs** that the greatest number of people/members have. Even simple systems and tools that meet the needs of large numbers of individual can yield very large organizational benefits.

2. Use agile development and rapid deployment methods

Agile development approaches[8] are underpinned by iterative and incremental development. Most "agile projects" are designed to be completed in a short duration of time and with the ability to adjust to changing expectations or new requirements. This is well suited to a "keeping it manageable" approach in that the NALCC is unlikely to have the large amounts of funding and staff necessary to undertake and manage large and complex information technology projects. Further, an agile approach provides a hedge against the rapidly changing technology landscape whereby large projects that can take over a year to complete may be delivered with technologies that are waning or even obsolete. The long timeframe and expense of the Wildlife Tracking and Reporting Actions for the Conservation of Species (TRACS) system[9] provides a cautionary tale for what the NALCC should try to avoid.

3. Plan for change and think of systems as a suite of related components

[8] See: http://en.wikipedia.org/wiki/Agile_software_development
[9] http://wsfrprograms.fws.gov/Subpages/TRACS/TRACS.html

As described above, technology is constantly changing and one must assume that technology platforms and norms will continue to evolve. One knows at the outset that everything will need to be replaced at some point; and with technology it is likely within 5-10 years. As such, it is critical to remain flexible, nimble and ready to adapt to new opportunities and platforms. One approach to achieving this is to design systems that operate as a suite of related components, as opposed to "one big system." Multiple smaller projects/systems can be designed to work together while sharing common services and communicating with one another via standards. In this manner, individual components can be expanded/adapted/swapped out without incurring the expense and inconvenience of replacing the entire system.

4. Choose your standards carefully

A huge number of technology standards exist. Some of them are very broad and pertain to things like the operation of the Internet; others are more narrow and focused and are aimed at specific niches such as GIS. While it impossible to know with certainty which standards will receive broad adoption and persist, the following provides some guidance on choosing standards:

- Understand the variety of standards; for example even with *data standards* there can be content, accuracy, metadata and schema standards for the same data set
- Look at which standards have already persisted (e.g., HTML has been around for a long time)
- When possible choose a "web/Internet standard" over a niche standard (e.g., JavaScript over a specialized GIS programming language/interface)

5. Think about third-party/outsource/cloud-based information technology provisioning

The increasing trend of organizations using third-parties, outsourced and cloud-based options for their information technology management is extremely well suited to a cooperative such as the NALCC. In addition to avoiding the management hassle of procuring and managing physical hardware, these options are provided as a service and can be more easily funded as a predictable, recurring operational expense as opposed to a periodic capital investment.

6. Think mobile at the outset

Increasingly, people are using their phones and other mobile devices such as tablets (or even laptops with Internet "air cards") as their primary means of access to the Internet and this trend is likely to continue. As such, almost all end-user oriented technology projects should be "thinking mobile" (i.e., the likelihood that users will want to access the system from their mobile device). Techniques such as limiting the size of Internet payloads and using adaptive design[10] for user interfaces can help make applications "mobile ready."

7. The NALCC IMS doesn't have to do *everything*

[10] Creating a user interface that can take multiple forms based on the size of the screen on which it depicted. Programming standards such as HTML5 support adaptive design.

The NALCC information management system does not necessarily need to act as a comprehensive repository or high powered application server. Some of the requirements documented above can be met by simply serving as a searchable index that directs people to primary sources or other existing resources host by members or partners. For example, the NALCC IMS doesn't have to house all of the USGS data contained in the National Water Information System (NWIS), rather the NALCC IMS can direct users to the NWIS and provide information on how to access and use that resource.

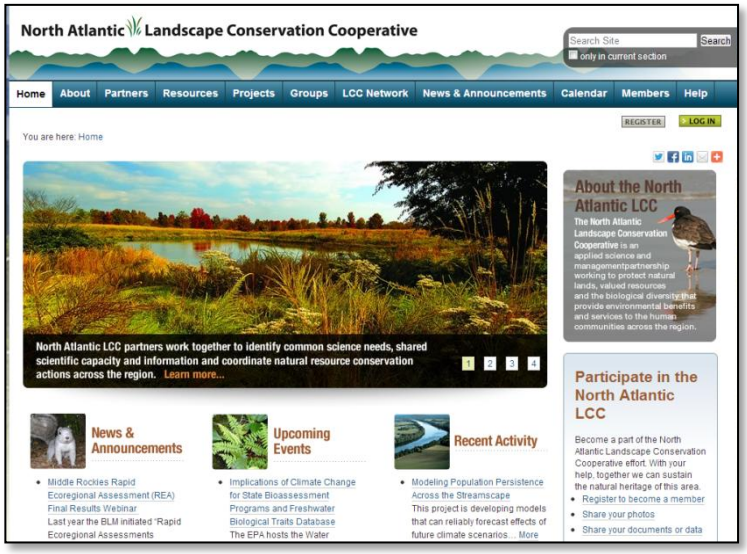
8. Don't overlook the cost/complexity of assembling required data

While some of the application requirements may be modest, the data components can be non trivial, especially when geospatial data is involved. The NALCC represents a large geographic area and some types of data (e.g., aerial imagery, or LiDAR) can have enormous storage requirements. In other situations, the data the NALCC requires needs to be collected and normalized from multiple states and Canadian provinces. While it is feasible to complete this type of work, it can be relatively expensive in comparison to the costs of building a simple application or web-site. As such, the NALCC needs to consider its application and data requirements in tandem, and design the incremental construction of the IMS in concert with a data development plan.

9. Leverage existing projects to maximum extent possible

There are several information technology issues that are ongoing within the NALCC and the LCC community at large. It is key that the team that oversees the development of the IMS understand these initiatives and continue to track them for relevance to the NALCC. The following describes four initiatives that were uncovered during the course of this study and provides a preliminary evaluation of the relevancy of those initiatives to an NALCC IMS.

- **New NALCC web-site:** The NALCC is in the final stages of launching a new and improved web-site. This web-site has been explicitly designed to be a richer destination that supports features such as two-way communications and the hosting of common work areas for member collaboration. This site will be actively maintained by the NALCC through a content management system and will be one of the key information technology assets of the cooperative. This site will be a key resource for helping to distribute information about IMS development efforts, and once the IMS is developed it can serve as a gateway to resources housed within the IMS.



- **Regional Wildlife Action Plan Database:** As documented above, the Regional Technical Committee has initiated efforts to build a Regional Wildlife Action Plan database. This effort closely mirrors the goal of pulling key information - such as SGCN habitats - out of the SWAPs to create region-wide data sets. The development of this database should be closely monitored as it will likely yield "lessons learned" that help other, future data aggregation efforts.
- **ScienceBase:** The USGS "ScienceBase" catalog is a metadata collection and collaborative data management platform for USGS scientists and partners which was developed to address the need for better data discoverability and accessibility[11]. This integrated database pulls from existing databases, metadata catalog systems, non-digitized collections, as well as ingesting new, original content. It is essentially a structured database containing "information stubs" to key data and resources which are tagged with core metadata components including title, description, provenance, accessibility, intended use as well as associated people, organizations, and teams to aid in finding collaborators. ScienceBase also stores citations/publications, projects, and geography associated with metadata records. Data is accessible through the ScienceBase Search user interface as well as ScienceBase Web Services that can drive applications or platforms like myUSGS, the Geographic Management Information System, or other systems.

  The screen shots below illustrate some of the capabilities of ScienceBase.

[11] From the USGS ScienceBase Wiki http://data.usgs.gov/DataServices/wiki/Main

FIGURE 1. EXAMPLE SCREEN CAPTURE OF SCIENCEBASE CATALOG SEARCH SCREEN. HTTPS://MY.USGS.GOV/CATALOG/

FIGURE 2. EXAMPLE SCREEN CAPTURE OF SCIENCEBASE CATALOG SEARCH SCREEN USING INTERACTIVE MAP TO BROWSE BY LOCATION HTTPS://MY.USGS.GOV/CATALOG/

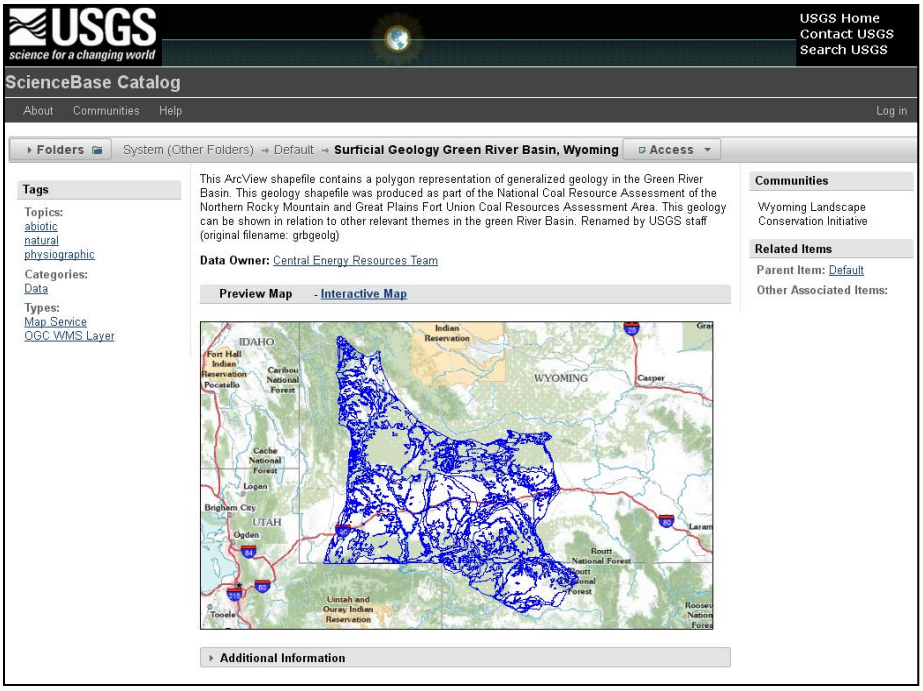


FIGURE 3. SAMPLE SCIENCEBASE METADATA RECORD FOR "SURFICIAL GEOLOGY GREEN RIVER BASIN, WYOMING" HTTPS://MY.USGS.GOV/CATALOG/ITEM/4F4E486FE4B07F02DB50CF87

The NALCC may be well served by tapping into this rich, existing metadata catalog to help meet its information management needs. Through web services the NALCC IMS could consume relevant information and tools from the ScienceBase catalog content and "toolbox". ScienceBase is currently being deployed by the Great Northern LCC and has the potential to be a valuable component of the NALCC IMS. The integration of ScienceBase data and tools fits well as a potential "searchable index of available" component of the Conceptual Diagram (presented above in Section 4.3).

- **DataBasin:** Another existing project aimed at data consolidation that some LCCs are investigating is the web-based "Data Basin" system which allows individual members and organizations to search for biological, physical and socio-economic spatial data sets and access a variety of interactive tools.[12] It is currently being designed and implemented by the Conservation Biology Institute (CBI) in partnership with Esri and using ArcGIS Server and ArcGIS Online technology. Users may search and download datasets, upload data and associated metadata, create and publish analysis, and create/share custom maps using an ArcGIS Online interface. The Data Basin project aims to create a growing community of connected users by leveraging ArcGIS Online collaboration tools, however, community membership access requires the creation of an Esri global account.

  Unlike ScienceBase, the fit of Data Basin within the NALCC IMS is less clear. Some of the unanswered questions include:

[12] From http://www.databasin.org/

- DataBasin relies on active contributions to build and maintain the database rather than data integration through web services. This could lead to content quickly becoming out of date.
- Each user is given 2GB of free storage from Esri, and given the geographic extent of some data sets, this storage may be quickly exceeded and may prove to be a barrier for further contributions.
- The lack of detail in the metadata schema documentation leaves some question as to how “discoverable” datasets will be once uploaded into the system.

Given these uncertainties, it is recommended that the NALCC continue to monitor other LCC uses of DataBasin to determine how well it meets general LCC needs. In the meantime, there are many other options for the NALCC IMS to obtain web-based geospatial data access.

10. Prioritizing IMS activities

Given the nature of the incremental development of the NALCC IMS and the large number of components that will need to be developed over time, there will be an ongoing need to evaluate and prioritize alternatives. Although there is no single way of prioritizing these kinds of projects, the following factors provide a basis for making decisions:

- **The *general nature* of the activity**: is this component something that's *specialized* for a smaller number of situations/users, or is it *foundational* and something that may be used in many situations and built upon
- **Cost**: It is always important to assess the "bang for the buck" any initiative delivers. Sometimes large investments are required to build foundational component; however, at other times multiple smaller investments can help to move an initiative forward.
- **Visibility:** It will be important that people see tangible evidence as the IMS is constructed. Aspects of the system that a larger group of people see or interact with may be prioritized to help generate support for further investment.
- **Return on investment:** Some aspects of an IMS provide improved efficiencies or demonstrable cost savings. Such savings and returns can help justify further investment.
- **Technical risk:** The larger and more complicated (and untested) an initiative is, the greater the risk that there will be problems. Risk should be avoided, especially at the early stages of development.

5.2 GENERAL BUDGET

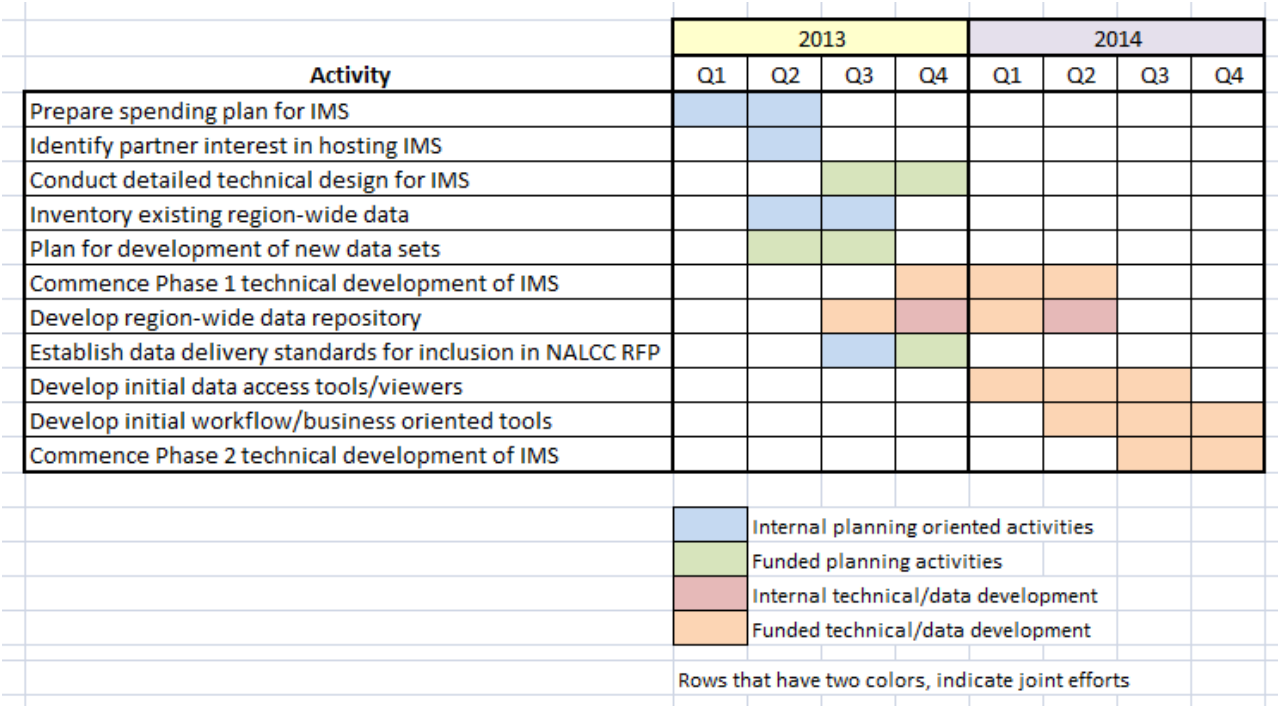
The table below presents a general budget for carrying out the activities that are identified in the strategic and programmatic goals presented above, in Section 4.3. These cost estimates were developed assuming the use of outside contractors and are presented as a "Low" to "High" cost range to reflect the variability of how these tasks may be scoped, and the uncertainty of a competitive contracting environment. As the timeline presented below in Section 5.3 indicates, it is assumed that

these costs would be divided across at least two fiscal years. It should be emphasized that this is only a *general budget* and that more detailed and precise budgeting will be possible after the first activity - i.e., completing a detailed technical design for the IMS - is completed.

Activity	Low Estimate	High Estimate
Conduct detailed technical design for IMS	$40,000	$60,000
Plan for development of new data sets	$25,000	$40,000
Commence Phase 1 technical development of IMS	$75,000	$125,000
Develop region-wide data repository	$40,000	$60,000
Establish data delivery standards for inclusion in NALCC RFP	$15,000	$30,000
Develop initial data access tools/viewers	$50,000	$75,000
Develop initial workflow/business oriented tools	$50,000	$75,000
Commence Phase 2 technical development of IMS	$75,000	$125,000
TOTAL	**$370,000**	**$590,000**

5.3 GENERAL TIMELINE

The timeline below presents the general flow of anticipated implementation activity across the following two calendar years (i.e., 2013, 2014). The timeline represents activities that are represented in the strategic and programmatic goals outlined in Section 4.3. The timeline is color coded to differentiate between NALCC led activities and those activities that may be best carried out through contracting. The activity names for "funded activities" are aligned with the budget spreadsheet presented above, in Section 5.2.



6 APPENDICES

Appendix 1: Project Methodology

Appendix 2: Detailed Strengths, Weaknesses, Opportunities and Threats (SWOT) Analysis

Appendix 3: Survey Results

6.1 APPENDIX 1: PROJECT METHODOLOGY

The following provides a chronology of project activities that supported the development of the NALCC Needs Assessment report.

1. **Project Planning Meeting (Conference Call)**
    - ✓ April 13, 2012

2. **Official Kick-Off Meeting with NALCC Steering Committee (Charleston, WV)**
    - ✓ April 18, 2012

3. **NALCC Information Management Stakeholder Survey**
    - ✓ Launched July 20, 2012
    - ✓ Received 110 responses from variety of stakeholders
    - ✓ Analyzed survey results and incorporated input into final document

4. **Project Committee Meetings**
    - ✓ May 24, 2012 (Hadley, MA)
    - ✓ November 7, 2012 (Conference Call)

5. **Focus Groups**

Two Focus Groups were held to further support information gathering:

- ✓ **Focus Group 1: May 24, 2012 (Hadley, MA)**
    - Attendees included:
        - Herb Berquist, US Fish & Wildlife Service
        - Chris Castiglione, Lower Great Lakes Fish & Wildlife Conservation
        - Kelly Chadbourne, US Fish & Wildlife Service
        - Clem Clay, The Trust for Public Land
        - Brad Compton, UMass Designing Sustainable Landscapes
        - Ron Essig, US Fish & Wildlife Service
        - Jeff Horan, US Fish & Wildlife Service
        - Tim Jones, ACJV Science Coordinator
        - BJ Richardson, US Fish & Wildlife Service
        - Scott Schwenk, NALCC Science Coordinator
        - John Tully, US Fish & Wildlife Service

- John O'Leary, Massachusetts Division of Fisheries and Wildlife

✓ **Focus Group 2: September 6, 2012 (via Webinar)**

- Attendees included:
  - Anne Kuhn, Research Ecologist, U.S. Environmental Protection Agency
  - Cynthia Loftin, Unit Leader, USGS-Maine Cooperative Fish & Wildlife Research Unit
  - Allison Moody, Postdoctoral Research Associate, U of Maine/Maine Co-op Unit
  - BJ Richardson, US Fish & Wildlife Service
  - Zoe Smith, Director, Adirondack Program WCS
  - Peter Winkler, GIS Specialist, NJDEP - Endangered & Nongame Species Program
  - Gillian Woolmer, Assistant Director, WCS Canada

6. Stakeholder Interviews

- Mark Anderson, The Nature Conservancy Northeast
- Rick Bennett, US Fish & Wildlife Service
- Ken Elowe, US Fish & Wildlife Service
- Steve Fuller, Wildlife Management Institute
- Dave Jenkins, New Jersey Department of Environmental Protection
- Kevin McGarigal, UMass Amherst Landscape Ecology Lab
- Andrew Millikin, US Fish & Wildlife Service
- BJ Richardson, US Fish & Wildlife Service

7. Report Authoring

✓ Development, circulation, review and approval of a draft SWOT (Strengths, Weaknesses, Opportunities, Threats) Analysis and Strategic Plan outline

✓ Presentation of an Information Management System conceptual diagram

✓ Report outline

✓ Report draft

✓ Final report

8. Release Report to Stakeholder Community

- ✓ Education and outreach to begin sharing and describing the plan to the broader stakeholder community
- ✓ Advocacy for carrying out the recommendations
- ✓ Internal meetings to discuss and act upon implementation strategies and options

6.2 APPENDIX 3: DETAILED SWOT ANALYSIS RESULTS

Strengths

- Individually, the NALCC partners have a high level of IT and GIS proficiency that can be leveraged and shared for mutual benefit
    - Exposure to GIS is not new and use is prevalent
- Many NALCC partners maintain varied and valuable datasets that could be useful to other partners
    - Many are also improving existing data sets and/or deriving new, widely-relevant data
- Informal data sharing is currently common among partners, however procedures for obtaining data are inconsistent
- There are many existing **partner data sets**, products and systems that are of interest to other partners. These include: TRACS, NatureServe Explorer, Avian Knowledge Network, etc.
- There is an existing culture of cooperation among Northeast states for support of habitat-focused projects
    - Use of common data standards/classifications with ability to create higher resolution if needed
    - Regional conservation processes in place for pooling conservation funds

Weaknesses

- Lack of access to current and relevant raw data to support hands-on analysis
- Lack of guidance/standards/tools for partners that support making data products available to others
- Lack of clarity on current data steward or manager; leads to confusion on authoritative data sources
- Lack of awareness about current of data; leads to redundant efforts to create/collect/derive data sets rather than tapping existing resource
- Lack of metadata and descriptive information on assumptions and uncertainties
- Lack of a clear leader that could house a regional resource. Some partners, such as the USFWS Northeast Region are still adjusting to losing their dedicated, internal GIS group.
- No "portal" strategy exists - NALCC as "translator/matchmaker"

Opportunities

- New staff at NALCC focused on compiling/cleaning up existing data, creating metadata and developing mechanisms to make data available
    - One person at USFWS Northeast; one person via The Nature Conservancy Northeast

- NALCC in unique position to:
    - Provide visual understanding of regional activity
    - Support communication and collaboration among partners
    - Offer interpretation and “meaning” of data to support decision making rather than just view of raw data
- Opportunity to build on existing, related efforts:
    - Piggy-back onto/synchronize with new NALCC web-site effort
    - Funded efforts to develop standards and a common lexicon for State Wildlife Action Plans (SWAP)
    - Efforts in other LCC's (e.g., ScienceBase, LCMap, DataBasin)

Threats

- Concerns and misunderstandings about Information Management System Needs Assessment Management project direction need to be addressed
    - Avoid perception of overstepping boundaries and interfering with partners already performing important analyses
- If data format and varied scale requirements are not met, many partners will not contribute to or use resource
    - For example, potential for loss of data integrity when “rolling up” data of differing accuracies and scales (i.e., challenges in aggregating local data into regional data sets)
- Inability to design a system that can be effectively implemented
    - Challenges coming to consensus on chosen approach
    - Confusion caused by competing approaches and systems

6.3 APPENDIX 3: SURVEY RESULTS

See attached slide presentation summarizing survey results.

NALCC Information Resource Management Survey Results

110 Surveys Administered

Final Survey Completed:
Wednesday, September 12, 2012 4:52:08PM

Executive Overview

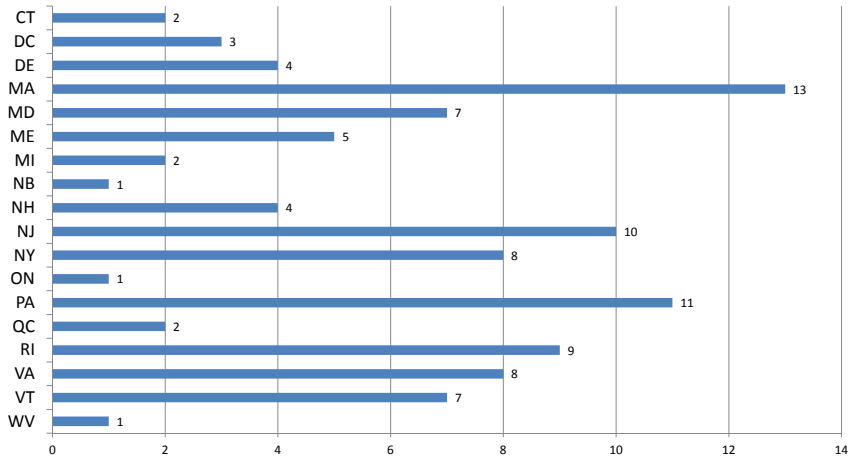
- The NALCC's partners have a **high level of IT and GIS proficiency**
- **Many partners** maintain varied and valuable datasets that could be useful to other partners
- **Data sharing is common among partners**, but the required steps to obtain data varies between partners.
- Survey participants are curious and somewhat confused about **overall project direction**

Survey Participation Composition

- 110 surveys started, 102 partially completed, 93 surveys fully completed
- Primarily State, Federal and Non-Profit Organizations
- ¼ of Respondents are "Heavily Involved" (i.e. >3 days/week) in NALCC Activities
- Natural Resource Management Focus

Q# 1, Sec. 2
Full Sample

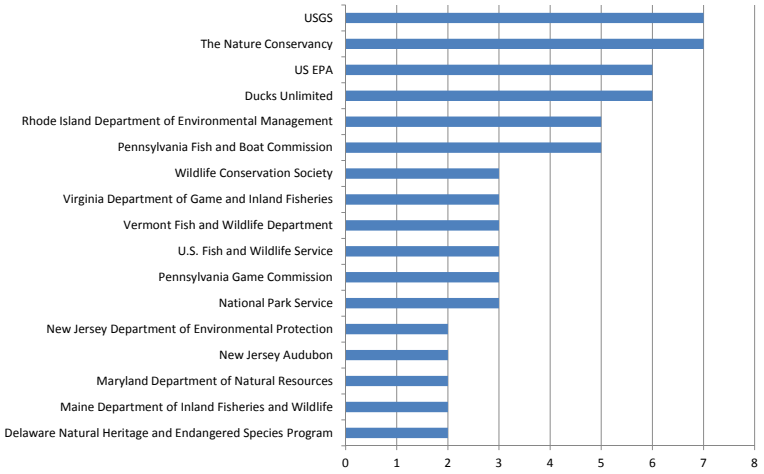
State Representation in Survey



Q# 1, Sec. 2
Full Sample

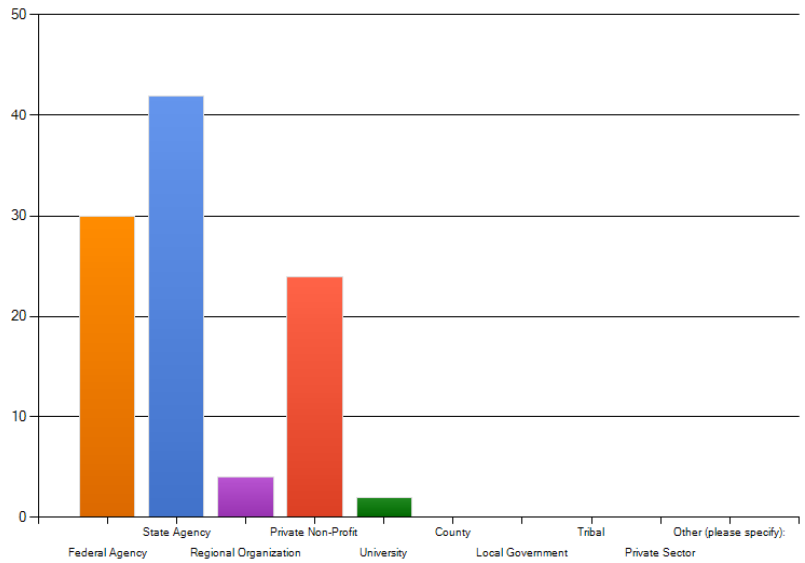
Organizations Represented

54 Different Organization Responded
Chart shows all organizations where >2 people responded



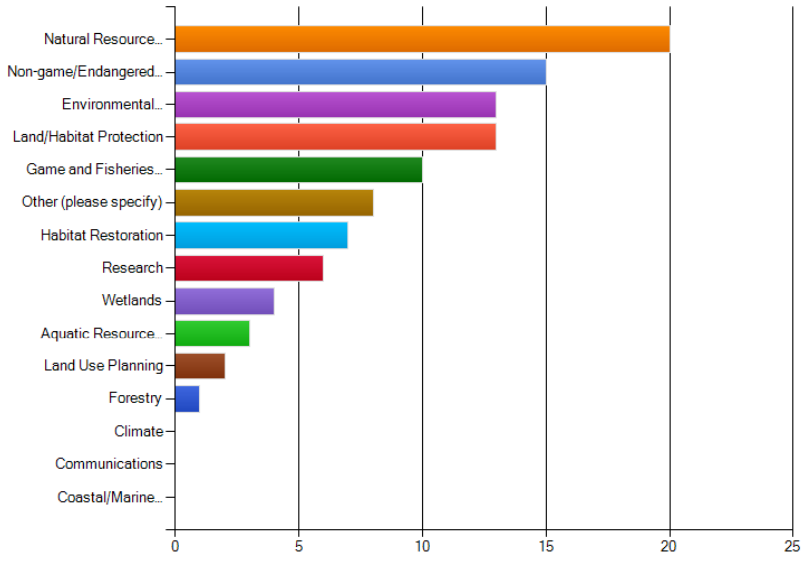
Q# 2, Sec. 2
Full Sample

Partner Organizations



Q# 3, Sec. 2
Full Sample

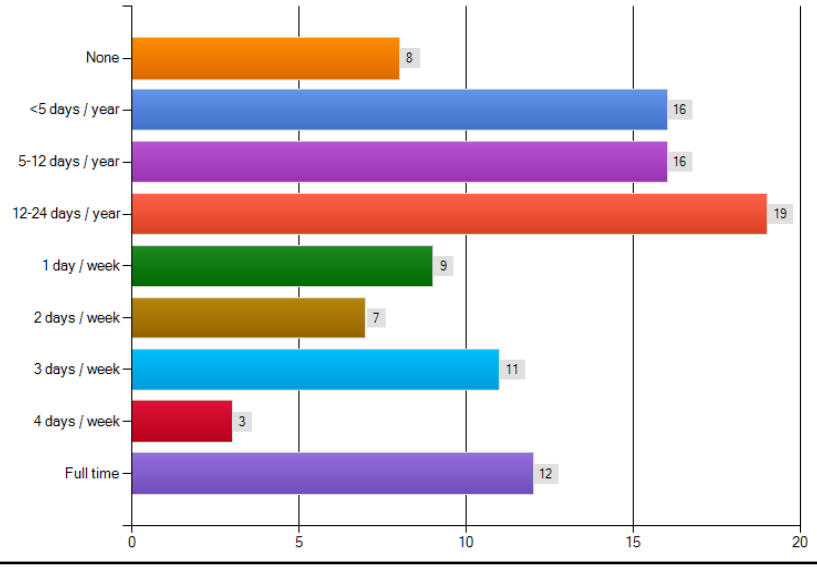
…best describes the business your organization is engaged with?



Q# 5, Sec. 2
Full Sample

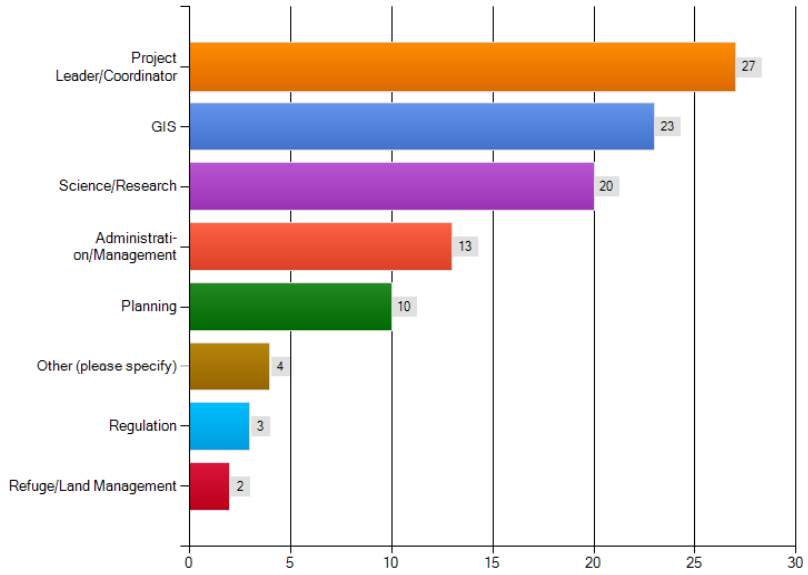
Involvement in NALCC activities

26 out of 101 are >3 days/week



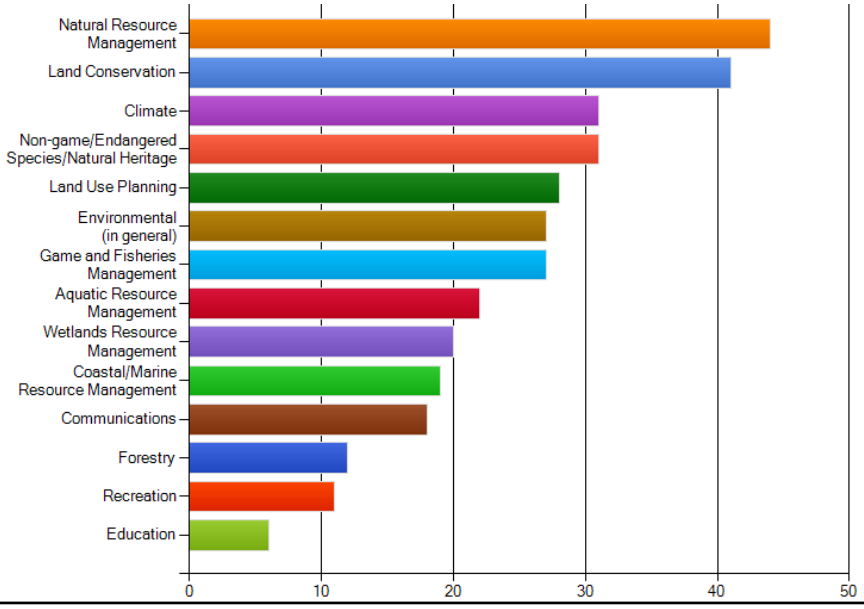
Q# 4, Sec. 2
Full Sample

Type of Work You Perform



Q# 13, Sec. 3
Full Sample

Issues that drive your information management requirements



Q# 6-7, Sec. 3
Full Sample

General Information Management and GIS Knowledge

Level of Knowledge	Info Mgmt	GIS
High = "Integral"	**45.5%**	**45.7%**
Medium = "Familiarity"	**44.8%**	**42.6%**
Low	**9.7%**	**11.7%**

Q# 21/35, Sec. 4/6
Full Sample

Active Management Responsibility

Survey "branching logic"

- Do you **currently work with *data* directly** and/or have direct knowledge your organization's **data holdings** and requirements? **69.7%Yes**
  - ~70 people answered **13 supplemental** questions on data
- Do you **currently work with information management and/or GIS *technology*** and/or have direct knowledge your organization's **technological capacity**? **58.2% Yes**
  - ~57 people answered **8 supplemental** questions on GIS

Q# 39/41 , Sec. 7
IT/GIS Sub-Sample

Importance of DB and GIS Technology

How essential is GIS/database technology to the business conducted by your organization/division?

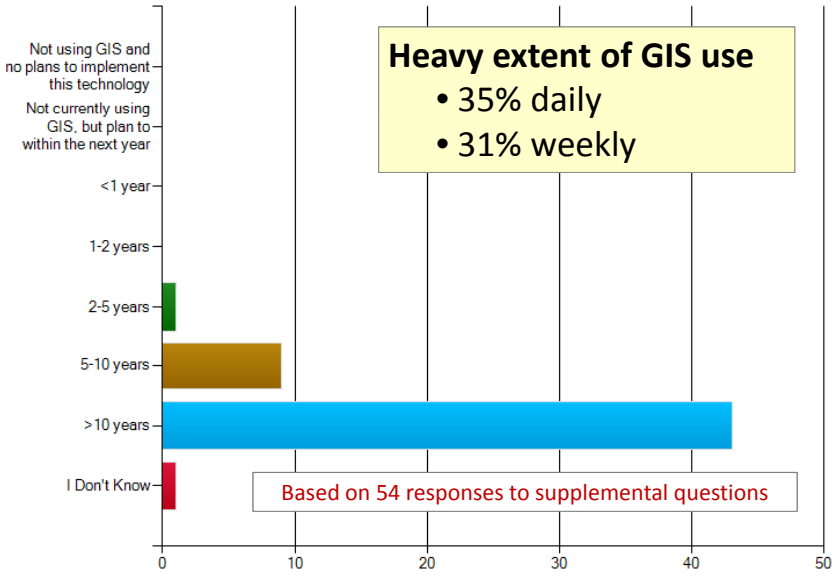
Technology	% Critical	% Very Useful	Critical + Very Useful
Database	**59.3%**	**38.9%**	**98%**
GIS	**90%**	**10%**	**100%**

Based on 54 responses to supplemental questions

Other choices were:
- Somewhat useful
- Not very useful
- Not relevant

Q# 8/40 , Sec. 3/7
Full - IT/GIS Samples

Exposure to GIS is Not New & Use is Prevalent

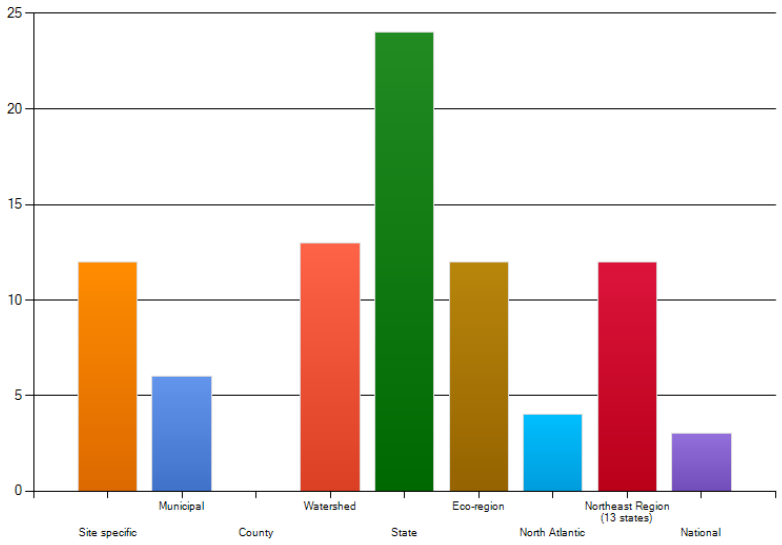


IT/ GIS profile of NCLAA partner organizations

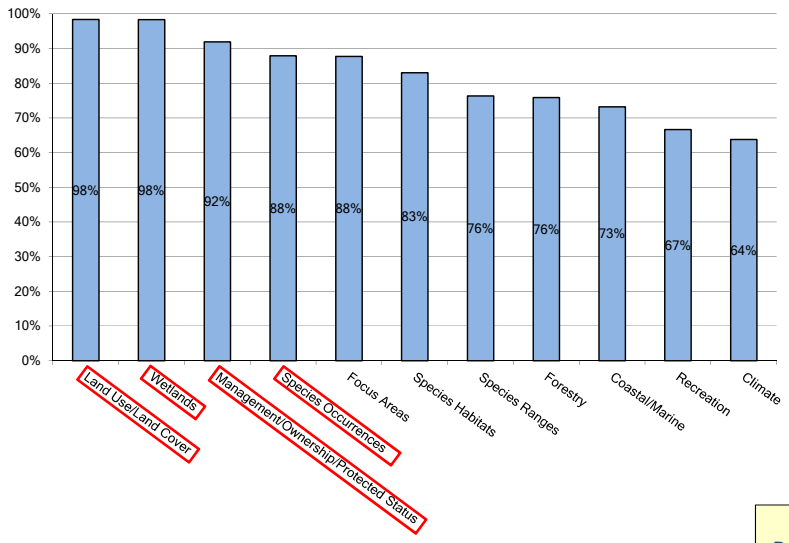
- 90% have individuals on staff with specialized database skills
  - 46.3% have a dedicated individual focused solely on database management responsibilities
- 70.2% have a dedicated GIS group or set of GIS specialists
- 92.4% of organizations indicate that IT and GIS support from the NALCC is not essential their acquisition or use of GIS resources
  - 39.6% said it would be helpful though.
- 60% of respondents said database technology is critical to their organization
- 90% of respondents said GIS is critical to their organization

Q# 14, Sec. 3
Full Sample

Geographic Extent Used Most Often NALCC Partners

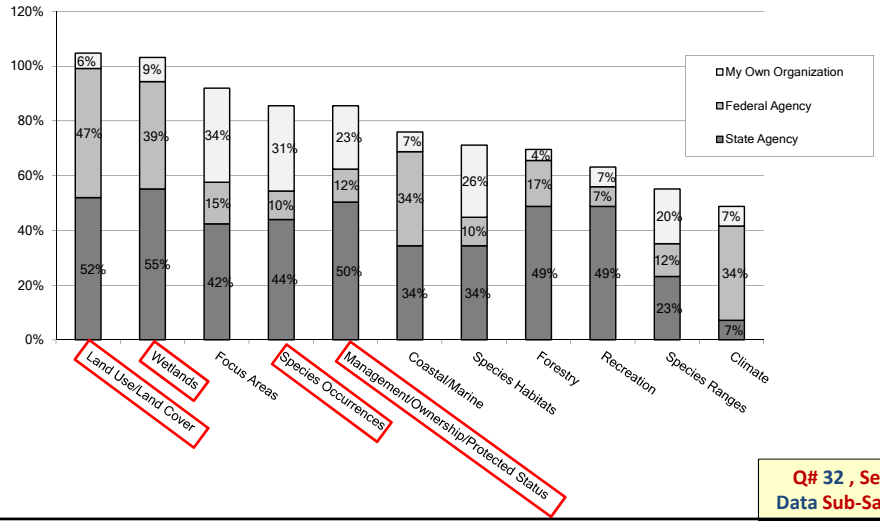


The Geospatial Datasets Most Often Used by NALCC Partners



Q# 31 , Sec. 5
Data Sub-Sample

Where is the Best Data Found?

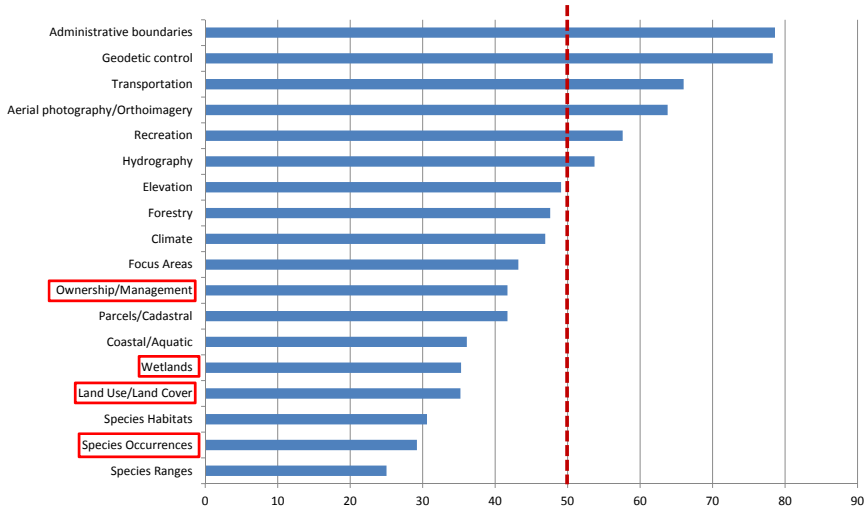


Q# 32 , Sec. 5
Data Sub-Sample

Q# 33 , Sec. 5
Data Sub-Sample

Existing Adequacy of Data

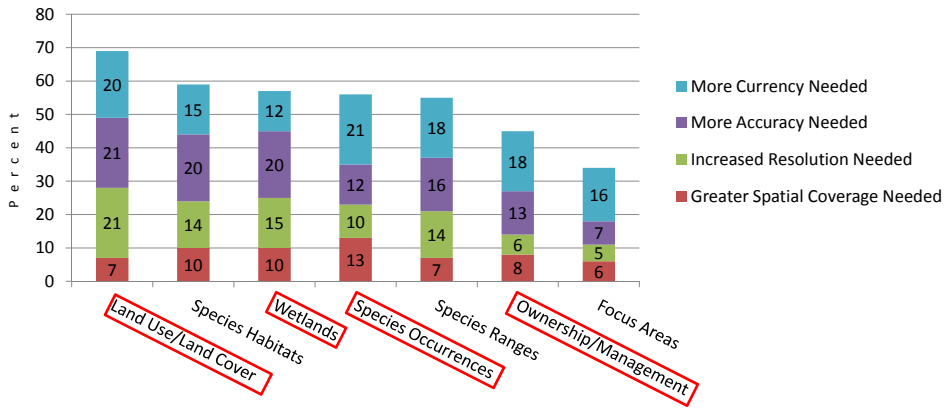
"Best available are adequate"



Q# 33 , Sec. 5
Data Sub-Sample

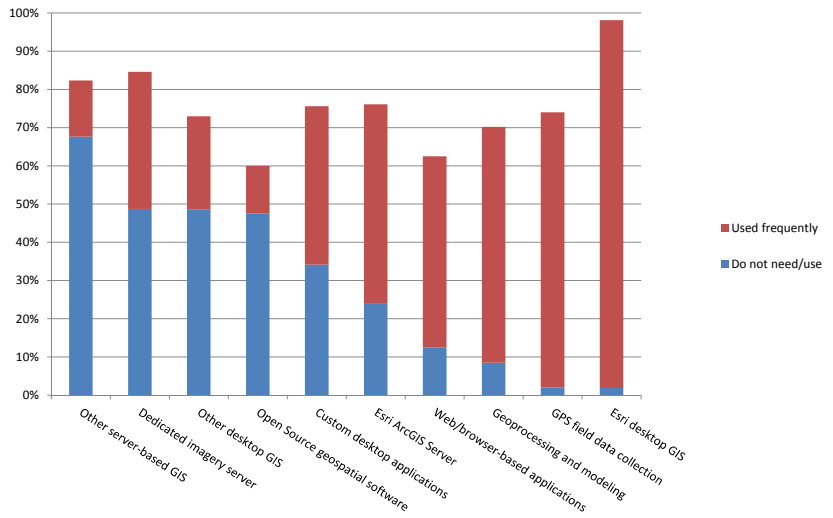
What Inadequacies Does this Data Have?

Not cumulative, could answer with >1 inadequacy



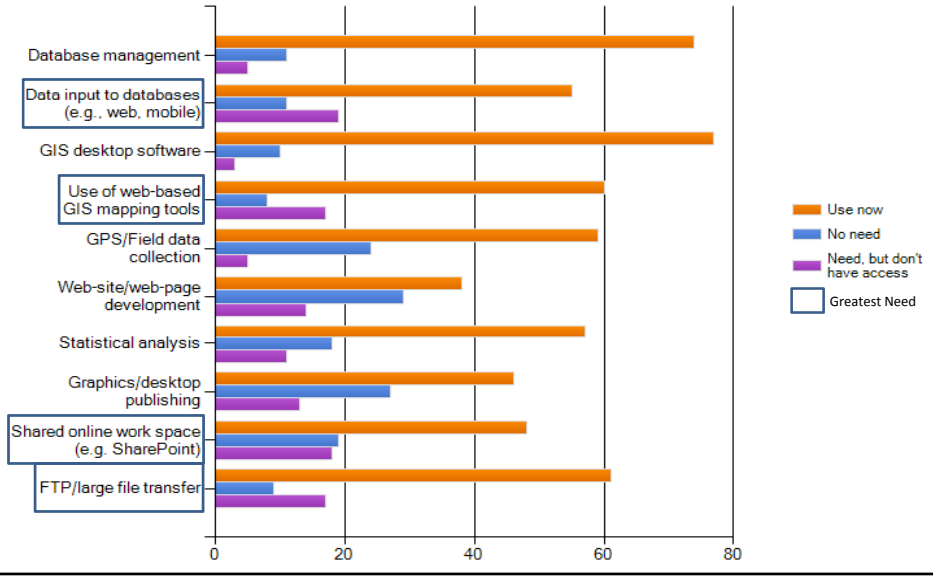
Q# 42 , Sec. 7
IT/GIS Sub-Sample

GIS Technology Profile



Q# 10, Sec. 3
Full Sample

Technology Profile:
What IT/GIS needs could NALCC be providing



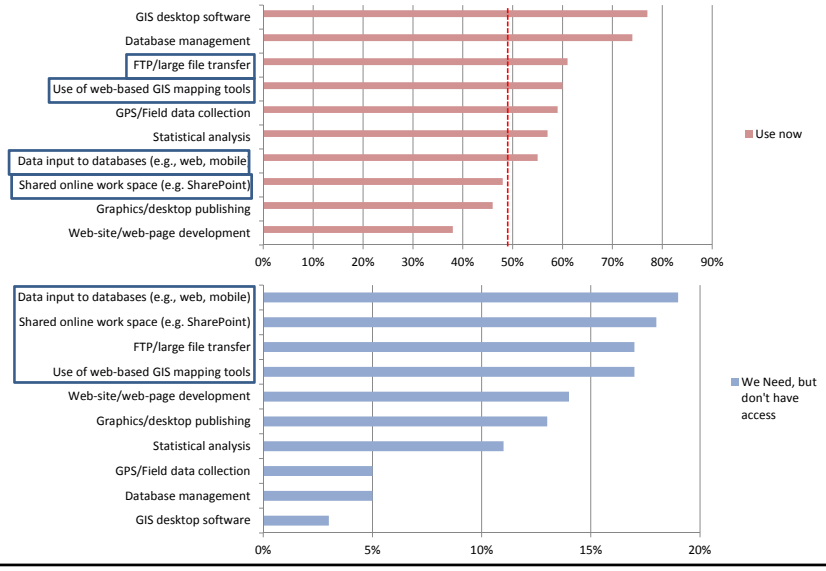
Q# 42 , Sec. 7
IT/GIS Sub-Sample

GIS Technology Profile

- Esri desktop GIS is the primary desktop application used by respondents
- 50% of respondents use Esri ArcGIS Server
- Web-based mapping utilities are also common among 50% of respondents
- Field sampling done frequently by 72% of respondents
- Geoprocessing, modeling and custom desktop application are frequently used by approximately 50% of respondents

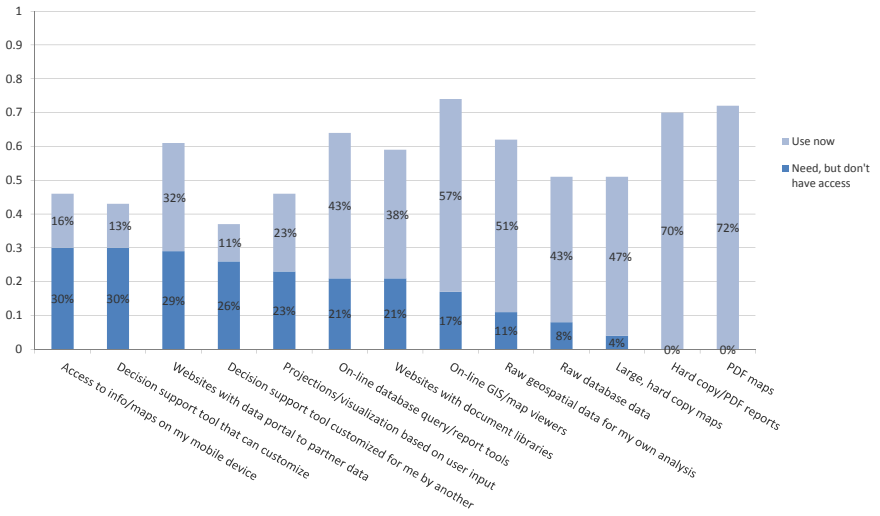
Q# 10, Sec. 3
Full Sample

Technology Profile:
What IT/GIS needs could NALCC be providing



Q# 12, Sec. 3
Full Sample

What are the most desired products you use currently or will need



Q# 12, Sec. 3
Full Sample

Most Desired Information Products

Technology Product	% that Need but Don't Have
Access to info/maps on my mobile device	30%
Decision support tool that can be customized by users	30%
Websites with data portal to partner data	29%
Decision support tool that is customized by technician	26%

Q# 16-20,Sec. 3
Full Sample

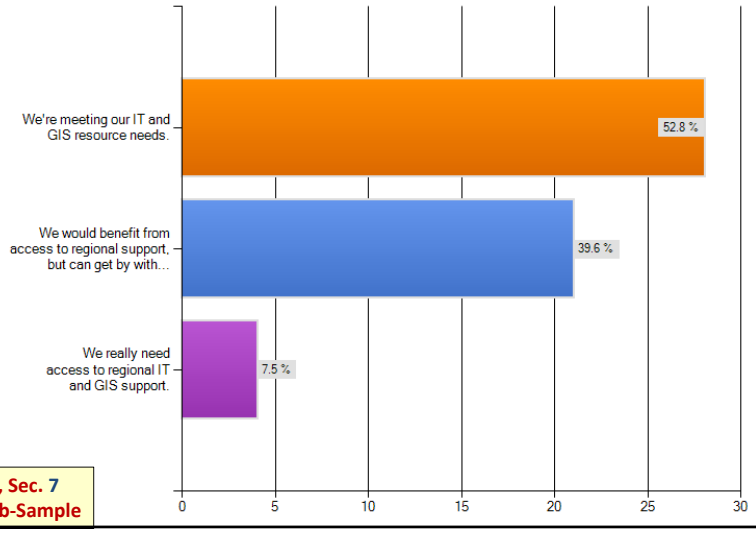
Models for an NALCC IM System

A North Atlantic LCC Information Management System should be comprised of…

Model	% that Strongly Agree + Agree
…a ***single, dedicated system***, exclusively focused on LCC activities.	**21.1%**
…an ***inherently collaborative system*** with multiple partner systems working in concert.	**73.3%**
…***hosted tools and data viewers*** available to all partners.	**81.3%**
…***shared web services/data sharing*** between partners.	**80.2%**
…only ***coordinated, formal data sharing*** between partners.	**15.4%**

Benefit from additional IT/GIS Support

Which option <u>best</u> describes your organization's need for additional IT or GIS support from the NALCC.



Q# 38 , Sec. 7
IT/GIS Sub-Sample

Q# 23,34,25 Sec 5.
Data sub-sample

Data Access and Sharing History

How are NALCC partners currently sharing their information?

- **Broad *sharing data***
  - **84.9%** *share database resources*
    - *66 respondents*
  - **92.2%** *share GIS resources*
    - *64 respondents*
  - *Explicitly defined partnerships are normally contingent on sharing information and sensitive data is normally withheld*
  - **69%** have access to data maintained by other partners

Valuable Insight from Members

- Collaboration and Sharing Insight
  - A key role of the NALCC should be to bring together and share partner data, analysis , decision support tools and applications at the landscape, watershed and even local scale. – Jeff Horan, USFWS
  - I think that a significant amount of the info mgmt needs of the NALCC could be satisfied by a comprehensive portal solution that includes both collaboration, knowledge management, database management and geospatial data management and visualization. – BJ Richardson, UFWS
- Data Availability and Security
  - Web/mobile apps are the future but we do not have the capacity to develop them. If you're thinking about providing a data portal, some thought needs to be given to ensure that data will be used properly. We maintain numerous data sets that have legal implications; misuse of those data has become problematic and caused setbacks to conservation efforts because of misinterpretation. - Don Katnik, ME Dept of Inland Fisheries and Wildlife
- Additional Partnership Suggestions
  - I strongly urge you to work in concert with NatureServe and the network of Natural Heritage Programs that are already partnering in ways similar to that which you are considering. – Lynn Davidson, MD Dept of Nat Resources
  - The NALCC needs to continue to reach out to other LCC's (e.g., AppLCC) to insure that Information Management, GIS, and Decision Support Tools are compatible across adjacent LCCs. – Paul Johansen, WV Div of Nat Resources

Valuable Insight from Members

- Finding and Explaining a Fully Inclusive Solution for Less Technical Members
  - We see the future in embracing new technology particularly through online, remotely hosted servers as a means of bringing together data and partnerships in conservation. The concern at this time is that there may be either a lack of understanding or misunderstanding about new technologies and their capacities to improve how we do business. I would recommend that you consider this diversity of understanding among your survey participants as you proceed forward in interpreting the survey data and ultimately drawing final conclusions. Perhaps more education about new technology is needed among NALCC partners and stakeholders in the future and that this survey could provide the evidence for such a need. –IP from Qunicy, MA
  - Need to ensure that technical aspects of system are translated into plain language for non-GIS gurus. – Gordon Batcheller, NYS Dept of Env Conserv
  - I don't see a collaborative system working, at least in the short-term. We just don't have the people to work on such an effort – Chris Burkett, VA Dept of Game and Fisheries
  - A description of the questions we are trying to answer or the decisions to be influenced might help make this effort more "real" or understandable to those who don't think about info mgmt... the "so what" of it all. does this exist somewhere? – Trish Garrign, MA Off. Eco Protect
  - Please explain more specifically what you mean by things like "information management", "database management", "decision support tool." I use excel to manage my own data all the time, does that count as database management? - Michale Glennon, Wildlife Conserv Society

Datasets of **Most** and **Least** Interest

- **Most:**
  - Land use/Land cover
  - USFWS - wildlife, plant, habitat data
    - Endangered / rare species data
  - Aerial /Ortho/Lidar Imagery
  - USGS Data
  - The National Map Data
  - State mapping and data repositories
- **Least**
  - Parcel and Geodetic Control

7 Federal FGDC Dataset Use

- Less than 5% rely on in-house datasets in the 7 categories
- State level data followed by federal level data are the most commonly used FGDC data extents
- Excluding Parcels and Geodetic data from the 7 FGDC types of datasets, State or Federal level information is used on average 90% of the time.