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GIS Collaborations in Saskatchewan: SGIC and the University of Saskatchewan Library

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GIS (Geographic Information System) libraries face challenges at both ends of the spectrum when it comes to acquiring GIS data. On one hand, the increase in popularity of GIS driven by services like Google Earth, Bing maps, and open data has made large amounts of GIS data freely available to users. On the other hand, specialty GIS data products, often needed by researchers, industry, and government, can be so costly that they are impossible for a library to purchase on its own. In situations like the latter, collaborations often provide the solution for acquiring the necessary GIS data. This report discusses one of the most significant collaborations the University of Saskatchewan GIS Library has been involved with, the Saskatchewan Geospatial Imagery Collaborative (SGIC). The report will outline the collaboration, its goals and outcomes, as well as provide examples of how various members of the collaboration are utilizing the data. Lessons learned through this collaboration are also discussed, which can aid other libraries interested in collaborating to purchase special types of data.

INTRODUCTION AND LITERATURE REVIEW: COLLABORATIONS, LIBRARIES, AND GIS

Looking across Canada, Saskatchewan Geospatial Imagery Collaborative (SGIC) seems to be a unique province wide collaboration that includes government, business, and nonprofit organizations working together to purchase and provide access to GIS data. However, several smaller-scale collaborations do exist nationwide, and much has been written about the importance of partnerships and collaborations in GIS libraries. In her paper, "Essential Collaborations," Dixon says, "Partners achieve mutual benefits through the synergy of ideas, research, and development that result in shared GIS resources and services" (Dixon, 2006). Specifically, libraries benefit from having more resources to provide their users. A paper regarding stocking the GIS data library also suggests that a good source of acquiring GIS data is through partnerships (Stone, 1999). The author quotes Carolyn Argentati, who states, "Partnerships and grants linking libraries with governmental and commercial organizations have offered opportunities for collaboration on service models and the development of large data collections and new access tools." (Argentati, 1997).

Partnerships can greatly contribute to the financial success of GIS libraries. Quite often libraries cannot afford to purchase, maintain, and store GIS data collections on their own. Looking specifically at SGIC, the cost requirements are in the millions, which would be impossible for the University of Saskatchewan Library to manage alone. Collaboration can also lead to free access to data. For example, the GIS library at Dalhousie University stores and backs up LiDAR data purchased by the municipality. In return, the university can use the data for teaching and research free of charge. The municipality has also contributed funding for this project, which contributes to the GIS library's budget (Boxall, J. E-mail message to author, July 28, 2011). Besides reducing costs, sharing GIS expertise is also useful as librarians often have little formal training in GIS. David Cobb (1995) writes that "GIS technology, while offering libraries a valuable new resource, will require the assistance of experienced practitioners." Partnerships provide the opportunity for libraries to utilize GIS professionals' knowledge and skills.

Also beneficial to GIS Libraries is the networking and knowledge that will be gained through working with GIS professionals in the area. These partnerships can lead to new opportunities and continual communication with people involved in GIS. The librarians at Cornell University noted that "the partnerships we formed with data providers are not one-time data acquisition agreements, but relationships that will grow and mature" (Herold, 1999). Argentati agrees, saying, "One strong partnership often leads to others and to additional contacts with people and organizations engaged or interested in GIS" (Argentati, 1997). This networking allows the library to expand into new and nontraditional partnerships with the GIS community.

The library is not the only member that benefits in a good collaboration. Steinhart (2006) lists several benefits of partnerships, including sharing information; enabling data reuse and cost sharing, improving, and correcting data; fulfilling data distribution requirements; and promoting data and meta- data standards. He goes on to say that not only does a partnership benefit the library, but the library has a significant offering itself: "Libraries can bring substantial expertise to bear on the collection, curation, and distribution of digital geospatial information, making them trusted and competent partners for organizations that wish to distribute geospatial data." The example from Dalhousie University demonstrates how useful the library's specialized knowledge of data storage and maintenance is to the municipality, resulting in an ideal collaboration (Boxall, J. E-mail message to author, July 28, 2011).

About the Saskatchewan Geospatial Imagery Collaborative

The Saskatchewan Geospatial Imagery Collaborative, formed in 2006, is a partnership of 29 organizations interested in Saskatchewan geospatial data who came together to share costs and expertise. A full list of members can be found in Appendix A: SGIC Organization Members. The goal of the agency was to finance and manage complete GIS coverage of Saskatchewan with aerial photography and satellite imagery. Members include crown corporations; provincial, federal, and municipal agencies; industry; nonprofits; as well as the province's two universities. The project was estimated to cost a total of \$5.2 million; therefore, the larger the group, the more feasible the project was.

Aside from financial contributions, there are other important roles that members have in the collaborative. The Saskatchewan Research Council serves as financial administrator for the project,

houses the imagery access system, and provides Web site support. A member of the government of Saskatchewan's Information Technology Office (ITO) chairs the collaborative and provides leadership and oversight. A multiyear contract has been signed by each organization outlining each partner's contribution over 5 years toward funding approved projects and establishing the governance process for the collaborative. Most importantly, all partners have a say in decisions, and they can attend quarterly meetings, which include learning, reporting, and decision making.

The imagery project itself had four tasks:

- Acquire 2.5-meter resolution satellite imagery for the province.
- Acquire 20-meter resolution, multispectral satellite imagery for the full province (multispectral imaging allows extraction of additional information the eye cannot capture).
- Acquire 60-cm, high-resolution color and color infrared aerial photography for the province over 5 years.
- Implement an online storage and access system. (Potter, 2011)

The 2.5-meter resolution imagery acquisition was completed in May 2007. The imagery and related data were purchased from Telus, but it is available only to members due to the license agreement. SGIC did manage to

license 10-meter imagery for public viewing. Twenty-meter imagery collection started in 2008; it will continue into 2011, and it includes a partnership with Natural Resources Canada. Project 3, acquiring 60-cm aerial imagery, started in 2008 and will be completed in 2011. Because the 60-cm imagery will be wholly owned by the collaborative, it will be available to the public at no charge. The online storage and access system, called FlySask, was launched in 2008; and it is the Web platform that allows both public users and SGIC members to access SGIC's geospatial imagery (www.FlySask.ca). The FlySask Web site offers online interactive mapping and downloading. A Web mapping service was also developed, allowing users to download data and images directly into programs such as ArcGIS.

The public has access to limited geospatial holdings, while members have full access. Full access is granted by a user receiving a username and password to log onto the secure site. At the University of Saskatchewan, faculty, staff, and students can request a password through the GIS librarian, who creates a user account. These accounts have end dates to take into account students who will be graduating. FlySask access is granted only to people having a valid Network Systems ID with the University of Saskatchewan. There are several GIS layers available to the public including:

- administrative boundaries of Saskatchewan (RMs, boundaries, etc.)
- National Topographic System
- FlySask Orthophoto (2008–2010)

- Raster Tile Indexes
- FlySask Orthophoto 60-cm Tile Dates
- National Road Network (Saskatchewan roads, freeways, etc.)
- SaskGrid (townships, sections, and quarter sections)
- SPOT 10 meter

Members of the Collaborative have access to additional layers, including:

- SPOT 2.5 Meter
- SPOT 2.5m-Tile Dates
- Regina 2006 imagery
- Saskatoon 2001 imagery
- City of Regina Imagery 2009

Why Do We Need This Collaboration?

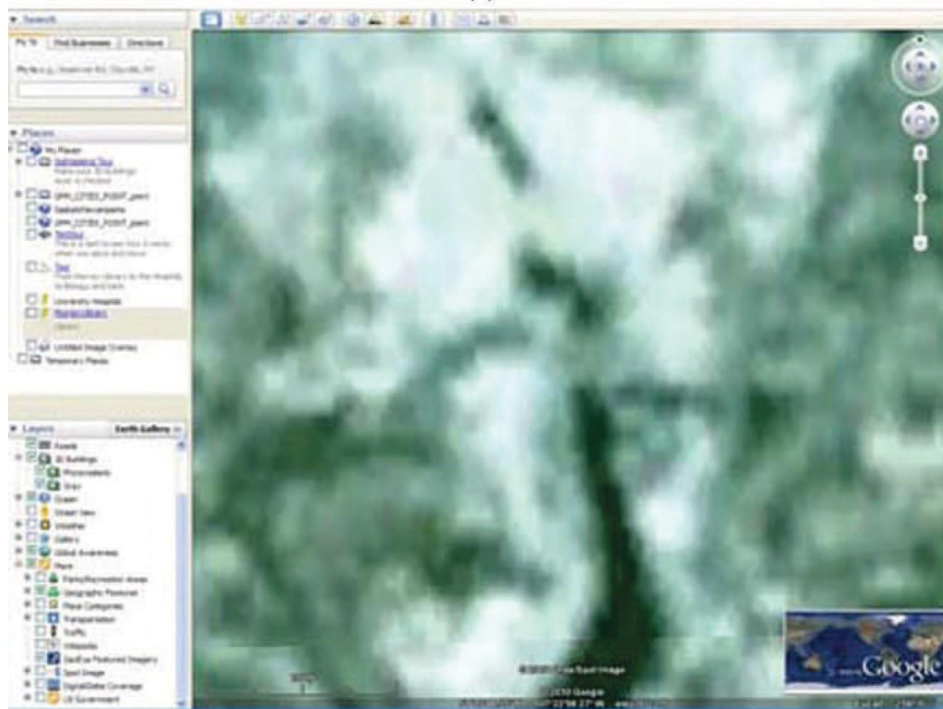
With all the free GIS data out there, why is there a need for SGIC? Although the satellite imagery offered via products such as Google Earth is becoming more up-to-date, FlySask currently offers higher quality imagery than can be accessed free online. Because of Saskatchewan's small population and remote areas, satellite imagery is not kept as up-to-date as it is for other regions. Figure 1 is a screen shot of the same area in both Google Earth and FlySask. Note the difference in quality and sharpness in the FlySask image. In the future, the Google Earth imagery may be better than FlySask, but for now this is the best product available for users.

This collaboration also offers the group ownership, control, and stability of data. Metadata, or information about the products, is known; and the data is owned, controlled, and stored by the SGIC. Data owned and controlled by another source can change or disappear without notice. Also, many free sources do not give information about the data's source or date, important things to know for research and planning.

Usage statistics back up SGIC's notions about the importance of its output. During 2009–2010, the average number of visits to www.FlySask.ca was 7,945 per month, with over 59,000 hits per month. This year, the server has averaged over 1 million hits per month (Potter, 2010).



(a)



(b)

FIGURE 1 (a) FlySask SPOT 2.5 Meter compared to (b) Google Eye snapshot.

SGIC Participant Survey

In a true collaboration, all members of the group benefit. In the summer of 2010, an ITO survey, with 22 SGIC members responding, showed that access to SGIC data has saved collaborative members time spent both on research and on field work and travel. Members also saved money due to reduced work for staff in accomplishing tasks. The data also increased knowledge and information for decision-making

purposes. Additionally, the survey showed that savings for participating agencies were, in some cases, over \$500,000 a year (see Figures 2 and 3: Survey Results).

The next survey will give further insight into how each member uses and benefits from the SGIC (Potter, 2011).

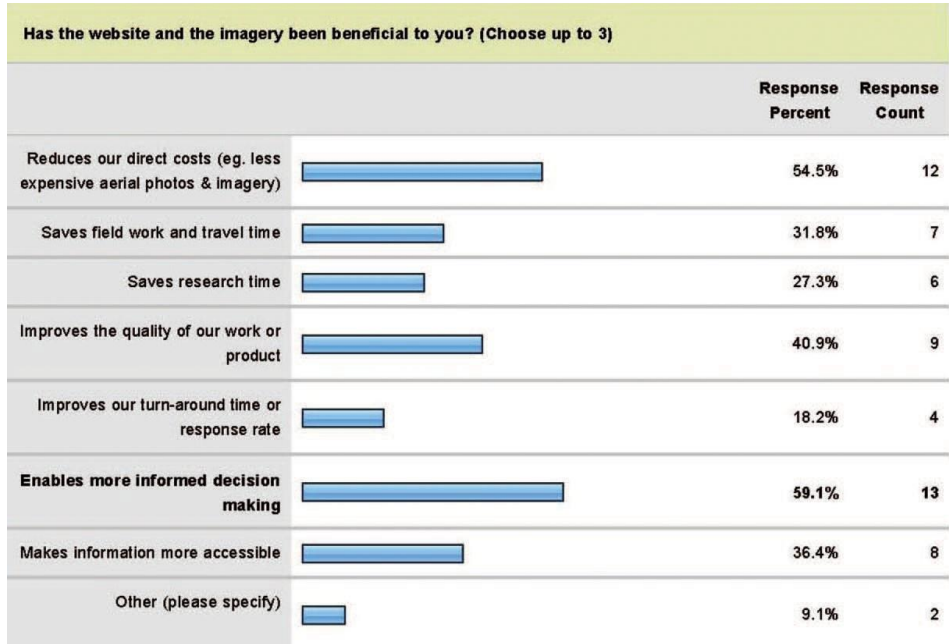


FIGURE 2 Survey results—benefits of website and imagery.

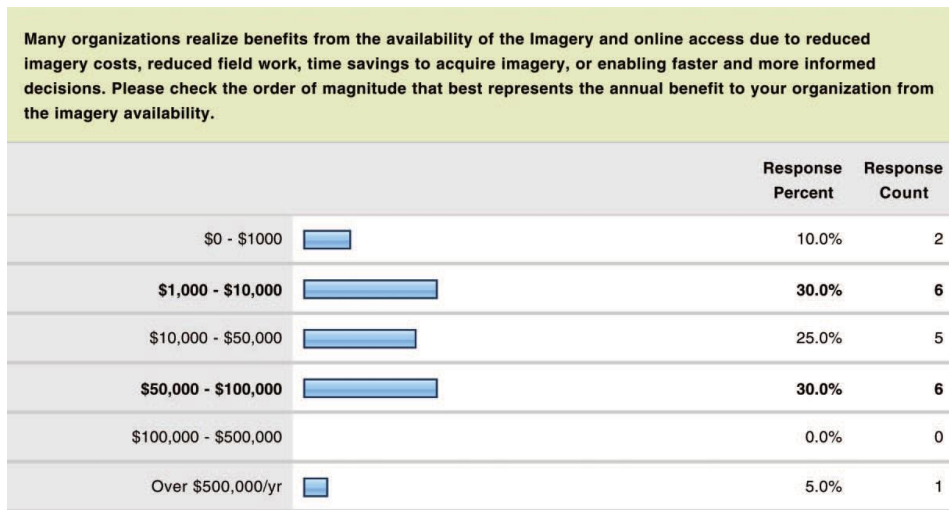


FIGURE 3 Survey results—financial benefits.

How Are the Data Being Used?

The imagery is used by various levels of government, the public, and industry for hundreds of applications. The survey results showed SGIC members using the satellite or air photo imagery data for emergency services, land planning, engineering, natural resources management, market analysis, reports, tourism, academic studies, and more. The following section will outline how some members are using SGIC data and show how varied work with GIS can be. These examples show how a collaborative effort to purchase and distribute data can be beneficial to all.

MEADOW LAKE FIRST NATIONS

The nine First Nations of the Meadow Lake Tribal Council utilize SGIC resources in their Traditional Lands Map System. The system contains GIS data layers together with SGIC's SPOT 5, 2.5-m satellite imagery. The First Nations use this data to meet their duty to consult requirements and land management decisions (Spofford, W., E-mail message to author, April 21, 2011).

SASKATCHEWAN URBAN MUNICIPALITIES ASSOCIATION (SUMA)

With their participation in SGIC, SUMA members have access to high-resolution satellite imagery of their municipalities. These data are often more current than the aerial imagery that urban administrators and councils are likely to have in their municipal offices. For municipalities, these data can be useful for planning, emergency preparedness, and tourism development.

SASKENERGY AND TRANSGAS

SaskEnergy and TransGas are looking at ways to integrate the SGIC imagery into their mapping on a project-specific basis. Some of the potential uses mentioned are

- planning: routing for new pipelines, and estimating for new pipelines and storage facilities
- Environment: assessing environmental concerns for pipeline projects, reviewing past environmental concerns
- Risk: identifying features along pipelines, counting dwellings within areas
- Engineering: pipeline route selection and design, landowner contacts/easements
- Integrity: selecting excavation sites, determining local conditions and features, detecting urgency for repair, improving pipeline data in integrity databases, assessing corrosion
- Public awareness: improving information for landowners
- Operations: emergency response planning, line locating

- CAD & mapping: overlaying imagery for improved visibility, improving geo-referencing (MacRae, D., E-mail message to author, May 20, 2011).

UNIVERSITY OF SASKATCHEWAN

Several faculty members, staff, and students at the University of Saskatchewan use FlySask for their research, teaching, and work. Tom Yates, a professor in the Department of Soil Science, utilizes FlySask as a resource for his Renewable Resource Management (RRM) 321 course—Resource Data and Environmental Modeling. He also uses FlySask as a planning tool for RRM 301.9, which is a field course in the Renewable Resource Management Program. Images captured from FlySask support the field exercises that he conducts with the students. He also uses FlySask to scout potential field sites for course planning. Yates states, “Especially useful is the orthophoto imagery available from the site. It is detailed enough to allow the students to stratify their assigned land areas into possible biophysical map units prior to the major course assignment—a map of plants and soils for the assigned area” (Yates, T., E-mail message to author, April 20, 2011).

SASKATCHEWAN WATERSHED AUTHORITY (SWA)

Flooding is a major issue in Saskatchewan, and the SWA uses SGIC imagery to aid in flood management and prevention. This year several organizations came together to share data and information regarding the flooding. In fact, SGIC has recently provided imagery to the National Department of Defense for planning purposes in case flood assistance is required. In April 2011, the SWA, together with other SGIC partners, came together to acquire satellite imagery for the regional municipality (RM) of Corman Park, which will define the high-water extent during the spring 2011 flood. This will assist in planning remedial efforts to minimize future problems. The watershed authority has also demonstrated a willingness to share new GIS data with the SGIC group. The Authority has created a seamless digital elevation model (DEM) from the SGIC elevation data and allowed the group to download these newly created data for their own use. (Potter, April 2011)

UNIVERSITY OF REGINA

Much like at the University of Saskatchewan, SGIC imagery is used for teaching and research at the University of Regina. Joey Pankiw, a master’s student in remote sensing, utilizes the SPOT 2.5-m pan imagery from FlySask to detect shelterbelts in the Prairies for his studies. His research showed that total carbon sequestration generated by shelterbelts balanced out the carbon use by farmers (Pankiw, 2011).

In Conclusion: Lessons Learned

In a report to new SGIC members, John Potter (ITO) outlines some of the lessons learned through this collaboration. These lessons are useful for GIS libraries or institutions that want to form a collaborative of their own for data purchasing and sharing.

1. Start the collaboration with structure so that successes can be noted and promoted. Having a structure, including timelines and goals, will keep the group on task, and also prove successes along the way. Structure can insure that the logistics of the project get completed. For this collaboration, the legal work was completed, 5-year contracts were signed, and policies were created. This kind of base structure is integral for a successful collaboration at this level.
2. When dealing with partners, prepare to work with organizations on an individual basis to fit with their goals and funding. Each partner will have different goals and resources, and these will not be the same as for the next partner. At the University of Saskatchewan, for example, imagery is imperative for research and teaching, while the watershed authority would use the data for flood management and planning. That being said, the goals laid out for the imagery collaborative, SGIC, are shared by all members, and they can hold the group together with a common purpose.
3. It is also important to be transparent and keep everyone involved in the process. This can be done by voting at meetings and having regular correspondence with partners. The SGIC group has quarterly meetings to discuss business projects, vote, hold a workshop, or have a guest speaker. The survey, conducted by ITO, gave consortium members a chance to voice opinions, raise questions, and inform other members. Regular surveys are a good way to keep people involved and informed.
4. For this group, it would have been good to explore more options for on-line access, as there were limited respondents to the request for proposals (RFP). Taking the time to allow for applicants and knowing what to look for are important for RFPs.
5. A final lesson is to be aware of the required skills and time commitment it will take to undergo such a large task. This project was province wide and complicated, and it could take considerable amounts of time and skill to manage and maintain (Potter, 2011).

From a library standpoint, the University of Saskatchewan GIS Library has also learned some important lessons.

- Create and maintain contacts in order to become involved in these collaborations. Without being in contact with other GIS users in the province, the U of S GIS Library would not have had the opportunity to be part of SGIC from its inception.
- Be open about funding (or lack thereof) available for the collaboration. Often academic institutions are unable to contribute less to group purchases as they have limited funding. It is important to inform the group of the library budget's limits, and to be able to explain why academic institutions should have reduced fees. The same can be said for time commitment and services such as Web site development and maintenance, as librarians have many roles to fill and jobs to do.
- Evaluate the resource. Keep examples of projects, numbers, and ways that the users have employed the product. Talk to users about what they are using the product for and how useful it is to them. This information will aid in making decisions about future investment in the collaboration and

help the librarian defend purchases and seek funding for them. On the other hand, evaluation may show that the collaboration is not benefiting users and that the contract may not need to be renewed in the future.

- Promote the resource. If the library has put the time and money into a new resource, it should be promoted so that users are aware of it and can take advantage of it. New resources can be displayed on library blogs, newsfeeds, and such, to make users aware of it. FlySask.ca is one of the resources demonstrated by the GIS librarian during in-class presentations, and it is often recommended to students doing GIS projects in Saskatchewan.

GIS libraries can benefit immensely from collaborations, and they should actively pursue becoming involved with, and in, such groups. Becoming a part of the SGIC proved to be invaluable, not only for the University of Saskatchewan Library, but for all members across the province. The hope is that this article will aid other libraries when they consider further collaborations, and that it will help them learn from the experiences of the University of Saskatchewan Library regarding partnerships for acquiring GIS data.

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APPENDIX A. SGIC Organization Members

SGIC Organization members (29)

Provincial Government First Nations - Saskatchewan

Agriculture Prince Albert Development Corporation Corrections, Public Safety & Policing
Municipal Government

Energy and Resources City of Regina

Environment City of Saskatoon

Highways and Infrastructure Saskatchewan Association of Rural

Information Technology Office Municipalities

Municipal Affairs Saskatchewan Urban Municipalities Association

Tourism, Parks, Culture, & Sport Academia

Elections Saskatchewan University of Regina

Provincial Agencies University of Saskatchewan

Meewasin Valley Authority Federal Government Agencies

Saskatchewan Assessment Management Agriculture Canada

Administration Indian and Northern Affairs Canada

Provincial Crown Corporations Environment Canada Information Services Corporation Industry

SaskPower Cameco Corporation

Saskatchewan Research Council Non-Profit Organization SaskEnergy Ducks Unlimited Canada
SaskTel

Saskatchewan Watershed Authority

Note: The list of members above is that of organizations who signed the SGIC members agreement. There are a number of other provincial ministries who contributed financially through the geo-levy sponsored by the DMGC and administered by ITO. It should also be noted that many of the participating organizations bring a large constituent base with them, who are also indirect participants in the SGIC.

E.g. Saskatchewan municipal organizations who represent the over 700 urban and rural municipalities of the province, all of which gain full access to the imagery products through this program. Similarly all First Nations Tribal Councils and other entities receive full access.