FIRST NATIONS
LAND MANAGEMENT
RESOURCE CENTRE

LAND GOVERNANCE MANUAL
A Guide to Land Governance

TMPD

MAPPING (GIS)

MAPPING (GIS)

Geographic Information Systems (GIS) can be a powerful tool for Land Governance under the Framework Agreement. It can serve as a database for Lands-related information, a tool for creating maps and other data visualizations relevant to Land Governance decision-making and can assist in conducting Lands-related planning.

To determine if a GIS is an appropriate tool to assist in carrying out the core functions and responsibilities of your Lands department, a GIS Needs Assessment is a good start. This assessment will assist you in identifying the necessity and potential for GIS use within your Lands department and lead to recommendations concerning software, equipment, personnel, and training needs.

The Resource Centre's GIS Needs Assessment Tool will allow you to gather the information that pertains to your land management needs. It has 7 sections of questions that once you have completed, will help you tailor a system that is right for you.

1. **Building Capacity**
   The Resource Centre cannot assist in funding your GIS endeavors, but rather can assist in determining what components should be considered for building capacity, if you choose to budget for GIS.

2. **Location and Governance**
   Knowing who will manage your GIS, will depend on discussions with Leadership, departments, and/or committees on how the GIS will be governed and which department it will be housed.

3. **GIS Personnel**
   Another key component to the implementation of GIS would be identifying who will use the GIS and in what capacity within the organization.

4. **Mapping Data/Library**
   Consider doing an inventory of existing land and environmental spreadsheets and, record names of hardcopy maps that exist with the community's Value-added information. Start listing the types of digital information you have and will need; knowing what types of layers you need will help you determine where to download from online sources. The creation of a digital Mapping Data Library must consist of comprehensive, current, and accurate data which are fundamental to the successful implementation of your GIS.

5. **Hardware**
   The Resource Centre will not make equipment recommendations, but instead will assist you in determining what hardware will work best for you. The data layers, the scanned maps, the software application, and the digital map projects need to be on a very capable computer system. Acquiring a comparable computer will require extensive research, an annual maintenance plan and good backup system or network.

6. **Software**
   The Resource Centre will not make software recommendations. Your software search criteria depend on your responses to the GIS needs assessment.

7. **Applications of GIS**
   Once you've identified the types of data needed to be mapped, the decision on how to apply your GIS will be determined by your department's responses to the questions within the GIS needs assessment. From agricultural mapping, mapping disasters, planning transportation routes, to cultural heritage protection, is all part of the applications GIS can assist with.

For more information, please refer to the LABRC website for access to our GIS Needs Assessment Tool.

LAND MANAGEMENT WITH GIS

Your Lands Department can use GIS for several land management functions, such as Land Use Planning, Environmental Health-showing areas where it may be at risk, Wildlife/Fish Habitat and Cultural Site Protection mapping. The list is almost as vast as the tasks a Lands Department must endure to manage, administer, and implement your land maintenance priorities. The following is an example of how GIS can assist in one task of your Land Governance planning.

A First Nation reserve may be surveyed by a Lands Surveyor into smaller parcels and shown on a Plan of Survey. A Plan of Survey shows the dimensions and location of that parcel of land and how it relates to other parcels on the reserve.

Natural Resources Canada (NRCan) houses the official registry of all surveys of Federal Lands. Official Survey Plans, information on surveys in progress, and other geospatial representations of parcels of Canada Lands are all accessible online through NRCan. NRCan also holds the digital mapping information that can be downloaded to any GIS capable system. (See below Map Browsers and Data Sources)

As mentioned in Chapter 4, the First Nation Lands Registry Site (FNLRS) houses all Evidence of Title, Parcel Abstracts, Right of Ways, Easements, and Instruments used for each parcel per Reserve. By appending the information from the FNLRS with the Parcel Fabric from NRCan you will be able to produce maps that show you where your attention needs to be. To effectively manage all the parcels on the reserve it is critical that you can see what areas need immediate attention. For example, knowing which parcels have no current title holders, or houses that are currently on land with no legal description, can help you better plan your work schedule of land issues that need to be rectified.

With GIS, you will have visually available, valuable Lands-related information, such as the Legal Descriptions of Land parcels, Area, Evidence of Title, Leases, Permits, Licenses, Cancellations, Allotments and Interest Holders within your reserve(s). Through the spatial tools provided in a GIS, you can analyze this information in useful ways such as: measuring distance, area, elevation, shared area profiles, and much more.

In the training section of the Resource Centre's website, you will find more information related to GIS and mapping.

GIS can be tailored to your community's unique vision of future Land Governance. Some First Nations under the Framework Agreement have developed their own processes to meet the needs of their unique land management systems. Some examples are as follows:

Examples of First Nations' unique perspectives with online land governance capabilities:

- **Squiala First Nation** – Lands Department – purpose to administer interests in land and natural resources consistent with the Land Code and related agreements. http://www.squiala.com/Lands-Department

- **Tsleil-Waututh Nation** – Reserve Lands Register – registration and recording of interests or licenses on Tsleil-Waututh Reserve lands are carried out by the Tsleil-Waututh Lands Register. https://twnation.ca/for-leaseholders/reserve-lands-registry/

- **Westbank First Nation (WFN)** – Regional Mapping System – WFN now manages their lands under their own self-government agreement. Being an urban reserve, WFN has entered into a regional mapping system with surrounding municipalities. WFN's manages their lands and taxation with customized operational software. https://www.rdcogis.com/GIS_App_public/index.html

Operating System File Structure

Most First Nations are managing with Web-based mapping browsers, such as those listed on page 4, however, as the First Nation continues to grow, their organizational needs may increase. There is potential for collaboration with surrounding communities and/or customizing their own administrative software.

Designing your own land management database is another suggestion. This spreadsheet could someday also be linked with your GIS. The following are some sample Land Inventory column headings that you may want to consider in your database design:

BAND_NAME	PIN_ID	SUBLOT_NO
BAND_NO	LESSOR	LSD_NO
PROVINCE	LESSEE	LESSEE_SUB_NO
RESERVE_NAME	EOT_NO	LANDUSE_TYPE
RESERVE_NO	EOT_TYPE	LANDUSE_CODE
LOT _ID	EOT_HOLDER	CUR_ENV_CONDITION
PLAN_NO	LEASE_NO	ENV_IMP_TYP
PLAN_TYPE	LEASE_NAME	PERMIT
STR_ADDRESS	LEASE_TERM	EASEMENT
REG_NO	BLDG_TYPE	FOLIO_ROLL#

A GIS requires a user (GIS Technician) who can clearly identify the steps of spatial data analysis, using the column headings above, within the software. The duties of the GIS technician may start with the creation of mapping directories which will include map projects and populating those maps with digital data layers that are relevant to the subject of the map.

One suggestion of an operating system file structure, a digital structure on your computer, is to create a root directory called "GIS" and within that Directory, create 5 or 6 main Directories which would include, but not limited to, "DATA", "DOCUMENTS", "EXPORT", "IMAGES" and "MAPS".

All layers, GPS information, excel spreadsheets with xy coordinates and land-based data that you produce or download, will be stored in the DATA directory, you can have sub-directories here as well, to help organize better. Another filing suggestion would be to store larger extents (area) and smaller extents in unique directories. Territorial Land base layers cover a larger extent (area), this could be stored under the scale it reflects, see 3rd example

below. More detailed maps could be refined to a particular reserve name you may want to have a directory for each as well. NRCan stores their reserve data in zipped files and each layer name per reserve, are the same, see 4th example below.

Examples of GIS DATA Directory

1. D:\GIS\DATA\LANDBASE\Roads, Rivers, Waterbodies, Elevations etc. to list a few.
2. D:\GIS\DATA\LUP\Zones, Community lands, Multi-housing, Single-family housing, Commercial etc. to list a few.
3. D:\GIS\DATA\250K\ Roads, Rivers, Waterbodies, Elevations etc. to list a few.
4. D:\GIS\DATA\MYREZ_12\Administrative_Area, Easement, Land_Parcel, Land_Parcel_Boundary, Plan_Envelope, In_progress to name a few.

All training documents, data sharing agreements, mapping license agreements can be stored in the GIS\DOCUMENTS directory.

All maps made can be exported to share with others, whether it be a jpg or a pdf, you could keep these in a directory called GIS\EXPORT. You also have the option of creating subdirectories to reflect what map-image file are in each directory. Remember, to let those who you are sharing with, know that this is a Large Format Document and to "Fit to Page" before hitting print, this will save paper.

Examples of a GIS EXPORT Directory

D:\GIS\EXPORT\LUP\zones.pdf, commercial.png, housing.tiff

D:\GIS\EXPORT\MYREZ_12\emp.bmp, addresses.jpg, occupancy.pdf

D:\GIS\EXPORT\CULTURAL\hunting.jpg, fishing.gif, arch_sites.pdf

The suggestion for a GIS\IMAGES directory is for the technician to keep logos, pictures and map surround images stored.

The final component to an organized GIS Database Management System is the MAPS directory. A GIS made map is considered a mapping project. Each project will hold different sets of layers, tools, output scales, sizes and reports, which means it holds its own title, north arrow, scale bar, sources of data and date of production.

A GIS Project (Map) points to the location where the layer information is located, for example, in your GIS\DATA directory. Depending on the types of maps you make, you can store several data layers in one project. This will allow you to turn on and off the access to see each layer. If you want to see rivers, you would check on the rivers access box. If you don't want to see rivers, you would check off the box. Having one copy of your map reduces the time looking for which map you created for Species at Risk Act (SARA), or Emergency Management Plans (EMP) etc. Putting the maps in appropriate directories, with appropriate names, will save time in the future looking for a specific map. Another tip would be to put the directory and map name within the map surround, could be small text only you would know to look for.

Examples of a GIS MAPS Directory

D:\GIS\MAPS\COMMUNITY\houses, roads,

D:\GIS\MAPS\TERRITORIAL\referals, SARA, guide outfitter, agricultural

D:\GIS\MAPS\CULTURAL\hunting, fishing, gathering, archaeological and all other cultural maps made.

D:\GIS\MAPS\RESERVES\myres_12, my_res32, and all other reserve maps made.

To populate a map with relevant layers, you must first have access to this information. Below are several websites that house either land management tools, online mapping tools, Web Map Browsers, and online data warehouses, that hold pertinent information to completing the tasks of gathering data that can then be used for mapping. Where the words are blue and underlined try hovering your cursor over to access the quick link (hyperlinked).

LAND MANAGEMENT SITES

- LABRC Website is a public site where Lands Governance Directors can access information, tools and effective practices such as documents, checklists, videos, etc.

- The Resource Centre is committed to assist operational communities in identifying their priorities, needs and work planning for successful implementation of their Land Code. Under the Training, Mentorship and Professional Development strategy, the RC continues to develop and deliver fundamental technical Lands Governance Training under the Framework Agreement.

- First Nation Land Registry System (FNLRS) is an electronic registry system, which holds a database of instruments registered in the Indian Lands Registry relating to Reserve Lands under the *First Nation Land Management Act*. There is a public site which can be accessed by any person interested in obtaining parcel information and a secure site which is managed by the First Nation. This system is hosted by Indigenous and Northern Affairs Canada ILRS/FNLRS.

MAP BROWSERS

Majority of the map browsers listed below require you to accept the terms of using their web browsers, it is suggested you read the terms before accepting.

To access the data, that you require from the map browser, you will need to add the layer to the online map. Use the Help section to get the procedures to do this, usually found in the upper right-hand side of map. Zoom in or window to your desired location, select the features you would like to download and select download now, some sites will ask you what format you require.

1) KML/KMZ Google Earth formats

2) GDB, SHP, QGIS and ESRI formats

3) IGDS and DGN. Auto-cad formats

Canada Lands Survey System (CLSS) – Natural Resources Canada provides the CLSS Map Browser, CLSS Survey Plan Search and Canada Lands overlay for use in google earth browsers – these systems allow users to browse the CLSS cadastral data to search and visualize administrative boundaries, related survey parcels and plans maintained by the Surveyor General Branch BC (SGB).

- o Survey Plan Search

- o Canada Lands Surveys

- o Canada Lands In Google Earth

iMap-BC View and analyze hundreds of map data layers compiled from across the B.C. Government and other public sector agencies. Upload your own map data, print or email the results of your work.

Integrated Cadastral Information Society – BC Web map Browser and Data access site, requires Information Sharing/Membership agreement to be signed with the First Nation Community

GeoBC Map Browser and map search engine by map sheet

ALBERTA Map Browser and Geographic Portal

ALBERTA Map Browser for Categorized Land Based digital layers

ALBERTA Map Browser for The Library Cultural Resources

SASKATCHEWAN Map Browser and Data Search Engine

ONTARIO Map Browser and Data Search Engine. This site will allow you to add your polygonal information just like google earth.

QUEBEC Map Browser and Data Search Engine

NEWFOUNDLAND AND LABRADOR Map Browser with community infrastructure

NWT Map Browser

GIS DIGITAL DATA SOURCES

There is more to GIS than just hardware, software and who is using it. It is finding the data you need, acquiring that information, managing, analyzing, and displaying it; showing the geographic location is an important characteristic.

There are several sites to access digital layers for mapping, the key here would be to know what format you will need, the type of data, and what scale. Your search for this information must always start with your local government. The sites below start with the Federal Organization and move to Provincial specific sites. You will notice a few of the links that refer to Canadian Digital Data all start with www.nrcan.gc.ca. Not all NRCan's Info links are listed below, we suggest you visit the Government of Canada site and browse all the location-relevant information that is available for you. You will also notice that some provinces are missing from the list below, majority of the Data Sources currently run off Map Browsers, so if your province is not listed below, please check the map browser list above.

CANADIAN GEOGRAPHICAL NAMES for individual provinces and territories download in Text, Shape, KML and GML formats.

NATURAL RESOURCES CANADA FTP SITE to download your community's Cadastral Fabric to work with your GIS.

CANADA'S SPATIAL DATA INFRASTRUCTURE

Geo BC creates and manages geospatial information and products to help better manage natural resources in British Columbia. The following links are part of the Geo BC Suite of free Data Access Sites

DATA SERVICES B.C. Government's data services

LAND USE B.C. Government's Land use mapping

DataBC is focused on managing B.C. Government's data as a strategic asset that meets the needs of citizens, businesses, ministries, and the broader public sector.

MANITOBA Lands Initiative Core Maps and Data Warehouse

MANITOBA Digital Data Search engine

ONTARIO GEOHUB Foundation Geospatial Data Sets

QUEBEC major cities datasets

NEWFOUNDLAND & LABRADOR - Fisheries and Land Resources for Google Earth

NEWFOUNDLAND Government Data

NOVA SCOTIA Open Data and sources of other free geospatial datasets

NOVA SCOTIA Geographic Data Directory – Green arrows mean the data is downloadable, you must agree to terms and know what format to download.

NEW BRUNSWICK - Geomatics provides digital data available for download.

NEW BRUNSWICK's gateway to geographic information this is a catalogue of very useful province wide information, not all formats available per layer.

PEI – go to the GIS data Catalogue.

NWT Geological Surveys

NOTE FOR FIRST NATIONS IN QUEBEC
The examples provided relate to common law jurisdictions. They must be adapted in Quebec when dealing with bi-juridical concepts. For additional support, seek assistance from the FNLMRC Support Staff.

USEFUL READING MATERIAL

Good Practices Guide – Success In Building And Keeping An Aboriginal Mapping Program - a useful document that was prepared by Centre for Indigenous Environmental Resources.

Aboriginal Maps and Mapping – Information on Aboriginal approaches to maps and mapping.

GIS for Indigenous Studies - A collection of GIS data and online maps for research in Indigenous Studies.

Google Earth Instructions – This document helps you download this free mapping software, bring in existing layers and assists you in creating your own information whether it be points, lines or polygons. You can also create your own maps with legends and scale bars.

Open Layers - Free GIS Web-mapping solution. Visit their OpenLayers Workshop to learn how to download this free software to start customizing and making your own maps.

Conclusion:

As you move forward with Land Management under the Framework Agreement you will discover that there are several advantages to using GIS as a tool for displaying, organizing, and analyzing your spatial information. You will benefit from the quick links provided in this chapter of the Land Governance Manual. Reminder too, that most sites get revised, refurbished, and sometimes deleted, so if you are having difficulty accessing the sites listed, we suggest running a search using the link's title.

If you need further assistance in any of your GIS and mapping endeavors, please contact your FNLMRC GIS Specialist, Leeanna Rhodes. She offers direct community support with GIS development such as implementing GIS, creating community GIS standards advice, trouble shooting, digital data management and several suggestions towards Cultural & Heritage, Land Use and Environmental Plan mapping.
Email: leeanna.rhodes@labrc.com