



**CANADIAN GEOSPATIAL DATA INFRASTRUCTURE  
INFORMATION PRODUCT 17**

**GeoConnections  
Geospatial Return on Investment Case Study:  
Cree GeoPortal**

**M. A. Stewart**

**2011**



Natural Resources  
Canada

Ressources naturelles  
Canada

**Canada**

**GeoConnections**  
**Geospatial Return on Investment Case Study:**  
**Cree GeoPortal**

**Developed by**  
**the Cree Outfitting and Tourism Association (COTA)**  
**and**  
**the Cree Trappers' Association (CTA)**

**Financial analysis performed by Mary Ann Stewart, Nova Blue Inc.**

**Report submitted April 25, 2011**

## Executive Summary

In late 2009 GeoConnections commissioned a Geospatial Return on Investment Case Study to add to the body of knowledge of case studies based on the GITA ROI methodology for financial analysis of geospatial projects. This study focuses on the Cree GeoPortal, developed by the Cree Outfitting and Tourism Association (COTA) and the Cree Trappers' Association (CTA). This study presents a unique opportunity to reflect on the impact of mapping technology, which served as the basis for Cree treaty negotiations and settlements over the past 30 to 40 years.

Phase 1 of the project provided a user-friendly online portal and application to deliver geospatial information to Cree communities in support of research, discussion, planning and decision making related to resource management and tourism development. Phase 2 of the project expanded the community of users, expanded the geospatial data available and developed new tools and applications for land and resources management. The project developed tools for management of trails and tourism packages for COTA and tourism users, refined the trap line mapping application for CTA, improved the existing projects database and developed an online applications system for project funding for Niskamoon Corporation, and developed tools necessary for management of Park resources and transfer of knowledge for Mistissini Albnel-Temiscamie-Otish (ATO) Park.

Having four distinct partners for the Cree GeoPortal presented the opportunity for a multi-participant ROI analysis. An analysis was done for each partner, with the results rolled up into the overall project. Incorporating all participants of the Cree GeoPortal, Net Present Value (benefits minus costs in 2006 dollars) is \$2.225M, with annualized Return on Investment (ratio of Net Present Value to cumulative costs) of 11%. Breakeven point will be reached in 2013, seven years into the project.

Analysis of each partner provides greatest insight into the tangible benefits of the overall project. For *Cree Trappers' Association (CTA)* the greatest tangible benefit is savings in redundant data entry for harvest reports. Considerable benefits were also found from reduced training requirements for Local Fur Officers due to improved data entry methodology. For *Cree Outfitting and Tourism Association (COTA)* the greatest tangible benefit is time savings for nine tourism officers, nine economic development officers, and four COTA staff members. Other significant benefits include savings on consulting fees for developing theme routes. For *Mistissini Park* the greatest tangible benefit is time savings for as many as 17 park officers. This analysis is noteworthy in demonstrating that savings by use of the GeoPortal will be sufficient to support a full-time GIS technician beginning in 2013. For *Niskamoon Corporation* the greatest tangible benefit is time savings for nine local coordinators and two regional coordinators.

Analysis was also done for the Offshore Islands Project involving new land that will be managed by CTA, with benefits similar to the CTA module. Alternate scenarios were analyzed for hosting by a Cree organization versus outsourced hosting, with a finding of \$180,000 in additional costs over nine years to bring hosting in-house.

Strategic benefits include property rights mapping, value to education, enhanced communication between youth and elders, and community building.

## Résumé

Vers la fin de 2009, GéoConnexions a demandé la réalisation d'une étude de cas sur le rendement du capital investi dans la technologie de l'information géospatiale pour ajouter au savoir en la matière. L'étude était basée sur la méthode que la GITA utilise pour l'analyse financière des projets géospatiaux. Elle met l'accent sur le géoportail cri élaboré par l'Association crie de pourvoirie et de tourisme (ACPT) et l'Association des trappeurs cris (ATC). L'étude offre une occasion unique de s'interroger sur l'impact de la cartographie, qui a servi de base à la négociation de traités avec les Cris et au règlement de leurs revendications au cours des 30 à 40 dernières années.

La phase 1 du projet s'est soldée par la création d'une application et d'un portail en ligne conviviaux pour diffuser de l'information géospatiale aux communautés crées et appuyer ainsi leurs recherches, leurs discussions, leurs travaux de planification et leurs décisions concernant la gestion des ressources et le développement touristique. La phase 2 du projet a permis d'élargir la communauté des utilisateurs, d'augmenter la quantité de données géospatiales disponibles, d'élaborer des applications et des outils nouveaux pour la gestion des terres et des ressources, de mettre au point des outils de gestion des sentiers et des forfaits touristiques pour l'ACPT et les touristes, d'améliorer l'application cartographique applicable aux sentiers de piégeage de l'ATC et la base de données sur les projets actuels, d'établir un système en ligne pour le financement des projets par la société Niskamoon, et d'élaborer les outils nécessaires à la gestion des ressources du parc Albanel-Temiscamie-Otish de la Nation crie de Mistissini et au transfert du savoir à son sujet.

Comme il faisait appel à quatre partenaires distincts, le projet de géoportail cri a permis une analyse pluri-intervenants du RCI. Chaque partenaire a effectué sa propre étude, et les résultats ont été regroupés. Dans l'ensemble, la valeur actualisée nette du géoportail cri (soit les bénéfices moins les coûts en dollars de 2006) s'élève à 2,225 M\$ et le rendement du capital investi calculé sur une année (soit la valeur actualisée nette par rapport aux coûts cumulatifs), à 11%. Le seuil de rentabilité sera atteint en 2013, sept ans après le début du projet.

Les analyses réalisées par chaque partenaire donnent un meilleur aperçu des avantages tangibles du projet dans son ensemble. Pour l'*Association des trappeurs cris (ATC)*, les économies réalisées en évitant l'entrée redondante des données des rapports de récolte représentent le principal avantage. De même, l'amélioration de l'entrée des données a également engendré des bénéfices considérables en réduisant la quantité de formation à donner aux préposés aux fourrures. Quant à l'*Association crie de pourvoirie et de tourisme (ACPT)*, le principal avantage tangible a été le temps économisé par neuf agents touristiques, neuf agents du développement économique et quatre membres de son propre personnel. Les autres avantages importants incluaient une réduction de la facture des consultants engagés pour élaborer des routes thématiques. Pour le parc de la Nation crie de Mistissini, le principal avantage tangible est le temps que 17 agents de parc ont pu économiser. L'analyse a véritablement permis de démontrer que les économies permises par le géoportail suffiront pour qu'on embauche un technicien SIG à temps plein à compter de 2013. Pour la *Société Niskamoon*, le principal avantage tangible est le temps économisé par neuf coordonnateurs locaux et deux coordonnateurs régionaux.

Le projet des îles au large des côtes a également été analysé. Il concerne de nouvelles terres qui seront gérées par l'ATC et offre des avantages semblables à ceux du module de cette

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association. Des scénarios de rechange ont été analysés concernant la prestation des services par une organisation crie plutôt qu'une organisation de l'extérieur, et on en a conclu qu'il en coûterait 180 000 \$ de plus sur neuf ans pour offrir les services à l'interne.

Les avantages stratégiques incluent la cartographie des droits de propriété, la valeur éducative, l'amélioration des communications entre jeunes et aînés et le développement de la conscience communautaire.

## Introduction

GeoConnections has been a partner in the development of the GITA Return on Investment methodology, sponsoring a portion of the original 2006 case studies. As the methodology continued to develop, GeoConnections became interested in sponsoring additional case studies suited to its mission in Canada. It issued an RFP in August, 2009, for consulting services and awarded a contract to Mary Ann Stewart at Nova Blue Inc. of Kansas City, MO, to perform this work. The first case study, for the City of Quinte West's PRISM-GIS and PRISM-911 applications, was delivered on March 31, 2010. The contract was extended on April 2, 2010, to include four additional case studies to be completed by March 31, 2011.

The Cree GeoPortal case study is the fourth of the contract extension studies. A kickoff phone conference was held November 2, with participation from Tim West of GeoConnections, Robin McGinley, Executive Director of Cree Outfitting and Tourism Association (COTA), Rick Cuciurean, Special Projects Coordinator of Cree Trappers' Association (CTA) and Valter Blazevic, technical consultant from Strata 360. The project was authorized on November 11, 2010, at the conclusion of a conference call with COTA and CTA stakeholders.

Phone interviews were conducted with the following COTA and CTA stakeholders: Rick Cuciurean, Special Projects Coordinator, CTA; Graeme Morin, Environmental Analyst, James Bay Advisory Committee on the Environment; Catherine Lussier, Consultant; Maxine Mark Stewart, GIS Technician, Cree Regional Authority (CRA); Robin McGinley, Executive Director, COTA; Julie-Ann Cooper, COTA Board, Waswanipi; John Reid, New Economy, Ottawa; John Brown, Economic Development Officer, Eastmain; Hugo Hester, Business Development Manager, Waskaganish; Reggie Tomatuk, Environmental Health PO, Public Health Department of the James Bay; Sherman Herodier, COTA Board Member, Chisasibi; Bert Moar, Waskaganish Director of Community Development and CTA Director; Edward Georgekish, Director, Wemindji; Edward Gilpin, Director, Eastmain; Steven Neeposh, Local Fur Officer (LFO) Nemaska; Reggie Bearskin, LFO Chisasibi; Betty Tomatuk, LFO Eastmain; Marc Dunn, Regional Coordinator for the Environment, Niskamoon Corporation; Willie J. Loon, LFO Mistissini; Geoff Quaille, Advisor to Director of Environmental Works, CRA; Andrew Coon, Tourism Coordinator, Cree Nation of Mistissini; Youcef Larbi, Chief Executive & Chief Geologist, Cree Mineral Exploration Board; Dorothy Stewart, Wemindji Protected Marine Area; Stephen Inglis, Cree Cultural Institute; Lloyd Cheechoo, Cree Native Arts & Crafts.

Ms. Stewart made a four-day site visit to Montreal, Quebec, December 13 through 16, 2010, to conduct on-site interviews with CTA stakeholders and to meet with the COTA board during its board meeting. An on-site planning meeting was held with Robin McGinley, Sophie Bosum, Rick Cuciurean, Valter Balzevic, and Sherman Herodier the morning of December 13. On-site interviews were held with: Jason White, Footsteps and Paddle Strokes; Steve Mianscum, Ouje-Bougoumou Tourism Officer; Jean Francois Ouellon, Wemindji Economic Development Officer; Jamie Moses, Eastmain Board Member; Graeme Morin, Environmental Analyst, James Bay Advisory Committee on the Environment; Maxine Mark Stewart and Chantal Tetreault, CRA; Valter Blazevic, Strata 360. The COTA board met to discuss the ROI study the morning of December 14, with thirteen board members in attendance.

## The Cree GeoPortal

The Cree GeoPortal brings together the mapping and research activities of four distinct Cree organizations into one common portal, facilitating data sharing and collaborative action. To understand the current status of the GeoPortal, it is helpful to understand how each organization came to participate in this project.

**COTA** was identified as a treaty obligation under the James Bay and Northern Quebec Agreement signed in 1975 and incorporated as a non-profit organization in 2000. COTA works with the nine Cree communities in Eeyou Istchee, the Cree traditional territory located in northern Quebec. COTA's mission is to develop and implement a collective vision for a world-class sustainable tourism industry in Eeyou Istchee, in harmony with Cree culture and values, and involving partnership among Cree communities, institutions and businesses.

COTA's first modern mapping initiative, the Eeyou Istchee Tourism Information Management System (EI-TIMS), began in 2001 as a result of the recognition that a computerized tourism information management system was needed to manage the land, water, wildlife and heritage resources of Eeyou Istchee. In 2003 the Tourism Resource Inventory and Proactive Planning project began to collect Cree traditional knowledge for use in EI-TIMS.

**CTA** was also created as a treaty obligation under the James Bay and Northern Quebec Agreement. Its role is to oversee the day to day operation of this new regime and provide leadership to maintain the cultural values and economic benefits from traditional land and resource-based activities and ways of life. As pointed out in the CTA mission statement, the traditional wildlife and trap line management expertise of the tallymen must be preserved and passed on to future generations. The CTA is taking responsibility for preserving this knowledge and assuring the future of this resource base.

Since the original modern mapping initiatives, the number of visitors to Eeyou Istchee has increased and there have been many competing land uses such as forestry, mining and hydro-electric development. Pressure from all areas prompted land use complaints from communities. In response to these issues, COTA partnered with CTA and started a project to organize information and make it available for mapping through a geospatial portal.

In the past, the region's data was collected using pencil and paper, then transferred to databases managed by Cree and non-Cree organizations. Although a significant amount of research has been done in the territory, it was very difficult for the actual users to access the information. A community member would have to approach each individual organization to piece together the complete land use picture for a community or trap line. The new vision is that diverse community members will use the Cree GeoPortal to capture previously collected data, input new data, and make information readily available to the entire community.

The **COTA/CTA project** has created a user-friendly portal to manage land and facilitate tourism planning. Developed in accordance with Canadian Geographic Data Infrastructure (CGDI) standards and services, the portal helps deliver geospatial information to Cree communities. The communities use the portal for planning, decision making, and supporting research related

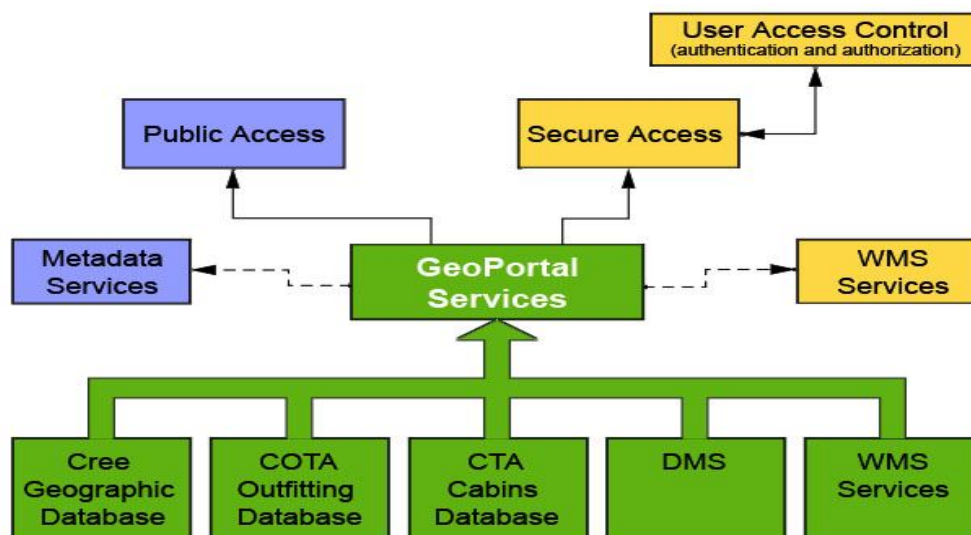
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to resource management and tourism development. GeoPortal users can combine different pieces of information from the portal with pre-existing map layers and produce a dynamic view of areas of interest. A tourism planner or community member can gain access to information about the details of outfitting permits. Also, a local fur officer or community member can gain access to information such as location of cabins and trap lines.

The portal incorporates traditional knowledge datasets in combination with information and base maps (vector and satellite images) from other distributed data sources. It supports applications based on visualization of map data such as outfitting permits renewal and right of first refusal, environmental monitoring, and environmental change monitoring. The inclusion of a georeferenced Cree knowledge component is a major contribution of the project.

The GeoPortal serves as a management tool for implementation of Eeyou Hunting Law. The Law spells out that in fulfilling responsibility for the management of land and resources, the overseer may: conduct necessary inventories to determine the status of wildlife resources; estimate the amount or condition of each resource which is available for sustainable harvest; develop an annual strategy for efficient harvesting by members of each hunting group; determine the number of each species that can be harvested; ensure that the seasons and periods within which it is permissible to hunt, fish or trap are respected; determine in any particular season where activities may and may not be carried out and determine who may engage in activities; monitor and verify the number of big game and fur-bearing animals that each trapper has taken; assign any quotas for the harvesting of specific species; determine if in any year it is necessary to leave trap lines unused in order for it to recover from over-harvesting, forest fire or declines in wildlife populations; and ensure that traps, snares, gill nets, nightlines and other similar equipment are checked regularly and are removed at the end of an activity.

Phase 1 of the GeoConnections project created the web-based portal and application. GeoConnections provided \$85,600 in funding, matched by \$ 73,485 cash and \$49,912 in-kind contributions from stakeholder organizations.





## Cree GeoPortal Return on Investment Case Study

Work on Phase 1 was done from fall of 2006 to fall of 2007, with the Cree GeoPortal launched at the COTA Member's Meeting in Waswanipi on October 18, 2007. Some requirements, such as the harvest database, could not be handled within the current projects due to resource limitations and have been moved to a Phase 3.

The user needs assessment (UNA) of Phase 2 of the project identified the application and data needs and required functionality. Two new partners were added, Niskamoon and ATO Park. The UNA was conducted with the end users of the proponent organizations and with other Cree entities. Project activities were conducted from December 2007 through May 2008, at a cost of \$80,000. GeoConnections provided \$39,875 and the four collaborating organizations provided roughly \$10,000 each in cash and in-kind contributions.

Phase 2 of the project took place from April 1, 2009, through March 31, 2010. It expanded the community of users and amount of geospatial data available and developed new tools and applications for land and resources management. For COTA it developed tools for management of trails and tourism packages. Two new partners were added for Phase 2. For Niskamoon Corporation it improved the existing projects database and developed an online applications system for project funding. For the Mistissini Albanel-Témiscamie-Otish (ATO) Park it developed tools for management of Park resources. Total cost of Phase 2 was \$470,564. GeoConnections provided \$166,235 and the four collaborating organizations provided the remainder of the costs in cash and in-kind contributions. GeoConnections funding was used for applications development by Strata 360. New published data sets for Phase 2 include: COTA Trails database, CTA trap lines database, Niskamoon projects database, Mistissini ATO Park database, and Cree traditional place names.

**Niskamoon Corporation** with Strata 360 developed in 2004 a geo-referenced database to track projects in the James Bay territory. As a funding agent, maintaining such a database is essential to ensure the equitable distribution of funds between family trap line units. At the time, the Niskamoon Information Management System (NIMS) was, to the best of their knowledge, the only one of its kind on the territory. The purpose of the system was to consolidate all information related to Niskamoon-funded projects in an easily used, georeferenced format. This allowed users to follow the evolution of a project and provided a reference for previously funded projects on the territory. In addition to the geospatial information, the NIMS provided a publicly available database for all documents reviewed at Niskamoon Corporation board meetings.

When the Cree Geo-Portal was developed, Niskamoon saw the logic of merging the NIMS mapping system with the GeoPortal to ensure data consistency and currency. Niskamoon used GeoPortal funds to match the NIMS to the GeoPortal and to develop applications that would allow project proponents to build project submissions within the interface.

The creation of **Albanel-Témiscamie-Otish (ATO) Park** is the result of a partnership between **the Cree Nation of Mistissini** and the Government of Québec. ATO Park is located entirely on Cree traditional territory and will be the first inhabited park to be created in Quebec. As part of the ATO Working Group, CNM representatives will ensure that ATO Park's planning, management, and long-term operational sustainability reflect Cree values, knowledge, and expectations. This offers exciting challenges for Cree-driven park planning and for the long

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term responsibility for park management and operations. ATO Park headquarters and an interpretation center highlighting Cree culture will be located in the community of Mistissini. The park will enclose part of the trap lines for 37 Mistissini tallymen.

The TRIPP planning tool application, developed in collaboration with COTA, provides tourism officials with the ability to plan activities at various seasons and including different modes of transportation and lodging. The trap line registry for Eeyou Istchee stores and distributes current trap line information including relevant documents through a document management system. The ATO Park management tool provides tools required for Park management and also contains a trapper's section including a feedback mechanism.

The Quick-Find and Itineraries maps provide key tourism information for the region. The educational application was developed in the Cree language and contains traditional knowledge datasets, including Cree traditional place names and stories. This information is being used to transfer elders' knowledge about the territory to a younger generation.

Fulfilling one of its main requirements, the Cree GeoPortal controls the level of access to different user groups through a database of users, in order to conform to data confidentiality concerns.

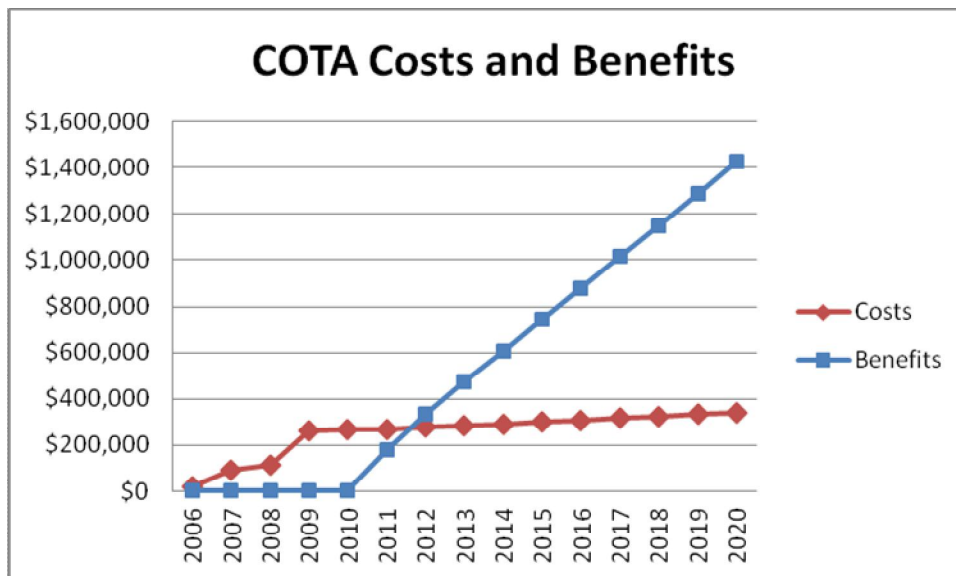
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## COTA Financial Analysis

Fifteen-year analysis of COTA costs and benefits shows \$1.08M Net Present Value (benefits minus costs in 2006 dollars) with a 21% annualized Return on Investment (ratio of Net Present Value to cumulative costs). Breakeven point will be reached in 2012, six years into the project. This is a short payback period with high returns considering COTA only began to use the GeoPortal in 2011, following five years of prototyping and development of the tool.

Greatest costs were incurred in 2007 and 2009, at the conclusion of Phase 1 and Phase 2 of the GeoConnections project. Costs following development are low, approximately \$8,000 annually.

Ten percent time savings for nine tourism officers, nine economic development officers, and four COTA staff will provide approximately \$135,000 in annual productivity benefits beginning in 2011. A one-time cost avoidance of consulting fees for developing theme routes will provide a \$42,500 benefit in 2011.



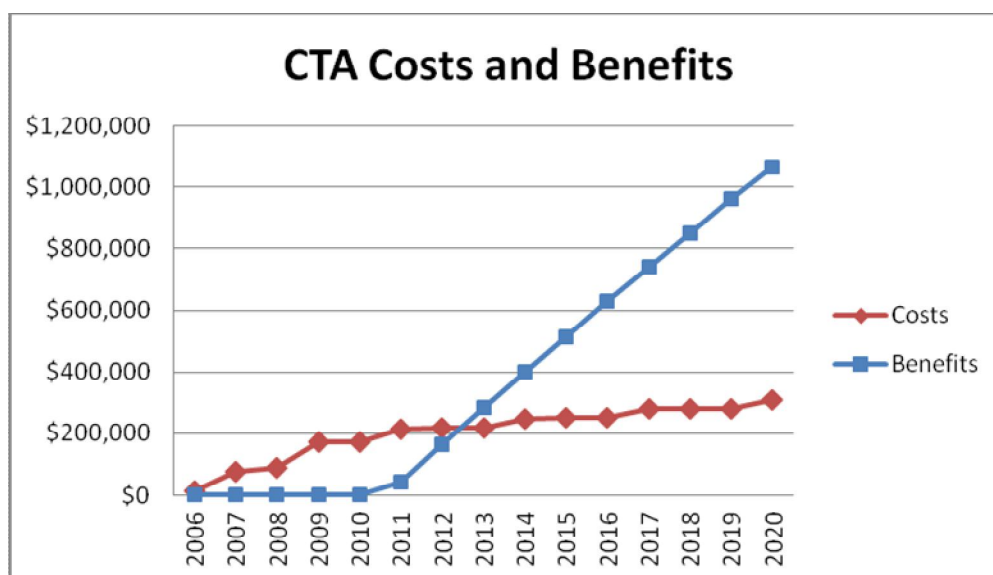
## CTA Financial Analysis

Fifteen-year analysis of CTA costs and benefits shows \$697,897 Net Present Value (benefits minus costs in 2006 dollars) with a 12.6% annualized Return on Investment (ratio of Net Present Value to cumulative costs). Breakeven point will be reached in 2013, seven years into the project. This payback period is relatively short considering CTA did not begin to use the GeoPortal until 2011, following five years of prototyping and development of the tool.

Greatest costs were incurred in 2007 and 2009, at the conclusion of Phase 1 and Phase 2 of the GeoConnections project. Costs following development are very low, \$2,400 annual cost for hosting, with the exception of Strata training Local Fur Officers to input trails data, at a cost of \$33,300 every three years.

Twenty-five percent time savings through elimination of redundant data entry for a Fur Technician, CRA data entry staff, and provincial data entry staff will result in approximately \$43,000 annual productivity benefits beginning in 2011, with an additional \$5,000 annual savings in FAX and phone communications. Cost avoidance of having Strata enter trail lines will provide a \$60,000 annual benefit beginning in 2012. There is an anticipated \$25,000 cost savings beginning in 2012 by elimination of one training session a year for Local Fur Officers due to the GeoPortal entry forms developed for the harvest database.

Several issues regarding full implementation of the applications were raised during interviews. Some Local Fur Officers indicated that they have difficulties entering data directly to the GeoPortal, particularly trap line editing. Others have difficulties printing or perceive the need for a large format printer. Slow communication lines have made for frustration in use of the GeoPortal and have somewhat limited adoption of its tools. It is anticipated that these issues will be resolved when higher speed lines throughout the territory are in place by the end of 2011.



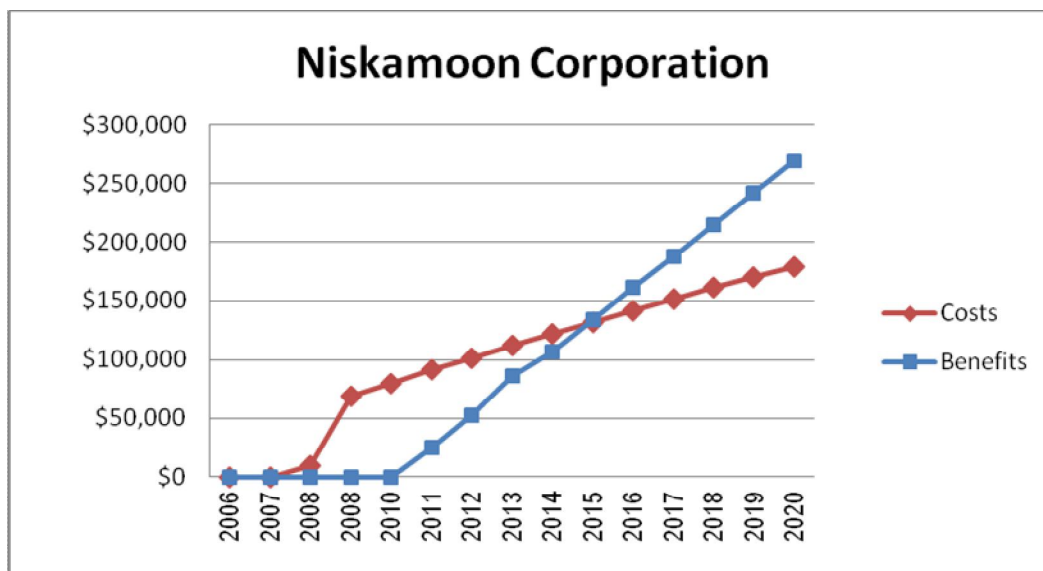
## Niskamoon Corporation Financial Analysis

Thirteen-year analysis of Niskamoon costs and benefits shows Net Present Value (benefits minus costs in 2006 dollars) of \$ 90,867 with 3.4% annualized Return on Investment (ratio of Net Present Value to cumulative costs). Payback period is seven years with breakeven point in 2015. Cumulative costs are \$178,850 and cumulative benefits are \$269,717. Greatest benefits come from increased efficiency for nine local coordinators.

Considering that the Niskamoon Board of Directors meets ten times per year, and that up to twenty projects can be submitted per meeting, the processing time allotted to projects can be significant. Niskamoon has nine local coordinators spread over a territory the size of France, with two local coordinators at a central location receiving projects from the local coordinators. Use of the GeoPortal will improve organizational efficiency.

The project tracking application developed within the GeoPortal allows projects to be entered directly into the system as they are conceived, greatly reducing processing times. Projects will be submitted to regional coordinators via the NIMS system as they are completed, eliminating the need for emails, scans, or faxes. The regional coordinators have the option of modifying projects, submitting them to the Board of Directors, or simply sending them back to the local level with comments. This also reduces processing and administration time. Projects that are submitted and approved are posted by the system immediately on the NIMS, eliminating the need for redundant data entry.

Niskamoon is limited by connection speed in many communities, resulting in slow uploads of maps onto the browser as well as reduced comfort local and regional coordinators have with these applications. The applications were developed with input from coordinators with varying degrees of computer literacy. It is hoped that use of NIMS through the GeoPortal will play an essential role in the decision-making process at Niskamoon.



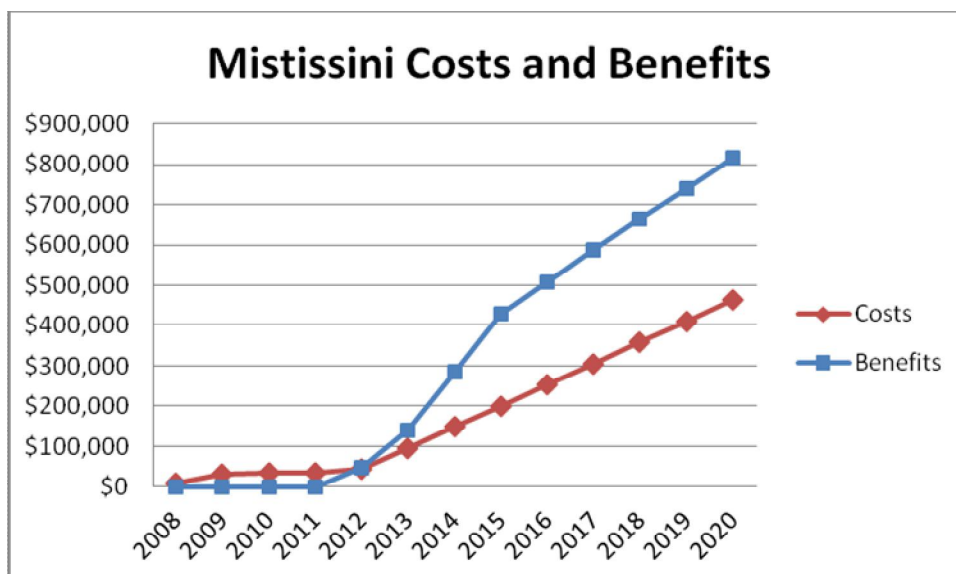
## Mistissini ATO Park Financial Analysis

Thirteen-year analysis of Mistissini costs and benefits shows \$353,603 Net Present Value (benefits minus costs in 2006 dollars) with a 5.09% annualized Return on Investment (ratio of Net Present Value to cumulative costs). Breakeven point will be reached in 2012, four years into the project. The payback period is short given Mistissini will not begin to use the GeoPortal until 2012, following prototyping and development of the tool and pending authorization and startup of the Park.

Greatest costs were incurred in 2009, at the conclusion of Phase 2 of the GeoConnections project. External costs following development are relatively low, with an approximate \$5000 annual cost for training staff in use of the GeoPortal. However, beginning in 2013 there will be a cost of approximately \$60,000 annually for a full-time GIS technical staff member. A significant finding of this analysis is that the Mistissini project can afford this staff member, as the benefits of using geospatial technology exceed the associated costs.

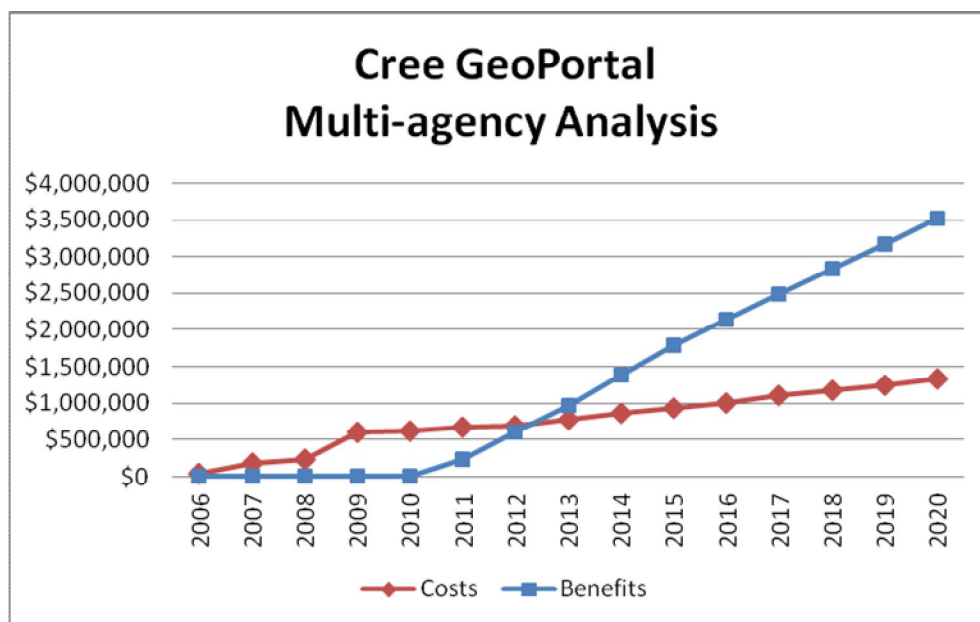
All tangible benefits come from increased productivity for Park staff members. Once the agreement is signed with the Provincial government, they will have three years to develop the Park and the GeoPortal will be helpful in this process. It can be used as an asset management tool for the park. New staff won't know as much about the land as they need to know and can use the GeoPortal to educate themselves.

Staff are estimated to receive 20% time savings benefits during the time of ramping up to 17 affected staff during growth of the Park. This benefit is estimated to drop to 10% time savings once staffing levels have stabilized and staff are more familiar with the Park and their new jobs.



## Multi-participant Financial Analysis of the Cree GeoPortal

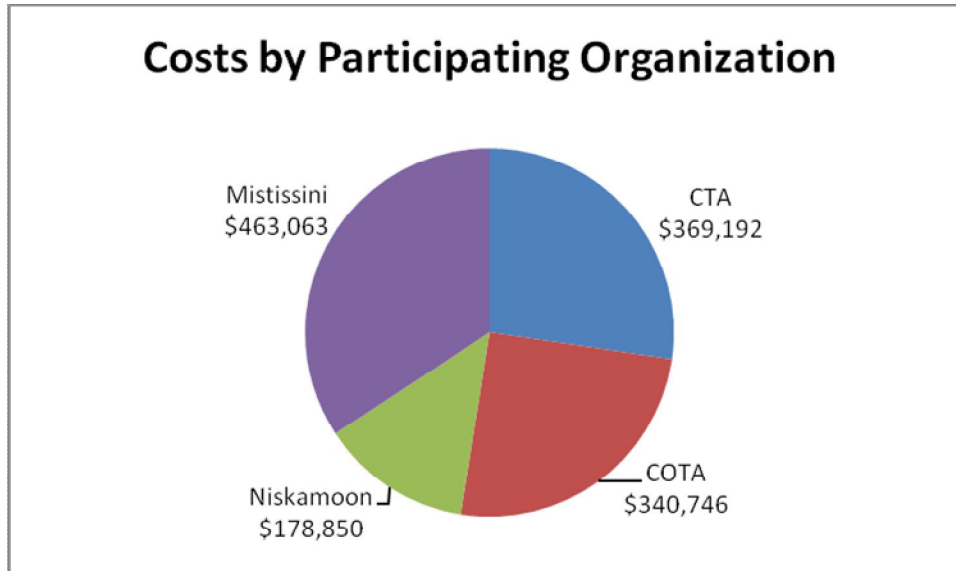
Having four distinct partners for the Cree GeoPortal presented the opportunity for a multi-participant ROI analysis. Analysis was performed for each partner, with the results rolled up into the overall project, incorporating Phases 1 and 2 and the User Needs Assessment of the GeoConnections project. Analysis of all participants shows Net Present Value (benefits minus costs in 2006 dollars) of \$2.225M, with 11% annualized Return on Investment (ratio of Net Present Value to cumulative costs). Breakeven point will be reached in 2013, seven years into the project.



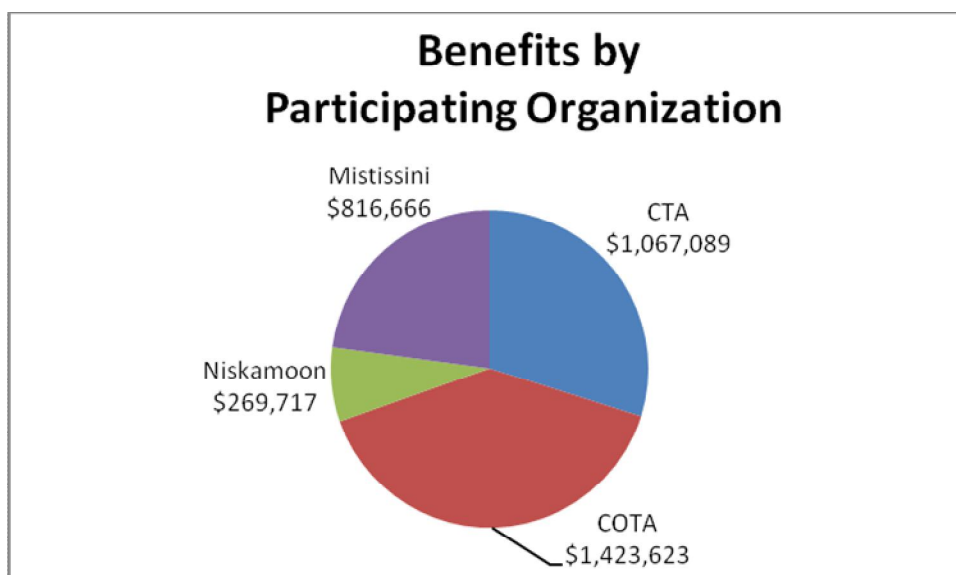
Greatest costs are in 2007 and 2009, at the conclusion of the Phase 1 and Phase 2 components of the GeoConnections project. This applies to the multi-agency analysis even though Niskamoon and Mistissini did not participate in Phase 1 of the project. Other areas of high cost are salary for a full-time GIS technical staff person for Mistissini beginning in 2013 and a recurring cost in a three year cycle to have Strata 360 staff train CTA local fur officers to input required data.

Benefits generally increase linearly once they begin in 2011. In 2014 and 2015 there were particularly high benefits due to the Mistissini ATO Park ramping up to peak staffing, with 17 staff receiving 20% time savings from use of the GeoPortal. Other areas of high benefits include time saved by staff, tourism officers and economic development officers for the COTA module of the project and cost avoidance of extra training and outsourced data entry for CTA.

Mistissini cumulative costs are the largest of the four partner organizations, due to a staffing plan for a full-time GIS technician beginning in 2013. CTA's recurring costs for training local fur officers to input required data information provides \$133,000 additional costs to this organization.



Benefits began in 2011 for COTA, CTA and Niskamoon Corporation. Mistissini benefits will begin in 2012. COTA shows the greatest quantifiable benefits. These come from increased productivity for staff, tourism officers and economic development officers. CTA benefits come from increased staff productivity, reduction in travel costs to train Local Fur Officers, and reduced costs for outsourcing data gathering and entry of trap line and trail information. Mistissini benefits come from time savings for park staff and the tourism officer. As staff benefitting from time savings grows to seventeen as Park activity ramps up, these benefits begin to dominate the Mistissini analysis.

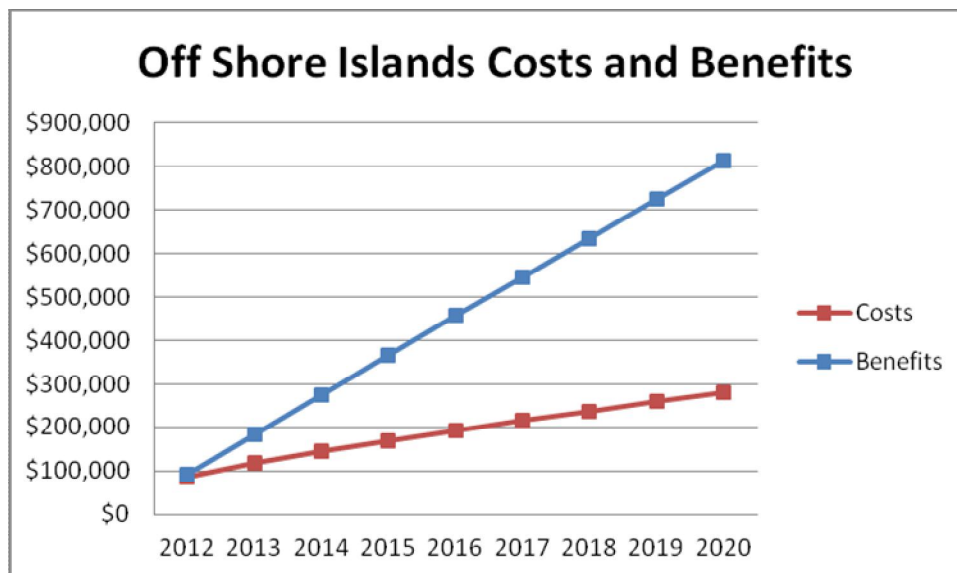




## Future Cree GeoPortal Modules

**Offshore Islands** – A module similar to the CTA module will soon be developed to support CTA's harvest management on Offshore Islands. Negotiations on the Offshore Islands Treaty were concluded in early 2009 and passed by Cree referendum vote in 2010. The Agreement applies to the offshore area in James Bay and Hudson Bay that the Cree have traditionally occupied and used, referred to as the Eeyou Marine Region. The Agreement recognizes Cree ownership of 80% of the land mass on the islands, including subsurface rights on these islands. It also recognizes the Cree right to trap, hunt and fish in all of James Bay and outlines the role of CTA in wildlife management in the region. Cree will have the right be consulted before any major decisions regarding development projects, share in royalty payments made to government from natural resources, and may claim compensation for any loss of property, income or harvested wildlife caused by development.

Offshore Islands analysis shows a Net Present Value (benefits minus costs in 2006 dollars) of \$532K with annualized Return on Investment (ratio of Net Present Value to cumulative costs) of 12.6%. The Offshore Islands GeoPortal component will reach breakeven point in its first year, 2012, due to its ability to leverage previously developed modules. Costs for development of applications will be greatest during startup in 2012 and 2013. Benefits will be similar to CTA benefits. This analysis shows five Local Fur Officers will be able to save 25% of their time by using this tool. There will also be a reduction in training costs due to one less training session a year required for Local Fur Officers as a result of standardized data entry methodology from the GeoPortal.



**Climate Change** – The Cree GeoPortal currently incorporates a Climate Change module. Financial analysis for the Climate Change module was not in scope for this case study. However, the module is an important component of the GeoPortal and further development is anticipated.

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The Climate Change module began when community members started to notice changes with respect to climate – migration patterns of geese, ice thickness and the like. The module is being used to collect and display data related to various projects studying climate change. CTA is documenting Cree knowledge of the behavior of migratory waterfowl, to determine if environmental change has altered flyways and behavior of migratory birds, as well as monitoring indicators of environmental change that may be related to climate change.

The 2009 data in the Climate Change module is the result of a study funded by the Department of Indian Affairs and Northern Development. It used professional researchers, anthropologists and others. The 2010 data consists of community observations and provides an example of what could become a monitoring program for the territory. A climate change study was done at three villages, raising interest from local environmental administrators at those villages.

**Additional Applications** -- An application for local environmental officers could be developed as a module of the GeoPortal. Currently, environmental officers have no access to GIS other than the existing GeoPortal modules and the trap line boundaries in a format for use in Google Earth. A module designed for environmental officers could be used for taking observations of toxic waste sites, dumps, or future projects such as schools, enabling the GeoPortal for use as a monitoring tool. One environmental officer is measuring the temperature of a lake at various depths. He wants a place to house this data and to share it, with the idea that multiple eyes on the data would lead to better understanding by using the GeoPortal as a tool for collaboration.

La Paix des Braves agreement has resulted in an upswing in mining and forestry activity. CTA may add modules incorporating forestry and mining data to the GeoPortal to assist in monitoring this activity. There is emerging legislation in the area of forest management and the GeoPortal could provide a mechanism to work with the new regulations to provide better planning. It would be helpful for CTA members to have access to forest fire data, plans of forestry companies regarding areas to be clear cut, and tools to show the effects of deforestation. There are 16,000 registered mining sites in the territory with 25 new mines scheduled to come into the area. Talleyman would benefit from the ability to track mining activity within their trap lines.

A Hudson Bay project will begin to place weather stations along key travel routes in 2011. This project is currently focused on Inuit lands but could be expanded to include Cree territory to benefit youth, climate changes studies, and health. There is also a potential Space Agency project to collect imagery for Labrador that would be useful for monitoring sea ice conditions. This project could be extended to provide a Cree pilot, with benefits from travel cost savings and greater travel safety through better knowledge of sea ice conditions.

CTA has discussed the possibility of creating a public GeoPortal application that would appear as a Travel Safety icon. This module could provide data from the monitoring modules discussed above and would be used to assist in travel planning with regard to ice conditions.

Additional Cree organizations that are not current participants in the GeoPortal have indicated an interest in future participation, including: Cree Native Arts and Crafts, Cree Cultural Institute, Wemindji Protected Marine Area, Cree Mineral Exploration Board, and Cree Regional Authority.

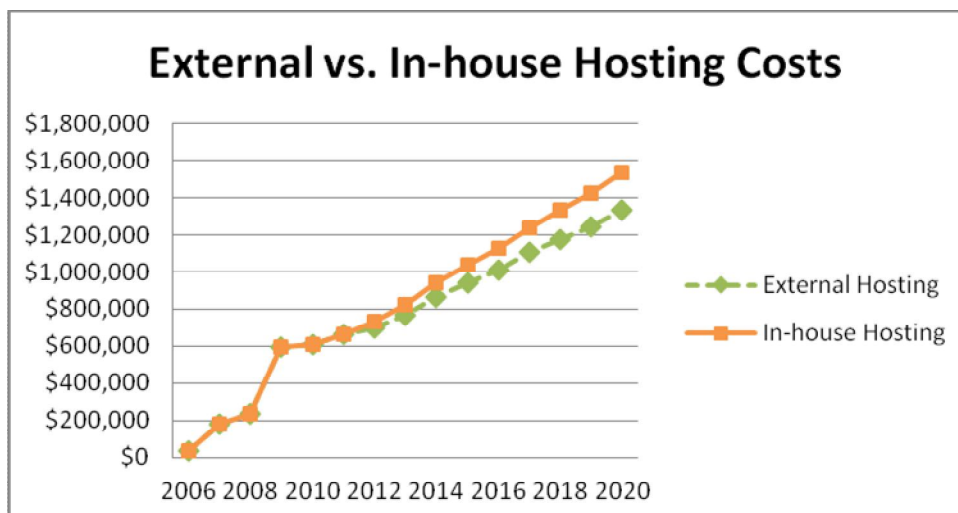
## Alternate Scenario: Hosting inside Cree Organizational Structure

In the course of developing the fifteen-year financial analysis and discussing the GeoPortal with potential participant organizations, there was recurring mention of a desire to bring hosting of the GeoPortal inside a Cree organization rather than continuing to outsource this capability to Strata 360. Although concern with information privacy was mentioned by some advocates of in-house hosting, the primary benefit appears to be increased Cree autonomy, as information privacy issues have already been technically addressed for the GeoPortal. COTA and CTA GeoPortal project leads suggested a financial analysis on two alternate scenarios, hosting inside Cree and outsourced hosting.

The in-house hosting scenario was created by removing \$2400 in annual hosting costs paid to Strata 360 by each of the four partners and replacing this with 25% of the following costs for each of the four partners.

Startup costs for hardware and software	\$21,000
Annual software maintenance	\$6,500
Half-time staff person annual salary	\$15,000
Consulting support fees annually	\$5,000
Backup server costs annually	\$1,800
New hardware/software every three years	\$11,000

The alternate scenario shows Net Present Value (benefits minus costs in 2006 dollars) of \$1.979M with 8.6% annualized Return on Investment (ratio of Net Present Value to cumulative costs) and a seven year payback period. Cumulative costs for the GeoPortal project with in-house hosting are \$1.531M versus cumulative costs with external hosting by Strata 360 at \$1.352M. Analysis with hosting continuing with Strata 360 shows Net Present Value of \$2.176M with 11% annualized ROI and a seven year payback period.



## Strategic Benefits

From the experience of GITA-methodology ROI case studies, a strategic benefit is any benefit not yet quantified. Strategic benefits may become quantifiable benefits once suitable metrics are discovered or further experience has been gained with the application under analysis. It may never be appropriate to quantify certain types of public benefits, but it is useful to take note of strategic benefits in anticipation of their quantification in the future.

The overall large issues mentioned by the majority of interview subjects for the Cree GeoPortal were safety, food security, migration of species, and youth employment. These topics are so broad as to be difficult to quantify for this case study. However, they emerged as recurrent themes when strategic benefits are analyzed.

**Safety:** The climate of Cree territory presents significant cold weather challenges regarding safety. The territory is the size of France and crossing by ice can greatly reduce distance to be traveled, yet falling through the ice will almost certainly result in fatality. Thus, use of the Cree GeoPortal to communicate current ice conditions and other significant travel conditions is a high priority.

Access to real-time ice monitoring would be particularly helpful at spring breakup time, when it would assist in organizing transportation to hunting cabins, thereby reducing costs. Similarly, it would be helpful in the fall for trappers to know if ice is forming earlier or later than usual. Using the GeoPortal to provide sophisticated ice monitoring output with additional local knowledge input would provide a powerful communication and planning tool for Cree trappers and other travelers.

**Food security:** The Cree Trappers Association uses the GeoPortal to manage their 7000 year old trap lines, which were originally designed to manage beaver trapping and moose hunting. Using the trap line system, families can do accounting of their wildlife balance. The trap line system was designed as a unique and precise management tool for doling out resources to the community and this could be facilitated through the GeoPortal. Economic benefits could be assigned to the community at large rather than individual families if the Cree Nation were in the future to develop another scenario for dealing with industrial development.

Management of the trap line system is of regional as well as local concern. There is a long-term goal of having local trappers using the GeoPortal to plan trips, decide where to build cabins, and mark the location of oil spills or fish kills. Mines will provide a new wave of impacts, with 25 at the planning stage. It would be helpful for trappers to be able to see protected areas relative to forestry as well as mining.

Trappers and elders who live in the bush have good knowledge of the territory. This knowledge is valued in the community and has political value. Trappers know habitat, cabin locations, and mining activity. Talleyman have traditionally kept their own land use records with family maps rarely seen outside. Getting the elders to make maps of the territory for the GeoPortal would provide a significant community benefit.

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CTA has eight million dollars invested in trap line cabins. Managing cabins through the GeoPortal helps CTA's accountability for government funds. These cabins may get burned during summer fires. Families could check maps in the GeoPortal to see if their cabin has burned and CTA could use the GeoPortal to manage insurance claims on the cabins.

When the area was opened for Hydro Quebec, access roads and other facilities were built. Hydro could use the GeoPortal to review siting issues with the tallymen to make sure proposed roads avoid burial sites, berry patches, bear dens and the like.

**Youth employment and education:** Involvement of youth in collecting data for the GeoPortal could provide an educational and employment benefit. We note that the BC eMap case study was able to quantify benefits to volunteers from learning to use geospatial technology.

The GeoPortal could be used to stimulate interest of youth in the environment. A GeoPortal teaching module could be developed for adoption by teachers, using the existing Climate Change module.

The GeoPortal provides a mechanism for students to educate their parents and help their communities to be more aware of environmental issues. A computer literate youth could show satellite imagery to a grandparent and ask about good places to travel. They could consider whether computer and elder information agree, resulting in a conversation between youth and elders. When youth see there are Cree place names written in Cree on maps in the GeoPortal, it provides them with an incentive to retain their heritage.

**Migration of species and environmental change:** A fisherman in Eastmain may catch a sturgeon in a place where it wouldn't typically be found, or perhaps there is a sighting of a new species of cattle egret. Making these observations available through entry to GeoPortal saves researchers making trips to collect data and also results in collection of data that researchers could not deliberately plan to collect. Communities making observations over many years and entering them into the GeoPortal would create a unique form of long-term research project.

From the research perspective of the James Bay Advisory Committee on the Environment (JBACE), the GeoPortal helps fulfill its mandate. Better science will give more weight to recommendations made by JBACE. The GeoPortal would foster transparency between the public and decision makers and between the JBACE and the Cree. Have point source observations available all in one place is a huge benefit to researchers. The user can see the geographic distribution of data without traveling to make observations and speak with tallymen.

The GeoPortal can be used to display the effects of rapid change from season to season. It could be used to create an adaptive management plan, showing social consequences as well as those to the ecosystem. It could show how things might look in ten years and link observations with causes of climate change.

**Political benefits:** The James Bay Cree have a sophisticated governance system. The Environmental Department and other components of regional government could make good use the GeoPortal to assist in planning, management, and decision making.

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There is political benefit to the Cree in having original place names used in the GeoPortal. Cree demonstration of historic use of their land due to existing place names strongly affected the outcome of the 1975 negotiations. More recently, Federal and Nunavut representatives were diverted from renaming islands by understanding there were already Cree names in place.

Maps serve as a means of putting new stakes in the ground in the time following the treaties. This is a large strategic benefit of the GeoPortal project. Having land use and ownership information available on the GeoPortal emphasizes Cree use and rights to the land.

## Conclusions

The Cree GeoPortal was built in two phases from 2006-2010, with benefits beginning to accrue in 2011. It was originally envisioned as a tool for tourism officers and local fur officers, with delayed benefits due to user lack of familiarity with the technology and very slow communications lines in Cree territory. However, the James Bay Cree have a sophisticated governance system, with diverse organizations in a position to benefit from current GeoPortal functionality as well as to extend capabilities to serve specific mandates.

The Cree GeoPortal presents innovation in a number of areas:

- First Cree tourism online mapping application for planning and business development
- First Cree online application integrating CGDI sources
- First Cree application using a geospatial browser for access and management of documents and maps
- First Cree application with a capacity to integrate datasets from multiple organizations

The Cree GeoPortal provided an opportunity for a multi-agency financial analysis, a compilation of a single agency analysis of each of the four partner organizations. COTA benefits are greatest in staff time saved. CTA benefits come from avoidance of outsourced data entry costs, staff time saved, and reduction in training costs for staff. Niskamoon Corporation will use the GeoPortal for project management and anticipates benefits in staff time saved. Mistissini will use the GeoPortal for Park management, with benefits in staff time saved during project startup.

Analysis of costs and benefits resulted in many findings regarding use of the GeoPortal for land management, tourism management, project management, and decision making. These include:

- Faster communication lines throughout the territory will aid in adoption of the GeoPortal.
- COTA can use the GeoPortal to plan tourism routes and market its offerings.
- Mistissini ATO Park can support a GIS technician based on time saved by staff using the GeoPortal and improved information access for new staff.
- CTA can streamline maintenance of its harvest database by using the GeoPortal.
- The GeoPortal can serve as a project management tool, with Niskamoon Corporation serving as an example.
- The GeoPortal can be used to foster communication between youth and elders.
- A Travel Safety addition to the GeoPortal would be heavily used by the community.
- The Climate Change module appears to offer the greatest opportunity for growth.

There is potential to extend the GeoPortal for additional uses: by the public to improve travel safety, by environmental officers to store observations, by trappers to understand forestry and mining activities on their trap lines, by educators to provide teaching modules, by researchers to reduce travel expense and promote collaboration, by youth to communicate with elders and understand their heritage. The participation of additional Cree organizations would also be a constructive addition to the project. Financial analysis of the addition of a module for the Off-

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shore Islands project provides an example of low startup costs from adding a module that leverages existing technology.