

INNOVATIONS IN WATER MANAGEMENT



Improving Access to Water Resource Information In Agricultural Watersheds



THE CONSERVATION AUTHORITIES OF ONTARIO

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PROJECT PARTNERS



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Disclaimer

The shallow susceptibility index and runoff index presented in this report were developed by the Maitland Valley and Saugeen Valley Conservation Authorities' local technical advisory group as part of a provincial pilot program entitled "Phase 2: Watershed Management Pilot Project" to meet local conditions.

These approaches have not undergone a formal scientific peer review process and do not constitute policy or approved management approaches of the Province.

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EXECUTIVE SUMMARY

The purpose of this pilot project is to explore methods for transferring water related information to a rural audience, and report on each method's effectiveness, costs/benefits, and considerations for implementation.

For source protection planning to be successful in rural watersheds, an understanding of how the rural community prefers to be communicated with is essential. Related to the communication method is an understanding of the type of supporting information this community requires and the effort and necessary skills required to deliver the information.

The target audience for this report is any organization that is attempting to communicate technical water information. Some of the details will be of particular interest to small organizations working with rural audiences.

Three communication methods were evaluated:

- Over the internet, with a mapping application (<http://myland.mvca.on.ca> or <http://myland.svca.on.ca>)
- Kiosk in the MVCA and SVCA offices
- Extension visit with rural landowners in their homes to discuss water and how it relates to their property

It is recognized that delivering basic water related information to landowners will not, by itself, cause landowners to make substantive changes to their farming operations. Conveying this information is seen as one step in building an awareness of water issues in the MVCA and SVCA watersheds and developing positive attitudes towards protecting water resources.

Based on the experiences of users to date it appears that a multiple communications approach will be most effective in delivering surface and groundwater information to rural landowners. While the My Land, Our Water mapping application is now at the stage that it requires little staff time to maintain, it is recognized that not every question can be answered through the website. In addition, most users are focusing on the mapping application and spending little or no time browsing the supporting material on the website. In comparison the extension visits require a considerable amount of staff time but landowners are provided with a very personal service that is able to address their specific questions and concerns. In the watersheds there remain a substantial percentage of rural residents that are not regular internet users. The extension visits showed that the participants without internet access were not interested in using the project kiosks. As a result it appears that providing the website coupled with a limited extension program will meet the needs of identified target audiences.



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1. INTRODUCTION

1.1 Background to the Report

The Province of Ontario created a Watershed Management Pilot in 2001 with a goal of implementing innovative and practical watershed-based approaches to managing local water resources. The pilot is a partnership between Ontario Ministry of the Environment, Ontario Ministry of Natural Resources, Conservation Ontario, individual conservation authorities and the Watershed Science Centre.

The process was to fund pilot projects to study and report on specific components of watershed management. Phase I began in the fall of 2001 with six place-based projects for local watershed managers. Standardized tools and approaches were developed to improve watershed management efforts. These can be viewed at <http://conservation-ontario.on.ca/projects/watershed.html>

Phase II of the Watershed Management Pilot began in the fall of 2002 with four watershed-based source protection projects. The focus of these pilots are technical and on-the-ground activities related to source water protection, especially in rural areas. These projects were to demonstrate innovative and cost-effective approaches to information management, modeling, and rural source protection mapping and planning. This project, Access to Information Related to Water Quality for the Rural Community, is one of the four and is a partnership between the Maitland Valley Conservation Authority (MVCA), Saugeen Valley Conservation Authority (SVCA), Ontario Ministry of the Environment, Ontario Ministry of Natural Resources and Conservation Ontario. The other three projects are:

- An Assessment of Data Requirements and Availability for Source Water Protection
- Lower Trent Region CA, Ganaraska Region CA, Crowe Valley CA
- Nutrient Management Pilot Projects - Lake Simcoe Region CA, Nottawasaga Valley CA, Kawartha Conservation, Greenland International
- Surface Water Quality Threat Assessment Method Using Landscape-Based Indexes
- Trent University Watershed Science Centre, MNR

Information on these projects is available at <http://conservation-ontario.on.ca/projects/index.html> .

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1.2 Project Area

Figure 1 - Study Area
Location of Maitland and Saugeen watersheds in Southwestern Ontario. Approximate Scale 1:5.2 million



1.3 Purpose

The purpose of this pilot project is to explore methods for transferring water related information to a rural audience, and report on each method's effectiveness, costs/benefits, and considerations for implementation.

It is recognized that delivering basic water information to landowners will not, by itself, cause landowners to make substantive changes to their farming operations. Conveying this information is seen as one step in building an awareness of water issues in the MVCA and SVCA watersheds and developing positive attitudes towards protecting water resources.

Three communication methods were evaluated:

- Over the internet, with a mapping application (<http://myland.mvca.on.ca> or <http://myland.svca.on.ca>)
- Kiosk in the MVCA and SVCA offices
- Extension visit with rural landowners in their homes to discuss water and how it relates to their property

Early on in the project process four target audiences for the water information were identified:

1. Farmers
2. Rural landowners
3. Municipalities
4. Agri-business professionals

Additional goals of the project were to document considerations when designing a computer interface to provide mapping information, to determine users' responses to water information for their property, and to discuss with landowners how they will use the information.

1.4 How the Report was Prepared

This report was developed through the practical experience of implementing each of the communication methods followed by an analysis of participating landowners' feedback. There were two committees that guided the project, a steering committee and a technical committee.

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Steering Committee Members

Chris Harrington	Conservation Ontario - WRIP
Bob Worsell	Huron County Health Unit
Brian Luinstra	Maitland Valley CA
Doug Hocking	Maitland Valley CA
Jayne Thompson	Maitland Valley CA
Rick Steele	Maitland Valley CA
Hugh Simpson	Ministry of Agriculture and Food
Rick Vantfoort	Ministry of Environment
Don Smith	Saugeen Valley CA
Martha Nicol	Saugeen Valley CA

Technical Committee Members

Hugh Simpson	Ministry of Agriculture and Food
Kevin McKague	Ministry of Agriculture and Food
John Gaiot	Ministry of Natural Resources
Jennifer McLellan	Private Hydrogeology Consultant
Jack MacPherson	Private Hydrology Consultant
John FitzGibbon	University of Guelph - Director, School of Rural Planning and Landscape Architecture
John FitzSimons	University of Guelph, School of Rural Planning and Landscape Architecture

The Maitland Watershed Partnerships Water Action Team and the SVCA's Water Response Team also provided direction and review.

Members of the Maitland Watershed Partnerships Water Action Team

Mike McElhone	Ashfield-Colborne Lakefront Association
Richard Anderson	B. M. Ross and Associates
Doug Layton	County of Huron
Susanna Reid	County of Huron
Dave McLachlin	Ducks Unlimited
Mark Pomeroy	Fisheries and Oceans Canada
Bob Worsell	Huron County Health Unit
Neil Vincent	Huron Farm Environmental Coalition
Geoff Peach	Lake Huron Centre for Coastal Conservation
Erica Allen	Ministry of Natural Resources
Jim Campbell	MVCA Director
Jane Muegge	Ontario Ministry of Agriculture and Food
Ryan Smith	Ontario Ministry of the Environment
Jeff Dickson	R. J. Burnside and Associates Ltd.
Brian Wretham	Town of North Perth
Paul Day	Wellington Stewardship Council

SVCA Water Response Team

Wietse Posthumus	Bruce County Federation of Agriculture
Mary Cumming	Councillor, Municipality of Arron-Elderslie
Ken Harrison	Councillor, Township of Southgate
Karl Chittka	Grey County Federation of Agriculture
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Dave Russell	Ontario Clean Water Agency
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Kathy Dodge	Ontario Ministry of Natural Resources
Larry Struthers	Ontario Ministry of the Environment
Chris Hughes	Regional Tourism Marketing Partners
Brian Hawksworth	Saugeen Cedars Family Campground
Doug Lonsdale	Saugeen Field Naturalists
Delton Becker	SVCA Director, Committee Chair
Wayne Lang	West Bentinck Springs

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2.0 APPROACH TO SOURCE WATER PROTECTION

At this point, the details of source water protection planning are being developed at the provincial scale so it is difficult to comment on how this project will specifically relate. If source water protection concentrates on municipal water systems, then this project will have a smaller role. However, for the purposes of this Pilot Study, we have assumed that the recommendations for the Walkerton Inquiry will be followed. Some key paraphrased recommendations related to this project include:

- Source protection plans are prepared through an inclusive process of local consultation
- Where the potential exists for a significant direct threat to drinking water sources, municipal official plans and decisions must be consistent with the applicable source protection plan
- Implementing local initiatives to educate landowners, industry, and the public about the requirements and importance of drinking water source protection
- All large or intensive farms in areas designated as sensitive or high-risk by the applicable source protection plan, should be required to develop binding individual water protection plans consistent with the source protection plan
- Protect all water for current and future uses

The combined Saugeen and Maitland watersheds have a land use distribution of 4% built-up area, 72% cleared agricultural land and 24% natural areas. There is a total population of 137,410 with 49% of the population on municipally supplied water in 26 settlement areas. The largest urban area has a population of 7,500. Therefore, 51% of the population is privately serviced with an estimated 13,400 known private wells.

Clearly, protecting water for users will involve private wells and large areas of agricultural land in addition to municipal wellhead protection areas. Private landowners have a critical role in protecting water quality and quantity. One of the key initial steps in source water protection will be to raise the awareness of landowners about how water moves over or through their property. It will also be

important for landowners to recognize how crucial a role they play in source water protection.

Of equal importance will be municipalities. They will have to develop wellhead protection plans and can use the information in this project to set priorities and communicate with landowners. Municipalities will also play a role in ensuring development is compatible with water resources. However, this role will be through building officials more than land use planning. In the Saugeen and Maitland watersheds, much of the area is designated as agricultural and the largest land use change is the intensification of agriculture. This intensification does not require a land use change and therefore source protection policies under the planning act would not be triggered. However, through the building permit process, if a building official has the correct information, development can be directed to appropriate areas. This project makes this information accessible and provides it in a form that is useful to municipalities.

From a land use perspective, the two watersheds could be considered "fully developed", since most of the area is in its final land use, agriculture. Below are two aerial photographs which demonstrate how little land use change is occurring.

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Figure 2 - Aerial Photograph Comparison: Land Use Change. The photo on top is from 1955 with the same area shown on the right in 2000. The star is for reference between the photos. Approximate scale is 1:40 000. The location is the area between Auburn and Whitechurch, west of the Maitland River.

Based on the distribution of land use and people, and due to the fact that the municipal capture zones are relatively small and land use change under the Planning Act is not occurring, actions to protect and improve water for all people need to occur at the property/farm scale. Therefore, source protection planning should be focused on land management and on techniques to engage, inform, and assist property owners in adopting appropriate practices. If individual landowners are to be successfully involved in protecting water, they need access to water information for decision making as well as for the development of farm planning documents. This project examines three methods of providing landowners with information that may need to be considered for source water protection.

Through past Conservation Authority projects we have learned that people become involved in an issue or activity when they feel they have a personal connection to it. This project provides water information at the property or farm scale to strengthen landowner interest and engagement in water issues.

It is a challenge to get good attendance at "regional" meetings for water protection. For example public meetings to review the Huron and Perth County Groundwater Studies were not well attended. The low population density of the rural area makes small group implementation difficult. This pilot could be considered a first step in raising awareness for the potential of water contamination. It may serve as a precursor to source water protection workshops and public meetings. Landowners will be more likely to respond to such meetings and participate in the proposed source water protection process if they have seen a higher vulnerability rating identified on their property.

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3.0 INFORMATION REQUIREMENTS

This project has focused on delivering basic surface and groundwater information to rural landowners and municipalities for the purpose of evaluating three communication methods: internet, kiosks in MVCA and SVCA offices, and extension visits. Refer to section 4.0 for more detail.

The information presented is critical to ensuring we are evaluating the communication method accurately. If a person does not see the relevance of the information presented they may respond negatively to both the communication method used and the project as a whole.

The same point can be made regarding the accuracy of the information. If the user perceives that the information is not accurate they may question the value of the project which in turn may influence their evaluation of the communication method used.

Therefore, before embarking on a project to provide information to landowners, especially over the internet, it is important to understand the information needs of your target audience and to ensure the information is as accurate as possible and delivered at the scale your target audience wants. It was recognized early on in this process that some of the data layers used in the mapping application contained inaccuracies and were at a regional rather than farm scale. The focus of this project was to evaluate communication and not to develop new or more appropriate layers. The technical committee decided that it was important to provide this information as it represents the best available data. Efforts have been made to clearly outline the limitations of this data in the mapping application.

3.1 Information of Interest to Users

When planning for the website and mapping application began, Conservation Authority staff identified information that they felt landowners would want to see. In particular staff focused on information needed to complete Nutrient

Management Plans, and factors that control water movement. This initial list included:

- aerial photos or base mapping
- soil type
- geology
- slope
- municipal well capture zones
- groundwater characteristics (i.e. depth to water table, depth to bedrock, flow direction)
- vulnerability of surface water and groundwater to contamination

After consultation with the Water Action Team it was decided not to provide municipal capture zones and groundwater characteristics. Municipal capture zones were dropped because municipalities indicated that they were not yet ready to deal with an influx of inquiries relating to capture zones. The source water protection planning process was not underway at this point. When considering providing information that will impact another organization, part of the communication approach should be consulting with these organizations to determine if they are ready to have the information made public.

Groundwater characteristics were removed because the Water Team indicated this was too much information for the average user. Also, it was felt that this information would not easily clarify for users the groundwater vulnerability layers used in the project (Intrinsic Susceptibility Index (ISI) or Surficial Susceptibility Index (SSI) are explained in sections 3.2.1 and 3.2.2 respectively and in the appendices). The Water Action Team felt the groundwater characteristics information was of less interest to landowners. It is recognized that these layers are important to understanding groundwater, therefore as the website is refined and improved these elements may be incorporated in the future.

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The Water Action Team did request that water well records be added to the information list. It should be noted that the water well records shown in the project are those from the entire MOE database for the study area, and not the dataset which comprised those records which were screened for accuracy and reliability prior to being used in the development of the regional ISI mapping.

3.2 Vulnerability Data

Landowners value data in the form of vulnerability or risk mapping. It is unrealistic to present base layers such as soil, slope and watercourses and expect users to accurately decide if erosion or runoff is high in a certain area. Providing an interpreted layer of vulnerability or risk ensures that everyone is looking at the same information and areas can be compared relatively. In an effort to help users understand the vulnerability layers, a description of how they were created was included on the website and in the support material provided to extension visit participants.

The use of a vulnerability layer is not counter productive, even if the absolute risk is unknown, since it is a relative measure. Provided the landowner understands that the inherent natural characteristics of the land associated with their property are being rated and not a particular operation or management practice, and the concept of a relative risk is explained, they are appreciative of the effort to communicate the best available data.

Three vulnerability layers were used:

- the intrinsic susceptibility index (ISI) created through the county groundwater studies in Huron, Perth and Grey & Bruce in 2002. Wellington County updated an ISI layer in 2004.
- surficial susceptibility index (SSI) (calculated for this project based on input from the technical team).
- a runoff potential layer (calculated for this project based on input from the technical team).

The objective of providing vulnerability information was to enable users to access both groundwater and surface water layers. This allows people to develop a comprehensive view of their property.

3.2.1 Existing Vulnerability Data (ISI)

As noted above, landowners do like vulnerability layers since it is a single layer and easily allows them to compare areas. However, a key step in the communication process is to determine the usefulness of the layer based on the input data and whether it is representative of local conditions.

Existing susceptibility data and/or methodologies were explored and rated by the technical team in order to identify the best options for incorporation into the project.

As a preliminary step, the technical team developed criteria to evaluate existing data/methodologies. Based on assumptions and experience in dealing with the public, the best data/methodologies were determined to be:

1. Accurate
2. Applicable
3. Scale appropriate
4. Understandable

Accuracy was felt to be a very important criterion as landowners have extensive knowledge of the natural conditions of their property, which in some cases has been passed down through several generations. Providing inaccurate information could discredit the source of information and lead to a rejection of all the available data - effectively skewing attempts to evaluate the communication methods.

Any data provided needs to be applicable to the rural landowner. In addition, it was determined that the data shown needs to be appropriate for viewing at a single lot (~100ac) scale. The final criterion developed was that information had to be understood by target users.

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The ISI (intrinsic susceptibility index) was selected as the layer to communicate groundwater vulnerability. This layer was created through the County Groundwater Studies in 2002. Refer to Appendix A for a non-technical description of the methodology, as well as a reference to the Technical Terms of Reference prepared by the MOE.

This layer did not meet the criteria for scale since it was created as a regional representation (1:50 000).

It also did not meet the criteria for accuracy since a core dataset was the Water Well Information System (WWIS). The ISI is calculated on the wells within the WWIS which have been screened for accuracy and anomalies. In addition, quaternary and bedrock geology, sand and gravel resource and water table information is used to create vulnerability maps. Bedrock aquifers, both shallow and deep, are adequately represented since the majority of wells are in bedrock. Larger overburden aquifers are also adequately represented when drilled bedrock and overburden wells are used. However, shallow overburden aquifers, represented by dug wells, are not as well represented because these wells are not as common in the WWIS and often predate the development of the WWIS. In Howick Township and the former Townships of Turnberry, Kinloss and West Wawanosh, a large portion of the population is Old Order Mennonite and they rely on shallow wells into these overburden aquifers. There is a need to communicate vulnerability information to this community. This created the need for an additional layer, which has become the surficial susceptibility index (SSI) described in Section 3.2.2.

Still, the ISI layer is the best available data and is far better than the information that preceded it. Therefore, the decision was made to incorporate this data as long as the proper qualification was provided.

3.2.2 Project Specific Vulnerability Data (SSI and Runoff)

As mentioned earlier, an objective of providing vulnerability information was to enable users to understand both groundwater and surface water layers. This allows people to develop a comprehensive view of their property.

In an attempt to incorporate the dug well (shallow overburden aquifers) information and support the need for more local information a surficial susceptibility index (SSI) was created. This layer also did not meet the criteria of accuracy since only the topmost geologic layer was used. It also may not be applicable to some areas since the presence of an aquifer was not confirmed. However, with the proper qualification, this layer defines potential aquifers and fills an important role in providing information on shallow groundwater.

A third vulnerability layer was created to highlight areas that may be prone to runoff and therefore contaminate surface water. The runoff index is scale appropriate and understandable, but may not be applicable since a transport function was not incorporated and the cropping system was assumed.

It should be noted that the strategies used to create these vulnerability layers were undertaken to fill the specific needs of this project and its target audiences. These methodologies have not been peer reviewed by the scientific community.

Refer to Appendix B for the methodology used to create the SSI layer and the development of a runoff index that defines surface water vulnerability.

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4.0 COMMUNICATION METHODS

This project has focused on delivering surface and groundwater information using three communication methods:

- over the internet (<http://myland.mvca.on.ca> or <http://myland.svca.on.ca>)
- at designated computer terminals in the SVCA and MVCA offices (kiosks)
- through extension visits to farms

The purpose of testing the three communications strategies was to determine if users had a strong preference for one method over the others and to examine the costs and benefits associated with each one.

Before construction of the website began several other websites and projects were reviewed including Oxford County's Map Your Farm and the Lake Simcoe Region Conservation Authority's Watershed Pilot Project.

- <http://maps.county.oxford.on.ca/mapyourfarm/>
- http://nhic.mnr.gov.on.ca/MNR/nhic/areas/natural_areas.cfm
- Communications for Watershed Information Sharing Phase I report - LSRCA, GRCA <http://conservation-ontario.on.ca/projects/watershed.html>

4.1 Internet

4.1.1 Technical Considerations

The first task was to develop a user requirement document for the four main target audiences: farmers, rural landowners, crop consultants and municipalities. This process involved assessing user skill, hardware and software, connection type, possible uses of the information and questions users would want answered from the mapping. It was evident that we did not have a good understanding of the target users and therefore we took a precautionary approach and estimated that

the users had limited internet experience, had not previously used mapping applications, had dial-up access and an older computer, and they would have only basic questions about their property.

Based on these conservative estimates, it was determined that the mapping application:

- Be a "thin client", which refers to requiring minimal processing of the mapping and internet applications on the user's computer
- Does not usually require a plug-in (third party software)
- Have the ability to customize available tools such as zoom and identifying features
- Work with various operating systems
- Support at least Netscape and Internet Explorer browsers since the mapping application is usually accessed through a web browser
- Have the functionality to include standard text webpages along with the maps to be used when explaining the maps on screen

The other consideration for the mapping application relates to the skill and resources required by the host agency. For rural Conservation Authorities, most IT staff also have other job duties. At the SVCA the main IT person is also the Forester and at the MVCA this staff member does GIS work and monitoring and reporting activities. For this reason, there is limited time to baby-sit an application and limited skill to program applications.

Three internet mapping applications were investigated:

1. Geomatica WebServer by PCIGeomatics <http://www.pcigeomatics.com/>
2. ArcIMS by ESRI <http://www.esri.com/software/arcgis/index.html> (Cuesta Systems Inc. also produces a GeoPortal product for ArcIMS)
3. MapServer open source originally by University of Minnesota <http://mapserver.gis.umn.edu/> through Cuesta Systems Inc. GeoPortal <http://www.cuestasys.com/>

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MapServer working with GeoPortal was the final selection based on the following evaluations:

Table 1 - GIS Web Server Comparison

Application	Pros	Cons
Geomatica Webserver	<ul style="list-style-type: none"> ■ works with MVCA current GIS (Geomatica) ■ reasonable cost of \$10,000 + maintenance ■ Canadian company ■ reproject on the fly ■ supports extensive file format list 	<ul style="list-style-type: none"> ■ would have to do configuration and programming for functions. Not out of the box functions and could be treated as a software development toolkit ■ requires a java plug-in (version 2) that is a 30 minute one-time download on dial-up. Windows does not load this version by default
ArcIMS	<ul style="list-style-type: none"> ■ ESRI is provincial standard for GIS ■ large amount of data already in a compatible format ■ can get Cuesta's GeoPortal to make it more user friendly 	<ul style="list-style-type: none"> ■ cost ■ requires higher skill level to operate ■ out of the box functions not developed ■ limited control over software and tool development
MapServer/Geoportal	<ul style="list-style-type: none"> ■ MapServer is open source ■ Natural Resources Canada extensively using ■ active user community ■ non-proprietary so ability to develop own functions or find someone else who has ■ supports required tools ■ GeoPortal makes managing MapServer user friendly ■ reasonable cost ■ supports shape files ■ reprojects on the fly us Proj4 ■ only html and xml knowledge required 	<ul style="list-style-type: none"> ■ must export all data to shape ■ less structured support network

A final factor for consideration was the application choices of neighbouring Conservation Authorities. This is important for two reasons. The first is that since municipal boundaries are not aligned with watershed boundaries, a municipality can visit both CA websites and get similar information and a similar look and feel with less learning. The second reason is the sharing of knowledge between CAs and the ability to pool resources to have common applications developed. The Upper Thames River, St. Clair Region and Ausable Bayfield Conservation Authorities also selected Geoportal for their web-based mapping application. The UTRCA selected the ArcIMS version, but to the user there is no difference.

The server was installed at the MVCA office. The existing configuration was a DSL modem that connected to a network card in an IBM Netfinity server (PII 450 MHZ with 196 MB RAM). The server used Wingate and Mdaemon to manage internet connections and e-mail. From a second network card the server was connected to a hub that had all the office computers connected.

An IBM xSeries 225 Xeon 3.06 GHz server with Windows 2003 server was acquired. The only major configuration change was to switch to a 160 GB IDE HD instead of a SCSI to save money. It was also upgraded to 1024 MB RAM.

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Apache and Apache Tomcat were installed as webserver applications. For backups, a second 160 GB HD was installed in a workstation and using FTP ServU a scheduled backup is done every evening to the workstation which has the FTP client software FTP Voyager.

A router with DMZ capability was also acquired. The server was originally placed in the DMZ, but the nature of a DMZ is that the server is wide open to the internet. Since we did not have the webserver handling any other services like VPN, remote access or e-mail, there was no benefit to being in the DMZ and it was moved behind the router and only those ports required were opened.

The configuration of the office is now from the DSL modem to the router, and the router is connected to the hub, webserver and the original server. Network computers now connect directly to the internet and the original server still handles e-mail with Mdaemon, but Wingate is no longer required.

4.1.2 Internet - Website Design and Content Development

In the summer of 2004 staff from the MVCA and SVCA developed the My Land, Our Water brand for the website. The initial website design and content was created with input from Connolly Design, Waterloo. During this development phase a series of assessment questions were used to assist with structuring the site and content:

- What am I looking at?
- How do I interpret this information? Supporting information needs to be provided to assist users in interpreting the map data at the farm scale as well as in a broader context.
- Where did this information come from? Users need to be provided with information about both the accuracy and limitations of the data.
- What can I do with this information? Users need to be given ideas about how risk can be managed.. If a user determines that their property is at high risk for contamination, staff felt strongly that support material be incorporated into the site

to provide ideas about how this risk can be appropriately managed.

- What do I do next? Encourage users to seek further information by contacting local agencies. Include opportunities for users to provide feedback.

Based on this assessment, the following content was written for the My Land, Our Water website:

1. A brief overview of why healthy water is important as well as an introduction to surface water and groundwater. This material was reviewed by MVCA and SVCA staff as well as local resource experts.
2. Short summaries of Best Management Practices relating to wellhead protection, protecting surface water and protecting groundwater. It should be noted that these summaries are very brief and are only intended as a starting point. It was recognized that users are unlikely to read much text on screen, so links are provided to assist them in obtaining the Ontario Ministry of Agriculture and Food Best Management Practices books.
3. A feedback form was created so users could anonymously evaluate the mapping application and website content. This form is also intended to provide staff with a picture of the types of users visiting the site. Refer to Appendix D to view this form.
4. In the mapping application the complete MOE Water Well Records Database is displayed. It is known that within the Maitland and Saugeen watersheds this database contains inaccurate and missing records. A form was created so users can notify the MVCA or SVCA of problems relating to the location or presence/absence of the well record for their property. Refer to Appendix D to view this form.
5. Information about how to create maps and manage data was included in the mapping application. In addition, information about the data sources used to create the maps was provided and learn more features written for each mapping section.
6. One goal of this project is to provide other Conservation Authorities and agencies with an overview of the approach used to create My Land, Our Water. An outline of the project process and the Terms of Reference is included on the website.

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4.1.3 Internet - Website Usability Evaluation

Focus groups, small group sessions and individuals were used to evaluate My Land, Our Water. Connolly Design provided assistance with planning these sessions, particularly with regards to observing users and documenting navigation problems. Cecilla Ferreyra, a PhD candidate at the University of Guelph, reviewed and commented on the questions used during these sessions to encourage feedback and comments from participants.

Focus Group Evaluations

Both the MVCA and SVCA have teams working on water-related issues. Each team participated in two evaluation sessions. These teams are comprised of farmers, representatives from community groups, municipal councillors, business representatives and planning officials. Participants' computer skills ranged from novice to expert.

The Maitland Watershed Partnerships Water Action Team was the first group, eleven participants, to evaluate My Land, Our Water. MVCA staff introduced the mapping application and emphasized that we wanted feedback from the participants, both positive and negative. In particular we were interested in finding out:

- What landmarks do users need to find their property?
- How do users prefer to find their property - zooming in on a watershed map or entering their lot and concession number?
- What navigation problems did participants run into?

Staff led the participants through the basics of the mapping applications including how to find their property and how to create maps. The team was then divided into three smaller groups and each participant was assigned a work station or lap top. Participants were then encouraged to explore the site on their own.

Assistance was given to users as soon as they experienced difficulty with the mapping application. Problems were documented by staff throughout the session. After approximately one hour the team gathered together and discussed their experiences. The participants were very enthusiastic about the possibilities of the mapping application but were frustrated by navigation problems. It was clear from this initial session that the mapping application was much too complex for average users. Refer to Figure 3 to view the initial mapping interface.

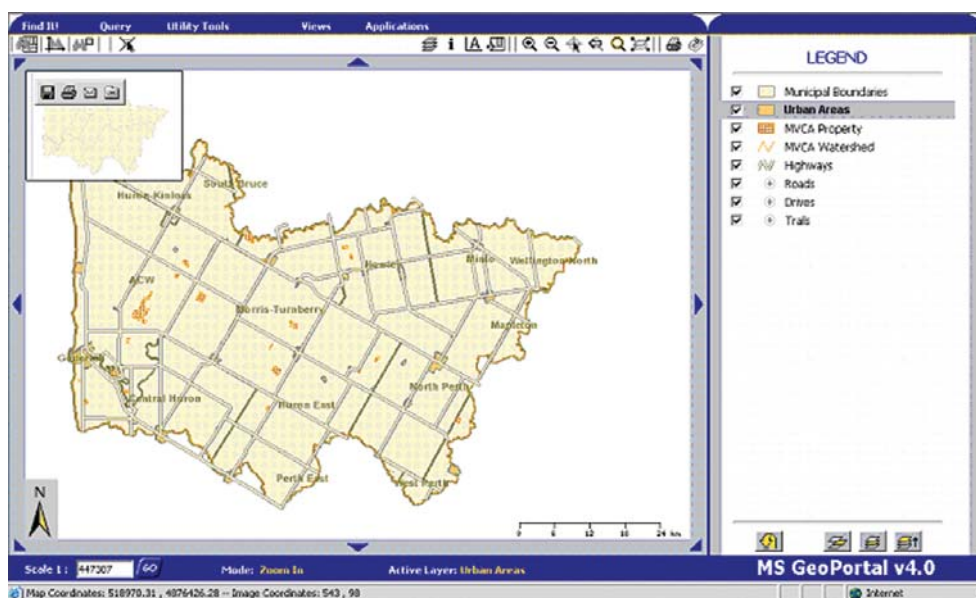


Figure 3 - Initial Mapping Interface

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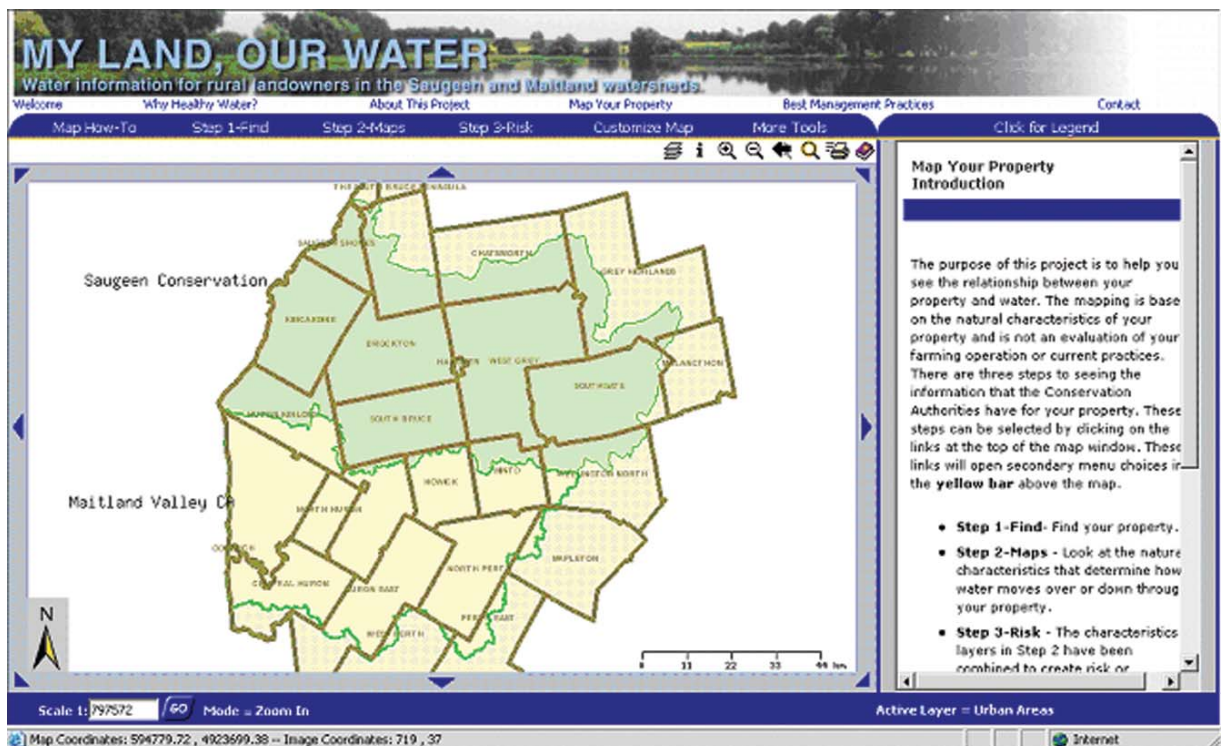
Immediately following this initial evaluation session, staff met to discuss their findings. Several key user preferences and usability issues became evident during this discussion session:

- Landowners preferred to use their lot and concession number to find their property rather than zooming in on the watershed map. The users were not accustomed to visualizing their property location on a watershed basis.
- Users provided feedback on the landmarks they use to identify their property on maps and aerial photos. Roads, watercourses and forests were identified as key landmarks by these users.
- When asked, "Does the information reflect your property?" landowners agreed with the information provided. The only layer questioned was the Water Well Database with these comments based solely on location or presence/absence of their well. It should be noted that this information layer included all the wells in the MOE database and not just those screened for accuracy and reliability in the development of the ISI.

- The mapping application was too difficult to use, in particular users had difficulty adding and subtracting map layers. Users also had difficulty figuring out how to start over again in the mapping application.
- Participants suggested increasing the font size of the symbols used on the geology and soil mapping.
- Users identified tools in the mapping application that they were particularly interested in using including zoom, pan, identify, print, and back functions.

Based on these results, changes to the mapping application were undertaken with assistance from Cuesta. The key change made was that users were now led through a defined series of steps leading to property characteristic maps (base map or aerial photo, soil, slope, geology, and well records) and the risk maps (ISI and SSI) rather than users managing the map layers on their own.

Figure 4 - Refined Mapping Interface
Current mapping interface based on a number of tests and changes that were made during the evaluation process.





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The SVCA's Water Team was the second group (14 participants) to evaluate My Land, Our Water. During this session participants were asked to evaluate their preference for managing the map layers themselves as compared to being guided through steps leading to the ISI and SSI mapping. Results confirmed the suggestions made by the first focus group that users preferred following defined steps.

Following these evaluation sessions, substantive changes were made to the site. A concerted effort was made to simplify the mapping application. Several tools were removed including annotation, display customizing, and Microsoft Word.quick forms. Additional refinements were made to make it easier for users to follow prescribed steps leading to the property characteristic maps (base map or aerial photo, soil, slope, geology, and well records) and the vulnerability maps (ISI, SSI and runoff).

Small Group Evaluations

Thirty-seven individuals reviewed My Land, Our Water in a series of small group sessions. The group size ranged from two to four participants. These sessions were held in participants' homes or at agency offices, none were held at the Conservation Authority offices. Participants often shared a work station or laptop with one other person. On average these sessions were 1.5 hours in length. An MVCA staff member provided an introduction to the My Land, Our Water project at the beginning of each session and then participants explored the site at their own pace. Staff closely observed the participants and provided assistance if they had difficulty navigating a section the website. Staff waited approximately 5 minutes before stepping in to provide help. This intentional delay enabled staff to observe if users were able to solve the problem on their own or if they required direct assistance.

Efforts were made to ensure that the target groups identified for this project (rural landowners, farmers, municipal staff and agri-business consultants) were represented in these small group sessions. In addition several other groups were specifically targeted for these evaluation sessions including:

- seniors
- cottagers
- Conservation Authority staff
- secondary school students
- local resource experts

Key results from these sessions were extremely consistent:

- Users had difficulty with the same sections of the mapping applications. In particular users had trouble with the Identify Features mode and changing the Active Layer.
- Users found the concepts of ISI and SSI difficult to understand. Visit the website to view non-technical descriptions of these layers and Appendix A for an additional method of explaining ISI.
- Approximately 40% of the users expressed doubt that they could have successfully navigated the mapping application portion of the website without staff assistance.
- Just over 50% of the users found location or presence/absence inaccuracies for their water well record.
- Response to the overall content was very positive.
- No concerns were expressed about the accuracy of the natural characteristics layers.

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Individual Evaluations

Seven resource experts and/or Conservation Authority staff were asked to review the website on their own. These evaluators emailed their comments and suggestions to MVCA staff. This group of users was much more comfortable with the mapping application component of the website as compared to participants in the focus groups and small group sessions. They provided valuable suggestions for improving the content of the site and correcting errors.

On-Going Website Refinements

Major changes were made to the mapping application following the initial focus group sessions and the small group evaluations. After these changes were implemented the Maitland Watershed Partnerships Water Action Team and the SVCA Water Team reviewed the website again. Both groups commented on how much easier the navigation of the mapping application had become.

In the Saugeen watershed mapping information is displayed on base maps rather than aerial photos. The SVCA's Water Team provided additional assistance with identifying the landmarks needed to assist landowners with finding their property.

Efforts to improve the usability of the site continue. Rather than the major navigation changes that occurred in the early stages of evaluation, recent changes have involved smaller refinements. For example it is now easier to enter township, lot and concession information to create maps. In addition, lot numbers and property boundaries are now displayed on maps to assist landowners with identifying their property.

It is hoped that as the site is more widely used, visitors will provide feedback that will enable additional improvements to be made.

4.2 Kiosks

Workstations have been set up in the MVCA and SVCA offices where visitors can access My Land, Our Water with assistance from staff if necessary. Staff are available to help users with navigating the site, answering questions that may arise from the information presented, and printing out maps. The purpose of the kiosks is to evaluate if landowners without internet access, or those who experience problems with the site, will be willing to travel to the CA office for assistance. Consideration was given to installing kiosks at other public venues (municipal offices, libraries, local agency offices) however the need for access to Conservation Authority staff made this option impractical.

To date the kiosk communication method has not been fully tested. Delays in obtaining the ISI information for Wellington County and technical difficulties encountered when the MVCA and SVCA data sets were merged meant that My Land, Our Water was not working well for the Saugeen watershed. As a result the public launch of My Land, Our Water was delayed until the end of June 2005. Promotion of the MVCA kiosk began in mid-July 2005. Promotion of the SVCA kiosk will begin in late August 2005. Usage over the next six months will be monitored to provide us with a better understanding of public interest in this communication method.

It can be noted that during the extension visits (see 4.3) participants were asked if they would be interested in using the kiosks. In all cases this question received a negative response whether the participant was an internet user or not. Signs were placed in the front lobby of the MVCA office in February advertising the My Land, Our Water kiosk. To date only six visitors have used the service. The MVCA office receives a low level of walk-in inquiries as compared to more urban-based Conservation Authorities.

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4.3 Extension Visits

The third communication method tested with the My Land, Our Water project involved extension visits with farmers. MVCA extension staff were selected to conduct these visits because of their extensive experience working with landowners and broad knowledge of soil and water conservation issues. Doug Hocking, MVCA Rural Water Quality Specialist, and Geoff King, MVCA Stewardship Coordinator, set up visits with twelve farmers in the Maitland watershed. They presented the information that is available at the My Land, Our Water website in a kitchen table discussion format. The purpose of these visits was to:

- determine if landowners were interested in the information presented
- evaluate if the mapping information reflects what the landowners know about their property
- evaluate how landowners respond to the vulnerability mapping
- determine how landowners prefer to receive this type of information

These visits were conducted mainly with landowners that were friends of the Conservation Authority (past participants in rural water quality programs or other MVCA initiatives). Staff also asked participants for suggestions of other landowners that might be interested in the information being presented. Five of the twelve participants had no internet access.

Efforts were made to mimic the My Land, Our Water website as closely as possible. A package based on the website was created for landowners (refer to Appendix E to view this package):

- Property maps were generated from GeoPortal (aerial photo, soil, slope, geology, wells, ISI and SSI).
- A factsheet introducing the project was developed based on the My Land Our Water home page.

- Brief surface water and groundwater factsheets were produced containing the same information as is found on the website.
- A user evaluation form based on the website feedback form was also developed (refer to Appendix F).
- A visit summary form was developed that was filled out by staff following each visit (refer to Appendix F).

After the first four site visits were completed staff met to review how the visits were being received. Based on this discussion minor adjustments were made to the landowners' feedback form and the staff summary form.

There were several issues of concern that arose from the extension visits:

- Eleven out of the twelve landowners indicated that there were either location or absence/presence inaccuracies with wells on their property. In total 41 wells were verified by the landowners with 31 being absent, nine with incorrect locations, and one correct. This was a higher percentage of inaccuracies than was seen in the focus groups and small group sessions. These inaccuracies generated questions from participants regarding the relationship between the well records and the ISI mapping. Whether this information can be extrapolated to the rest of the study area is unknown.
- Staff were not able to gauge reactions to the ISI regional vulnerability mapping because landowners did not view it as being accurate on a local scale.
- Participants found the concept of ISI and SSI mapping difficult to understand.
- Participants in the initial extension visits indicated that the slope map was confusing and difficult to understand. To alleviate this problem the slope categories were changed into ranges (10 categories were combined into 4 ranges) that match the NMAN groupings.



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- Overall response to the extension visits was extremely positive. Visit summary forms noted that participants were very interested in the material presented and they asked a wide range of questions. The bulk of the visit time was spent examining the maps. Once the changes were made to the slope map landowners assessed the soil and slope information for their properties as being very accurate.

With regards to how landowners wish to receive this type of information we found that landowners without internet access (6) were not interested in using the My Land, Our Water kiosks. Participants with internet access (6) indicated that they would visit the website but also stated that their preference at this point was for an extension visit. Follow-up conversations with five of the participants with internet access showed that they had spent time on the website. These participants indicated that they were able to understand the information on the website because they had participated in an extension visit prior to using the website. All these participants were on dial-up access and while they did mention that the maps were slow to render on screen they also commented that this is typical of their general internet experience.

Now that the SVCA portion of My Land, Our Water is working effectively staff are working to set up a series of extension visits in the Saugeen watershed. We are interested in learning if using a base map as compared to an aerial photo of a property generates different questions or concerns from participants.

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5.0 UNDERSTANDING OUR USER

Logitpro, a web traffic monitor, was installed on the webserver around December 17, 2004. As of May 17, 2005 there have been 771 unique visitors based on IP address and 10,200 hits. One of the main complications with developing the mapping application was trying to determine which operating systems, display and browsers to support.

For browsers, we decided to support Netscape and Internet Explorer as a minimum. This was not perceived as an issue at first because of the impression that there were standards for how to render web coded information. As the project progressed it became clear that Netscape used style sheets and some coding differently. Making Geoportal compatible entailed a considerable amount of work by Cuesta.

Operating systems were not as big an issue, until WindowsXP service pack 2 came out which by default installs a pop-up blocker. Some functions in Geoportal open a separate window that is interpreted as a pop-up. This also brought up the issue of third party pop-up blockers and that the user needed to be informed about how these programs limit the web application.

Display is a large issue since different size monitors coupled with different display resolutions create a variety of geographically viewable areas. We informed users of an optimal resolution for a minimum sized monitor for best viewing.

Below are tables from the web traffic monitor that indicate the details of the users that have visited the site. It should be made clear that these are the attributes of the users that visited the site, and may not reflect the hardware and software of our target audience.

From these results, most users have up to date browsers and operating systems with displays that should make most mapping applications visible.

Table 2 - Users Computer Specifications

Browsers	Total
MSIE 6.0	2702
Netscape 7.02	295
MSIE 5.5	120
Firefox 1.0	47
Netscape 7.2	29
X11	25
Firefox 1.0.2	21
MSIE 5.0	18
MSIE 5.17	7
MSIE 5.01	6
Firefox 1.0.4	5
Konqueror 3.4	5
Netscape 7.1	2
Firefox 1.0.1	1
Macintosh	1
Platforms	Total
WinXP	2273
Win98	657
Win2000	237
WinNT	82
unknown	26
WinNT 5.2	19
Mac_PowerPC	12
FreeBSD	4
WinME	4
Screen Size	Total
not tracked	2525
1024x768	410
800x600	181
1280x1024	117
1152x864	24
1400x1050	13
1600x1200	10
1280x960	7
1280x720	4
640x480	3
720x480	2
960x720	1
1920x1200	1
Color Depth	Total
not tracked	2525
32bit	540
16bit	186
24bit	54
8bit	8
1bit	1

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Table 3 - Search Term Referers - How do users find My Land, Our Water

Search Term Referers	Total
MNS(US):my land	3
GOOGLE:welcome to my land	1
GOOGLE:myland svca	1
YAHOO!:SAUGEEN WATHERSHED MAPS	1
MSN(US):Maitland Valley myland	1
MSN(US):my land	1

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6.0 COST - BENEFIT REVIEW

Some of the staff time incurred with this project was common to all of the communications methods. This included tasks such as:

- developing the website
- assessing program tools in the mapping application
- creating the supporting text for the maps

- evaluating the usability of the website and the associated support material
- implementation of website improvements

The task outcomes were applied to the website, kiosk and extension visit communication methods. These over-arching tasks are detailed below.

Task	Staff	Total Hours
Site architecture and navigation	Communications Coordinator Interface designer/usability specialist Watershed Information Coordinator	22.5 hours x 3 = 67.5 hours
Site design/interface	Communications Coordinator Interface designer/usability specialist	15 hours x 2 = 30 hours
Initial site content	Water Resources Coordinator Rural Water Quality Specialist Communications Coordinator Watershed Information Coordinator	15 hours 7.5 hours 30 hours 30 hours
Content review	Education Assistant GIS technician Communications Coordinator Hydrogeologist - community partner	7.5 hours 7.5 hours 15 hours 7.5 hours
Focus Group Sessions - preparation	Communications Coordinator University of Guelph researcher	7.5 hours 7.5 hours
Focus Group Sessions - Implementation	Communications Coordinator Water Resources Coordinator Watershed Information Coordinator Ecologist/Planner	3.0 x 4 sessions = 12 hours 3.0 x 2 sessions = 6 hours 3.0 x 4 sessions = 12 hours 3.0 x 1 session = 3 hours
Focus Group sessions - Initial Evaluation	Communications Coordinator Water Resources Coordinator Watershed Information Coordinator Ecologist/Planner	4 hours 2 hours 4 hours 2 hours
Focus Group Sessions - Follow-up	Communications Coordinator Watershed Information Coordinator	3.5 x 4 sessions = 12 hours 3.5 x 4 sessions = 12 hours
Small Group Sessions - Preparation	Communications Coordinator	30 hours
Small Group Sessions - Implementation	Communications Coordinator	45 hours
Small Group Sessions - Follow-up	Communications Coordinator	15 hours
Individual Evaluations - preparation and follow-up	Communications Coordinator	7.5 hours
Implementation of website changes recommended by user evaluation sessions	Web Programmer	20 days - this may be less since new tools and functionality has been added to GeoPortal since the project began
Total Staff Time		549 hours 73.2 days

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6.1 Internet

Hardware	Cost
IBM xSeries 225 Server Xeon 3.06 GHz. 512 MB RAM	\$1,704.00
2 - 160 GB IDE Hard Drives. One for Server as single drive and one for a workstation to be used for backup via FTP	\$658.00
Uninterruptable power supply	\$449.00
512 MB Upgrade for a total RAM in server of 1024 MB	\$464.03
Linksys 4 Port Router	\$129.00
KVM switch - to switch monitor, keyboard and monitor between servers	\$129.00
PST	\$282.64
Sub-Total	\$3815.67
Software	
Microsoft 2003 Server	\$964.70
FTP Voyager Secure Client (1 license)	\$109.00
FTP ServU Secure Server (1 license)	\$129.00
Wincron by Tomasello (incl taxes)	\$36.80
Logitpro web traffic monitor (incl taxes)	\$62.71
Geoportal by Cuesta license	\$8,900.00
MS Office Pro (to enter web traffic info and feedback data, incl tax) optional item	\$484.92
MapServer	N/C
Apache Webserver	N/C
Apache Tomcat	N/C
PST	\$808.22
Sub-Total	\$11,495.35
Professional Services	
Sever setup, router, ports (6.5 hours)	\$617.50
Cuesta Implementation (some of this cost was to switch Geoportal from ArcIMS to MapServer, and therefore would not be applicable to a new installation today)	\$7,280.00
Setup feedback form so that it is anonymous (incl tax)	\$170.10
Interface design (all but Geoportal)	
PST	\$631.80
Sub-Total	\$8,699.40
Total One Time Costs	\$24,010.42
Operation/Maintenance (Annual)	
MapServer Geoportal maintenance (incl tax)	\$2,160.00
DSL Service (basic service \$70/month - upgraded to 1MB upload at \$90/month)	\$1,166.40
Static IP (\$10/month)	\$129.60
Total Annual Costs	\$3,456.00



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Internet - Benefits

The website and mapping application was 90% complete by mid December 2004 and at this time a web traffic monitoring application was installed. From December 17, 2004 to May 17, 2005 there have been a total of 771 unique users and a total of 10,200 hits. The hit information is misleading since every function in Geoportal will generate a hit, even if the person is just panning a map.

A fifty percent increase in use was experienced following the launch of My Land, Our Water in the Maitland watershed at the end of June. By the end of July 2005, there have been 1300 unique visitors and 15,892 hits. Traffic will be monitored following the launch in the SVCA at the end of August to see if a similar increase occurs.

Based on the current traffic, it could be expected that there would be 1850 unique visitors to the site per year. Based on a five year hardware and software life and no major functional changes, each visit has a cost of \$4.46. This cost would likely be lower since some of the software will be of value longer.

The major benefit of this communications method is that people have been engaged that would normally not contact the Conservation Authorities. Neither office gets 150 requests a month for general information by landowners. The second major benefit is that staff time associated with making maps has been reduced. It is questionable whether the revenue from map sales covers all costs. The biggest issue in a small office is having the staff time for a given work plan, versus actual revenue. Staff are able to concentrate on larger and more proactive programs without the added work of information requests.

Another benefit is the ability for more staff to become self-sufficient in GIS. A small office cannot afford to have multiple GIS licenses and there is a concern with untrained staff using the GIS data. The web based mapping application allows a safe and easy interface for staff to query data, make maps and provide printed material for their program area. The use of Geoportal allows multiple versions to be running and therefore a custom interface can be developed for staff, landowners and municipalities with the appropriate data and tools.

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6.2 Extension Visits

Cost for staff time spent on preparing, delivering and evaluating twelve extension visits is detailed in the table below.

Task	Staff	Total Hours
Development and production of participants package: <ul style="list-style-type: none"> ■ project factsheet ■ surface water and groundwater factsheet ■ feedback form ■ visit summary for staff use 	Communications Coordinator	15 hours
Printing of maps for each visit	GIS Technician	1 hour per visit = 12 hours
Set up of visit schedule	Rural Water Quality Specialist Stewardship Coordinator	15 hours
Initial planning meeting	Rural Water Quality Specialist Stewardship Coordinator Communications Coordinator	1.5 hours x 3 = 4.5 hours
Conducting visits	Rural Water Quality Specialist Stewardship Coordinator	5 days = 37.5 hours
Training meeting to familiarize extension staff with My Land, Our Water	Rural Water Quality Specialist Stewardship Coordinator Project Coordinator	1.5 hours x 3 = 4.5 hours
Meeting to review progress after the four visits	Rural Water Quality Specialist Stewardship Coordinator Communications Coordinator	1 hour x 3 = 3 hours
Completion of participant feedback form and staff summary form for each visit	Rural Water Quality Specialist Stewardship Coordinator	1 hour per visit = 12 hours
Evaluation meeting following completion of visits	Rural Water Quality Specialist Stewardship Coordinator Communications Coordinator Project Coordinator	1 hour x 4 = 4 hours
Compiling of feedback and summary information	Communications Coordinator	15 hours
Additional follow-up as requested by participating landowners	Rural Water Quality Specialist Stewardship Coordinator	3 hours x 2 = 6 hours
Total Staff Time		17.13 days (1.44 days per visit)

Mileage was an additional expense associated with the extension visits. The average distance for a site visit was 80 km return.

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Extension Visits - Benefits

Based on feedback from participants and staff a number of benefits were identified for this method of communication:

- Participants were very positive about the visits both in terms of the information being presented and having contact with CA staff. This is likely, in part, a reflection of the fact that the initial group of extension participants were friends of the Conservation Authority.
- While the website can't address everyone's questions the extension visits offer the chance for participants to get specific questions answered by CA staff. It is a very personal approach to providing information about a landowner's property.
- While the My Land, Our Water project was the starting point of the visits discussion often ranged to other soil and water issues.
- The visits gave staff the opportunity to update landowners about projects the MVCA is delivering including Rural Water Quality Programs.

6.3 Kiosks

Costs for kiosk hardware were reduced by using older workstations from the MVCA and the SVCA offices. By using surplus computers there were no capital costs associated with setting up the kiosks.

Kiosk Method - Benefits

- Involves less staff time than the extension visits but still provides a personal approach to delivering basic surface and groundwater information. Users are able to ask specific questions about their property.
- Comfortable environment for users in that they have support from staff if they require it.
- Kiosk may increase traffic into the Conservation Authority offices which will provide opportunities for staff to discuss stewardship issues and programs with users.
- High quality copies of property maps are available to kiosk users on a cost recovery basis.

Task	Staff	Time or Cost
Set up of workstations	GIS Technicians	3 hours per office = 6 hours
Signs developed for office entryways	Communications Coordinators	3 hours per office = 6 hours
Training to familiarize staff with My Land, Our Water	Front office staff member in each office Project Coordinator - MVCA GIS Technician - SVCA	2 hours x 4 = 8 hours
Newspaper and farm publication advertisements launching My Land, Our Water ran in the MVCA watershed in July. Similar advertising is scheduled to run late in August in the SVCA watershed.	MVCA Communications Coordinator SVCA Communications Coordinator	4 hours staff time 2 hours staff time
Total Staff Time		26 hours of staff time (3.5 days) plus \$1500 in advertising costs

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7.0 LESSONS LEARNED

Based on the experiences of users to date it appears that a multiple communications approach will be most effective in delivering basic surface and groundwater information to rural landowners. While the My Land, Our Water mapping application is now at the stage that it requires little staff time, it is recognized that not every question can be answered through the website. In addition, most users are focusing on the mapping application and spending little or no time browsing the supporting material on the website. In comparison, the extension visits require a considerable amount of staff time but landowners are provided with a very personal service that is able to address their specific questions and concerns. In the MVCA watershed there remains a substantial percentage of rural residents that are not regular internet users. The extension visits showed that the participants without internet access were not interested in using the project kiosks. As a result it appears that providing the website coupled with a limited extension program will meet the needs of identified target audiences.

Additional work needs to be done to better evaluate how landowners respond to the vulnerability mapping information. In the testing that has been done so far the emphasis has been on evaluating the usability of the site. Now that the mapping application has been improved efforts are underway to document how users respond to finding out that their property is at low, moderate or high risk to surface or groundwater contamination. This process should also help to identify any additional content that users would like to have included on the site.

7.1 Lessons Learned - Website/Mapping Application

1. Response to the My Land, Our Water website has been very positive. In focus groups and small group evaluation sessions participants were enthusiastic about the mapping application. Despite navigation problems in early versions of the mapping application, users were interested and engaged in the property characteristics maps and the vulnerability mapping. When usage on the site is examined this interest in the mapping application is also clearly apparent. Approximately 90% of traffic is focused on the mapping application.
2. Staff are pleased with the choice of Cuesta's GeoPortal software for the mapping application. It has performed up to expectations with relatively few problems.
3. It is extremely important to design this type of mapping application for the average user. Initial versions of the mapping application were much too complex for users. Tools that staff were very comfortable using were not intuitive enough for target users to manage.
4. Repeated testing of the application with target users was instrumental in improving usability and identifying bugs. The assistance of a usability specialist during this process was very helpful.
5. Users indicated a strong preference for having clear steps to follow to produce the maps as opposed to having to manage the map layers on their own.
6. Users have been very enthusiastic about being able to easily access aerial photos of their property. Focus group testing in the Saugeen watershed indicated that these users would have preferred aerial photos to the base maps that they are currently able to see on the site.
7. Users had a strong preference for using their lot and concession information to find their property as compared to zooming in on a watershed map. Target users had difficulty orienting themselves to the watershed maps and identifying the general location of their property.

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7.2 Lessons Learned - Content

1. Keep it short. As expected, users read a very limited amount of text on-screen.
2. Branding the project as My Land, Our Water has been beneficial. The name has been useful in building an awareness of the project amongst MVCA and SVCA staff, Directors and community partners. Users and local media have been intrigued by the name which has assisted in advertising and promotion of the site.
3. To date users have been much more interested in the mapping application than the support material and contact information included on the website. This was true for both internet users and extension visit participants.
4. In the case of both internet users and extension visit participants there was a very positive response to the aerial photos. All users were pleased to have access to aerial photos of their property.
5. In presenting derived information, such as a vulnerability layer, it is important to present the information used to create it. It is also important to clearly qualify the use of the data. For example, the well locations shown to users represents the entire well database and not the screened one used to create the vulnerability index.
6. The concepts of ISI and SSI are difficult for users to understand initially. While providing descriptions of how these layers were created did assist users to a certain extent, providing extension staff with additional training relating to ISI may help to alleviate this problem. Once users understood SSI they were comfortable with the mapping. This appears to relate to the fact that SSI incorporates surficial features that are visible and familiar to landowners.
7. Staff noted that extension visit participants understood the limitations of the ISI mapping better than focus group and small group participants who were using the website.
8. During the project delivery, individuals were quick to question the applicability of the ISI mapping if they found that their wells were not mapped correctly. This indicates that the regional ISI mapping may not be useful when applied at a local farm scale.
9. Data products provided to the public must meet with provincial and federal data standards where applicable.
10. When project specific classifications and ranking systems are created and used, they must be clearly documented to avoid confusion.

7.3 Lessons Learned - Kiosks

1. More evaluation of the effectiveness of the kiosk approach is needed.
2. The extension visits showed that the participants without internet access were not interested in using the project kiosks.

7.4 Lessons Learned - Extension Visits

1. Landowners who participated in the extension trial were extremely positive about their site visits. The personal nature of these visits added to the participants' satisfaction with this method of communication.
2. The extension visit benefited the MVCA by providing opportunities for staff to discuss programs and stewardship issues in detail with participants.
3. Landowners raised a broad range of issues during the extension visits related to stewardship and agricultural practices. It was a benefit that the staff had a broad range of knowledge so that questions could be answered during the visit. However, they were not as comfortable answering questions related to ISI and SSI. This may have led to landowners questioning the applicability of the ISI layer on their property. The usefulness of this layer may be increased if presented with full qualification by a hydrogeologist or resource manager trained in ISI development, but this was not tested in this project.

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7.5 Lessons Learned - Response to Information

1. Although it is hoped that My Land, Our Water will encourage users to think about their farming operations in relation to water quality and quantity, participants in this project were not ready to make changes to their farming operation based on the information provided.
2. Crop consultants using the site have responded enthusiastically to the information provided and to being able to access it over the internet. One crop consultant has indicated that three hours of labour per plan are saved due to the website.
3. When using a derived layer the underlying layers must be accurate and applicable to users.
4. All of the extension visit landowners that had inaccurate water well information in terms of presence/absence or location were willing to provide the location to the extension staff to be used to update the database. There have been no data feedback forms submitted for well information from the 1300 unique visitors to the website. This may indicate that people are less comfortable filling out on-line forms as compared to speaking with a staff member.

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8.0 NEXT STEPS

Additional small group evaluations focusing on user response to groundwater and surface water vulnerability mapping (ISI and SSI). Emphasis will be placed on the qualification and applicability of regional scale ISI mapping used at a local farm scale. Efforts will be made to develop techniques to convey more detailed ISI data (i.e. inclusion of additional layers - depth to water table, depth to bedrock, flow direction) to users in a manner that is accurate and easy to understand. Additional training in ISI will be undertaken and the results tested.

- More detailed analysis of My Land, Our Water website traffic.
- The development of comprehensive follow-up packages for users who are interested in going beyond the basic surface and groundwater information provided on the website. It is recognized that the information currently available is simplistic and landowners contemplating changes in their land management practices will need more detailed information. This could include specific recommendations for best management practices, more detailed ISI information, and updates on the proposed source water protection planning process.

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9.0 ACRONYMS

MVCA	- Maitland Valley Conservation Authority
SVCA	- Saugeen Valley Conservation Authority
UTRCA	- Upper Thames River Conservation Authority
MNR	- Ontario Ministry of Natural Resources
MOE	- Ontario Ministry of the Environment
ISI	- Intrinsic Susceptibility Index
SSI	- Surficial Susceptibility Index
GIS	- Geographic Information System
WRIP	- Ontario Ministry of Natural Resources' Water Resource Information Project
WWIS	- Ontario Ministry of the Environment's Water Well Information System
DMZ	- In computer networks, a DMZ (demilitarized zone) is a computer host or small network inserted as a "neutral zone" between a company's private network and the outside public network. It prevents outside users from getting direct access to a server that has company data. (The term comes from the geographic buffer zone that was set up between North Korea and South Korea following the UN "police action" in the early 1950s.) A DMZ is an optional and more secure approach to a firewall and effectively acts as a proxy server as well.
NMAN	- Ontario Ministry of Agriculture, Food and Rural Affairs' Nutrient Management Program
ArcIMS	- ESRI's software program for Information Management, such as web hosting
GWISI	- Groundwater Intrinsic Susceptibility Index
USLE	- Universal Soil Loss Equation
RUSLE	- Revised Universal Soil Loss Equation
CN	- Curve number, a dimensionless number to characterize the potential for runoff
FC	- Deep percolation, an estimation in mm/hour of water infiltrating below the rooting zone
AES	- Atmospheric Environment Service, part of Environment Canada