

PARTICIPATING ON THE GEOWEB:

Evaluating the Effectiveness of the Geoweb for Supporting Participation in  
Environmental Governance Issues in the Okanagan Valley of British Columbia.

by

Patrick M. Allen

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**Abstract:**

The Geospatial Web (Geoweb) is taking an increasingly important role as a tool for supporting participation in governance. For the purposes of this study, web-based participatory tools, including a web portal, forums, blogs and a discussion map application now called Geolive, were developed to support collaborative planning efforts on environmental governance issues in the Okanagan basin of British Columbia. These tools were used to evaluate how effective the Geoweb is as a participatory tool for supporting environmental governance issues. A participatory action research approach, utilizing mixed qualitative methods, including surveys and focus groups, was used to involve project participants and gather their feedback on the design, development and usability of these web-based tools. The 20 participants involved in the study consisted of representatives from local, provincial and federal government, as well as local non-government organizations, the university and professional biologists. Preparation and refinement of the web-based participatory tools developed for the research extended throughout the timeframe of the study and as a result the project participants did not use them directly to support local-level environmental governance efforts. Thus, the effectiveness of the Geoweb for the purposes of participants in this study could not fully be determined. The research does however identify key concerns and suggestions regarding the design and development of effective web-based participatory tools. The findings are categorized and discussed based on the following themes: usability, technological capacity, cost, information abundance and credibility. Through the review of these themes in relation to current literature, this research provides insight into the concerns and issues associated with the effectiveness of Geoweb as a participation tool for environmental governance purposes. The research also contributes to the broader discussion of the sustainability of the Geoweb and of optimum technology design considerations for developing the Geoweb.

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## **1.0 Introduction:**

Organizations and individuals involved in environmental governance, from global-level concerns such as biodiversity depletion and climate change, to the local-level concerns like stream pollution, seek effective methods for engaging broad participation in the governance of these issues. Research by Kingston (2002) finds that the Internet is increasingly championed around the world as a new democratizing tool that could bring people closer together and allow them to better participate in governance. Findings such as this have led to a growing number of communities and institutions investing time and energy in developing and deploying web-based technologies for engaging the public in environmental issues.

An increasingly popular approach to developing participatory tools is by combining web-based technologies with maps, referred to as the Geospatial Web (Geoweb). The Geoweb allows users to assign geographic coordinates to user-generated content such as digital photos, videos and blogs (Hacklay, Singleton and Parker, 2008). According to Scharl and Tochtermann (2007) the Geoweb will have a profound impact on communicating knowledge, structuring workflows within and across organizations, and connecting like-minded individuals in virtual communities.

Due to the emerging nature of the Geoweb, there is a need for research into the effectiveness of these tools for supporting participation in governance. This thesis evaluates the effectiveness of the Geoweb for supporting participation in environmental issues through examining a case study of environmental governance efforts by the Okanagan Collaborative Conservation Program (OCCP) in the Okanagan Valley of British Columbia. The OCCP is a network of conservation-oriented organizations that work together on shared conservation planning and management related projects in the Okanagan Valley. In the last two years the OCCP has focused on developing web-based tools to facilitate

more effective communication and sharing of resources among its partners. This research examines the efforts of partners in the OCCP to design, develop and use the participatory Geoweb to support the identification of a potential north/south sensitive habitat connectivity corridor across political boundaries in the Okanagan Valley. The results of the case study are reviewed and discussed in the context of the literature to provide insight into the opportunities and challenges involved with the use of Geoweb based tools for environmental governance.

Using the Okanagan-based case study, this thesis sets out to evaluate the effectiveness of the Geoweb in supporting OCCP partners as they identify and discuss the connectivity corridor. It describes:

1. The design, development and application of the Okanagan Conservation Planning (OKCP) Geoweb portal,
2. Geolive - a map-based discussion tool created at the University of British Columbia Okanagan (UBCO), and
3. Revisions to the Okanagan Habitat Atlas, a web-based collection of spatial layers and data depicting habitat resources throughout the Okanagan.

These project tools are used within the study to represent the Geoweb, and project participants are requested to base their feedback with regards to the Geoweb as a participatory tool on their experience with these tools.

Using a participatory action research methodology, mixed qualitative research methods, including surveys, focus groups, semi-structured interviews and participation observation, are used to gather data. Research data is based on feedback and observations of project participants throughout the design, development and usage stages of the OKCP portal and the web technologies it provides such as Geolive and the Okanagan Habitat Atlas. Usability testing of these tools assesses their ability to aggregate community members' comments

and support engagement in on-going planning processes, including sensitive corridor identification and related decision-making.

This thesis evaluates the role of the Geoweb as a communication support tool in governance by addressing this primary research question:

- Is the Geoweb an effective tool for supporting participation in local-level environmental governance and if so, in what ways and to what extent is it effective?

Through addressing this research question, the thesis aims to contribute towards a greater understanding of issues that may mitigate the effectiveness of the Geoweb for supporting governance processes. In this way, the results of the thesis are intended to contribute to Public Participatory Geographic Information System (PPGIS) literature.

This first section of the thesis provides an introduction to the impetus of this research. Section 2 reviews literature on PPGIS and the emerging understanding of the role for the participatory Geoweb in environmental governance. Section 3 identifies the setting of the case study and explains the purpose for using the Geoweb as a participatory tool in this context. Section 4 presents the research methodology and outlines the mixed qualitative approaches used to gather data. Section 5 describes the design and development of the research tools. Section 6 assesses the results of the data gathering approaches and presents the results of the study. Section 7 discusses the results of the study based on five themes that evolved through participant feedback and observations on issues that may mitigate the effectiveness of the Geoweb as a participatory tool. It further relates these findings to the literature. Lastly, Section 8 concludes and summarizes the primary findings of this study.

The following section presents a review of relevant literature to provide background on the current understanding of the Geoweb as a method of participation in governance. The literature review begins with describing



governance; it progresses from discussing the role of local-level knowledge in governance to outlining the emerging role of the Geospatial web technologies as methods of engaging and supporting more effective participation in governance issues.

## **2.0 Literature Review:**

### **2.1 - Governance**

Governance is used to refer to methods and mechanisms for dealing with a broad range of problems and conflicts. For the purposes of this thesis, governance is considered in relation to managing different and often conflicting ideas about how resources should be allocated (Parto, 2005). The Commission on Global Governance defines governance as:

The sum of many ways individuals and institutions, public and private, manage their common affairs. It is a continuing process through which conflicting or diverse interests may be accommodated and co-operative action may be taken. It includes formal institutions and regimes empowered to enforce compliance, as well as informal arrangements that people and institutions either have agreed to or perceive to be in their interests (The Commission on Global Governance, in Weiss, 2000, p. 796).

Jasonoff and Martello (2004) describe governance as the process by which stakeholders arrive at mutually satisfactory and binding decisions by negotiating and deliberating with each other and cooperating in the implementation of these decisions. The former UN Secretary-General Kofi Annan specifies that 'good' governance also involves ensuring respect for human rights and the rule of law; strengthening democracy; and promoting transparency and capacity for public administration (in Weiss, 2000 p.797). Hajash (2009) adds that governance can also be considered as the art of steering societies and organizations, to apply the rules with which they conduct themselves. Parto (2005, p. 5) simplifies the notion of governance even more as, 'the way human communities organize themselves'. He further points out that there have been various forms of governance, both formal and informal, for as long as there have been human societies.

In recent decades, the term governance has been used to reflect the continuing processes through which conflicting or diverse interests may be accommodated and co-operative action may be taken (Commission on Global Governance, in

Weiss, 2000). According to Stoker (1998) governance represents a change in the meaning of government, referring to a new method by which society is governed. From this perspective, community involvement and co-operation is key to implementing successful governance.

### 2.1.1 - Environmental Governance

Within this thesis, governance is referred to in the context of methods and mechanisms for dealing with environmental issues. Smith and Pansapa (2008) define dealing with environmental issues such as pollution, resource management and resource depletion as environmental governance. Pressing environmental issues such as these, are not only local concerns, but also global challenges that are increasingly having an impact in our everyday lives. As a result, our collective understanding of the environment is changing, as well as our understanding of how we interact with it.

Bakker (2003, p.5) provides the following definition of water governance that is applicable to understanding environmental governance processes:

“Water governance is the range of political, organizational and administrative processes through which communities articulate their interests, their input is absorbed, decisions are made and implemented, and decision makers are held accountable in the development and management of water resources and delivery of water services.”

In relation to this definition, Brandes, Ferguson, M’Gonigle and Sandborn (2005, p. iii) describe the ultimate goal of environmental governance as “ensuring that natural ecosystem processes be carefully considered in all decision-making processes up and down a watershed”. They argue that government, business and the public must participate in decision-making processes in order to incorporate sustainability into environmental governance.

Kemp, Parto and Gibson (2005) also argue that environmental governance should integrate sustainability objectives, and thereby serve as a mode of steering and coordinating interactions and collective decisions towards

sustainable development. Brandes and Curran (2009) add that environmental governance should involve society in planning for sustainable development, through creating public and private working and decision-making arrangements with ecological principles embedded within them.

‘Sustainable development’ is a broad and ambitious term that the World Commission on Environment and Development, known as the Brundtland Commission (1987: Chapter 2) defined as ‘development that meets the needs of the present without compromising the ability of future generations to meet their own needs’. Kemp, Parto and Gibson (2005), suggest that modern concepts of ‘governance’ and ‘sustainable development’ both emerged in the late 1980s in response to the growing desire to address global issues and that they share characteristics and overlapping potential.

Today, the link between sustainable development and our evolving understanding of governance continues. Kemp, Parto and Gibson (2005) see the public as more powerful now with respect to influencing how governance is exercised. They suggest that this has been achieved through increased realization and understanding of rights to information and co-determination, as well as more radical actions such as consumer boycotts.

International banking organizations such as the Asian Development Bank (2001) now recognize environmental governance entails the integration of environmental objectives with social, political and economic objectives such that the long-term sustainability of ecosystems is preserved. Roseland (2005) recommends that new approaches to governance be non-compartmentalized, open, decentralized, flexible, and holistically deal with environmental issues in the context of other community issues in order to contribute towards sustainable community development. In his review of environmental governance, de Loë (2009) references diverse literature by writers such as Levin (1999), Berkes (2003) and Glasbergen (1998) who also believe that the boundaries between ecological

systems and social systems are dissolving and that environmental issues have given new impetus to the debate on the opportunities and limitations for managing social change.

#### 2.1.2 - Public Participation in Environmental Governance

According to the definition provided in Section 2.1, governance should encourage and enhance public participation. Bowles and Gintis (2001) note that citizens have the most direct experience – and, therefore, the greatest understanding – of the needs, capacities and behaviours of their community. Fisher (2000) adds that having a solid understanding of local citizens' understandings is essential to effectively identifying and defining significant problems. In this regard, local knowledge plays an important role in problem identification and in determining solutions to these problems. Also, as identified by Gronholm (2009), involving citizens can identify ways to explore a range of alternatives, and explores the consequences of choices (Gronholm, 2009).

Carver (2001, p.61) refers to the process of ordinary citizens getting involved in discussing, sharing information and making decisions regarding the implications of social and economic changes as 'public participation'. It has been found that when citizens are well organized in groups, and their knowledge is sought, incorporated and built upon during planning and implementation, they are more likely to support and sustain activities in the long-term (Pretty and Ward, 2001).

Engaging the broader community is a key component of good governance (McCall and Minang, 2005), since anything beyond the simplest of problems cannot be handled either by individuals acting alone nor by governments (Bowles and Gintis, 2001). According to Agyeman and Angus (2003), a greater sharing of control by citizens, non-government organizations and local governments reflect a 'broad focus' on civic environmentalism, where communities work together on governance of the environment.

Concern over environmental issues such as habitat degradation, climate change and their resulting local and global-level impacts is often a motivating factor for the public to demand a say in decision-making processes. Research by Rydin and Pennington (2000) identifies local-level participatory approaches to environmental governance as being the most effective way of accessing local knowledge and helping local communities act globally to address environmental issues. Jasonoff and Martello (2004) add that in making room for local knowledge, groups dealing with environmental issues internationally have learnt that environmental governance at a global level requires recognition of the divergent ways in which the world's people have chosen to make sense of nature and the environment.

Bowles and Gintis (2001) find that local-level governance can address state failures, for example, enhanced small-scale local responses such as developing cooperatives increase in importance for handling the economic problems that in turn influence how communities manage local-level environmental issues. Following this line of reasoning Weiss (2000, p. 807) states, "the best way to achieve support for global issues is, therefore, through increasing the skills and capacities of individuals in the community at the local-level".

Governments around the world increasingly use participatory based planning processes to bring people together to deal with problems and develop sustainable policy solutions for land use and resource management issues. In a review of the forest sector in Alberta, Parkins (2006) notes that in Canada, government is orientated towards providing a greater role for the public in policy development and that there is a noticeable movement toward greater public participation as a key component of environmental governance. Brandes and Curran (2005) support this direction, arguing that the collective power of citizens to direct their future is embodied in the institutions of governance that mediate the relationships between citizens, the economy and the environment.

According to Hodge and Gordon (2007) provincial planning legislation across Canada ensure that planning and policy development processes support avenues for public comment and consultation. Legislating a role for the public in planning processes is widely considered to be a positive step, for as Jasonoff and Martello (2004) point out, it signifies that local communities and groups are no longer seen as mere victims of ecological breakdown; rather, they are assumed to hold some part of the solution to these problems.

By involving the public in sharing their local knowledge, participatory planning approaches seek to develop plans for growth that are most likely to receive local support during implementation. According to Hodge and Gordon (2007) methods of communicating with the public have traditionally involved information sessions, neighbourhood notifications, focus groups, surveys, referendums and consultation documents to attempt to engage participation in planning processes.

Traditional methods of engaging the public in planning processes have been criticized for several reasons (Healey, 1998). One reason Kingston (2002) points out is that activities that solicit participation are usually held in a fixed place like a town hall at a fixed time, this limits segments of the population from attending. Public meetings are also often confrontational, can be dominated by minority vocal groups, are often difficult to understand for laypersons and can go on for a long period of time (Kingston, 2002).

When methods for engaging the public are poorly provided or if decision-making is found to be distant from citizens at the local-level, a number of negative outcomes may result, including individuals taking their own, rather than collective, action in determining solutions or, people becoming apathetic due to their inability to influence decisions that affect their lives. According to Dale (2001), if people do not feel that their voices are making a difference, they become disempowered and, ultimately, disengaged.

Despite the method of engagement used, it is standard for public participation rates to be low in planning processes and for the public to be dissatisfied with the level of involvement that participatory methods provide them. In 1969, Sherry Arnstein defined eight levels of citizen participation within planning processes that Hodge and Gordon (2007) categorize into three types of power sharing as follows:

- '*Contrived participation*', in which the sharing of any planning power is avoided;
- '*Token participation*', in which a bare minimum of power is shared with citizens; and,
- '*Power sharing*', in which citizens take increasingly greater degrees of power over planning decisions (Hodge and Gordon, 2007).

Lukensmeyer and Torres (2006) have identified five related elements of engaging the public: informing, consulting, engaging, collaborating, and empowering. Ganapati (2010) argues that, in all of the models of public participation, the level of 'information provision' that most governments remain limited to is within the lower levels on the spectrum of participation. He argues that meaningful participation only takes place in the higher levels, such as collaboration and empowerment, where citizens know their contribution can have an impact on decision-making processes.

In order to empower people towards higher degrees of participation, it is important that they recognize how their personal actions impact local decision-making and resource management planning processes. Shifts towards a greater role for local citizens in environmental governance recognize that broad public participation in evaluating and monitoring local-level land, water, and air issues also helps people understand and support environmental planning. Continued effort is needed to determine effective measures for sharing information on natural resource issues and to engage people in planning processes. This includes both providing opportunities for people to gain access to information on



related issues, as well as providing them with opportunities to share their own knowledge about problems and the potential impacts of proposed solutions.

Involving the public in governance decision-making can also mean sharing responsibility and juggling diverse vested interests in resource use. New mechanisms such as markets, co-management arrangements and non-state actors (e.g., private sector organizations, non-government organizations, public private partnerships) are taking on key roles in the implementation of environmental governance. However, it is argued by authors such as Stoker (1998) and McCarthy (2003) that the increasing role of diffuse interests in environmental governance challenges governments' ability to achieve the greater public good in the management of natural resources. For example, while contracts with private businesses and organizations, appointed bodies, public-private partnerships and round tables are all new approaches designed to integrate diverse voices and assist in making decisions, this broad collaboration can result in what Stoker (1998, p. 23) refers to as an "accountability deficit". In other words, a participatory approach to governance appears to remove anyone from being responsible for decisions, or the long-term results of decisions.

Both Stoker (1998) and McCarthy (2003) question whether the notion of "multi-stakeholder governance" is a ploy to distract public attention from government cost cutting and offloading of decision-making responsibility without the accompanying provision of capacity within government itself to be responsible for the results of decisions made on behalf of the public. They question whether new approaches to governance are merely old governance structures being rebranded to reflect today's privatized, market oriented society. In this line of thinking, governance is positioning government in a new, more closely partnered role with private interests, while shifting responsibility and offloading the costs associated with decision-making roles. This shift sees government step back in an effort to push increased responsibility for decision-making onto the private and voluntary sectors and, more broadly, the citizen (Stoker, 1998).

The issue of how to achieve balanced governance structures and what they could and should look like is at the crux of this thesis. Rydin and Pennington (2000, p. 166) argue that, "to ensure that community cooperation to deliver on effective environmental governance policy will result, more complex participatory structures are needed." De Loë (2009), believes new approaches to governance require providing opportunities for adaptability and positive transformation by incorporating diverse points of view within group decision-making processes and providing shared learning experiences. However, further research into the long-term outcomes of current environmental governance practices is required in order to determine effective governance approaches towards sustainable development outcomes.

## **2.2 - The Internet and Public Participation**

Research into current Internet activity and e-commerce use shows that over half a billion people worldwide make use of the World Wide Web (Norris, 2007). The Internet has become a widely accepted part of popular culture within a short period of time. Kingston (2002) argues that the Internet has become part of society faster than any other technology such as television, the telephone or automobiles.

The popularity of the Internet offers diverse opportunities for engaging participation in governance. According to Kingston (2010) the Internet is rapidly becoming a preferred method for people to communicate with their elected officials. He found through research in England that when people complain to their local council about environmental issues 27% now use the web, 1% face-to-face and 72% use the telephone.

The Internet offers the potential to address some of the challenges to public participation discussed in Section 2.1.3 for segments of the public and even to reach audiences, such as youth, working parents or ethnic groups who have not

responded to typical participatory methods. Carver (2001) suggests that engagement processes over the Internet can be more transparent than other methods of communicating such as telephones, written letters, surveys, or face-to-face. He notes that online forums and discussions, web surveys and online decision support systems have expanded the opportunities for engaging participants, and are taking an ever-increasing role as methods for accessing information, contributing feedback, sharing opinions and monitoring the results of decisions. The Internet allows people to review the opinions and feedback of other users, assess problems in an area, how they are being dealt with, and reflect in preparing their own response.

As a participatory tool, the Internet is potentially a powerful method for engaging with elements of the public that are often disgruntled over their elected government representatives not representing their points of view (Norris, 2007). Flanagin and Metzger (2008) describe the Internet as a dynamic, collaborative environment in which diverse information, opinions, experiences, and skills can be aggregated to provide substantial resources.

In his paper on the politics of local knowledge, Fischer (2000) highlights the importance of facilitating citizen involvement in commenting on and discussing social implications of expert analyses. He notes that participation tools such as on-line maps are valuable as tools for creating dialogue between decision makers and residents, encouraging learning about local concerns and increasing scientific understanding (Cinderby, Snell and Forrester, 2008).

Research by Elliot (2007) finds that Internet applications help people connect with local-level issues such as environmental concerns and lower barriers to participating in, learning about and sharing their thoughts related to these issues. Carver (2001), identifies the following benefits of Internet use in breaking down key barriers to participation:

- Participation is not restricted by geographical location.

- Relevant information can be accessed from anywhere.
- Information is available at any time of day that is convenient to who is seeking it.
- Participants can express their views anonymously (for some this is less confrontational).

Talen (2000) indicates that there have been many studies that show how the Internet empowers local organizations by providing better access to information. Furthermore, according to Norris (2007), the Internet offers the potential to increase inclusiveness in governance processes by facilitating a broader conversation across all stakeholders and the public at large. Conversely, the difficulties in structuring such a conversation, and indeed questions surrounding whether online exchanges can facilitate a meaningful forum for debate, learning and compromise are very real. They represent critical design issues that must be addressed if we are to create a system of functioning democracy that relies in whole or in part on the use of the World Wide Web (Norris, 2007).

If the aim of on-line participatory systems is to engage diverse segments of the public by giving them greater level of access to the relevant tools, data and information that will enable informed participation and decision-making (Kingston, 2002), then we must find tools that facilitate that process. Integration of Geographical Information Systems (GIS) into the planning process is one such approach that has become standard at all levels of planning activity (Nedovic-Budic, 1998).

### 2.2.1 - Geographical Information Systems (GIS)

A GIS is a computerized mapping and database system capable of managing and manipulating spatially referenced data (Carver, Evans, Kingston and Turton, 2001). Chrisman (1997) describes GIS as a system of hardware, software, data, people, organizations and institutional arrangements for collecting, storing, analyzing and disseminating information about areas of the earth. According to

Steinman, Krek and Blaschke (2004), GIS functionalities include basic operations such as zoom, pan, copy, and paste themes between views, spatial queries or simple calculations to more complex operations such as topological overlay, 3D visualization or statistic calculations.

GIS can offer local organizations and individuals greater understanding and awareness of the spatial implications involved in decision problems. Open provision of GIS over the Internet offers the potential to put all stakeholders, including the public, on the same footing (Carver, 2001). Based on this belief, there have been great strides in research and technology that facilitate peoples' interaction with GIS, allowing them to explore spatial issues and present their viewpoints on decision problems in a spatial context.

As a result, today GIS is widely used in planning processes as a decision-support tool, helping to engage the public through increasing access to spatial information. Grassroots groups and community-based organizations are increasingly making use of GIS as tool for capacity building and social change (Sieber, 2006). According to Sieber (2006, p. 491), "the use of GIS has been furthered by members of the public and private sectors who believe that access to computer tools and digital data forms an essential part of an informationally enabled democracy". Carver (2001), adds that GIS-based decision tools should provide the means by which stakeholders can explore a problem using existing information, experiment with possible solutions, view other people's ideas, formulate their own views, and share their thoughts with the wider community.

#### 2.2.2 - Public Participatory GIS (PPGIS)

Public Participatory Geographical Information Systems (PPGIS) is a concept, process and practice that describes the use of GIS technologies to capture and communicate local spatial knowledge with the goal of including and empowering marginalized groups (i.e., youth and/or immigrant groups) and organizations in governance related activities (Brown and Reed, 2008).

Sieber (2006) defines users of GIS technologies as stakeholders who are affected by, bring knowledge or information to, and possess the power to influence, a decision or program. 'Stakeholder' is understood to be any person or community that has a concern in a process or in a geographical area through residence, work or interest. Stakeholders may be people with resources to share, decision makers and/or people affected by the decisions. Further to this, Cinderby, Snell and Forrester (2008) add that stakeholders involve a whole range of actors from statutory agencies through to individual citizens.

According to McCall and Minang (2005), by using local knowledge and exposing local stakeholders to geospatial analysis, PPGIS empowers community members' participation in decision-making for land-use planning decisions. Sieber (2003) also finds that PPGIS succeeds in supporting better policy-making when the opportunity to utilize spatial information is extended to all relevant stakeholders in a public decision-making process. Harris and Weiner (1998) caution however that while the overall goal of PPGIS is empowerment, the outcomes of a PPGIS endeavor can be the simultaneous empowerment and marginalization of a particular community or group.

As a method of public engagement in decision-making, PPGIS provides a unique approach to incorporating local knowledge, integrating and contextualizing complex spatial information, allowing participants to dynamically interact with input, analyze alternatives and empower individuals and groups (Sieber, 2006). Drew (2003) adds that PPGIS aids in articulating stakeholders' views, increasing individuals' or groups' understanding of spatial issues, making complex decisions more transparent and objective, and in disseminating or sharing information, resolving conflicts, and enabling greater exploration of ideas (Sieber, 2006).

Corbett, Rambaldi, Kyem, Weiner, Olson, Muchemi, McCall and Chambers (2005) argue that the process of carrying out PPGIS can also have profound implications for marginalized groups in society, such as:

- Enhancing capacity in generating, managing and communicating spatial information;
- Stimulating innovation; and ultimately,
- Encouraging positive social change.

They also find that the tools generated and used for PPGIS can become interactive vehicles for networking, discussion, information exchange, analysis, and decision-making.

Methods of PPGIS include a combination of digital cartography, satellite images and air photo interpretation, mental mapping exercises, spatial multimedia, geo-visualization, and virtual GIS, with digital mapping at the core of PPGIS efforts. According to Harris and Weiner (2003) PPGIS emphasizes the participatory methods used in the production of GIS and the importance of participation as a process that can take many forms. They add that popular participation engages with various elements of civil society in a community and assumes both social and spatial differentiation. They add that in this way, PPGIS can be conflictual and get caught up in local politics, but that it is more representative of the diversity of opinions held by segments of the public.

Since the 1990s, the use of PPGIS applications for supporting stakeholders in decision-making processes has been extensive, ranging from community and neighbourhood planning, to mapping traditional ecological knowledge of indigenous people (Brown and Reed, 2008). According to McCall and Minang (2005), PPGIS has two decades of history of being applied to both participatory spatial planning for rural 'community-based' natural resources - such as land claims issues, and land and resource management. PPGIS is also widely used for urban oriented 'participatory neighbourhood planning' processes addressing conflict management, the mapping of social and environmental inequalities and building community through raising awareness of cultural identity. Sieber (2006) points out that PPGIS projects concentrate on supporting various stages of a more collaborative planning process, such as disseminating planning-related

information online, easing the understanding of analyses through visualization, and weighting alternatives utilizing graphical user interfaces.

In a review of ecological governance measures for sustainable water management, Brandes, Ferguson, M'Gonigle, and Sandborn, (2005) show that new innovations into the use of web-based PPGIS technologies increase and, in many cases, improve the ability to facilitate citizen participation in planning processes. The technologies increase people's understanding of the issues at stake, allowing them to better contribute towards dealing with pressing environmental problems. GIS is regarded by researchers such as Sieber (2006) as a tool for capacity building and social change that has been championed by members of the public and private sectors who believe that access to computer tools and digital data forms an essential part of an information enabled democracy. One of the main strengths of GIS for environmental governance lies in its ability to handle spatial information and communicate this to interested stakeholders, and in turn, accept, organize, and reflect inputs (spatial or otherwise) that users provide during the participation process (Carver, 2001).

In recent years, researchers have taken significant interest in the development and analysis of innovative new tools for participatory uses of GIS. Talen (2000) points out that multimedia and hypermedia components are just two of the new approaches to improving how decision makers interact with GIS. These resulting tools, referred to as geospatial technologies, have advanced rapidly and are increasingly becoming integrated into everyday life. In 2008, Ben Macintyre from the Times of London newspaper announced:

"A new golden age of cartography has suddenly dawned, everywhere. We can all be map-makers now, navigating across a landscape of ideas that the cartographers of the past could never have imagined" (Macintyre, 2008).



In 2010, we are now well established in the golden age of cartography and the most current evolution of web technologies that is already widely known by popular culture is Web 2.0.

### **2.3 - Web 2.0**

Back in the early years (1990s) of the Internet, a user downloaded content from a webpage. Goodchild (2007) referred to this as a one-way relationship.

According to Goodchild (2007) by the early 2000s the role of users has become more sophisticated, as the ability for users to access and add information on all variety of topics to databases was developed. In the new era of what has been referred to by Goodchild and others as 'Web 2.0', users can now use Web applications to generate content, edit content contributed by others, allow users to edit their own content, and self or communally monitor content with or without moderation or restriction on the content.

O'Reilly (2005) visualizes Web 2.0 as a set of principles and practices that tie together a myriad of sites that continually evolve with users contributing, editing and monitoring content. According to O'Reilly, the main principle is that the web itself serves as a platform for accessing services and that these services get better as more people use and contribute to them.

Web 2.0 appears to have arisen somewhat organically out of the increasing capacity for interaction on the web, represented by the growth in popularity of online blogs and user-generated information sources such as Wikipedia (Helft, 2007; Keen, 2007; Tapscott and Williams 2006; Sui, 2008; Goodchild, 2007). Facebook, Myspace, Linked In, Flickr and Habbo, generally referred to as 'social networking' sites, are widely known applications of Web 2.0 technology that are used for communicating and sharing information with associates worldwide over the Internet.

A Wikipedia search (2010) found that Flickr has 32,000,000 users and Facebook over 500,000,000 users worldwide. Lenhart (2009) found that the use of social network sites such as MySpace, Facebook or LinkedIn by adults in the USA increased from 8 percent in early 2005 to nearly 46% in 2009, clearly indicating the growing popularity of these technologies as communications tools. Applications such as these are often freeware or open-source, meaning that there is no fee for their use, a feature that seems to contribute to their broad appeal.

Given the mass popularity affiliated with these technologies, Web 2.0 is seen to play an increasingly important role in supporting the communication of local-level knowledge, as well as in providing opportunities for the public to collectively depict their own realities. Ganapati (2010) finds that the Geospatial capacity of Web 2.0 platforms further enhances their participation capacity from mere information provision tools to tools that can empower the public to actively participate in decision-making processes. Sieber (2006) provides the following three main reasons geospatial information contributes to planning processes:

- Most information used in policymaking, whether with regard to crime, land-use planning, environmental health, habitat conservation, or social service provision, contains a spatial component, i.e., address, latitude/longitude.
- Extending the use of spatial information to all relevant stakeholders presumably leads to more targeted policymaking.
- Policy-related information can be analyzed and visualized spatially, and the resulting output (mainly maps) can persuasively convey ideas and convince people of the importance of those ideas.

Ganapati (2010) describes how the capacity of Web 2.0 to add a geographical element provides participants of popular social networking sites such as Facebook with GIS and GPS capable smart phones with the ability to participate in public processes in real time and space. Sui (2008) adds that new technologies such as these carry the potential to bridge the gap between

technologies that are truly participatory, and end results of participatory processes, such as neighbourhood plans, that can be considered to reflect public input. He believes that this success is embedded in the nature of these technologies to facilitate processes that can enhance the capacity of individuals to improve their own lives and facilitate social change through education and community cohesion.

#### 2.3.1 - Geospatial Web Technologies – ‘The Geoweb’

Geospatial web technologies are commonly referred to as the Geoweb, and are closely affiliated with Web 2.0 (Goodchild, 2007; Sui, 2008) and GIS/2 (Miller, 2006 and Sieber, 2006). Elwood (2008) defines these new technologies as ‘not-quite-GIS’ assemblages of hardware, software, and functionalities. The Geoweb furthers the goal of PPGIS in that it seeks to use these technologies to engage and empower people to access and share local information by supporting their ability to interact with spatial data and contribute and share their own knowledge and ideas in association with locations on a map.

By providing individuals with the opportunity to add and edit their own data on the web, a voice is given to those who are the most knowledgeable about the issues that surround and affect them specifically (Miller, 2006).

The Geoweb has shown itself to have the potential to reach large numbers of people, cater to a growing pop culture and evolve to meet changing demands of an increasingly technology-oriented society. The implications that advancements with Geoweb technologies could have for engaging people in contributing and sharing their local knowledge (e.g., community plans) will depend upon how such projects are approached, and the objectives that are sought.

The capacity to collaborate with a group of similarly situated individuals, and spatialize data that represents a commonly held understanding may, as Sieber (2006) points out, constitute in and of itself a form of participatory development. It empowers members of a given community, while simultaneously educating

them about the people and the places that the map serves to illustrate.

Furthermore, through the use of online tools such as maps, communities in one part of the world can learn from communities sharing common characteristics in regions all over the world (Sieber, 2006).

It is common for today's Internet oriented citizen to want the ability to quickly and easily look up an issue on their personal media device or share their thoughts on routine issues today such as movies, hotels, restaurants, tourist attractions and news items. Such contribution of information is referred to as volunteering geographic information – or VGI.

### 2.3.2 - Volunteered Geographic Information (VGI)

Information such as maps, text, audio, videos, photos and blogs that are contributed by individuals to the Internet are referred to as 'user generated content'. Goodchild (2007) coined the term 'Volunteered Geographic Information' (VGI) for this type of information that also has embedded location information. According to Coleman, Sabone and Nkhwanana (2009) these terms refer to public participation geographic information systems (PPGIS) where interested individuals have offered input and feedback to professionals and communities of interest in both roundtable and web-based settings (Coleman, Sabone and Nkhwanana, 2009). Connections between VGI and the literature in PPGIS are also supported by Tulloch (2008), who refers to the frameworks and comparisons of PPGIS as a potential locus for housing ideas about VGI and connecting it with existing literature.

Goodchild (2007) describes VGI as the harnessing of tools to create, assemble, and disseminate geographic data provided voluntarily by individuals (Brown and Reed, 2009). Based on the usage of VGI to date, Tulloch (2008) describes it as a series of applications in which people, either individually or collectively, voluntarily gather, organize and/or disseminate geographic information and data in such a manner that many others can use the information. According to Tagg

and Taylor (2006) integrating local knowledge with information technology provides a common information base that is understandable, acceptable and freely available to all partners.

Today, nearly anyone with access to the Internet can contribute and share geographic information. Survey data from research by Lenhart (2006) between 2004 and 2006 in the USA, shows that common uses of the Internet for contributing content include the following:

- Creating a personal webpage, creating webpages for others,
- Sharing something online that they created themselves, such as artwork, photos, stories, or videos.
- Remixing content found online into a new creation
- Maintaining an online journal or blog
- Rating a product, service
- Using online social or professional networking sites

VGI is a significant part of the current popular culture in which people are discovering, exploring and pushing the potential of web-based technologies as a new form of communication. Goodchild (2007, p. 4) refers to the popularity of Google Earth, which has been downloaded by several million people around the world, as the 'democratization of GIS' because it has opened some of the more straightforward capabilities of GIS to the general public. According to Goodchild, tools such as this are making previously sophisticated GIS tasks possible for novice users of the Internet to manage in mere minutes.

Goodchild (2007), Sui (2008) and Elwood (2008) refer to developments with VGI as being driven by citizen demand to describe and disseminate their own observations and geographic knowledge versus professionals who have traditionally been charged with producing spatial data. Individuals are making use of the growing number of tools at their disposal to communicate what they see and how they interact with the world around them. According to Elwood

(2008) a growing number of cell phones, digital cameras, personal digital assistants (PDAs) and other handheld devices use Global Positioning System (GPS) technology to provide users with information on their location, or to add locational information to other media, such as digital photographs, narrative text or video clips (Elwood, 2008). Capturing the geographic location of information posted online such as its latitude/longitude or place name is referred to as Geotagging. More specifically, a geotag is defined by Goodchild (2007, p.7) as a, “standardized code that can be inserted into information in order to note its appropriate geographic location”.

Wiki-mapping, Geovisualization Application Programming Interfaces (API's), and geo-tagging share something in common with geographic information systems, in so far as they play a part in the digital storage, retrieval, and visualization of information based upon its geographic content (Elwood, 2008). Goodchild (2007) explains that the advent of easy to use GPS devices for purposes such as Geotagging has sparked all sorts of VGI activities such as creating maps while people walk, bike, drive, run and generally make their way around their communities. In this regard, VGI is providing insight into geographic information that is not available through traditional cartographic representations.

A tremendous amount of user-generated or ‘volunteered’ geographic data is now available on-line with place-based data, images and other geographically relevant information. Flanagan and Metzger (2008) point out that this information greatly enhances the overall body of environmental knowledge as it is typically provided by individuals with indigenous experience and understanding of a particular physical environment and current information on local conditions.

### 2.3.3 - The Volunteers

Local people often have unique knowledge of the area in which they live and thus can reasonably be expected to provide detailed insights into local phenomena that are not normally available via ordinary geographical information datasets

(Carver, 2001). People also tend to be most interested in problems that pertain to their area and affect them directly (Carver, Evans, Kingston and Turton, 2001).

Public participatory engagement methods traditionally have sought to include this local insight in local and regional planning processes. Web-based public engagement methods such as PPGIS and Geoweb technologies offer new opportunities to facilitate the engagement of diverse segments of the public in sharing information on local issues and enabling individuals to volunteer their own local knowledge.

In the paper *Citizens as Sensors*, Goodchild (2007) proposes that humans are sensors of information and that the 6 billion people on the planet today offer a network of intelligent synthesizers and interpreters of local information. According to Goodchild (2007), VGI can be seen as an effective use of this network, enabled by Web 2.0 and the Internet technology of broadband communication.

The popularity of new trends in GIS such as VGI have, according to Sui (2008), transformed the public from being passive users of GIS to being active users and contributors of geospatial information. Flanagan and Metzger (2008) explain that the interactivity of Internet design in general allows users to play the dual roles of information consumer and information provider. Tulloch (2008) argues that the users of these technologies are often now the innovators of new applications, despite having limited to no backgrounds in related PPGIS research and literature.

Advancements with Web 2.0 expand upon this interactive dynamic by facilitating the creation and sharing of all types of information, programs and applications to serve diverse needs and interests, helping people learn about and share a broad range of spatial knowledge. As a result of these advances, we are witnessing

the emergence of what Sui (2008, p. 5) refers to as, "geography without geographers".

Furthermore people with access to mobile Internet devices and GPS mobile phones are, knowingly or not, the collectors and contributors of data (Tulloch, 2008). A report by Lenhart (2006) on survey data in the USA from 2004 to 2006 collected by the Pew Research Centre provides insight into these users and contributors of data. The report showed that 73% of American adults 18 and older go online, while 87% of American teens 12-17 go online. Further findings of this research include the following:

- 35% of Internet users in the USA have created content and posted it online
- Teens are significantly larger users of the Internet for creating content and posting it online
- Men are greater users of the Internet than women
- Income level did not seem to be a clearly determinative factor of users contributing information.

Flanagin and Metzger (2008) interpret these findings as suggesting that the large percentage of the population is participating in creating and sharing information online. A search of the usage rates of the globally popular online program Google Earth, shows that there have been over 200 million unique downloads of Google Earth since its launch in 2005 (Google Press Centre, 2010). Popularized on-line tools and applications like Twitter and Facebook have also gained broad usage by diverse sectors of the population. The growing familiarity with these forms of technologies appears to be moving the general population's comfort zone towards acceptance of integration of these technologies into how they participate in public affairs.

In the 2008 elections in the USA, a Pew Internet survey found that for the first time in a US election, more than half of the voting-age population used the



Internet to get involved in the political process (Smith, 2009). Smith (2009) adds that 74% of Internet users went online in 2008 to get involved in the political process or to get news and information about the election.

Ganapati (2010) points out that government use web-based engagement tools are slowly evolving. However, sites such as FixMyStreet, which is designed for the specific purpose it identifies, help local governments with limited resources gain first hand information on priority infrastructure repairs as identified by local residents. Web-based resources are also taking on an expanding role with environmental governance within government. Sites such as the Community Mapping Network in British Columbia ([www.cmnbc.ca](http://www.cmnbc.ca)), the Green Map System ([www.greenmap.org](http://www.greenmap.org)) and the Landscape Values and PPGIS Network (<http://www.landscapevalues.org>) represent the expanding popular movement towards engaging citizens with online mapping tools and facilitating them in sharing and contributing towards local knowledge on habitat resources.

## **2.4 - Research Question**

Despite the diversity of hurdles that still face large segments of the population (e.g., access to computers, speed of internet connection and skills) in accessing and using the Internet, citizens are increasingly being provided the opportunity to contribute feedback on neighbourhood, community and regional land use planning exercises via the Internet. Opportunities for citizens to share their local knowledge and contribute feedback using web-based technologies such as Google, Twitter, Wiki or Facebook applications are being provided within many communities within Canada and around the world. However, there is a growing need for research that assesses the success of these efforts and identifies the most effective applications of these tools.

In light of this, this research asked the primary research question, 'is the Geoweb an effective tool for supporting participation in local-level environmental

governance, and if so, in what ways and to what extent is it effective'? In addition to this question these related sub-questions are addressed:

- What issues limit the Geoweb's potential as a tool for governance related participation?
- Is the Geoweb sustainable as a method of participation in governance?

The following section presents the Okanagan case study that was used to explore the application of Geoweb technologies in supporting environmental governance efforts at a local-level. This case study examined the design, development and use of web-based tools for supporting localized efforts to participate collaboratively in environmental governance concerns in the Okanagan Valley of British Columbia.

### 3.0 Collaborating on Environmental Governance in the Okanagan:

#### 3.1 - The Okanagan Valley

The Okanagan Valley is a semi-arid region with desert like habitats, making it a unique and sensitive ecosystem hosting a diverse assortment of flora and fauna that are rare in Canada (Ministry of Forests, 2001). The Okanagan was recognized in 2000 by the federal government as being one of the four most endangered ecosystems in Canada. The Okanagan Valley (see Figure 1 for a map of the Okanagan) itself acts as a giant corridor between the Interior grasslands of British Columbia and the Great Steppe grasslands of the United States and Mexico. Nearly half of the bird species in Canada are found in this area, and many of the plants and animals exist nowhere else in the world (OCCP, 2010).



Figure 1 – Map of the Okanagan Valley, British Columbia

Within the Okanagan, the loss of habitat from urban and agricultural development has resulted in an increasing loss of connectivity between natural and protected areas, threatening the already disproportionate number of species at risk in the region (OCCP, 2010).

### 3.1.1 - Environmental Governance in the Okanagan

In the Okanagan local governments from the North, Central and South Okanagan Regional Districts (the boundaries of these regions are shown in Figure 1) divide responsibility for the region. They have traditionally worked independently on planning issues at the municipal level and within regional boundaries. Often, both government and non-government land-use planners in the region do not have the data, capacity or expertise within their own offices to make scientifically sound environmental planning decisions.

Furthermore, due to the numerous regional districts and municipalities involved in making decisions on valley wide environmental issues such as air and water quality, there is often limited collaboration between the various levels of government. There are also several partner groups, such as the Okanagan Collaborative Conservation Program (OCCP) and the South Okanagan Similkameen Conservation Program that have scientific and expert capacity, but limited ability or experience with collaborating with all of the local governments.

### 3.1.2 - Okanagan Collaborative Conservation Program (OCCP)

The OCCP represents an effort by local-level organizations and groups sharing environmental interests in the Okanagan to pursue new relationships in order to maximize the use of time, resources and experience in order to address pressing issues related to effective local-level environmental governance. The OCCP is made up of government, non-government, industry, community group representatives and residents (see Appendix A for a list of these partners). These stakeholders have signed an agreement to work together on shared

environmental interests, in particular, biodiversity management and protection efforts taking place throughout the Okanagan basin.

The umbrella structure of the OCCP is intended to facilitate the collaborative planning efforts of member organizations by increasing access to and distribution of local-level ecosystem data and information. This approach is intended to assist in exchanging resources, data and experience, as well as fostering mutual learning. It is based on recognition that, in order to achieve sustainable environmental objectives, there is the requirement for in-depth knowledge about local conditions.

Collaborative approaches to environmental governance such as the OCCP seek to involve the participation of local people and businesses in planning, implementation and monitoring of local issues. This form of involvement and information sharing seeks to raise the collective knowledge of partners and the general public in the hopes of creating a more engaged and empowered community. For local governments, participation provides access to flows of local knowledge and experience, and allows the municipality to be part of that flow (Granberg and Elander, 2007). Broad participation and public engagement also serve to inform communities and better enable their members to pose important questions about their futures. As Fischer (2000, p.184) points out, “helping people pose questions is essential to empowering them”.

For regions such as the Okanagan, inter-jurisdictional collaboration is a necessary approach to responding to growth related issues that are shared across political boundaries. It allows the development of more cohesive and cost effective responses to these issues within relatively short periods of time.

### 3.1.3 - Environmental Partners in the Okanagan

The three regional districts in the Okanagan share a number of environmental governance issues such as air quality impacts, water quality and quantity, habitat

depletion, biodiversity loss, and ecological connectivity (OCCP, 2010). Issues such as these have raised the level of demand by broad segments of the public for action on the part of decision makers in the region. Under these pressing circumstances, enhancing cooperation and integration of government, non-government, industry and public efforts stands out as a practical approach towards planning and implementing sustainable environmental governance in the basin.

Partnered conservation related ventures such as the OCCP represent an understanding by participating organizations that the challenge of dealing with environmental governance issues is too broad to tackle alone. In the Okanagan context, the partners in the OCCP stand to benefit from the efforts of their collaborators. Through working together, partners gain access to the diverse levels of capacity of various members, e.g., by sharing policies and procedures that have been developed for addressing problems that are similar to those being experienced or anticipated by others in the region, or sharing resources such as ecosystem data and/or funding for data development. By sharing these resources and experiences partners gain the capacity to learn from one another, implement consistent measures and potentially encourage the implementation of higher standards for development activity. Multiple stakeholder environmental governance is a way to enforce existing environmental regulations and garner the political will needed to raise standards (ADB, 2001, p.16).

Many of the partners in the OCCP, particularly government related institutions, required assurance when signing their declaration of support for the initiative that the partnership would not speak as a collective voice on issues. Instead, the OCCP is intended to assist partners to share information, to collaborate on research to fill knowledge gaps, and to set priorities for local conservation issues. Through the collective networks of the partners, relevant input can then be gathered and the results related to shared issues distributed more broadly than any one organization would likely be able to achieve on its own. Partnered

projects through the OCCP also try to balance the role of technical partners such as scientists or planners with outreach partners such as educators, to ensure information for decision makers is also engaging and informing broad segments of the public.

#### 3.1.4 - Applying the Geoweb to Environmental Governance Efforts in the Okanagan

Partners in the OCCP, such as local governments share the mandate of providing open access to environmental information and data to the public. In this regard, conservation related organizations with responsibility for environmental governance in the Okanagan have made two separate attempts (described in Section 5) since 2005 to develop web-based resources for local-level habitat and resource information. Through working together, OCCP partners hope to integrate efforts to share and distribute local ecosystem data.

Since 2009, the OCCP has refocused efforts to gather regional land use planning oriented information and develop web-based mapping tools that utilize free, open source technologies to facilitate ease of access and use of this information. The OCCP seeks to use web-based tools to enable partners and members of the public to review, discuss, and comment on geospatial data online, as well as to contribute related data about issues associated with the data. The hope is that this will support planning throughout the Okanagan valley and increase public engagement in environmental governance.

The popularity of Web 2.0 technologies such as Google, Wikipedia, Flickr, Twitter and their perceived success in engaging broad segments of the public, encouraged partners in the OCCP to devote the time and resources necessary to develop web-based tools to increase communication opportunities and build on the capacity to work together. At the same time, the OCCP hopes to encourage the incorporation of public knowledge related to local-level ecosystem

governance issues, and thereby enhance public participation in local environmental governance initiatives.

Web-based resources developed by the OCCP are intended to provide a hub for land, water, wildlife and climate data in the Okanagan region and to engage partners and the broader community in accessing, sharing and using local-level ecosystem data and information to support sustainable decision-making in the region. Federal government funding was necessary to hire coordinators and skilled technicians to implement this project. In this regard, the question of how to ensure long-term capacity to manage and maintain the site and the information gathered there is of significant concern for stakeholders in the project. Further research and monitoring will be required in order to determine how this resource and the many like it being developed for governance purposes in other regions internationally will hold up over the long-term.

This thesis will examine the efforts of OCCP partners to use the Geoweb to improve communication and participation in environmental governance issues in the Okanagan. The OCCP experience with the Geoweb offers a valuable opportunity to research the effectiveness of Geoweb applications for supporting participation in environmental governance. The following methodology section describes the process followed through the course of this study to evaluate and respond to the research question.



## **4.0 Methodology:**

As identified in section 1.0, this thesis set out to answer the primary research question, 'is the Geoweb an effective tool for supporting participation in local-level environmental governance and if so, in what ways and to what extent is it effective'. For the purposes of this research, a case study was carried out with partners in the OCCP. This involved the development of web communication tools designed to support environmental governance related purposes in the Okanagan Valley. This case study was used to determine if use of the Geoweb could increase the effectiveness of their efforts to communicate and work together on shared environmental issues in the region. This section describes the methods used to carry out this research.

### **4.1 - Participatory Action Research**

The research design for this paper is grounded in the methodological field of qualitative research, using a participatory action research (PAR) approach. Qualitative research is a particular tradition in social science that fundamentally depends on watching people in their own territory and interacting with them in their own language, on their own terms (Kirk and Millar, 1986). Qualitative research is used for research that produces findings that are not arrived at by means of statistical procedures or other means of quantification (Strauss and Corbin, 1990). Given the interactive, communication-oriented nature of this research, the qualitative methodology offers a framework for analysis of the findings that are largely non-statistical, being based instead on people's oral responses, actions or lack of action, and general impressions often shared through conversation – as well as more formal qualitative tools.

The PAR approach to qualitative research is distinguished by three key attributes: shared ownership of research projects, community-based analysis of social problems, and an orientation towards community action (Kemmis & McTaggart, 2005). O'Brian (1998) adds that within PAR, the researcher makes

no attempt to remain objective, but openly acknowledges his or her bias to the other participants. This aspect of PAR is appropriate to this research project, as several of the participants in this project are long-term associates with the researcher through affiliated regional conservation efforts and are aware of his bias on the issues involved. Also, the ultimate goal of PAR, identified by Simmons (1994), to empower people, is aligned with an OCCP goal of facilitating greater levels of public participation in regional environmental governance issues.

Using a participatory action research methodology assists the researcher in exploring the potential of the Geoweb to positively affect the low levels of participation in local-level environmental governance. It also adds meaning for the researcher, as he is also a member of the community. The research shares common stakes, challenges and concerns in terms of overcoming local problems and will be acting, on an intrinsic and empathetic level with the participants throughout the entire process.

According to Stringer (2007), a fundamental premise of PAR is that it commences with an interest in the problems of a group, a community, or an organization. Its purpose is to assist people to deepen their understanding of their situation and collectively highlight the skills and tools available to them, this can eventually help them to resolve the problems they confront (Stringer, 2007). Through this research, the participants began a dialogue on issues of sensitive habitat connectivity through the Okanagan Valley (described further in Section 4.1.2), learned from each other and together contributed towards improving on-line mapping tools in a manner that ideally will generate broad involvement and support from the participants and other community users. By opening this dialogue, Kemmis and McTaggart (2005) point out that awareness is raised between researcher and participants and subsequently with decision makers about the nature of the problem as experienced by each participant, leading to

the development of critical insights and ideas about how things might be transformed to overcome the problem.

#### 4.1.1 - Researcher and the Research Team

The general design and development of the online tools created for this project were largely managed by a small team including the researcher, a GIS technician from the Spatial Information for Community Engagement (SPICE) research laboratory at UBC-O, a GIS technician from an associated NGO, the lead researcher of the SPICE lab and the coordinator of the OCCP. Researchers at the SPICE lab share a focus of evaluating the use of web-based mapping tools for facilitating engagement in community issues. The two GIS technicians provided support in GIS, cartographic, and web development and the coordinator of the OCCP assisted with the coordination, design, fund management and planning of this project.

Both GIS technicians were Okanagan based at the time of this study and anticipated being available to collaborate on an in-kind, or contract basis with the OCCP on future web tool development and maintenance projects. The GIS technician at the SPICE lab shared his experience from this research project with other GIS students associated with the lab and the other GIS technician is did the same with associates within his organization.

The researcher of this project was involved in each stage inclusive of the applications for funding, project design, technology design, communications, meeting coordination and facilitation, usability testing and follow up. The lead researcher of the SPICE lab provided guidance and support throughout each step of the project.

#### 4.1.2 - Engaging the Participants

In order to engage participants in using online map-based tools for discussion purposes, the subject of a connectivity corridor of sensitive habitats in the

Okanagan Valley was chosen following its identification at the OCCP's 2009 Annual General Meeting as being a topic of interest and relevance to the majority of members. This topic also made use of inventories of sensitive ecosystems throughout the Okanagan that had recently been completed by OCCP partners across each of the political boundaries in the region and made available as spatial data.

The connectivity corridor discussion was based on taking data layers with land use information from throughout the Okanagan Valley - i.e., sensitive habitat inventory data - and identifying the connectivity of these sensitive habitats across the municipal boundaries in the region. Discussion of this topic involved technical issues such as wildlife movement patterns, associated bylaws and development guidelines as well as social issues related to how local residents interact with the landscape. In this regard it was important to involve a diverse network of partners with scientific, technical and social backgrounds in discussion of this environmental issue.

Having decided upon the topic, an email invitation was sent to members of the OCCP and affiliated organizations, providing background information on the proposed process and requesting their participation. Each of the representatives of partnered organizations in the OCCP already share an interest in conservation and planning related issues in the Okanagan, and have signed a statement of cooperation, stating a commitment to the conservation-oriented goals and objectives of the OCCP. Within the OCCP, members voluntarily participate within 'action teams' that deal with shared conservation efforts from throughout the Okanagan basin. Action teams form to deal with a specific task and then disband once that task has been completed.

Participants were asked to commit for a three month period during which time they were expected to complete approximately three on-line surveys, attend up to three focus group meetings, and contribute to the broader discussion of how to

further the sustainability of online communications tools for the OCCP. Further project tasks included:

- Confirm the data layers needed for the discussion and review once posted.
- Use the discussion tool for corridor identification.
- Discuss and review potential implementation of corridors.
- Identify and discuss relevant policies, example of successful mechanisms for protecting corridor routes.
- Guide usability follow-up regarding use of the tool.
- Develop and test supporting tools such as forums, blogs and information storage on an associated web portal.
- Carry out revisions based on feedback.

A key aspect of this research project was that, due to the technical nature of the subject material and the team oriented approach, it was structured to physically gather participants together and facilitate their introduction to the subject content and approach to discussing a connectivity corridor in the region.

#### 4.1.3 - The Participants

In addition to the researcher and GIS technicians, the 20 participants (see Appendix A) who agreed to participate in this project are primarily made up of representatives from environmental organizations that were already partnered through the OCCP. While there have been casual involvement and feedback by professional associates and affiliates outside the OCCP through the course of this research, the key research participants have the following members:

- 8 representatives of local government (City of Vernon, City of Kelowna, Regional District of the Central Okanagan, Regional District of the North Okanagan, Regional District of the South Okanagan, District of Lake Country, Municipality of Coldstream)
- 3 Registered professional Biologists

- 5 representatives of Non-government organizations (Grasslands Conservation Council of BC and Okanagan Basin Water Board, Community Mapping Network, OCCP and South Okanagan Collaborative Conservation Program)
- 2 representatives of provincial government (Ministry of Environment)
- 1 representative of federal government (Department of Fisheries and Oceans)
- 1 academic

This cross section of stakeholders involved in conservation planning from the North to South of the Okanagan Valley represent local-level environmental governance interests in the region. Key to the choice of participants was that each represented and had influence within larger organizations and networks involving regionally significant decision makers. Furthermore they had the capacity to share their own experiences with the research project. Nine of the participants were planners within local governments and had significant experience with public participation processes and tools as well as with making policy recommendations to decision makers.

Each of the participants was informed by email and at focus group meetings that the connectivity corridor discussion and associated development of participation tools were part of the researcher's graduate research at UBC-Okanagan. A university research ethics consent letter (see Appendix B) was also issued outlining the purpose and intended use of this research. While this thesis includes information and insights from various members of the research group, comments were aggregated and individual members were not associated with their comments by name or affiliation.

This research used qualitative approaches to gathering data that included: online surveys, focus group discussions, participant observation, and semi-structured interviews with participants. Each of these approaches is described below.

#### 4.2.1 - Online Surveys

Three surveys were developed and distributed to gather guidance and feedback from project participants on Geoweb application related design and development issues. One of these surveys was related to design issues and the other two surveys were related to usability of the resulting web tools.

The first survey (see Appendix C) was designed to assess the participants' level of sophistication and comprehension with the use of Geoweb technologies, including whether they made use of web-based technologies on a regular basis and if so, whether they used it for land use planning and environmental governance related issues. There were nine responses to this survey.

The second survey was designed to gather feedback on the usability of the OKCP Geoweb portal and the functions that it provided (see Appendix D). There were no responses to this survey collected from participants.

The third survey was specific to the usability of the Geolive tool (see Appendix E), a geospatial data oriented web application designed over the course of the project for the participant's use. There were two responses to this survey.

Surveys were designed using 'Survey Monkey' for email distribution among participants. Survey Monkey is an Internet-based commercial software application for creating and analyzing surveys. Survey Monkey was chosen for this project based on it being easily accessible and simple to use for garnering participant feedback.

Surveys were designed to take no more than approximately 10 to 15 minutes to complete and provided space for comments if desired. Participants were provided with a space on the survey to give their name and contact information, but were not required to do so. Participants were informed at the outset of the project that survey responses would be used to facilitate research analysis by the researcher but their names would not be used. The responses to the surveys are discussed in Section 7.

Hyperlinks to the online surveys were included along with each action team email update, posted on the front page of the OCCP website and included in the digital version of the OCCP's spring 2010 newsletter. Hard copies of the surveys were also provided at the January focus group meeting of the Connectivity Corridor Action Team meeting and at the OCCP's 2010 AGM in May. Attendees at each of these meetings were reminded to complete the survey. In total, nine design-oriented surveys and two usability surveys were completed.

Along with issuing web links to the surveys, participants were also given the option to share their feedback via email, on a forum developed for this purpose or by telephone. Comments are presented within the study results in Section 6 of this thesis discussed within Section 7 based on general themes that emerged from the responses.

#### 4.2.2 - Focus Group Meetings

Focus group meetings consisted of two meetings of the full action team, one meeting consisting of seven members of the action team along with some associates discussing a related topic and approximately 50 meetings of the research team that took place on a routine basis over the course of the project. The focus group technique, according to Morgan (1988, p. 12), makes "explicit use of group interaction to produce data and insights that would be less accessible without the interaction found in a group." Meetings were designed to encourage group exchange of feedback and suggestions on the connectivity



corridor topic, while examining the potential of the tools to help participants contribute informed feedback on this key environmental governance issue.

During focus group meetings the researcher acted as both participant and discussion facilitator, encouraging the participants to share their feedback and ideas through dialogue and group brainstorming. The research team guided participants in how to use the Geoweb mapping tools to discuss, provide feedback and offer suggestions on the connectivity corridor topic. This provided opportunities to assess the potential of the tools to enhance participants' ability to contribute informed feedback on these community issues. Questions and discussion topics allowed participants to share their feedback and suggestions related to the on-line mapping tools, as well as to discuss possibilities for improving the effectiveness of these tools. In keeping with an action research approach, this process of actively discussing and reflecting on the issues was intended to enhance both the researcher's and participants' overall understanding of how to better support and sustain collaborative planning opportunities.

#### 4.2.3 - Participant Observation

Due to the small group size and the researcher's familiarity with participants, participant observation was used to track casual responses and general observations over the course of the research process. Bogdewic (1992, p. 46) describes participant observation as a social science method "characterized by a prolonged period of intense social interaction between the researcher and the subjects, during which time data, in the form of field notes, are unobtrusively and systematically collected." Gathering data through participant observation fits with this project's PAR approach in that the researcher plays the dual roles of actively involved participant and objective observer.

Over the course of 24 months, since the early stages of research design and applying for funds, the researcher kept a journal of his own observations related

to the research process along with notes of comments shared with him directly by participants in the project. He also posted excerpts of project related emails sent to him directly, onto an online forum on the topic provided on the OKCP portal, thus attempting to foster further sharing of insights between participants. Notes in this journal were not limited to observations of project participants. They also included observations related to feedback on site development and usability of web-based applications that had been shared by outside associates based on their experiences with similar projects.

#### 4.2.4 - Semi-Structured Interviews

The other primary form of gathering data for this research was through five semi-structured interviews in which the OCCP coordinator and researcher met directly with participants. These meetings followed a semi-structured interview approach. Davis-Case (1990) notes that a semi-structured interview is determined only in the sense that some form of guide provides a framework for the interview. This allows for the flexibility of questions being developed in the course of the interview, with the people being interviewed invited to respond to, and further engage in, areas of their own interest. According to Chambers and Gijlt (1998), semi-structured interview techniques involve: probing replies to a question in order to clarify and uncover more layers of information; asking open-ended rather than leading questions; showing an interest and enthusiasm in learning from people; having second and third meetings with the same people; and, above all else enjoying the research process.

The semi-structured interview approach was chosen to allow for more informal and conversational sharing of information on the project, as well as to allow the researcher to get a sense of how the participants were experiencing the Geoweb applications developed by the project. Furthermore these meetings provided an opportunity to work directly with participants using the Geoweb portal to guide them on using the mapping tools, to allow them to give feedback and identify suggestions on the connectivity corridor topic, as well as to discuss informally

and directly the potential of the tools to facilitate participants' ability to contribute informed feedback on these environmental issues.

Each of these qualitative approaches to gathering data provided an interactive method in which participants had the opportunity to learn more about the research issue and could contribute to improvements in the effectiveness of these Geoweb tools through their feedback. In this way, the participatory action research itself was meant to facilitate participants in developing an element of ownership in the research and building local capacity to engage in local-level environmental governance and explore potential solutions to existing problems.

The following section of this thesis reports on the design and development of the participatory Geoweb tools used in this study.

## **5.0 Design and Development of the Research Tools:**

Efforts to develop web-based communication tools for the OCCP described within this thesis built upon previous efforts undertaken by OCCP partners between 2004 and 2010. The Okanagan Conservation Planning (OKCP) portal builds upon efforts that began in 2006 to create an online hub for land, water, wildlife and climate data in the Okanagan region that was referred to as 'SPOKE' (Sustainable Planning for the Okanagan Environment). It also builds on the online habitat resource atlas developed by the Community Mapping Network in 2005. The atlas initiative included the involvement of five OCCP partners and their associates in the North Okanagan and the online mapping resource was always envisioned as being expanded to become an Okanagan wide resource.

The OKCP portal is intended to encourage the sharing and distribution of local-level ecosystem data and information that will support sustainable decision-making in the Okanagan. The SPOKE site developed in 2006 was never put online due to capacity and funding shortfalls. Partners envision the OKCP portal incorporating the materials and resources gathered during the initial SPOKE project - however key to the Geoweb project described in this thesis is the need to find ways to build the capacity for this resource to be locally managed and maintained over the long-term (an area undeveloped in the SPOKE project).

Up until the start of this project in 2008, habitat data, such as stream surveys and sensitive habitat inventories for the Okanagan Valley have been posted to the Community Mapping Network and ECOCAT. The Community Mapping Network hosts thematic maps online, making them easily available to the public, local government, and groups such as partners within the OCCP. ECOCAT is a website hosted by the Ministry of Environment in British Columbia that provides access to digital reports and publications, and associated files such as maps, datasets, and published inventory information (BC Ministry of Environment, 2010). These resources contain data and information from throughout the

province of BC and partners in the Okanagan are unable to determine how the data is presented or to control how users are able to interact with the data. The OKCP portal will incorporate access to these resources, but will focus on providing the functionality to facilitate partners and the public in accessing and interacting with Okanagan-oriented data and maps.

The efforts of partners to develop these web-based tools have evolved through grassroots organizations within the region, and have been largely dependant on in-kind support such as through the provision of web-based map hosting services and technical advice. The OCCP was also successful with attracting financial support; however, funds are limited and do not cover costs associated with long-term upgrades and maintenance to the web tools after completion of the project.

### **5.1 - The Okanagan Conservation Planning Portal (OKCP)**

Based on the results of planning efforts and discussions amongst partners in and associated with the OCCP for the design of SPOKE, the intention and purpose behind the OKCP portal was clearly outlined. Partner input specified that the OKCP portal should provide basin wide ecosystem data and resources in a form that is easy to access, understandable and able to be incorporated into local decision-making processes. The OKCP should serve as a web-based portal for the OCCP's online communication tools that are intended to support partnered planning and decision-making initiatives in the Okanagan basin.

Data and information on regional ecosystem-based and natural resource planning initiatives would be provided in map-based and graphical forms to users throughout the Okanagan. Easy access to this information will help planners, conservation organization representatives, elected local government officials and members of the public to better understand and support sustainable land and water use decision making. This resource will also be an outreach tool for raising awareness about local ecosystems, biological populations, environmental

features, conservation management, and restoration within the Okanagan watershed and adjacent lands.

Other than the information gathered from the two completed web tool design surveys, participants in this research project did not get actively involved in the development of the web-tools beyond providing a vision and goals. Project participants' involvement in the development of the OKCP portal consisted of formal and informal interaction with the research team through the course of associated project work, allowing participants to enquire how the portal was developing and to share suggestions based on the stages of development. Other than the research team members who were involved in each stage of portal design and development, one project participant contributed to and monitored design plans for the portal. Over the course of the yearlong development phase of the OKCP portal and Geoweb application, three of the participants expressed their desire to be able to access data and information from the portal and refer associates to it for related information.

In developing the OKCP portal, the research team determined that the most cost effective and easy to manage approach was to make use of free, open source software applications. Joomla was chosen for managing and controlling access to information such as documents contributed to and stored on the portal, Phoca galleries for sharing and accessing photos, Kunena for holding forums, Jevents for an events calendar, and Google Maps for mapping functions. Web applications such as these are also referred to as 'plug-ins' and they were chosen based on positive online reviews provided by other users. The Joomla application also allows for the easy addition of new plug ins or updating of old plug ins over time, thus suggesting that the OCCP should be able to stay current with technological advances by monitoring Joomla user updates that are easy to access online.

The OKCP portal is now hosted on a UBCO server that was offered as an in-kind service to the OCCP for a five-year renewable term (see Figure 2 for an image of the front page). All of the project participants encouraged and supported the establishment of this relationship with UBCO. It is seen as a positive step in ensuring that this resource is based in the Okanagan and associated with what is considered to be a neutral organization, located centrally within the valley. It is hoped that the SPICE lab will continue to maintain a connection to the OCCP over time and that future projects will include opportunities for students and faculty at the university to participate in the maintenance and advancement of the OKCP portal.

On the launching of the OKCP portal in May 2010, an OCCP press release described the new portal as offering the following features:

- User registration and password secure access,
- News and events sections with the latest information about conservation and environmental planning issues in the area,
- Upload your own news and events,
- Access or share information about habitats and land use planning tools from throughout the Valley,
- Forums and blogs that can be open access or regulated to control who views or comments on the material shared,
- Dynamic maps with multiple layers and functions available,
- Visitors to the portal will be able to access and contribute web links and articles of common interest,
- Mapping Tools such as the Geolive discussion map and the Okanagan Habitat Atlas can be accessed from the portal.
- Access to the both OCCP and partner sites with additional information and data related to each partner and their joint projects.



Figure 2 - Homepage of the OKCP Portal - [www.okcp.ca](http://www.okcp.ca)

In June 2010 an OCCP news update informed partners and associates that new data layers had been added to the mapping tools on the OKCP portal and that more information was continuing to be added to the portal. This newsletter also encouraged partners to begin contributing their own information to the portal:



“If you have any piece of information you want to share in the portal, please go to Media on the left menu, select the category where you want to add the info and follow the instructions on how to do it” (OCCP, June 2010).

At the time of writing this thesis in early July 2010, 12 OCCP partners had made arrangements with the OCCP coordinator to learn how to contribute information to the OKCP portal, three partners contributed information and two other partners have asked for assistance. There have been 236 hits to the portal (Google Analytics, July 2010).

#### 5.1.1 - Online Habitat Atlas

Within this project, participants also outlined a goal of incorporating the North Okanagan Resource Habitat Atlas that is currently hosted on the Community Mapping Network and increasing its scope to encompass the entire Okanagan basin. The Okanagan Habitat Atlas is intended to serve as a tool for providing broad access to the spatial data and support information that is used to facilitate the planning initiatives of partners in the OCCP, making it a "one-stop shop" for environmental information (OCCP, May 2010).

All of the project participants have visited the Community Mapping Network website at [www.cmnbc.ca](http://www.cmnbc.ca) and many have had experience working with it on other projects. One of the main challenges with the Community Mapping Network is that often there is only one GIS technician (based in Nova Scotia) who is relied upon to manage updates for the approximately 60 atlases hosted on the site. This can cause delays in getting updates completed. In addition, the costs of data upgrades are high. As a result, upgrades to the atlas are limited and the data and functionality offered by the site can quickly become out of date. This experience influenced feedback related to developing the functionality of the site and the capacity within the Okanagan to manage and update web-tools such as this into the long-term.

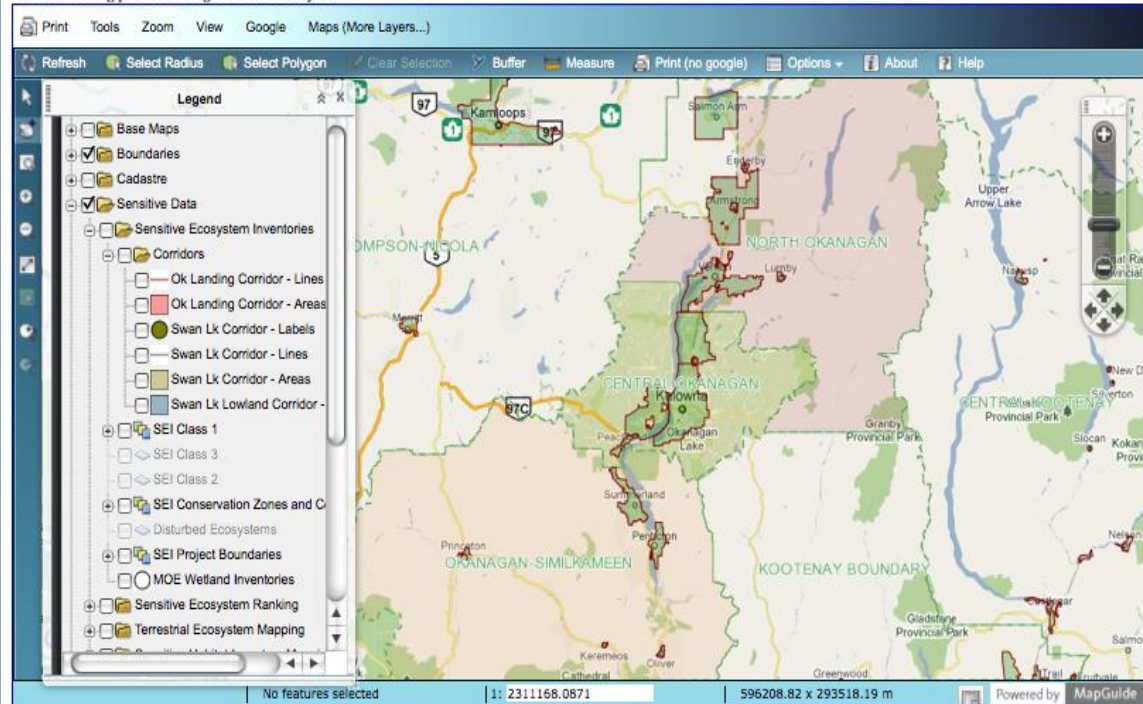
Participants offered a number of suggestions for further development of the new Okanagan Habitat Atlas, including providing greater functionality, e.g., speed up the process of opening and navigating through data layers and make the navigation tools easier to use. It was also requested that the data layers on the site be updated more frequently and new layers added.

At the time of writing this thesis in July 2010, the Okanagan Habitat Atlas had been updated to include spatial data for habitats throughout the three regional districts in the North, Central and South Okanagan. This resource atlas now provides access to all Sensitive Ecosystem Inventory information, Environmentally Sensitive Area maps, Priority Grassland Mapping from the Grasslands Conservation Council of BC, cadastral layers and, zoning and Official Community Plan maps in these areas. The two GIS technicians on the project team were trained by a staff member of the Community Mapping Network to use the Mapguide software upon which the Okanagan Habitat Atlas is based for managing updates and data layer changes as required. The GIS technician with the OCCP partnering non-government organization has now moved out of the region and did not transfer his experience with Mapguide to his associate within the organization. The GIS technician with the SPICE Lab will be available for support to the OCCP with research web-tools for an additional year and is in the process of training students in the lab on the use of Mapguide and associated technologies.

**Description:** The Okanagan Habitat Atlas (OHA) is an interactive mapping tool hosted by the Community Mapping Network (CMN) and UBC-Okanagan. The OHA provides access to map layers of sensitive habitats and species distribution in the Okanagan Basin of BC. The OHA has links to local and remote databases, WMS sources and geo-referenced video. Data on the OHA is meant to give the public open access to regional habitat information and to assist landuse planning processes in the Okanagan Basin.

**Atlas Help:** [OHA Users Guide](#)

You are viewing public and registered users layers!



**Figure 3 - Okanagan Habitat Atlas**

Participants also requested that the Okanagan Habitat Atlas (shown in Figure 3) be enhanced to allow OCCP partners and the public to contribute comments and information related to the data provided. It was determined through the course of the project that this interactive functionality should be developed separately from the atlas to avoid high licensing fees associated with Mapguide and to make use of easy to use functionality such as Google base maps and navigation controls. Developing a separate interactive mapping tool also offers the potential to facilitate the OCCP or any organization on discussing spatial issues using data not relevant to the Okanagan Habitat Atlas, such as food or health-oriented data. These considerations ultimately led to the development of an online discussion map.

The use of a participatory action research approach to evaluating the Okanagan case study contributed towards increasing participants' awareness of the

opportunities presented by the Geoweb and alternatives available for supporting broader public participation in local-level planning processes. The experience and feedback shared by project participants through the spiral of cycles involved with PAR provided valuable insight for developing and refining the OKCP portal and Geolive discussion tool in order to improve the capacity of these tools to support local-level environmental governance. The collaborative approach established through this research will also continue to benefit the OCCP coordinator in working with associates to maintain and revise the OKCP portal and Geolive into the future.

#### 5.1.2 - An Online Discussion Map Tool

Based on the results of the first survey and initial communications with project participants, the framework was developed for designing an online mapping tool that would complement the Okanagan Habitat Atlas by allowing project participants, and subsequently the general public, to better comprehend and interact with the spatial data described in Section 4.1.2. The purpose of this tool is to allow users, such as representatives of diverse government and non-government organizations, throughout the region to engage in map-based discussions over time without the need to meet regularly in person.

The online discussion map is also perceived as a potential tool for supporting the involvement of diverse segments of the public in environmental governance issues by facilitating their ability to contribute information, comments or suggestions related to environmental governance issues. Ultimately, the vision for this mapping tool is that it will serve as a virtual whiteboard for marking up maps and discussing land use related issues.

For the purposes of this research, this tool was designed with particular emphasis on facilitating the participants in communicating with each other on the connectivity corridor discussion identified in Section 4.1.2.

#### 5.1.2.1 - Online Discussion Map Design Goals

The goal for the development of the online discussion map tool was to provide an interactive application for communicating on multi-party planning initiatives, while also providing the ability to engage diverse segments of the public. The overriding objectives outlined by OCCP partners when developing this tool was that it be low cost, easy to use, and easy to manage and maintain over time.

Final plans for the development of the OCCP's web-based participation tools outlined the following additional guidelines and development requirements:

- User registration and login, with capability for varying permissions based on user-type.
- Dynamic map window, with multiple layers and functions available.
- Tutorial and other associated documentation.
- Public or regulated access forums and comments.
- Surveys for general users or user-types.
- Interpretive information linked to layers and polygons.<sup>1</sup>
- User generated content, e.g. point sightings, spatially references photos, video, uploading links to documents – implemented in Google Maps.

Based on these guidelines, the participants in the development of the tool added the following development criteria:

1. That it be a mapping tool that allows users to interact with spatial data, to scroll over points on map and view pop up interpretive information.
2. Make use of open source software and applications as much as possible.
3. Determine that web-technologies used in development of a participation tool are well supported with user assistance and that they have a good reputation and are anticipated to be active and supported for a long period of time.

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<sup>1</sup> The term polygon is used to define a transparent shape that can be placed on a map and its shape altered by clicking on corners of the shape and dragging them to define and outline areas on the map.

4. Easy to use and understand. It should be intuitive. Easy for use from both administrative and participant use perspective. Easy for sharing, contributing and accessing information as well as managing the tool and information gathered over time.
5. Users can contribute information to the maps, draw on maps, upload photos, video and related documents or post links.
6. Security permissions on content, so that access can be restricted to select users or opened to the public by tool administrator (OCCP coordinator).
7. Administrator should be able to review and determine what contributed data is included onto map.
8. Web enabled bibliography – geotagged data maps on each topic, polygons on map that link to data and resource.
9. Provide specific icons for topic discussions – or users can select from list of icons those appropriate to the discussion they are holding, or data that they want to contribute
10. List of available map data layers to choose from, or ability to upload another data layer and set restrictions such as public or specified users can access or use it.
11. Bookmark feature – ability to send a link to another user that allows them to open map to settings you last used so they can view and participate in discussion from the same point.
12. Users can set their own parameters of type of info that they want to access and tool should be able to notify other participants when something is posted that fits in their parameters.
13. Ability to save or print their own maps.
14. An associated forum for discussion and stakeholder input.

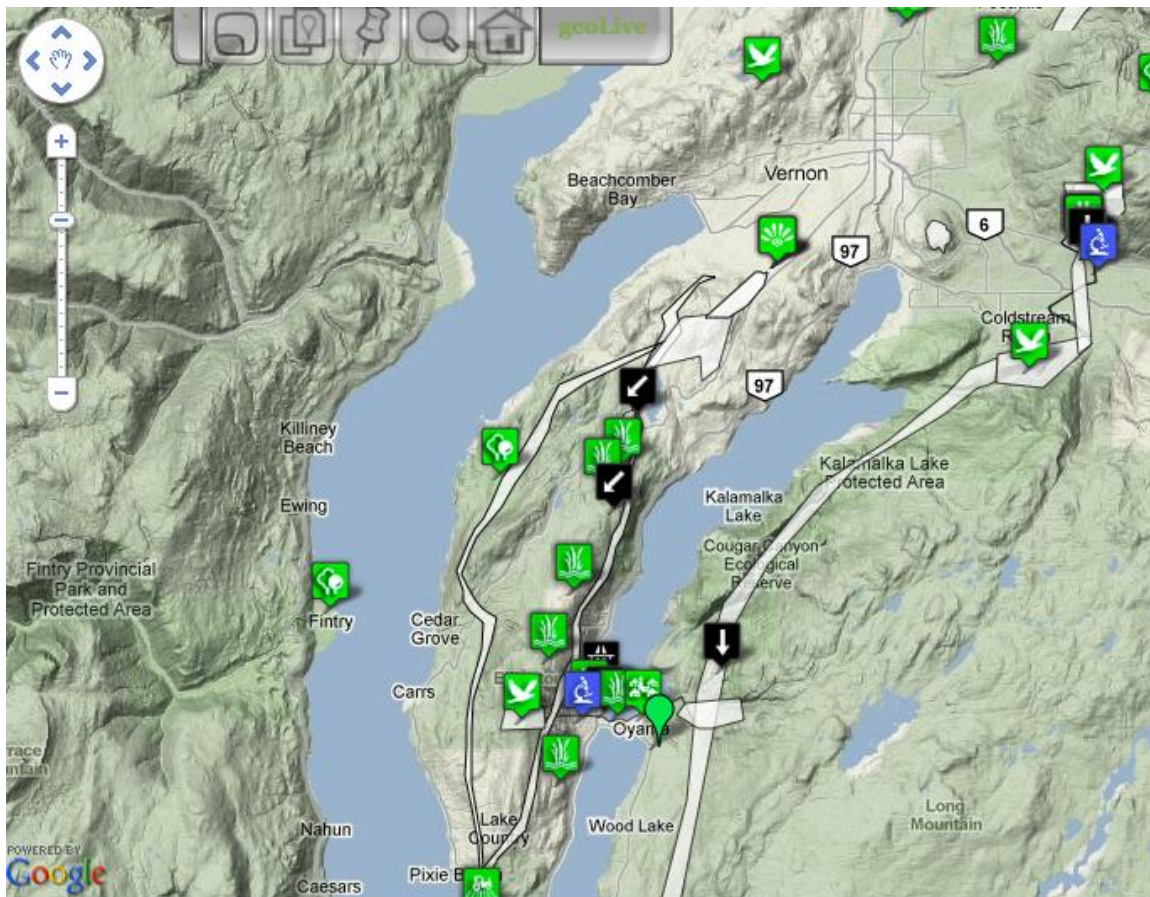
## **5.2 - Geolive**

The resulting tool developed for the project has become known as 'Geolive'.

Geolive is a map interface application that allows users to view geospatial data

layers and also allows users to contribute their own content onto the map (Blackwell, 2010). Some of the features that Geolive provides are:

- Highly customizable interface control (admin).
- Locally hosted data for user generated content (privacy, security).
- Map based discussions (live spatial communication using AJAX).
- User content creation tools.
- Timeline interface for chronological data (simile timeline).



**Figure 4 – Connectivity Corridor Discussion on Geolive.**

Geolive was also designed to make use of free, open source software used by the OCCP, such as Joomla and Google Maps (see Figure 4). Geolive is built in Javascript on top of the Joomla platform and uses Google Maps for base maps, offering users Google navigation functions which were considered by project participants to be widely known and user friendly. Geolive is also hosted on the UBCO server as a function of the OKCP portal, providing the OCCP extensive



capacity for data to be contributed by project partners or interested segments of the public. The Geolive map application can be added to any Joomla web site, each with its own configuration, data layers and user restrictions. The framework provided by Joomla allows Geolive to be installed quickly and easily regardless of the server platform.

One of the key concerns with using Google Maps to add public content for decision-making is how to analyze user-generated content and use it in a meaningful and scientific way. With Geolive, content is created and managed locally (on the OKCP portal hosted at UBCO) and therefore administrators are able to analyze content, participation, community use patterns, and much more.

Through examining the use of Geolive, this thesis aims to explore and evaluate the possibilities of on-line mapping for supporting participation in local-level environmental governance. The following section presents the results of this process.



## **6.0 Results:**

The PAR approach utilized to evaluate the data gathered from the case study involved the researcher, research team and participants carrying out what Kemmis and McTaggart (2005) refer to as a spiral of cycles, which involves planning, acting, observing, reflecting, and then re-planning, further implementation, observing and reflecting again. This spiral of cycles provided the research stakeholders a number of learning opportunities. These included developing an understanding of what each of the other participants do in relation to conservation planning in the Okanagan, how they interact with each other, what they see as obstacles to their ability to work together, the potential of the Geoweb, and how they would like to be able to interact with each other and involve greater representation of the public in planning processes. According to Kemmis and McTaggart (2005) these spirals of cycles reveal the discourses in which people understand and interpret their world.

The process of designing, developing and using the OKCP portal, Geolive and associated tools is presented in order to evaluate the effectiveness of the Geoweb for supporting participation in local-level environmental governance. This process involved continual testing, evaluation and redesigning of these web tools. The cycle of evaluating the design then developing and using the project tools in order to evaluate their effectiveness took place throughout the research. Each time that project participants provided feedback, the researcher would reflect on this feedback and discuss it with the research team in order to determine the best approach for revising the tools. The researcher would then provide project participants with the opportunity to view and interact with these changes so that they could further reflect on them and continue to guide the tools development. Using Kemmis and McTaggart's (2005) framework, the spiral of cycles used in this research was carried out as follows:

***Planning a change*** – Developing the OKCP portal, Geolive and associated tools as a sample of Geoweb technologies, for engaging OCCP partners in the connectivity corridor discussion.

***Acting and observing*** – Using Geolive for OCCP partners to identify potential connectivity corridors in the Okanagan basin based on sensitive habitat data and other related information available in the region.

***Reflecting on these processes*** - Group discussions and on-line discussion forums and surveys provided a forum for OCCP partners to review, critique and offer suggestions regarding the use of Geoweb applications, and share their insight into the effectiveness of these Geoweb tools for supporting communication on the connectivity corridor issue. The researcher also relies on his own observations of the OCCP partners and the needs they have shared with him to determine how the web tools need to evolve in order to meet these needs and thereby better engage their participation.

***Replanning*** – Feedback informs the design and redesign of web tools. The research team offers a sounding board for discussing both the identified and perceived improvements needed for the OKCP portal and Geolive application and the means for how best to go about implementing those changes.

***Acting and observing again*** – Once significant changes are made to the web tools, OCCP partners are engaged again and encouraged to interact with the changes to the web tools that resulted from their feedback.

***Reflecting again*** - Further reflection on the different perspectives, theories and discourses uncovered during the research process, to explore the extent to which they provide practitioners with a critical grasp of the problems and issues arising (Kemmis and McTaggart, 2005). The feedback of OCCP partners provides a community-based evaluation of the effectiveness of on-line mapping tools such as the OKCP portal and Geolive in supporting broader access to land use information and design recommendations, as well as suggestions for improving the engagement potential of these web tools.

Based on the collaborative, participatory nature of this research, this evaluation approach helped to more fully explore the effectiveness of the Geoweb in supporting a joint learning process. This process has been particularly relevant to addressing the research question for this thesis, in that it helps evaluate participants' interaction with the OKCP portal and Geolive, and determine how Geoweb tools such as this support participation in local-level environmental governance issues.

Through this cycle, the participants have shaped the results of the research. The findings reflect their perspectives on web-based tools, based on their experience with using the OKCP portal and Geolive and understanding of its potential for supporting participation on the topic of determining a connectivity corridor of sensitive habitats in the Okanagan Valley.

### **6.1 - Assessment of Data Gathering Results**

Despite frequent requests for participants to engage in providing answers to specific web tool design and usability related questions through methods such as, surveys, forums or emails, these approaches met with limited response. Only 11 surveys were completed in total in three different surveys. Gathering participants together for the focus groups to discuss the development and use of web tools, and meeting with participants individually proved to be the best means for gathering direct feedback on the topic. Due to the participants being spread over the 200 plus kilometer length of the Okanagan Valley however, opportunities for focus group meetings were limited to three. It also became increasingly necessary to base decisions on refinements to the OKCP portal and Geolive on feedback and observations of OCCP partners gathered by the researcher. Participant observation also provided insight as to why participants were not using applications such as Geolive or the forums to discuss the connectivity corridor discussion topic.

Development plans were designed to integrate a series of follow up usability tests and feedback surveys. Given the PAR based approach of this project, capacity was limited and the time requirements of attaining funding for developing and refining the web tools took much longer than anticipated. As a result, there was limited opportunity to follow up on and evaluate the effectiveness of the tools for supporting and engaging in the discussion topic once many of the usability improvements had been completed.

The following sections provide a breakdown of the data gathering results for each of the four data gathering methods used in this study, notably; surveys, focus groups, semi-structured interviews and participant observation.

#### 6.1.1 - Surveys

Surveys proved to be the most ineffective means of collecting data from the participants in this project. One of the participants, a planner with a local government, informed me that he receives online surveys on a routine basis, sometimes several a week, and he has made it his policy not to participate in surveys as he does not have the time. Project participants preferred to share their feedback on this research through discussion on the phone, via email or during work related encounters. Based on the majority of participants sharing their feedback on the web tools in these other ways, it appears that they also either did not have the time or did not feel the need to complete surveys as well.

There were nine respondents who completed the first survey, no respondents to the second survey and two respondents to the third survey. The main points raised in these surveys have been compiled and are presented below based on the themes of the points raised. The questions posed in the online mapping tool design survey (survey 1 - Appendix C) and Geolive usability testing survey (survey 3 – Appendix E) that will be analyzed in this thesis address the following points:

- To what extent do participants currently use existing online mapping tools?
- Do participants see a need for the online mapping tool? If so, do they anticipate using it themselves?
- How do participants define the strengths and weaknesses of the tool developed?
- Do participants consider the tool effective at facilitating the discussion topic?
- Is the tool easy to use and discussions easy to follow?
- Will participants use the tool on a regular basis?
- How could the tool better serve participants, what improvements may be needed?

Responses to the online survey questions were reviewed on Survey Monkey and compared using the analysis tools provided by this software. Two key themes that will be discussed in more detail below emerged from the survey responses:

- Technology (i.e., what type to use, what it is capable of doing, and maintaining it over time)
- Ease of use

Analysis of the nine surveys completed on the design of the web tools showed that seven of the respondents had a high familiarity with online mapping tools. Of the online mapping applications that they use, six of the nine indicated they use Google Earth or Google Maps. Four of the nine indicated that they use the habitat atlases available through the Community Mapping Network. In regards to the participant's perceptions of the potential for online mapping to benefit their planning efforts, seven of the nine indicated it could benefit their efforts. These benefits included:

- Helps increase access to spatial information and integrate with other sources of information for partners and decision makers.

- Helps to access specific non-scientific information (e.g., zoning, proposed developments, policy suggestions etc.).
- Facilitate public access to the data.
- Enable non-experts to participate in decision making alongside experts.
- Help identify missing information.
- Help support decision-making.
- Potential to utilize free software.
- Supports the strategic plans of the OCCP.

There were no responses to the survey regarding the usability of the OKCP portal. Analysis of the two surveys completed on the usability of Geolive shows that both respondents found it straightforward to use but that the data layers provided were insufficient and unclear when overlapped with each other. Both respondents also noted that the tools for drawing lines and identifying areas on the map, specifically the polygon function, needed improvements. Both respondents found Geolive highly effective for supporting discussion – they also found that the navigation functions worked well. In addition, they identified the need for improvements in the tool's ability to upload data layers and help prioritize discussions.

### 6.1.2 - Focus Group Meetings

#### 6.1.2.1 - Focus Group 1 – Designing the Online Discussion Map

At the first focus group meeting held in the SPICE lab at UBCO, there were eight participants representing 4 NGOs, 4 local governments, and 2 regional governments along with the researcher. Follow up notes on this meeting were requested by participants unable to attend due to transportation issues. This meeting turned into a question and answer session as participants wanted to learn what the Geoweb could offer in relation to their needs. Questions about the development of the web-tools were related to these two themes:

- Technological capacity;

- How fast would the technology become redundant because of continual advancements?
- Can partners manage and maintain the tools themselves?
- Who would be available to offer technical support?
- How would partners keep the information up to date?
- Usability;
  - What base maps would be used?
  - How would someone set the criteria for the type of data they want to view for a specific location?
  - Who would prepare the data to be posted to the mapping tool?
  - Would the tool remember the data layers and settings compiled by the user and could a link be sent to another person to open the same view of the map and contribute to it from there? (i.e., could bookmarks be created)
  - Could users download shapefiles?

The meeting evolved into an information session about the possibilities that the Geoweb offer and provided an opportunity for the participants to ask questions and discuss the technology. However, the following feedback was contributed as general guidelines for development of a pilot discussion map.

1. That someone who is not a GIS expert can upload information, overlay related data and save this to use as a contribution to a community planning process or share to generate discussion on an environmental governance issue.
2. The tool should be as simple and familiar as Google Maps for viewing and navigating data.
3. That accessing information should not require users to make more than 3 clicks of a mouse.
4. Be clear on the user that the tool is designed for, i.e., the type of user and their purpose.
5. Provide a comprehensive and comprehensible user tutorial.

6. That participants should review the pilot tool, once developed, and reconsider all that it should be able to do.

One of the participants expressed the need to see a pilot demonstration and begin to work with the web tools in order to get a better understanding of their potential and, thus, determine if and how they could be of use to their work. Google Maps came up in the discussion repeatedly and, when asked, the participants unanimously responded that they have used Google Maps and find it understandable and manageable.

#### 6.1.2.2 - Focus Group 2 – Presentation and Discussion of Geolive

A demonstration version of Geolive was presented to members of the Regional District of the North Okanagan's regional growth environment and natural lands working group in November 2009, held at the Regional District office in Vernon. Of the twelve members in attendance, all were associated with partners of the OCCP and five of them were participants in the action team for this project.

Members of this planning session had requested to use Geolive to facilitate their planning discussions. The layers necessary for their discussions had not been fully loaded and the tool itself was still undergoing revisions at the time of this meeting. This was also the last meeting of this group. As a result, instead of this meeting focusing on the usability of the tool, it became a presentation of the potential of the tool and opportunity for gathering feedback from participants and responding to their associated questions.

Planning session participants provided input on how they would like to see the application function and commented on the general challenges they have experienced in the past with similar forms of web-based tools. The main usability features identified by this group were:

- Easy to access and navigate the data layers.



- Logically laid out with a clear purpose identified on how users expected to make use of it.
- Intuitive tools to contribute comments, or link information to the layers.
- Google Maps should be used or serve as an example of an easy to use mapping tool that is familiar to the broad population.

The main concerns related to Geolive raised by this group were:

- Access to the tool being blocked by government offices, determined to be a result of the tool being created with Javascript which many government offices block. Given that at least 11 of the 20 project participants worked in government offices, this was determined to be a significant hurdle to the use of the tool and thus the engagement of these participants.
- Who will regulate the information contributed to the discussion tool, i.e., monitor accuracy?
- Use of the discussion tool is still limited to versions of Internet Explorer 6 plus and Firefox. Participants have been unable to get it to function well with other web browsers.
- Confusion over the password protection of content on the discussion tool.

#### 6.1.2.3 - Focus Group 3 – Usability of the Web Tools

There were 14 participants representing 6 local governments, 2 regional governments and 5 NGOs involved in this focus group meeting that was once again held in the SPICE lab at UBCO near Kelowna. At this meeting, the web tools were still under development and all of the data layers required for the discussion were not ready. The Okanagan Habitat Atlas had not been revised at this point and there were anticipated revisions still under way with the OKCP portal and Geolive. However, this focus group was able to test the usability of these tools.

The response to the OKCP portal and Geolive application was positive from all of the participants. They identified the potential for these tools to be very useful, once further anticipated refinements were completed. One of the local government representatives stated that, due to their office not having access to an easy to use GIS, they would like to make use of Geolive on a day-to-day basis.

The following points capture concerns raised by participants in this focus group:

- Data Accuracy
  - Ability to monitor data accuracy, for example through having someone identified to validate the data or notification of who provided the data.
- Quantity of data
  - The quantity of data and ensuring that the OCCP has established a long-term plan for sufficient data storage.
- Technological capacity
  - That the OCCP and partners be able to manage the data, updates and maintenance of the technology over time.
- Usability
  - Approximately six of these participants had forgotten their passwords or had not accessed the tool due to the requirement to register in order to use it.
  - Three of the participants commented on how they wished to receive notifications of new contributions to the site, i.e., they wanted the ability to choose how and of what they were notified to reduce or eliminate notice of contributions in which they were not interested.
  - Three of the participants wanted the ability to engage in the map discussions via forums and to be able to invite people to participate.
  - Two participants mentioned they would like the ability to create a personalized discussion map, choose layers, icons, map location and invite participants.

A detailed summary of design revisions that were identified at this focus group meeting and through associated follow up by the research team is provided in Appendix F.

There were also many challenges raised by participants in this focus group regarding the use of web-based technologies for environmental governance that would require further research beyond the scope defined in this project. For instance;

- Contributed data can become difficult to track as changes are made and volunteers cannot be relied upon to provide updates over time.
- What is a “good” versus a “bad” contribution?
- What should be done as volunteered contributions diminish over time?
- How can decision makers manage the quantity of the contributions, especially if each requires validation?

At the end of this focus group meeting it was determined that Geolive should be used to support further discussion virtually in order to avoid the participants having to take time off from work and travel to a central meeting location. It was also requested that a potential corridor be identified on the map along with the rationale for identifying it, as the majority of the participants were mainly interested in discussing potential implementation issues versus route identification, which is more scientifically based.

#### 6.1.2.4 - Virtual Focus Groups

The purpose of the virtual focus groups was compatible with the intention of developing Geolive, i.e., to discuss the connectivity corridors over an extended period of time with partners in geographically dispersed locations. The added factor here, however, was that the usability of the discussion tool was still a key factor requiring critique and feedback.

For the virtual focus groups, participants were sent a discussion topic such as the one below and asked to make use of the Geolive application to comment on the connectivity corridor issue and the functionality of the OKCP portal and Geolive for supporting their discussion.

*First discussion:* The research team planned to allow one week for participants to contribute responses using Geolive. They asked participants to 'highlight core conservation areas', where they saw most overlap of highly sensitive habitat features. Specific questions included:

1. Is there sufficient data available on Geolive to facilitate identification of sensitive habitats and potential connectivity between them?
2. Does Geolive provide the functionality for supporting this process?
3. Was it easy to login, maneuver through the map layers, add points, draw a line/polygon, contribute your thoughts and follow/understand the information presented on the map?
4. Action – Identify using polygon function what habitats or areas are most in need of protection?

*Second discussion:* The research team planned a second virtual forum group to take place the month following the initial discussion. This would also allow one week for participants to contribute responses using Geolive. Discussion focused on the identified core areas in need of protection. Participant input from these two discussions would be used to map out a potential connectivity corridor.

Specific questions included:

1. Based on the information provided within the data layers, identify core habitat areas that should be connected.
2. Using Geolive, draw how you would connect these areas?
3. Highlight issues that arise based on linking areas – i.e., development plans that could impact proposed corridor.
4. Identify where there are gaps/bottlenecks in the information.

5. Select on map where there is a need for targeted mapping and/or groundtruthing.

The virtual discussions did not take place despite two attempts to initiate discussion. Each attempt followed a similar format to the outlines provided above with effort made to simplify the process in order to facilitate participation. None of the participants, other than the researcher and another member of the research team contributed to the discussion on Geolive. Near the end of the research, one associate participant contributed information to the OKCP's online forum function after being encouraged to do so. She chose to add this information to the forum because she was not comfortable with using the Geolive application, as she felt her information would go unnoticed on the discussion map and be difficult for participants to find.

#### 6.1.3 - Semi-Structured Interviews

The researcher conducted seven semi-structured interviews with individual participants. These interviews took the form of discussions while reviewing the OKCP portal on a laptop computer and evaluating its usability. During each of these interviews, the researcher attempted to solicit feedback from participants related to the design, development and use of the project tools through discussion of questions that included:

- Are you using the web tools for work? If so which ones, for what purposes and how often?
- Have you contributed information to the OKCP portal using the tools or followed the connectivity corridor discussion?
- What is your initial impression of the tools? Do they function well? Are you having problems using them?
- Are you able to do what you want with the tools? If not, how could they be changed to better suit your purposes?

A consistent theme that emerged from these interviews was that each of the participants were supportive of the OKCP portal and Geolive application, believing that it would be useful for supporting environmental planning efforts on shared issues throughout the region. One of the participants raised the concern that the connectivity corridor issue itself was not receiving sufficient attention due to the project being consumed with technology development.

Each of the interviewees expressed their support for the concept of the OKCP, as a portal for accessing and sharing Okanagan oriented conservation related information and resources. However, this support was irrelevant to the level of functionality of the OKCP portal during the period of the interviews. Three of the participants had not logged on to use the OKCP portal at the time of the interviews, while the other four had accessed it, found that it was still in development and had not returned to the portal. It was also notable that six of the seven did not remember the registration login they had been provided to access the OKCP portal.

Through these interviews the issues faced by participants became clearer as the same points were raised time and again, allowing them to be discussed in more detail. The following themes capture the issues and feedback identified by participants:

- Usability - Ease of use/ complexity.
- Technological capacity – keeping up with the technology and maintaining the tool over time.
- Cost – to manage and maintain the tool over time.
- Credibility of the data/ validating accuracy.
- Information abundance.

Each of these themes is discussed in further detail in Section 7 of this thesis.

#### 6.1.4 - Participant Observation

In order to continue with evaluation of the web tools, participant observation played a role in determining the best approach to developing the tools to engage OCCP partners and members of the public.

Through interacting with and observing the participants over the course of the research, the following five issues associated with the research process arose as having an influence on the perspectives of participants and their level of engagement in the project.

##### *1. Developing the capacity to facilitate the discussion*

Before starting the discussion process, the research team wanted to have the tools developed to a stage where participants could easily contribute information without the need for user manuals or tutorial demonstrations. The team believed that in order to engage users and keep them coming back to the OKCP portal, their initial experience when using the tools had to be positive and intuitive. However, it took approximately 12 months to develop the OKCP and Geolive to the point where people could use them to view the relevant data and contribute information. At that point the tools still needed multiple refinements to make them convenient and easy to use.

It became apparent after 12 months of trying to keep the participants engaged, that they were losing interest in the process. Much of the reason for this long period of preparation was based on the 'beta' nature of the tools as well as the complexity of the connectivity corridor topic chosen for engaging the participants in using the discussion tool.

##### *2. The topic*

From the outset the project participants had understood that we would be discussing connectivity corridors and that together with the research team,

participants would be evaluating the effectiveness of Geolive and the OKCP portal in supporting that discussion. However, more time and energy were needed for developing the technological capacity to start the discussion than had been anticipated.

The objective for this research project was to support the participants in discussing and potentially identifying a connectivity corridor of sensitive habitats in the Okanagan Valley. Therefore, the project had limited ability to deviate from this topic. Significant time was devoted to gathering the multiple data layers needed to discuss the connectivity corridor issues. Gathering the data layers involved organizing data sharing agreements with two of the partners, while data had to be sent by one partner to another partner to prepare for uploading and then sent to the university GIS technician who posted it to Geolive.

### *3. Data layers*

There were 27 layers included in the connectivity corridor discussion, which took approximately seven months to gather and then display on Geolive. We further found that important layers were missing and that critical layers of the discussion were not clearly represented. Participants requested detailed descriptions of the data layers to know how each layer contributed to the discussion, this also required further time for linking pop-up descriptions when the mouse is scrolled over each layer title.

Participants raised concern that the ability to 'pick and choose' from so many data layers, would impact how data was analyzed and in turn how decisions were arrived at. Unfortunately, there was no method for identifying which layers formed the basis of comments being made on the map nor a means for others to open Geolive to the exact display that the contributor would have had when adding his/her comment including which layers were open at what zoom level and whether they were viewed in



terrain or satellite view. This led to confusion amongst participants over what information would form the basis of comments contributed to the Geolive discussion map.

Additional problems related to the data included:

- There were examples of out-of-date data being posted. New data had to be gathered and posted in its place.
- Some data layers such as the parks layers, were missing information and had to be replaced.
- It was challenging to represent data consistently across the Okanagan Valley. For example, approximately seven different Sensitive Ecosystem Inventory data sets were developed independently of each other, but they needed to be represented cohesively. Achieving this only took place near the end of this research project.
- Not all participants were familiar with all of the layers and requested that interpretive information be attached to the layers as a pop-up box.
- Having 27 layers on the discussion tool confused participants as to what layers they should use, what they should use them for and which layers should be used in conjunction with one another and why.

By the time of the final focus group meeting the issues with the data layers were not fully resolved and many of the data layers were still not posted onto Geolive. This resulted in losing the opportunity to support the planning efforts of the North Okanagan regional growth strategy working group discussed in Section 6.1.2.2 and to determine a potential connectivity corridor of sensitive habitats through the Okanagan Valley.

#### *4. Methodology for the discussion topic*

Another aspect that contributed to the complexity of the topic was that a methodology for discussing connectivity corridors was not clearly laid out. As

a result, the participants were not clear on the parameters for identifying a connectivity corridor. Therefore, even if Geolive had been the most effective method for identifying and discussing a corridor, participants still would likely have struggled with how to proceed.

### *5. Responses*

Through participant observation, it became apparent during the second of the three focus group meetings that many of the participants were beginning to perceive that the limitations of web-based technology outweighed the potential benefits. This focus group gave the distinct impression that they were disappointed that Geolive was still not able to support their needs, given that it was their last opportunity to use it. The researcher was left with the impression that those participants had been turned off by the process and had concluded that the Geoweb was not yet an effective tool for facilitating their planning purposes. In the seven months since that meeting, a review of the user management function for the tool shows that only four of the members of that group have visited Geolive again.

Similarly, of the participants involved in the connectivity corridor discussion, only one appears to have subsequently checked in to see the latest status of Geolive, and only one comment was contributed, with the assistance of one of the project coordinators.

## **6.2 - Findings of Results**

Having observed the project participants' experiences with the web tools and heard some of them express concerns over the financial costs associated with such technologies, the researcher formed the conclusion that at this stage they did not feel it was worth the time, money and skills resources required to develop and maintain the tools. However, none of the participants specifically stated this or recommended stopping the process, leaving open the possibility that they hold

out hope that the investment required for the development of these tools will pay off in the long run.

In the third focus group meeting one of the participants who is a planner with local government related her frustration with entering information into both the OKCP portal and Geolive application. She commented on how she doesn't want to have to use any form of GIS to contribute information to maps, but rather, just wants easy access to information she needs for planning.

This sense of dissatisfaction with an online approach to planning was apparent from several situations that arose and comments shared by participants. An example is once again with the data. On reviewing the data on Geolive and considering its use for the discussion topic, members of the research team realized the connectivity corridor topic involved much more than simply the map and sensitive habitat data. For example, participants indicated political issues, economic concerns and competing interests involved with the connectivity corridor discussion when in the same room together that they were not willing to put in writing within Geolive or on a web forum. This observation indicated that the perceived level of access protection to the discussion tools is not sufficient for supporting the participants in discussing such issues amongst each other online. For this topic, participants need to engage in face-to-face review of related data and discussion. Feedback offered by two project participants in the third focus group supported this observation, sharing that they preferred to get together to discuss issues like planning a connectivity corridor and were much more engaged in the discussion by interacting with each other personally. There was general agreement amongst participants with this perspective, however at the close of the third and last focus group, project participants decided to use Geolive to support the connectivity corridor discussion as opportunities for face-to-face meetings were limited.

### **6.3 - Relating Results back to the Research Question**

This research set out to evaluate the primary research question of 'is the Geoweb an effective tool for supporting participation in local-level environmental governance and if so, in what ways and to what extent is it effective'. It used the Okanagan based case study of partners in the OCCP discussing the identification of sensitive habitat connectivity corridors in the region as a basis from which to examine this question.

Revisions to the project's geoweb tools were not fully completed by the end of the study, limiting the ability of project participants to use or comment on the effectiveness of the completed project tools for supporting the identification of connectivity corridors. Subsequently, these associated time delays caused project participants to become less engaged in the study. In relating this experience back to the research question, the study demonstrated that the Geoweb could be both ineffective and unproductive for supporting local-level environmental governance. However, the data gathered during the design and development of the tools does provide significant insight into understanding issues that may mitigate the effectiveness of the Geoweb for supporting participation in local-level environmental governance issues.

The participatory action research (PAR) approach of this project also provided a valuable opportunity for partners in the OCCP and members of the research team to work together on identifying and addressing the participatory engagement needs of partners in the OCCP. This collaborative effort resulted in the development of the OKCP portal, Geolive and associated web tools, as well as refinements to the Okanagan Habitat Atlas, and online provision of data for public access, which was not available prior to this project. These new online resources also provide partners in the OCCP with increased capacity to manage these tools themselves. Project web tools have been designed to be resources that are shared by the partners in this process and the participatory structure

established for developing them may serve to guide further development and refinement to the project tools now that they are ready for use.

The data gathered through each of the qualitative methods used in this research facilitated continued improvements to the functionality and usefulness of the web tools. Even though participant engagement in the study dwindled by the end due to time delays, project participants continued to verbally express their support for developing the web tools and contributed their insights into developing a greater understanding of how the Geoweb should function in order most effectively support local-level environmental governance efforts.

The following section provides a detailed discussion of the data gathered during the study based on five themes identified in Section 6.1.3 that were raised by the project participants in relation to the design, development and use of the project tools. Each of these themes is discussed individually in relation to the literature and then is reviewed collectively in terms of the overall sustainability of the Geoweb as a participatory tool.

## **7.0 Discussion:**

### **7.1 – Discussion of the Effectiveness of the Geoweb**

Using project participants' responses, this study identifies five themes related to the effectiveness and use of the project's web tools and the Geoweb overall, to support participation in local-level environmental governance. These themes are:

- Technological capacity – keeping up with the technology and maintaining the tool over time.
- Usability – Ease of use/complexity.
- Cost – to manage and maintain the tool over time.
- Credibility of the data/validating accuracy.
- Information abundance.

#### **7.1.1 - Technological Capacity**

The technological capacity theme presents participants' issues associated with the functionality of project web tools and the skill requirements for development and maintenance of these tools. Within this project, representatives of the OCCP and the project participants identified their concerns over the capacity of the partners to develop and maintain web-based mapping technologies over time. Concerns were related to the OCCP not having the server space to handle potentially large quantities of digital data, such as maps, or the technological skills to manage and maintain a participation tool beyond the end of this project.

Each of the project participants have past experience in working within associated networks to develop local on-line mapping tools such as the Okanagan Habitat Atlas and SPOKE, and based on those experiences, many shared concerns over the course of the study about the effectiveness of such tools. One of the respondents in the semi-structured interviews specifically referred to an experience with the Okanagan Habitat Atlas project where it took two years for upgrades to be made to the functionality of the site and data layers

provided on it. This participant had reservations about the time demands involved with developing web-technologies, especially considering how fast they become outdated and require upgrading which in turn requires additional resources and time. She stated in an email regarding this same topic that:

“As soon as technology like the Okanagan Habitat Atlas becomes out of date, people stop using it and it then becomes uncertain as to whether it is worth upgrading the technology because it might become hard to encourage people to use it again”.

Another participant echoed this perspective during the focus groups, stating:

“Atlases on the Community Mapping Network sometimes become irrelevant because people stop using them. The tools have to be good enough to keep people interested”.

Traditionally, maps have been designed and produced by so-called ‘experts’, cartographers and GIS technicians who have been educated extensively in various mapping procedures, and are well paid for their efforts (Keen, 2007; Miller, 2006). Goodchild (2007) notes that this approach to map-making has resulted in only a very small fraction of human knowledge of the planet [making] its way through the various processes used to acquire, assemble, and disseminate geographic information. For the design and production of the OKCP portal and associated tools such as Geolive, the traditional expert oriented relationship pattern does generally apply. Participants were involved in the process of designing the portal but the research team took the lead role in designing and implementing the technology to meet participant goals. The GIS technician at UBCO was primarily responsible for the development of the tools.

In contrast to traditional expert-driven mapping processes, the PAR approach used in this research increased the knowledge of all project participants regarding geospatial technologies and the GIS technician advanced from what Coleman, Sabone and Nkhwanana (2009) refer to as an ‘expert amateur’ to an

‘expert authority’ in learning to develop and refine the web tools developed for the research. The OCCP coordinator also gained extensive knowledge related to the design, development and management of the OKCP portal and Geolive. As long as the technologies used to develop these tools remain supported and major refinements are not required, the OCCP coordinator is now very comfortable with managing and maintaining these tools and the information and data contributions they support.

One participant suggested that the web tools could benefit from being able to make use of ‘open sourcing’ to access technical support for maintaining them over time. Tapscott (2008) refers to open sourcing as leveraging the mass collaboration enabled by Web 2.0, and comments on the 100,000 plus web programmers available over the Internet to help with developing and refining web technologies for free. At the close of this study the researcher was unable to determine if open sourcing would be of assistance in the maintenance of the OKCP portal and Geolive, however the GIS technician agreed that this approach had potential to support these tools in the long-term.

The goal of developing web communication tools for the OCCP was to provide partners without web based GIS capability, such as small local governments and non-government organizations access to the same level of habitat data and planning tools to which larger institutions typically have access. Through providing greater access to this data and associated planning tools over the Internet, the OCCP hopes to overcome the local digital divide that it recognizes is negatively impacting environmental governance in the Okanagan region.

Using web-based participation tools can have a short turnaround time for stakeholders involved in governance processes (once the tools are developed) – but it has the disadvantage of requiring stakeholders to have access to both a computer and the Internet (Brown and Reed, 2009). Brown and Reed (2009) further argue that issues such as lack of Internet access, the speed of access



and the technologies available to groups and large portions of the population can negatively influence the response rate and potentially introduce bias by limiting participation to those with competency in or access to the Internet and advancements in web-technologies.

As a result of this 'digital divide', Sieber (2006) argues that the concerns and perspectives of portions of the public can become increasingly marginalized from accessing and using information that is Internet based. She points out that certain interests (e.g., corporate, rich, technically able, young) may be better able to participate in planning processes than are others. Kingston (2002) further adds to this issue that GIS and internet based technologies have been criticized as being an elitist technology that give increasing power to those already holding power, while the general public is becoming less able to access and understand advancing technologies and have a say in decision making processes as a result. Carver (2001) contributes the perspective that better access to the Internet may help more people be informed, but there will always be a significant proportion of the population who do not have the appropriate training or intelligence with which to use it effectively. According to Goodchild (2007), PPGIS could therefore prove divisive if technically able members felt more empowered than non-technical members to influence policy.

Kingston (2002) writes that by democratizing the technology and providing open access to GIS, some of the recent criticisms of GIS as an elitist technology can be overcome. The OCCP has taken steps towards such democratization through the use of the Geoweb for sharing environmental resource information in the Okanagan, but the results of these efforts require time to overcome elitism within the region.

The OCCP web tools are still a work in progress and further research is needed into whether these technologies will be effective, and manageable by partners, their networks and the general public, for helping to support increased

participation in environmental governance issues. Through discussing the OKCP portal and Geolive and observing participants' responses to refining the tools, the researcher concluded that participants continued to be excited by the potential of these tools and the technologies that they make use of.

#### 7.1.2 - Usability

The theme of usability encompasses issues and comments brought forward by participants related to how the tool should function and for whom it should be designed. Feedback from project participants, and the OCCP coordinator in particular, outlined that web-communication technologies used by the OCCP needed to be easy to use and manage by partners and their networks over time. In response to a design survey question regarding the importance of ecosystem mapping to guide policy development, one of the survey respondents stated:

“I think there is high potential for using ecosystem mapping as a decision support tool, especially in tandem with user-friendly, interactive, and visually appealing applications for reviewing proposed development”.

To this same question, another respondent added:

“Data such as ecosystem mapping needs to be easily accessible”.

In discussing the information that the OKCP portal provides access, an interviewee who works as a planner with a municipal government in the Okanagan pointed out that he uses whatever site provides the fastest and easiest access to current versions of the data and information. In the four years he had been with his organization, he shifted from accessing Okanagan-oriented habitat data on the Community Mapping Network atlases to the regional government online maps, to now using the municipal government online maps as they are the most up to date and easiest to access and use. This interviewee added that he finds all web technologies to be similar,

“They become out of date in a couple years and you have to shift to the latest and greatest”.

On evaluating the responses of participants related to usability, it is important to take into account that the participants in this study were fairly sophisticated users of web-technologies for content management, viewing GIS and using online maps in their environmental planning oriented careers. Based on characterizations provided by Coleman, Georgiadou and Labonte (2009) of data contributors, the researcher estimates that of the 20 participants in the project; 50% are expert professional users of online mapping tools and GIS, meaning that they rely on their knowledge of this technology for their living, 30% are expert amateurs who know a great deal about the technology but do not rely on it for a living, and the other 20% are expert authorities who are widely studied and practiced on the use of this technology.

Project participants (see Appendix A) were also motivated to interact in the development and testing of this online participatory tool by their associated organization's mandates of incorporating public participation in planning processes. Understanding people's motivations for contributing information is important to determining the direction of advancements in Geoweb technologies and how to effectively use these tools for increasing public participation in planning processes. In this regard, participants shared their impressions on the usability of web tools with consideration for how associates or the public in general will interact with the tool, as well as how they use GIS and mapping tools in their own professional roles. Discussion of the potential users of the tools developed in the project raised the topic once again of the roles of experts versus amateurs.

In light of the recent advancements of the Geoweb, a reconsideration of the roles that should be occupied by the public and those which should be held by 'experts' regarding online participatory mapping must occur. According to Sieber (2006) there is a tendency in PPGIS practice to view relationships as elastic; for example, the line between experts and amateurs can be quite thin and shift over

time. During the design phase of this study, feedback from participants indicated that project tools should employ easy to use technologies that are familiar to the general population, such as Google's 'My Maps'. User-friendly web applications, such as this allow for the representation of the knowledge that the average citizen possesses, forcing an amendment to previously held notions about what it means to be an 'expert' in the first place (Kesby, 2007). There are mixed opinions regarding the role of professionals versus amateur contributors to a wide variety of web-enabled media today, be it in terms of journalism, video, and even mapping. Influential enthusiasts like Leadbeater & Miller (2004), O'Reilly (2005) and Tapscott & Williams (2006) all see tremendous benefit from this revolution in user contributions. However, critics like McHenry (2004) and Keen (2007) have been equally articulate in their concerns that "crowdsourcing" represents a disturbing trend that the influence of amateurs is increasing at the expense of the legitimate influence of experts and professional media organizations (Coleman, Georgiadou and Labonte, 2009).

Although it is noted that everyone should be capable of commenting on a particular problem, it is recognized that differences in age, background education, profession, etc., require different levels of information and technological capacity if effective interaction is to be achieved. Kingston (2002) points out that how effectively web-based participatory tools can be engineered depends very much on the complexity of the problem and potential users that they are addressing.

During the course of the research project, access issues were raised by participants on several occasions, related to who could participate in the connectivity corridor discussion on Geolive or view associated materials stored on the OKCP portal. This was a general topic of early web tool design discussions in the focus groups and three participants commented specifically on this during the interviews as well. A project participant representing local government specified in an interview that;

“We have to define security with very clear terms of access to information on the tools”.

Her example was that,

“We don’t want developers to view conservation oriented discussions of lands that they may have development plans for, as they could start to lobby local politicians for exemptions or to stop conservation plans before any potential implementation guidelines are even proposed”.

Project participants discussed the pros and cons of limiting participation in the discussion topic. The point was raised that local knowledge of the segments of the public such as naturalists and landowners could greatly contribute to the discussion, however four of the participants were clear that due to the sensitive nature of the data involved in the connectivity corridor discussion and the complexity of the issue, the discussion needed to remain closed. In the end, it was decided that the discussion would be closed to encourage open sharing of specialized knowledge on issues such as movement corridors, habitat disturbances, species populations and land-use planning. Then, if a potential corridor was identified, sensitive data could be removed from the web tools and the general public or interest groups such as naturalists, could be invited to contribute input on the issue. Goodchild (2007) agrees that there may be situations where restrictions on who participates could be necessary in order to ensure adequate expertise on an issue.

The vision for the OKCP portal and Geolive was that they would eventually be applied to OCCP partner’s efforts to engage public participation in related local-level environmental governance issues. In envisioning the role of the Geoweb and sharing feedback on the design of the OKCP portal and Geolive, all of the participants expressed an awareness of current trends such as people using mobile Internet devices and GPS mobile phones to share information digitally on governance issues. It was clear through interacting with each of the participants that they supported the development of the web tools and shared their time with

the project based on their belief that these technologies have the potential to support the efforts of OCCP partners.

Research, such as Sui's (2008) findings regarding the Wikification of GIS and its consequences, show that technologies that enable users to edit or add to the body of spatial information are growing exponentially in popularity. According to Elwood (2008) these technologies are being used to participate in governance in a variety of new ways such as using online maps to create and share information to demonstrate anything from the detailing of shops and services within a community, complete with photos and video footage, to an archive of illnesses that are being reported at a local hospital. The development of the OKCP portal and Geolive represents the OCCP embracing this popular cultural movement in Web 2.0.

Though it was not expressed in the same way, the intention for developing the OKCP portal and Geolive evolved over the course of meetings and discussions to harnessing as Coleman, Sabone and Nyhwanana (2009, p. 2) state; "the power of new media and volunteerism in order to improve their own change detection and geospatial data updating processes". They add that Geoweb technologies such as Geolive should be able to significantly increase access to information and reduce the turnaround time for information updates from weeks to hours, making new information available to users in a much more timely manner. This involves streamlining approaches to changing datasets, improving systems of reporting, verifying, correcting, and passing new data to users.

There were only the two completed survey responses and little verbal feedback on the usability of Geolive once it was prepared for facilitating the connectivity corridor discussion. Each of the participants who provided feedback during this project on the usability of Geolive evaluated it during a pilot development stage and therefore their feedback largely consists of hypothetical input regarding how the tool should function. It is significant to note that once participants had

provided feedback on Geolive, monitoring of their access to the tool showed that they did not revisit it despite being requested to view and interact with revisions. This finding may indicate that participants lost interest in the tool, due to it not being able to serve their perceived purposes. However, there was no clear statement by any of the participants as to why they did not attempt to use Geolive, or login to the OKCP portal more than once.

Participant feedback and observed challenges with using both Geolive and the OKCP portal in relation to the connectivity corridor discussion, provided guidance on improving the usability of these tools. Future research will be needed in order to determine if the usability refinements that have been made will benefit future projects and environmental governance issues in the Okanagan. This study indicates that unless the research issue and purpose for contributing is straightforward (i.e., have many less than 27 data layers), the method of contributing intuitive, and clear messaging inviting participation is promoted, people are unlikely to use a web-based participation tool. If they do try it and it does not meet these criteria, they are unlikely to try again.

#### 7.1.3 - Costs

Project participants' responses related to the theme of costs varied widely; from issues associated with the potential cost savings related to using Geoweb based technologies, through to issues of expenses that could arise, such concerns related to the long-term maintenance of web technologies, or hiring skilled technicians.

The researcher had been involved with other participants from this study on the past SPOKE project and Okanagan Habitat Atlas development. During each of these projects, partners raised concerns regarding the large amount of money being invested in the technology without a financial plan for maintaining and upgrading the technology over time. This concern was raised again on several occasions during this study. During the interview discussions a participant

commented that local organizations such as partners in the OCCP have limited skills and financial capacity. She questioned whether any of the web technologies developed previously by the partners in the OCCP have proven effective with regard to the time and money that have gone into them compared to how many people are actually use them.

Producing geographic information can be costly for official agencies and they can find that they are unable to cope with the challenges involved in keeping up with data provision. According to KeBler, Janowicz and Bishr (2009), freely available GIS technology makes it possible for communities to generate some of the planning oriented information they need through accessing local knowledge. As a result many local governments cannot justify the expense of continuing to provide data that people can provide for themselves.

Partners in the OCCP have maintained a commitment to investing in web technologies based on the understanding that this has the potential to be the most efficient and in the long-term, most cost effective way to provide access to information and facilitate understanding of local and regional issues. Research by Ganapati (2010) finds that the advancement and increase in use of web-based engagement tools is expanding as opportunities are identified for cutting the costs of service provision through soliciting public knowledge and experience on local-level governance issues.

Governments are increasingly turning to maps generated by communities to inform themselves on local-level governance issues. Goodchild (2007) finds that governments are shifting their interest to gathering information on local geography from people familiar with the areas on the ground through VGI rather than paying for traditional data gathering sources. Online community atlases such as the Okanagan Habitat Atlas for example, represent efforts begun back in 1993 by the Canadian Department of Fisheries and Oceans to provide open access to fish population and habitat data throughout British Columbia with the



intention of gaining local knowledge of potential impacts to the integrity of fish habitat province wide. Ganapati (2010) also offers several examples of local governments adopting the use of Web 2.0 for engaging citizens in VGI, such as in Washington DC for getting people to report crime and building permits using real-time iPhone applications and in cities like Philadelphia and New Jersey where [www.seeclckfix.com](http://www.seeclckfix.com) is used to elicit citizen reports on neighbourhood issues and to request the problems be fixed.

The use of web-based participatory tools for public engagement can also cost significantly less time and money compared to mail or workshop based approaches. Previously, the costs of producing and disseminating information were often prohibitive and the return rate low. Researchers such as Flanagan and Metzger (2008) argue that emerging web-technologies have lowered the cost of information production and dissemination, increasing the sheer amount of information and the number of information sources available as well as opportunities for citizens to comment on this information.

According to the Organization for Economic and Community Development, utilizing collaborative approaches to reduce financial costs by leveraging the experience, expertise and resources that exists within communities is 'key' to developing effective new governance structures (OECD, 2010). The shift of governments towards greater sharing of accountability and decision making capacity related to environmental governance with diverse citizen groups and private organizations may be a first step in recognizing the complexity of the issues and that governments can no longer manage them on their own.

OCCP project proposals initially spoke to the need for enhanced partner collaboration in order to fill gaps in the governance of local-level environmental issues left from government downsizing. In this regard, the OCCP responded to government having downloaded financial responsibility for environmental governance onto local organizations by turning to the private sector for financial

support of environmental project work in the Okanagan. In moving forward the OCCP determined that web-based communications tools offer the greatest potential for cost effectively supporting information sharing, exchange and networking.

Costs for the design, development and testing of the OKCP portal and Geolive for this project were approximately \$75,000. From the perspective of the OCCP budget, this was a lot of money especially as these web-tools did not succeed in their intended goal of supporting participation in the connectivity corridor discussion topic. The experience of this study highlights the need for a clearly identified purpose for the use of web tools and that the cost of marketing associated with promoting the existence of the tools and how they can be used to participate in environmental governance is accounted for during initial project planning.

At the close of this study, refinements to the OKCP portal and associated tools, such as Geolive and the Okanagan Habitat Atlas were just being completed. These tools have been designed with consideration of cost effectiveness through the use of freely available open source software and broadly popular technologies such as 'Google Maps' and 'Joomla'. The research team expects these technologies to be supported by the user community for many years to come, allowing the OCCP coordinator and partners to access free upgrades and assistance, as they need. Participants in this study also established a relationship with UBCO to provide server space and technical support on an in-kind basis on a five-year renewable basis. Whether or not these tools will be considered a cost-effective approach in the long-term was not concluded with this research and will require further research over the coming years to determine.

#### 7.1.4 - Information Abundance

Many of the issues identified by the project participants fell under the theme of

information abundance. More specifically five of the seven interviewees questioned the management of the quantity of data such as maps that would be contributed to and stored on the OKCP portal and Geolive into the future. For example, one participant commented that:

“The information has to be categorized in a manner that makes sense to all the users, I’ve used sites in the past where I can’t find data or it takes too much time to try to search for it and I don’t bother to use those sites again”.

One of the key challenges with the use of online participatory technologies according to Flanagan and Metzger (2008) can be how to manage the quantity of data that is contributed. Managing volunteered data contributions requires the resources to monitor and potentially to act on feedback. For instance, when people contribute first hand knowledge of wildlife populations, or habitat destruction, they expect to know their contribution is being reviewed. If citizens do not see actions result from their contributions, research by Coleman, Sabone and Nyhwanana (2009) notes that volunteerism drops.

Now that more people have access to production means such as cell phone cameras, digital recorders, GPS devices etc, emphasis of both consumers and professionals shifts from production to filtering the quantity of data that can be contributed. In the future there may be a mix of responsibilities when it comes to determining who actually performs such filtering or quality control – trained professionals or a network of informed consumers (Coleman, Sabone and Nyhwanana, 2009). Goodchild (2007) argues that the accuracy of each piece of the patchwork of information contributed by individuals in a community as well as the frequency, with which it is updated, can be determined by local need.

Currently, according to Flanagan and Metzger (2008) it continues to be a common perception among users of Internet applications that as the popularity and use of an application grows, users can judge the credibility of contributed information

based on the quantity of contributions and the general consensus of these contributions. Using technologies such as the Google mash-up, citizens may be involved in a truly participatory process that engages them “in all stages from problem prioritization, data collection, spatial analysis, through to decision-making” (McCall, 2003, p. 555). However, the argument has surfaced that this kind of unregulated contribution of information is diluting the larger knowledge base, undermining truth, and relegating valuable expert opinion, shaped by years of training and experience, to the lesser-visited corners of the Web (Keen, 2007).

The OCCP web tools were designed to make use of evolving information technology to build upon individual and locally based knowledge with the intention of harnessing what O'Reilly (2005) calls 'collective intelligence', to embrace the power of the web. Whether or not this will lead to an abundance of information or to useful or disruptive information are issues that will require future research of these tools once they have been put to greater use in order to determine.

At the time of writing this thesis, contributions to the OKCP portal and Geolive application have largely been managed and organized by the research team. UBCO has provided the OCCP with access to all the server space anticipated to be necessary for containing the data, resources and potential information that could be contributed to the OKCP portal, Geolive discussions or associated web applications, for the next 5 years. The research team has attempted to develop the best framework for the OCCP coordinator to organize and manage contributed information, however follow up research is necessary in order to determine how these web tools will support large quantities of information being contributed on an on-going basis.

#### 7.1.5 - Credibility

In connection with information quantity discussed in the previous section, participants also raised issues associated with managing the quality, validity,

accuracy and credibility of volunteered information to the OKCP portal and Geolive. These issues raised by project participants were also related to the Geoweb tools being opened up to public contributions on environmental issues in the future.

Despite increasing availability of avenues to support volunteered geographic information exposing a broader audience to the richness of local knowledge, researchers such as Tulloch (2008) raise concerns over the associated difficulty in quickly assessing the reliability of all of this data. Flanagan and Metzger (2008) also raise concerns over the quality, reliability, and value of VGI as an information resource.

For the public and decision makers to be able to trust participation processes and the information shared through them, Carver (2001) is clear that they need to be able to trust the data and tools they are given. According to Flanagan and Metzger (2008), with VGI there is great uncertainty regarding who is responsible for the information contributed and consequently, whether or not it can be trusted. For example, project participants wanted assurance that the information contributed to the Geolive discussion map on issues such as wildlife habitats and movement corridors were provided by qualified professionals basing their contribution on scientific data versus a member of the public providing personal observations. The reasoning for this stipulation was based on the belief amongst project participants that there is a high probability of misinformation with VGI, which could confuse truth of issue and therefore their ability to participate in the discussion in an informed manner.

KeBler, Janowicz and Bishr (2009) propose that trust and reputation of contributors is proxy for VGI quality in that if an item of geographic information is useful and relevant to a large group of users, it can be said that it is of acceptable quality in a more objective sense. KeBler, Janowicz and Bishr (2009) also indicate however, that new strategies are required to check the validity of user-

generated entries over time.

There are significant and, to date, unresolved problems concerning the representative nature of the data generated and the validation of individual responses (Carver, 2001). One participant in this study observed that some groups, including local government, may use tools like Geolive to push their agenda, and with that in mind, it may be hard to distinguish between genuine contributions and those intentionally planted to influence the outcome of decision-making processes.

People's motivations for contributing information can also have implications for credibility. Coleman, Georgiadou and Labonte (2009) find that there are many positive and negative motivations for people to provide information to online user contribution systems of all kinds. Observation of the participants in this study indicates they are motivated by professional interests related to their work, and trying to contribute towards protecting sensitive habitat in the region which they share concern for. Flanagan and Metzger (2008) add that people may contribute data to support others within a community of users, to achieve desired political outcomes, or because doing so is consistent with an altruistic worldview of generalized reciprocity. This could have become an issue in this project, however it did not by end of the study.

KeBler, Janowicz and Bishr (2009) argue that we need to be able to scan the enormous amount of user contributions and extract potentially useful information while discarding incorrect, inaccurate and fraudulent information. The credibility of the data is critical to its relevance for purposes such as planning a connectivity corridor, educating stakeholders and the public on the issue, or making policy decisions based on the information available. If people lose trust in the information contributed to the tool, it will go unused and could become irrelevant.

In identifying information related to a connectivity corridor, some of the

participants in the study indicated a desire to involve landowners, biologists, or naturalists with first hand experience on wildlife species in the region and their habitats. Relying on volunteered information has risks however, and KeBler, Janowicz and Bishr (2009) point out that contributors are not equally experienced about the places they report information about and the accuracy of the information they provide needs to be verified before this information can be deemed trustworthy for potential users and especially decision-makers.

Issues of managing large quantities of data and filtering more reliable data from less reliable data are subjects of research by Bishr and Mantelas (2008). They propose a method of assessing the trust and reliability of contributed information based upon the probable experience and knowledge of the contributor, for instance where they live in relation to observations contributed. For instance, basing reliability upon the proximity of the observer to the phenomenon for which s/he is providing information. The proximity would be associated with a reliability rating and the number of times the same observation is reported by multiple contributors.

Elwood (2008) discusses similar approaches in her research, along with looking at the number of times the same observation is reported by multiple contributors for validating contributions. Coleman, Sabone and Nyhwanana (2009) also reference similar forms of validating information using spatial and temporal considerations, adding that the date and time of a contribution may also indicate a contributors association with an event. As a result of this recognized need, tools such as a wiki-scanner are being developed to reveal the identity of contributors of wiki content, with the intention of increasing transparency of data sources within VGI systems (Flanagin and Metzger, 2008).

In discussing the credibility of contributed data a significant debate arises between the 'expert' knowledge of people in decision-making positions versus the 'amateur' knowledge of citizens. Information science perspectives that view

credible information as only that which is “accurate” lean too heavily on expertise: non-experts can also be credible, and many studies have found instances where local knowledge or expertise has eclipsed that of credentialed experts (Flanagin and Metzger, 2008). There is a perception of credibility with VGI, as people may trust information and opinions of the contributors who they see to be the best source of relevant information to an issue. In the case of this study, biologists were recognized as the experts on sensitive habitats that should be included in the corridor. Even so, the general public may consider members of local naturalist clubs, landowners or simply local residents as experienced contributors of information on this issue.

While the debate over amateur versus expert continues, important questions remain concerning environmental governance issues, specifically those related to whose knowledge counts when views conflict with one another? The emergence of local knowledge as a serious and credible resource for achieving sustainable development has, in some cases, broadened the definition of ‘expert’ to include non-scientists and caused expert committees to become more diverse and inclusive. Furthermore, this has helped to redraw the meanings and goals of capacity building. Jasonoff and Martello (2004) argue that new respect for local forms of knowledge has the potential to transform capacity building by strengthening and enabling existing, in-situ capabilities among recipients of development assistance.

There is often more trust and credibility of sources of information based on the depth of connection of the contributor to the information being discussed, for instance with a guest at a hotel providing a review of the service it provided. According to Flanagin and Metzger (2008) credibility-as-perception is more useful for those who use VGI for social, communal, or political purposes and it is critical for understanding the social and political power of VGI.



As discussed in Section 7.1.1, participants in this study raised a number of concerns related to who should be involved in the connectivity corridor discussion or have access to sensitive data on the OKCP portal. Many of these concerns were raised because of participants questioning the credibility of potential contributors to the discussion from outside of the project group. With regards to establishing levels of access to information on the web tools, a project participant representing an NGO commented that:

“User categories should be established so that contributions to the site can be assessed based on the category of the contributor”.

This interviewee also asked how users would differentiate scientifically verified information contributed to the site from non-verified data, they therefore recommended that users should be able to tell what information was contributed by experts versus non-experts. He also wanted experts to also be able to verify non-expert contributions.

The design survey for the development of Geolive indicated that five out of the nine respondents believed that the discussion should be private among the project participants. Through interviews and meetings with partners it was clear that the majority felt that at a planning stage, this topic could only involve experts on the issue. As a result Geolive and the OKCP portal were designed to offer secure, password-protected access to discussion maps, and the connectivity corridor discussion was only made accessible to the experts in the project.

The overall credibility of contributed data may rest on the extent to which a representative sample of people provide their personal input honestly and accurately (Flanagin and Metzger, 2008). Many applications, such as Wikipedia offer the potential for peer-to-peer credibility assessment ranging from people’s corrections of inaccurate entries, to blogs and other forums where individuals pool firsthand experiences to create and maintain spatial information (Flanagin and Metzger, 2008).

So, while digital media and information abundance may complicate peoples' confidence in and knowledge of who is an authority or 'expert', electronic networks and social computing applications make it easier to harness collective intelligence to assess and evaluate information and sources online (Flanagin and Metzger, 2008). Demands for methods to assess the credibility of information are driving advancements in technologies such as reputation systems, rating systems and wikis that may emerge as new arbiters of credibility and possibly even replace the need for experts on data that is voluntarily contributed.

By the completion of this study there were no concerns over the credibility of the data that was actually contributed to the OKCP portal or Geolive, due to the project participants being comprised solely of 'experts' on the discussion topic. If the OCCP is to make use of web tools such as Geolive for involving the general public or even specified groups in contributing information on environmental issues in the future, a procedure would need to be established for determining the credibility of shared information. If not, users of the tool may lose trust in the data that it provides and consequently stop using it. Future research into the long-term use of the OCCP tools would be useful for addressing issues such as this.

## **7.2 - Sustainability of the Geoweb**

The themes discussed in Sections 7.1.1 to 7.1.5 present on the direct findings of this research project. In raising these points however, participants also expressed interest and concern related to the overall sustainability of the OKCP portal, Geolive and associated tools and applications.

Based on previous experience with web tools, project participants share a concern over ensuring the long-term sustainability of web-based mapping applications for the OCCP. Issues such as the time, money and skills required to manage and maintain the tool were highlighted by participants as priorities that

need to be considered from a longer-term perspective than offered by the period of this study. Specific questions were raised, including;

- How will the OCCP coordinator or partners in the OCCP manage potentially large quantities of data and keep up with continually changing web-technologies? And,
- How can organizations such as the OCCP keep on top of the latest advances in the technology and stay abreast of the trends and motivations influencing different groups of users to contribute towards governance issues?

Coleman, Sabone and Nyhwanana (2009) determined that the longer-term sustainability of a VGI initiative depends upon its inherent ability to appeal to one or (hopefully) several key motivations of its contributors. Motivations for individuals to contribute information identified by Coleman, Sabone and Nyhwanana (2009) are believed to be of a broad range from altruistic reasons of benefiting others with no promise of gain, to professional or personal interests of making a contribution as part of a job or personal project.

Despite their level of participation in this study, each of the project participants appeared motivated to cooperate in integrating their planning and decision-making approaches towards implementing sustainable environmental governance in the region. Over the two-year period of this study, the participants took advantage of the opportunities to meet and work together to share experiences and resources. The tools that participants have contributed to have also established a resource, namely the OKCP portal, that supports the public in accessing local environmental information and contributing towards environmental decision-making processes in the region. Such information sharing is critical for filling policy gaps and has the potential to help make services responsive to local needs, in the face of diverse opportunities and challenges (Tagg and Taylor, 2006).

Another important sustainability oriented outcome related to the collaboration between participants in this project was that the OCCP partnered with the local university on long-term technical support and resources for the technologies developed together. OCCP partners agreed to have the OKCP portal hosted at UBCO as the campus is centrally located in the Okanagan and the university is recognized as serving the entire Okanagan region. According to Brown and Reed (2009) research organizations such as universities can also be perceived as neutral which can be important given the political and often contentious nature of natural resource issues. Brown and Reed (2009) add that building and sustaining trust will always be an important component in PPGIS success. In this regard, collaboration between UBCO and the OCCP initiated discussions of the university becoming a partner in the OCCP and working together into the long-term on environmental initiatives in the Okanagan valley.

This research was unable however to evaluate how sustainable the Geoweb tools developed for this project will be for the OCCP over an extended period of time. However, even during these initial development stages a number of questions regarding the long-term sustainability of these forms of technology arose. These included;

- Is the technology popular and well supported, with a network of current user groups, online chat rooms for asking questions, engaged computer geeks contributing free upgrades and refinements? Without a strong support network, Sieber (2006) advises that it is likely to be informal and fragile and fail to ensure long-term sustainability.
- Is the application compatible with other popular open source software?
- What are the social aspects of decision-making process that the tool is being used for? According to Carver (2001) social and political dimensions have trouble keeping pace with technological developments, and having a broad and detailed understanding of these local social aspects is critical to being able to apply them within the rapidly changing technological arena.

- Do Geoweb tools trivialize governance issues such as environmental concerns to tidbits of information? If so, is it sustainable for people to make decisions or form an understanding based on hastily created and digested information?
- How can local knowledge best be balanced with the views and experience of experts?

Research into Geoweb technologies seeks to address questions such as these and the potential of Geoweb tools to support participation in local-level environmental governance issues increases daily as advancements in this technology are implemented. However, a 2009 study by Brown and Reed has found that Internet-based participatory mapping methods continue to be insufficient for capturing the broadest cross-section of the public.

As Geoweb technologies advance, continued research will be necessary in order to determine their effectiveness and how best to balance the use of such technology with traditional tools of public engagement. In reference to the use of the web technologies developed for this study, one participant stated that:

“They cannot be the only way of communication, we have to use additional tools to communicate with people because not everybody is familiarized with these technologies, some people may just like to receive emails or letters in the mail with information”.

Sieber (2006) also found that even with the most sophisticated web applications on hand; methods of public engagement still need to encompass the paper map and pencil. Carver (2001) agrees that new technologies should not be viewed as replacements for more traditional forms of participation in the democratic process rather their role is seen more as augmenting and supporting stakeholder dialogue and public involvement in decision-making.

The following section provides a conclusion to this thesis.

## **8.0 Conclusion:**

Emerging Geoweb technologies such as wikimaps, geoblogs, interactive web-mapping platforms and geotagging are increasingly used for communicating planning information and supporting public participation in governance processes. Literature reviewed in this thesis indicates that due to the emerging nature of these technologies there is a need for more research into their effectiveness for supporting participation in governance. Based on this need, this research set out to evaluate the primary research question of: 'is the Geoweb an effective tool for supporting participation in local-level environmental governance and if so, in what ways and to what extent is it effective'. For the purposes of this research, a case study was examined of web-based tools being designed, developed and used by partners in the Okanagan Collaborative Conservation Program (OCCP) to support discussion of identifying a connectivity corridor of sensitive habitats in the Okanagan Valley.

The PAR approach used to examine the Okanagan case study contributed towards increasing participants' awareness of the opportunities presented by the Geoweb and alternatives available for supporting broader public participation in local-level planning processes. The experience and feedback shared by project participants through the spiral of cycles involved with PAR provided valuable insight for developing and refining the OKCP portal and Geolive discussion tool in order to improve the capacity of these tools to support local-level environmental governance. The collaborative approach established through this research will also continue to benefit the OCCP coordinator in working with associates to maintain and revise the OKCP portal and Geolive into the future.

Over the two-year period of the case study, partners in the OCCP remained committed to the potential of the Geoweb for increasing their capacity to share, gather and spread information on environmental issues in the Okanagan. However, the delays and subsequent extended timeframe involved with

developing the Geoweb tools for this study resulted in project participants losing interest in using them. At the end of the study, revisions to the OKCP portal and Geolive discussion map had not been completed, project participants had not used these tools for supporting discussions, and they had stopped contributing feedback through online surveys, forums or virtual discussions related to the usability of the tools. Consequently, the OKCP portal and Geolive did not support the identification of a connectivity corridor in the Okanagan Valley during the course of this study.

This experience with the web tools developed for the Okanagan case study demonstrated that the Geoweb could be both ineffective and unproductive for supporting local-level environmental governance. However, as identified in Section 2.2.2, PPGIS is about more than the creation of a product in that it encompasses in its broad focus the process involved with carrying out the research. In this regard, even though the web tools developed for this project did not support local-level governance, the process was effective at facilitating a variety of positive outcomes. For instance:

- Researching the potential of geospatial technologies for the OCCP brought relevant stakeholders together to discuss local environmental issues and utilize spatial information on land-use in the Okanagan.
- Awareness was raised among participants of the benefits of sharing information and resources as well as the need to work together on shared conservation issues in the Okanagan. Many of the participants at the start of the project were unaware that planners throughout the Okanagan basin had not previously come together to share resources and discuss land-use planning issues across political borders, or that much of the data necessary to support these decisions had only recently been completed throughout the Okanagan basin.
- Planners from the different jurisdictions involved developed a plan to hold quarterly meetings in order to continue to work together and share information beyond the scope of this project.

- The need for a secure online discussion space for planners and associates was agreed upon and developed.
- Gaps in the data needed to determine a connectivity corridor were identified and an ultimate decision was made by participants to hold off recommending a corridor until the completion of a biodiversity strategy throughout the Okanagan basin in the coming year.
- A decision was made to pursue an educational awareness program on connectivity corridors outlining what they are, why they are important, and how to implement them geared towards decision makers and the general public. This program is intended to use and enhance the capacity of the OKCP and associated features such as Geolive and the OHA, i.e. have youth from schools across the Okanagan identify and discuss online a potential movement corridor for a badger on a map and identify potential obstacles, discussing how to mitigate these obstacles.

Benefits of the PPGIS process such as these indicate that its success was not based on the Geoweb tools alone. The stakeholders have gained a better understanding of the potential of the Geoweb and how to use it. Also, the functionality of the OCCP tools now enhances the capacity of marginalized groups with environmental concerns in the Okanagan such as small NGOs', school groups and community organizations in accessing information on local environmental issues and exchanging relevant information. As broader segments of the public throughout the Okanagan gain a greater understanding of local-level environmental issues and become more familiar with the evolving capacity of the Geoweb as a communications tool, partners in the OCCP anticipate that the Geoweb will become an effective tool for supporting participation in local-level governance.

The data gathered during the design and development of the OCCP tools also provided significant insight into identifying issues that may mitigate the effectiveness of the Geoweb for supporting participation in local-level



environmental governance issues. Data gathered from project participants indicated that these issues could be captured within themes of usability, technological capacity, cost, credibility of the data and information abundance.

The themes identified within the data are consistent with the findings of Geoweb research reviewed for this thesis. Research by Kingston (2002) showed similar findings regarding the design and implementation of web-based participation systems in the UK. These included; the management of large quantities of information, credibility of contributors, access by sectors of the public, reliability of their contributions and cost effectiveness of these approaches. According to Kingston (2002) these problems must be addressed and put to rest if VGI using the Geoweb is indeed to play a serious role in contributing to gathering and making effective use of local knowledge in planning processes.

Concerns associated with the issues captured in these themes caused some of the project participants to question the sustainability of investing time and money into web technologies. Participants agreed however that the long-term potential of the Geoweb to support the OCCP's environmental governance efforts, warranted moving forward on the project and using awareness of these issues to guide development of the project tools.

Elwood (2008) argues that the strength of Geoweb technologies such as the project web tools lies in their ability to be responsive to everyday knowledge. In this regard, in order for governance processes to benefit from the wisdom of those using and sharing geographic information, a greater understanding is required of how voluntarily contributed geographic information is and should be produced, evaluated and used by experts and novices alike.

The issue of novice versus expert knowledge was identified by project participants as a significant management concern related to who had access to sensitive information associated with the connectivity corridor discussion. Project

participant determined that the sensitivity of the data layers involved in the connectivity corridor discussion required that access to the discussion on Geolive be restricted to professionals within the group. Whose knowledge counts is a topic of great discussion within PPGIS literature. This research determined that issues involving sensitive information, such as species at risk data and where to position their movement corridors, required that access be limited to experts, i.e., the project participants, in order to encourage these experts to share openly in the discussion and trust the credibility of information contributed to it.

The results of this research also indicated that in order for the Geoweb to effectively support the participation in local-level environmental governance processes such as identifying a connectivity corridor, the following points are important:

- The governance issue should be of pressing concern, i.e., water shortage. In the case of the project topic, identifying a connectivity corridor was of interest to project participants but it was not a priority for them, so they were not highly motivated to use the project tools.
- The purpose for contributing should be straightforward, i.e., sharing knowledge of a sensitive wetland.
- The method to contribute should be intuitive, i.e., simply look at a map, place an icon and add a comment without the need for instructions.
- Clear messaging inviting participation is promoted, i.e., a message or reminder that clearly articulates the issue and how to contribute.

Without addressing these points, people are unlikely to use a web-based participation tool. If they do try to use the tools and they do not meet these criteria, they are not likely to try again and it may be important to have other alternatives for them to contribute readily available.

Sieber (2006) agrees that participatory uses of the Geoweb such as the Geolive discussion map should only be one of an assortment of participatory methods such as paper maps and pencils and town hall discussions, used to inform and

help people participate in governance issues. Carver (2001) says that greater participation implies greater levels of social inclusion. He articulates well the perspective of much of the research reviewed in this thesis: that developments in the information society such as Internet access for all, digital television, and mobile wireless communications, will mean greater accessibility of information for all. This implies greater opportunity and higher levels of social inclusion. Kingston (2009) adds that potentially the real power of PPGIS and associated technologies is to facilitate public pressure on issues of concern, bringing attention to news media of where there is public interest, and further spreading information to enlighten change.

Project participants within the Okanagan case study had anticipated that once a potential connectivity corridor was identified and agreed to, sensitive information would be removed from the discussion map and that public interest groups such as naturalists or landowners would be encouraged to access the web tools and use them to contribute their own knowledge related to the topic. Even though this goal was not achieved within the period of the study, the OCCP remains committed to revising and maintaining their new web-based communications tools in order to continue to provide greater access to and opportunities to interact with, local environmental information.

No matter how the OCCP's web tools evolve, they now support partners in the network and interested segments of the public in gaining access to Okanagan oriented environmental information and provide the capacity to contribute towards this information. It is conceivable that soon more user groups with environmental interests in the Okanagan will be taking advantage of the presentation/visualization facilities provided by these web tools to learn about and contribute information related to local-level environmental issues. Partners in the OCCP continue to believe that through this improved capacity to interact with this information that broader segments of the public in the Okanagan will become more empowered to participate in local-level environmental governance.

Therefore, it would be worthwhile to revisit the primary research question of this thesis in the future after these tools have been in use for an extended period of time in order to contribute further to understanding if the Geoweb is an effective tool for supporting participation in local-level environmental governance and if so, in what ways and to what extent.

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## **Appendix A – List of Partners**

### **OCCP Partners in the Connectivity Corridor Action Team**

Brooke Marshall	– City of Vernon
Tasha Sargent,	- Grasslands Conservation Council
Todd Cashin	– City of Kelowna
Anna Page	– Regional District of North Okanagan
Margaret Bakelaar	- Regional District of Central Okanagan
Wayne Darlington	- Central Okanagan Parks
Genievieve Dunbar	- Okanagan Basin Water Board
Lisa Tedasco	– BC Ministry of Environment
Bryn White	– South Okanagan Simikameen Conservation Program
Wesley Miles	– Municipality of Coldstream
Jillian Tamblyn	– Regional District of the South Okanagan
Carie Leifke	- District of Lakecountry
Shane Cote	- District of Lakecountry
Patrick Allen	– Researcher - SPICE lab – UBCO
Brad Mason	- Community Mapping Network
Rob Knight	– Department of Fisheries and Oceans

### **Technical advisors**

Ian Mackenzie (GIS)	- Grasslands Conservation Council
Owen Fritch (GIS)	- Grasslands Conservation Council
Nick Blackwell (GIS)	– SPICE lab
Jon Corbett	– SPICE lab
Allison Haney	– Biologist
Susan Latimer	- Biologist
Orville Dyer	– BC Ministry of Environment
Kristi Iverson	– Iverson and Mackenzie (Biologist)

## Appendix B – Ethics Certificate of Approval

The University of British Columbia  
Okanagan  
Research Services  
Behavioural Research Ethics Board  
3333 University Way  
Kelowna, BC V1V 1V7  
Phone: 250-807-8832  
Fax: 250-807-8438

### CERTIFICATE OF APPROVAL - MINIMAL RISK

<b>PRINCIPAL INVESTIGATOR:</b>  Jon Corbett	<b>INSTITUTION / DEPARTMENT:</b> UBC/UBCO IKE Barber School of Arts & Sc/UBCO Admin Unit 1 Arts & Sci	<b>UBC BREB NUMBER:</b>  H08-02275
<b>INSTITUTION(S) WHERE RESEARCH WILL BE CARRIED OUT:</b>		
<b>Institution</b>		<b>Site</b>
N/A		N/A
<b>Other locations where the research will be conducted:</b> Surveys will be online and through telephone interview.		
<b>CO-INVESTIGATOR(S):</b> Patrick M. Allen		
<b>SPONSORING AGENCIES:</b> N/A		
<b>PROJECT TITLE:</b> Exploring the Status of Voluntary Geographic Information in BC's Community Mapping Atlases		
<b>CERTIFICATE EXPIRY DATE: November 26, 2010</b>		
<b>DOCUMENTS INCLUDED IN THIS APPROVAL:</b>		<b>DATE APPROVED:</b> November 26, 2009
<b>Document Name</b>	<b>Version</b>	<b>Date</b>
<b>Consent Forms:</b>		
Community atlas survey consent form	2	November 24, 2009
Community atlas survey consent form	N/A	November 4, 2008
<b>Other:</b>		
The questionnaire survey is posted at: <a href="http://www.surveymonkey.com/MySurvey_EditorPage.aspx?sm=5AHbqxmtk6ZMVsh1Hr9UDNUnWXlkQjIgr3TJvD8wjGI%3d">http://www.surveymonkey.com/MySurvey_EditorPage.aspx?sm=5AHbqxmtk6ZMVsh1Hr9UDNUnWXlkQjIgr3TJvD8wjGI%3d</a> Atlas manager/coordinator contacts are available through <a href="http://www.cmnbc.ca">www.cmnbc.ca</a>		
The application for ethical review and the document(s) listed above have been reviewed and the procedures were found to be acceptable on ethical grounds for research involving human subjects.		
<p><i>Approval is issued on behalf of the Behavioural Research Ethics Board Okanagan and signed electronically by:</i></p> <p>_____</p> <p>Dr. Daniel Salhani, Chair</p>		

## Appendix C – Survey 1 - Designing the Web Tools

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**1. What on-line mapping tools and applications do you use?**

1.

2.

3.

4.

5.

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**2. What is the potential for ecosystem mapping to guide where development takes place and what sort of tools/bylaws/policies are needed in order to do that?**

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**3. For the purposes of this Action Team's discussion regarding Sensitive Ecosystem Ranking (SER) throughout the Okanagan basin, the following data layers are being gathered;**

- \*Sensitive Ecosystem Inventory data (SEI)
- \*Foreshore Inventory Mapping (FIM)
- \*Sensitive Habitat Inventory Mapping (SHIM)
- \*Regional Boundaries
- \*Current Orthophotography

Please identify any other data layers that you consider necessary for carrying out this planning process and how this data can be accessed.

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**4. Data layers will be presented on a working map using Google and Wiki tools to facilitate this action team in viewing SER data throughout the Okanagan corridor. This interactive map will allow partners to identify special features, mark points on the map for discussion and contribute relevant information to the discussion such as images or text.**

Please share any comments or concerns you may have regarding this process.

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**5. Do you think Sensitive Ecosystem Ranking (SER) is an effective and useful interpretive layer for planning in the Okanagan corridor?**

☐ yes

☐ no

Please comment on best way to communicate this information.

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6. Are you supportive of the SER (Sensitive Ecosystem Ranking) guidelines based on SEI 0-3 = yellow, 4-7=orange, 8-10=red. (Please see SER123 Goals and Guidelines document.)

☐ yes

☐ no

Please comment

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7. Do you feel that this is a good project to be undertaken through the structure of the OCCP and SOSCP?

☐ yes

☐ no

Comment

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8. Should working maps for OCCP action teams such as this, be password protected for controlled access of action team members only?

☐ yes

☐ no

please explain

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9. The OCCP recently completed a five year strategic plan with the goal to:  
Facilitate integrated planning and decision making at the local government level by:  
\*cultivating peer-reviewed cutting edge environmental information  
\*facilitating access to rigorous and applicable biological knowledge  
\*catalyzing agreements, policy direction, and integrated process in urban land use planning

Question: Based on this direction and your own needs/requirements, do you see the electronic map services as potential for supporting these efforts, and for each area, what could the services provide (based on the online applications you have used)?

Add Question Here Split Page Here

Edit Question Move Copy Delete Add Question Logic

10. Are there are any web services that the OCCP could provide that you believe users such as your organization would subscribe too and potentially pay a fee for?

☐ yes

☐ no

Add Question Here Split Page Here

Edit Question Move Copy Delete

11. If you answered yes to the previous question, what type of subscription would you prefer?

Subscription type

please choose from  
the drop down list

Other (please specify)

Add Question Here Split Page Here



Edit Question Move Copy Delete

**12. Do you have any comments to share or additional points to raise for consideration in this process?**

Add Question Here

Split Page Here

Edit Question Move Copy Delete

**13. Please provide your contact information.**

Name

Organization

Email

Phone

Add Question Here

## Appendix D – Survey 2 - OKCP Portal Survey

**1. Default Section**

Add Question Here

Edit Question Move Copy Delete

1. Please list 3 words that best identify your first impression of the portal.

1

2

3

Add Question Here Split Page Here

Edit Question Move Copy Delete

2. Please rate each of the following components of the portal? (from 1 for poor to 5 for really great)

	1	2	3	4	5
OKCP logo					
Colour scheme					
Navigation					
Organization					
Background info					
Habitat info					
Project descriptions					
Banner photos					
Fonts					
Contact info					
Website overall					

Add Question Here Split Page Here

Edit Question Move Copy Delete Add Question Logic

3. Is core information missing?

☐ Yes

☐ No

If yes, please list what should be added

Add Question Here Split Page Here

Edit Question Move Copy Delete

4. Please rate each of these functions from 1 being poor to 5 being very good. (0 indicates you have not tried this function)

	0	1	2	3	4	5
Events calendar						
Ok Habitat Atlas						
Geolive discussion map						
Login - registration function						
Photo gallery						
Directory						
My details						
Docs and Info submission						
Discussion forum						
Connect with us applications						
Other (publications, docs, news and events)						

Add Question Here Split Page Here

Edit Question Move Copy Delete Add Question Logic

5. Did all of the functions of the portal work for you?

☐ Yes
☐ No

If no, which functions did not work? Do you know why?

Add Question Here Split Page Here

Edit Question Move Copy Delete

6. How often will you likely visit this portal?

Frequency

Please choose from the drop down menu

Please comment

Add Question Here Split Page Here

Edit Question
Move
Copy
Delete

7. Please identify which features would likely keep you coming back to the OKCP portal.

Current articles	Ok Habitat Atlas	Geolive	OKCP Map resources	OKCP Planning resources	OKCP Habitat Info	Links from the site	Events calendar	Partner directory	Discussion forum with partners	Blogs on current partner projects	Photo sharing	Other
------------------	------------------	---------	--------------------	-------------------------	-------------------	---------------------	-----------------	-------------------	--------------------------------	-----------------------------------	---------------	-------

Please mark your top choices

Other (please specify)

Add Question Here

Split Page Here

Edit Question
Move
Copy
Delete

8. What are the most useful features on the OKCP portal for you?

Networking with conservation partners	Partner directory	Forums	Geolive Blog	Info about partner projects	Mapping resources	Planning tools and resources	Events calendar	Docs, info and weblinks	Photos	Outreach with public	Other
---------------------------------------	-------------------	--------	--------------	-----------------------------	-------------------	------------------------------	-----------------	-------------------------	--------	----------------------	-------

Please mark your top choices

Other (please specify)

Add Question Here

Split Page Here

Edit Question
Move
Copy
Delete
Add Question Logic

9. Will your organization link the OKCP portal from its website?

☐ Yes  
☐ No

Comments

Add Question Here

Split Page Here

Edit Question
Move
Copy
Delete
Add Question Logic

10. Do you feel the portal offers sufficient security (i.e. password protected access for partners) for sharing information among partners?

☐ Yes
☐ No

If no, please explain

Add Question Here
Split Page Here

Edit Question
Move
Copy
Delete

11. Do you have any additional comments to share or points to raise?

Add Question Here
Split Page Here

Edit Question
Move
Copy
Delete

12. Please provide your contact information.

Name

Organization

Email

Phone

Add Question Here
Split Page Here

Edit Question
Move
Copy
Delete

13. Please identify your association with the OKCP.

Affiliation

Which option from the drop down menu best represents your affiliation?

Add Question Here

## Appendix E – Survey 3 - Geolive Survey

### 1. Default Section

**1. Please provide up to 5 words that best describe the strengths of Geolive.**

1

2

3

4

5

**2. Please provide up to 5 words that best describe the weaknesses of Geolive.**

1

2

3

4

5

**3. Please rate the effectiveness of the Geolive tool for facilitating discussions?**

Rate from 1 for ineffective to 5 for very effective

1
2
3
4
5

Please describe how it helped facilitate this discussion.

**4. Please rate the following components of Geolive. Rate from 1 for poor to 5 for great. (0 indicates you did not use that component)**

	0	1	2	3	4	5
Login function	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Lines and polygons	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Discussion tool	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Navigation tools	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Icons	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Data layer management tool	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Search function	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
User notes	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Visual quality	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Geolive overall	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

**5. Were the contributions of other action team members easy to follow and understand?**

☐ yes

☐ somewhat easy

☐ no

Please explain

**6. Were all the data layers that you needed to make decisions on this issue available on the discussion tool?**

☐ yes

☐ no

If no, what layers would you like to see added?

**7. Were the data layers easy to use and view?**

☐ yes

☐ no

If no, please explain

**8. Does Geolive provide you sufficient security (assigned protected access) for sharing information with partners on this tool?**

☐ yes

☐ no

If no, please explain

**9. What other functions would you like to see available through Geolive?**

ability to print map

ability to print  
discussion  
comments

ability to upload a  
map as a layer

ability to prioritize  
discussion topics

ability to turn off  
contributed data  
layer

other

Please mark your choices

☐☐☐☐☐☐

Other (please specify)

**10. What other issues would you recommend for discussing using Geolive?**

**11. Do you have any specific advice on how we should improve the Geolive discussion tool?**

**12. Do you have any comments to share or additional points to raise?**

**13. Please provide your contact information.**

Name	<input type="text"/>
Organization	<input type="text"/>
Email	<input type="text"/>
Phone	<input type="text"/>

**14. What web browser were you using while viewing Geolive?**

Browsers

Please choose from drop  
down menu

Other (please specify)



## Appendix F – Geolive Usability Feedback

- The discussion box opens too large. It blocks out map and the area being discussed.
- Need to be able to edit discussion titles. Titles of discussions in legend should link to the discussion symbol on the map for ease of finding the topic.
- Save function on lines and polygons not working.
- Save function on discussion boxes not working– have to close it then reopen and then can save.
- When you click on a symbol – the screen scrolls down hiding box and often zooms in, causes viewer to get lost on the map.
- Some of the entered polygons and boxes don't always show when you zoom between layers.
- Polygons don't allow you to give them a name.
- Layers box often opens slightly off screen or opens in closed form so that you can't get at the layers. There is a hide/show function on layers box that closes all your layers or shows all, which takes time to load and bogs down the system. It is not clear what this function does, it gives impression this function is to get the layer box out of the way – or open it up.
- There gets to be a lot of discussion boxes – not clear which ones are in use, how many entries in them etc., so it is hard to follow which discussion box is worth viewing.
- With tutorials, need to further develop tips for each tool and function of the site. Have interpretive information for data layers, details on what each layer is and what it is intended to be used for.

Features that require further changes and refinement in order to continue making the application more user friendly and assist people in contributing to a conversation once engaged in the issue.

- The latest discussion topics need to be easy to find. They should show the number of contributors and number of new contributions since last viewing.

In drawing the proposed corridor research team became aware of multiple challenges that would have faced individuals not familiar with the use of the tools or all the issues involved in determining a connectivity corridor.

- First of all the process was time consuming.
- The application was not always saving the data that was being entered for the first few weeks until this problem was corrected, it was not clear what symbols to use to identify what issues.
- Identifying a corridor required switching back and forth between data layers, as they could not always be clearly understood when turned on at the same time. Through trial and error, the team determined that a good approach was switching between a useful data layer such as SER 1 or SEI 1 and the Google orthophoto or terrain map. This often affected the zoom level of the map however requiring a repositioning of the map and occasional loss of position as a result.
- When entering a symbol or discussion box the application causes the map to shift to fit the data entry box onto the map, this feature can also cause the user to become disoriented as to their position on the map and often the data entry box blocks the section of the map being discussed also potentially leading to a challenge for the user.
- Data layers required descriptions, i.e., interpretive text for SEI, which based on the number of data layers, required a long period of time for research and follow up, and by the end of the study no descriptions were posted for each of the layers.
- Need to having colour associated with each data layer in the drop down legend and a description of what it stands for.
- Needed the ability to change the title of a discussion box or symbol if it was not entered correctly.

- Should be a clear connection between the symbol on the map and the contributed content layer in the legend.
- Need the ability to quickly see what discussion on the map is new, or has a recent posting. Also should be able to find this from the legend or associated forum on the OKCP.
- Should have RSS feeds so that users can choose to follow discussions of their choosing.
- Should provide the ability for a user to send a link to a Geolive discussion to an associate and have them be able to open the discussion map to the same settings, including zoom level, data layers open etc.