

**SENSITIVE HABITAT INVENTORY AND MAPPING:
PROCEEDINGS OF COMMUNITY WORKSHOPS IN
NANAIMO AND ABBOTSFORD, BRITISH COLUMBIA
(MAPPING A COURSE FOR OUR WATERSHEDS)
1999**

PREPARED FOR:

Fisheries and Oceans Canada
Pacific Region, Habitat and Enhancement Branch
Information Management Unit
Fisheries and Oceans Canada, Pacific Region
Vancouver, BC

Environment Canada
Canadian Wildlife Service, Pacific Region
Delta, BC

British Columbia Ministry of Environment, Lands and Parks
Lower Mainland Region, Fish, Habitat and Wildlife Protection Unit
Surrey, BC

British Columbia Ministry of Environment, Lands and Parks
Vancouver Island Region, Planning and Assessment Unit
Nanaimo, BC

PREPARED BY:

Paul McElligott, Ph.D., R.P.Bio.

Aquatic Resources Limited
9010 Oak Street
Vancouver, BC

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EXECUTIVE SUMMARY

Workshops were held in Nanaimo, BC (on November 19, 1999) and Abbotsford, BC (on December 16, 1999) to assess the current status of sensitive habitat inventory and mapping in coastal BC.

Numerous, diverse Sensitive Habitat Inventory and Mapping (SHIM) projects are now under way. Most initiatives are geared specifically toward streams (*Streamkeepers*, SHIM), but several focus on wetlands (*Wetlandkeepers*) or shoreline areas (*Shorekeepers*). Methodologies and technologies used for habitat mapping vary widely among the initiatives, but standardized techniques are available for mapping all three habitat types. The development of stream mapping and inventory methods has received the most attention to date because of concerns about the destruction of salmon streams in developed areas of the coast.

Mapping of sensitive habitats in developed areas is mainly carried out to define stream locations in the context of municipal land-use planning. Municipalities can use these locational data to ensure that riparian habitats are considered during the permitting of developments. In future, the data may be used to ensure compliance with the new provincial *Fish Protection Act*.

Habitat problems are identified locally and solutions are generated locally. Because of funding and staffing constraints in senior government (i.e., DFO, MELP), much of the sensitive habitat data collection is done by community groups, First Nations, or similar agencies in partnership with municipal governments.

Groups and agencies represented at the workshops all had their own successes and problems. Key recommendations resulting from the workshop presentations and breakout sessions were:

- Goals of SHIM mapping projects should be clearly defined at the outset, in consultation with potential data end-users and data producers. The roles of the various players should also be defined from the start.
- Data credibility is critical to habitat protection. Mapping data must be accurate, reliable, and must stand up when challenged. A quality assurance program is essential, as is ground-truthing of photo-interpreted streams.
- An effective, standardized methodology for sensitive habitat inventory and mapping (e.g., SHIM) needs to be refined and broadly implemented. This standard must be endorsed by senior government (DFO, MELP), as well as by municipal governments.
- Adequate training and technical supervision of field personnel is essential to maintaining data quality.
- High-end GPS units (e.g., Trimble Pathfinders) are required to map streams at a high degree of accuracy. A mechanism needs to be developed for making the necessary hardware and software available to the community groups.

- There is a definite need for a common method of recording and storing data.
- Provision of adequate funding is needed for community groups who are willing to get involved. The technology, training, and project management are expensive, but worth it in the long run.
- Networking among community groups and other mapping agencies needs to be improved. Information-sharing is essential to promoting partnerships, standards, and common goals.
- Educating the public about sensitive habitat issues and values is important to developing a stewardship ethic, and will build support for SHIM in the community.

The concept of creating regional *Stewardship Centres* is worthy of further consideration, in that they could provide services described in the previous sections. According to workshop participants, *Stewardship Centres* could serve as:

- centres for data entry and storage, with appropriate hardware and software;
- producers of custom end products (e.g., maps, brochures, *etc.*) for specific end-user groups;
- points of access to the data by the public and interested parties;
- public education centres;
- a “virtual” (i.e., Internet) presence, as well as a physical presence for community stewardship efforts;
- loan-out centres for GPS units and other field equipment;
- meeting places, where different groups can network and share experiences, expertise and ideas.

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Sensitive habitat inventory and mapping in coastal BC is a combined effort by many individuals who have dedicated their time and effort to the cause of stream stewardship. The two workshops benefited immeasurably from the wealth of enthusiasm brought by the nearly 300 participants, many of whom took time out of their busy schedules to attend the workshops at their own expense. Some individuals travelled long distances to attend.

Special thanks are extended to all of the workshop presenters, breakout session leaders, and recorders who contributed material to this report. In particular, workshop organizers Brad Mason (DFO), Gretchen Harlow and Kathleen Moore (CWS), Peter Law and Rob Knight (MELP), and Ken Lewis and Sheila Creighton (North Fraser Community Futures Development Corporation) are to be commended for their excellent work.

1. INTRODUCTION

1.1 Background

The temperate forests and floodplains of coastal British Columbia historically supported a diverse and productive array of habitats, which in turn supported a rich and abundant fish and wildlife fauna. Today, in densely populated areas such as the Lower Mainland and the eastern coast of Vancouver Island, much of the original habitat has been impacted or irreparably altered by urban and suburban development.

Of the habitats that remain, many (such as small fish-bearing streams, wetlands, and intertidal zones) continue to be destroyed at an alarming rate, largely because most people simply do not realize or care that they are there. Streams and wetlands in BC are inaccurately mapped (if they are mapped at all), riparian habitat values are generally unknown, and information concerning fish and wildlife presence or distribution is sorely lacking. Unless sensitive habitats can be identified, and their importance conveyed to the public at large, it will be impossible to prevent their continued destruction. Fortunately, a growing number of BC residents are recognizing the value of sensitive habitats and the need to protect them.

Mapping is one of the best ways to communicate sensitive habitat values. The federal/provincial *Sensitive Habitat Inventory and Mapping* (SHIM) program, now in its fifth year, was launched on Vancouver Island in 1996 to provide a framework wherein community groups could collect data for use in municipal land-use planning. It is important to note that since its inception, SHIM has been very much a community-driven initiative. In contrast to forested areas of the province, there has never been a large outlay of funding or resources geared toward protecting urban streams in BC, and concerned residents have generally had to look after their own watersheds with relatively little external support.

After five years, considerable money, time and effort have been expended at the community level to map and protect sensitive habitats (although very little money has been allocated for training, equipment, data modelling and analysis to *support* these initiatives). Understandably, this has led to an expectation from the individuals who produce the maps and databases that their products will be used to protect habitats, fish and wildlife during land-use planning.

However, a number of concerns have been raised about sensitive habitat inventories:

- data producers (e.g., community groups, First Nations, *etc.*) are concerned about the availability of funding for their efforts, their need for improved, standardized data collection methodologies, their need for better training and certification, and the lack of co-ordination and networking among their various initiatives;
- land-use planners and managers are concerned about validity of the habitat maps and the accuracy of the information they contain;

- government and other funding agencies are concerned with whether money is being allocated in the most efficient fashion.

1.2 Workshop Objectives

At this point in the development of SHIM, it is important to step back and take stock of what has been achieved to date. To this end, two community workshops were co-sponsored by the federal Departments of Fisheries and Oceans Canada (DFO), Environment Canada's Canadian Wildlife Service (CWS), and the provincial Ministry of Environment, Lands and Parks. These workshops were held late in 1999, in Nanaimo on Vancouver Island, and in Abbotsford in the Lower Fraser Valley.

The main objectives of these workshops were to:

- acknowledge and review existing sensitive habitat inventory and mapping projects in developed areas of BC,
- provide the different community groups involved in sensitive habitat inventory and mapping with an opportunity for networking,
- clarify technical requirements for the collection, entry, management, and presentation of SHIM data (e.g., data resolution, standardized data collection procedures, data entry tools, training and certification, quality assurance, monitoring and assessment, integrating systems),
- refine a vision for future community mapping and inventory initiatives (e.g., the role of local and senior governments and community groups, Stewardship Centres, priorities for mapping and inventory, avoiding duplication, the need for data concerning riparian habitats and wildlife).

Workshops consisted of morning presentations, which provided overviews of ongoing projects, methodologies and administrative frameworks. In the afternoon, workshop participants re-convened in smaller break-out sessions to discuss key topics related to SHIM, such as administration, methodologies, end products and stewardship centres.

All workshop attendees were requested to complete a questionnaire designed to collect detailed information about their experiences with SHIM, and their recommendations for its improvement.

The following report provides a summary of the workshop presentations and recommendations. It is divided into four sections:

- i) Conclusions and Recommendations,
- ii) Proceedings of Nanaimo Workshop,
- iii) Proceedings of Abbotsford Workshop,
- iv) Summary of Questionnaire Responses.

2. SUMMARY AND CONCLUSIONS

2.1 Summary

Numerous sensitive habitat inventory and mapping projects are currently under way in coastal BC. Most are geared toward streams (e.g., *Streamkeepers*, SHIM), although there are also projects aimed at identifying and mapping wetlands (e.g., *Wetlandkeepers*) and coastal areas (e.g., *Shorekeepers*). Standard methodologies for habitat mapping have been developed for all three of these habitat types, although stream mapping has received the most attention because of concerns over losses of salmon habitat in settled areas.

Almost invariably, sensitive habitat inventory and mapping is focused on fish and fish-bearing streams. Relatively little effort has been spent in identifying wildlife or wildlife habitat values.

Most of the habitat data collection is performed by community groups or similar agencies, in partnership with municipal governments. Mapping of sensitive habitats in developed areas is mainly done to ensure that the data can be available to municipal land-use planners. Municipalities currently vary widely in the degree to which they protect riparian habitats from development pressures. However, in future the new provincial *Fish Protection Act* should foster a greater need for sensitive habitat data.

All of the groups and agencies represented at the workshops had their own successes and problems. Mapping projects which were notably successful include those in the Alberni-Clayoquot Regional District, the Regional District of Comox-Strathcona, the Nanaimo Regional District, Langley, the Fraser Valley Regional District, and Langley. The following section is a summary of the key recommendations that resulted from the presentations and breakout sessions.

2.2 Key Recommendations

2.2.1 Inclusion of Wildlife and Coastal Habitat Values

At present, sensitive habitat mapping in coastal BC is very strongly oriented toward protection of salmonids and salmonid-bearing streams, with relatively little emphasis on wildlife habitats in non-stream areas. There is a serious need to expand sensitive habitat mapping efforts to include the riparian zone, and (where applicable) coastal areas and floodplains.

Of the respondents to our questionnaire, 56% indicated that wildlife values are not adequately represented in current SHIM methods, and 90% felt that there is a need to expand SHIM to include coastal foreshore areas.

2.2.2 Project Management Improvement

There are many current and potential user groups for resource inventory data. The 'product' must therefore be developed and stored in a way that recognizes and respects the needs of these diverse groups.

The goals of SHIM mapping projects should be clearly defined at the outset of a project, in consultation with potential data end-users (e.g., What types of data do you need?) and data producers (e.g., What types of data are practical to collect?). It is also necessary to accurately define the roles of the various players at the outset of the project (i.e., who is responsible for the data quality, collection, management, interpretation, etc.). In a given jurisdiction, the areas where the survey work is to be carried out must be prioritized in light of the needs of the various end user groups. This was emphasized repeatedly by workshop participants.

If we agree that the primary purpose of resource mapping is to record information so that we can monitor, manage and plan for our natural resources over time, then the role of First Nations and local governments becomes key. Their active involvement in the planning process, their contribution to data collection and management, and their endorsement of the end products are fundamental to the success of any habitat mapping project.

Projects should be managed by local Steering Committees composed of representative end-users of the data, with representation by field and data management personnel. At the operational level, the purpose of this committee should be to oversee the data collection effort, and to ensure that project meets its goals in a timely and cost-effective fashion. Regional efforts should be overseen by an “umbrella” steering committee.

2.2.3 *Data Quality Assurance*

The level of data quality required in a sensitive habitat mapping project is determined by the target audience for the finished project. School groups and local community organizations may simply want to gain a better appreciation of the natural values of their watershed, and consequently have little need for precise locational information. In contrast, land-use planners require very accurate data to define riparian set-backs and protected areas.

It is important at the outset of a mapping project to clearly identify the degree of confidence that will be required of the mapping data. Some means of identifying the degree of confidence which should be placed in data should be developed, so that the locational data produced by a school group's sketch map is not considered equivalent to data collected by a trained, experienced GPS crew working with a high-end GPS unit.

To ensure the credibility and acceptance of data by planners, developers and the public at large, mapping data collected for land-use planning purposes must be accurate, reliable, and defensible. In addition to ensuring the appropriate level of mapping technology (e.g., Trimble GPS, GIS) and personnel training, there needs to be a defined, acceptable standard for data accuracy, and some form of quality assurance (QA) program for enforcing it. The QA should focus on both the field data collection and the actual mapping. Ground-truthing photo-interpreted streams is essential to ensuring data quality. Eighty seven percent of respondents indicated their support for a federally/provincially endorsed QA program.

2.2.4 *Standardized Data-Collection Methodologies.*

An effective, standardized methodology for sensitive habitat inventory and mapping (e.g., SHIM) needs to be refined and broadly implemented. This standard must be endorsed both by senior governments (DFO, MELP), municipal governments, and community stewardship groups. Sixty two percent of survey respondents indicated that DFO and MELP should develop data collection standards.

This standardization should extend to a common format for storing and sharing data. Sixty percent of respondents indicated that a standardized data entry tool is required.

2.2.5 *Provision of Adequate Training and Certification*

The importance of adequate training and technical supervision of field personnel was mentioned repeatedly at both workshops, and 84% percent of our survey respondents indicated a need for more training.

It is essential that training courses be developed and implemented. Eighty five percent of respondents to our survey indicated that training should be accompanied by certification.

2.2.6 *Provision of Adequate Equipment*

High-end (e.g., Trimble Pathfinder) GPS units are required to map streams at a high degree of accuracy, and 85% of respondents to our survey indicated such units are essential to accurately map stream centre-lines. This is expensive technology, especially for small community groups with little or no funding base. The computer hardware and GIS software needed to run SHIM are also prohibitively expensive for many groups. Some mechanism needs to be developed of making the necessary hardware and software available to community groups.

2.2.7 *Data Management*

Currently, there is a diversity of GIS and data storage systems in place throughout BC. This means that data collected at one locale may be partly or wholly incompatible with data collected in an adjacent area, which presents a significant obstacle to initiatives that attempt to collect and map data on a regional basis. There is a need to establish a standard method for recording and storing digital mapping data, to enable sharing and consolidation of data sets.

In the context of land-use planning, maps are only useful insofar as they are accurate. Hardcopy maps therefore have a relatively short shelf life, especially in populated areas where the features of the landscape are in constant state of flux. To ensure that sensitive habitat maps do not rapidly become “dated”, they must be updated on a regular basis. Updating the maps would involve:

- plotting new hardcopy maps on a regular basis, to reflect ongoing changes in the mapping database.

- regular (e.g., every five years) verification of the accuracy of the database, to ensure that changes in the landscape (e.g., changes in stream channels over time) are reflected.

In the future, there is a need to develop diagnostics (e.g., impermeable area, proper functioning condition) to enable sensitive habitat data to be used for assessing ecosystem health.

Walking streams and collecting new data is always much more exciting than ploughing through boxes of old records. Nonetheless, there exists a definite need for someone to sift through existing data for watersheds in developed areas of BC. We need to ensure that previous data collection efforts are not wasted or needlessly duplicated, and to recognize the importance of historical data, both as a baseline and as a record of what we have lost over time.

Another often-neglected source of valuable information is the local knowledge of First Nations and other long-term residents, which encompasses spiritual and cultural values, as well as a wealth of biophysical data.

2.2.8 *Funding*

Mapping and resource inventory, to be done well, require a long-term commitment of energy, focus and funding. A key concern of nearly all workshop participants (including senior government, local government, and community groups) was how to secure long-term support and funding commitments. They were also concerned that they spent a disproportionate amount of time chasing money, at the expense of time spent collecting data. A total of 75% of our survey respondents indicated that the federal and provincial governments should provide increased funding for community mapping efforts.

Provision of adequate funding is needed for community groups willing to get involved in habitat mapping. The technology, training, and project management are expensive, but this expenditure is well worth it in the long run. Mapping is an excellent way to get people familiar with their streams, and fostering the enthusiasm and concerns of watershed residents is essential to nurturing a healthy stewardship ethic.

Local volunteers will remain in their watershed long after professional consultants have completed their inventory projects and moved on. Provision of funding to help community groups get involved in mapping their watersheds ensures that the knowledge concerning sensitive habitat values will stay within the watershed, where it can do the most good.

2.2.9 *Sharing of Knowledge and Expertise*

During the workshops, many of the presenters and other participants provided valuable insights into what worked (and did not work) in their SHIM mapping projects. This information is invaluable to those starting or developing new mapping programs, and work needs to be done to improve networking among community groups and other

mapping agencies. Information-sharing is essential to promoting partnerships and common goals, which are essential to the success of SHIM.

2.2.10 *Public Involvement*

Ninety percent of respondents to our survey indicated that SHIM information is not being adequately shared with the community at large. Educating the public about sensitive habitat issues is crucial to developing a stewardship ethic and building support for SHIM in the community. More needs to be done.

2.2.11 *Stewardship Centres*

The concept of creating regional *Stewardship Centres* is worthy of further consideration, in that they could provide services and roles described in the previous sections. Fully 92% of our survey respondents endorsed the idea. *Stewardship Centres* could:

- serve as centres for data entry and storage, with appropriate hardware and software
- produce custom end products for specific end-user groups (e.g., maps, brochures, *etc.*)
- serve as points of access to the data by the public and interested parties
- be public education centres
- have a physical presence and a virtual (Internet) presence
- be loan-out centres for GPS units and other field equipment
- be meeting places, where different groups can network and share experiences, expertise and ideas

2.2.12 *Mapping Products*

Creation of an accurate, reliable GIS database is key to producing maps for a range of user groups. A variety of information (e.g., stream locations, cadastral, roads, known fish distribution, *etc.*) can be included and managed in a single database, from which different maps could be produced as needed to meet the requirements of various stakeholders. A unified database format would facilitate creation of regional products, such as sensitive habitat atlases. Eighty seven percent of respondents to our survey indicated that they would like to see a sensitive habitat atlas for their community.

3. NANAIMO WORKSHOP PROCEEDINGS

3.1 Setting

This workshop was held at the Dorchester Hotel in downtown Nanaimo on Nov. 19, 1999 from 9:00 to 16:30. The workshop was attended by over 130 participants from throughout Vancouver Island.

3.2 Presentations

3.2.1 Summary

In morning sessions of the workshop, representatives of the federal and provincial governments provided an overview of their *Sensitive Habitat Inventory and Mapping* (SHIM) program. This was followed by a synopsis of the data needs of local governments in the context of the BC *Fish Protection Act*, and overviews of the various mapping initiatives currently underway on Vancouver Island.

The following pages present summaries of presentations made during the morning and early afternoon of the Nanaimo Workshop. Presentations are grouped under the headings:

- Introductory Remarks;
- Mapping and Methods Overview;
- Community Mapping Projects;
- Watershed Assessment and Planning Requirements for Mapping and Inventory;
- Synopsis.

3.2.2 Introductory Remarks

TOPIC:	Workshop Objectives
ORGANIZATION:	Habitat and Enhancement Branch, Fisheries and Oceans Canada, Pacific Region
PRESENTER:	Brad Mason
E-MAIL:	masonb@dfo-mpo.gc.ca
PHONE	(604) 666-7015

Objectives of today's workshop are to:

- i) Acknowledge and review existing work and contributions for mapping and inventory in settlement areas to date.
- ii) Determine technical requirements for:
 - mapping and inventory (i.e., watershed planning, OCP, Fish Protection Act)
 - standard procedures

- data entry tools and data management,
 - training and certification,
 - quality assurance and quality control,
 - integrating systems,
 - monitoring and assessment,
 - networking, communicating
- iii) Create a vision for future community mapping and inventory initiatives
- Review the status and types of mapping and inventory products (atlases and internet)
 - Examine the role of local and senior governments and community groups.
 - Should we promote mapping and inventory in Stewardship Centres?
 - Determine the priorities for mapping and inventory after a first pass?
 - How do we avoid duplication?

TOPIC:	Opening Comments
ORGANIZATION:	BC Ministry of Environment, Lands and Parks, Vancouver Island Region
PRESENTER:	Peter Law, Urban Habitat Biologist
E-MAIL:	plaw@nanaimo.env.gov.bc.ca
PHONE	(250) 751-3228

Thank-you all for coming to this mapping workshop. Over the past month, I have participated in the organization of this workshop as a representative of the Vancouver Island Region of the Ministry of Environment Lands and Parks. This office has been mapping “sensitive environmental habitats” for many years. The Ministry has actively mapped habitats (Fish, Wildlife and Water) for use in large-scale land planning initiatives such as the Vancouver Island Land Use Plan. Over the past 10 years, we have participated in many non-forestry mapping initiatives, including the following:

- partnered with other agencies, and developed the “Sensitive Ecosystem Inventory”;
- initiated a number of small contracts to map eagle and heron nest trees;
- our Fisheries Program has been very active over the past number of years working with Urban Salmon Habitat Program (USHP) stewardship groups, and many have mapped their streams;
- partnered with local governments and DFO to build the ‘*Sensitive Habitat Atlas*’ products for CSRD, RDN and soon the CVRD;
- water management have mapped all of their licence locations.

In the near future, our goal as a Ministry will be to have our digital information easily accessible to all who request it. We have a long way to go to meet this challenge, but we are moving in this direction. We recognize the need to develop co-operative agreements for sharing data, and to help support (training and standards development) the many local environmental mapping initiatives now underway. This will take a little time, and we will need your help. We also recognize the very important role that local governments have in protecting these ‘sensitive

habitats', and we will focus our support in this direction. In closing, I look forward to hearing about your projects in the workshop today, and I will be listening to your suggestions about how this office can help deliver and maintain these very worthwhile products in the future.

TOPIC:	Opening Comments
ORGANIZATION:	Environment Canada, Canadian Wildlife Service, Pacific Region
PRESENTER:	Gretchen Harlow
E-MAIL:	gretchen.harlow@ec.gc.ca
PHONE:	(604) 946-7022

Hello, I'm Gretchen Harlow, and I'd like to welcome you to today's workshop on behalf of the Canadian Wildlife Service.

For those of you who aren't aware of the Service's role in Environment Canada, it is the agency responsible for the conservation of migratory birds and their habitats.

Hence our interest in habitat mapping, inventory and land use issues, and in cosponsoring this workshop. Over the last decade we've partnered in the development of mapping initiatives to support land use planning, and to support stewardship of sensitive habitats at the local level.

You'll learn more today about:

- *Wetlandkeepers*, the volunteers who map and monitor local wetlands and represent wetland issues at public forums and to municipal councils.
- *Sensitive Ecosystem Inventory* that identifies rare terrestrial ecosystems on Vancouver Island, and the *Sensitive Habitat Inventory and Mapping program (SHIM)* that trains people to ground survey aquatic and riparian areas using GPS and orthophotos.

Our aim in participating in these efforts is to have wildlife habitat features like shrub characteristics, snags, diversity of tree species incorporated into the mapping being done.

It is especially important on Vancouver Island and the Georgia Basin area because these areas have the highest diversity of landbirds in BC. We're interested in learning what wildlife features you are mapping, and if you aren't, what the barriers to collecting this information are, and whether incorporating this into your field work would be easy.

We are also interested in your thoughts about creating local stewardship centres, whether you consider this a good thing, whether creating local centres is feasible, and if you would like a workshop specifically focused on local stewardship centres.

Again, welcome and enjoy the day.

3.2.3 Mapping and Inventory Methods Overview

ORGANIZATION:	Habitat and Enhancement Branch, Fisheries and Oceans Canada, Pacific Region
PRESENTER:	Brad Mason
TOPIC:	Overview of SHIM
E-MAIL:	masonb@dfo-mpo.gc.ca

What is SHIM?

SHIM is a mapping procedure and project designed to identify and map sensitive fish and wildlife habitats (notably small streams and riparian areas) so that this information can be incorporated into community planning and development. *SHIM* integrates selected sensitive resource information with cadastral lot boundaries and orthophotography. The emphasis is on accurate mapping of sensitive habitats and fish and wildlife presence.

Once approved by the federal-provincial Resources Inventory Committee (RIC), *SHIM* will become the standardized method for fish and fish habitat mapping in developed areas of BC.

The *SHIM* program is funded through (among others):

- i) Habitat Renewal Salmonid Enhancement Program (HRSEP),
- ii) Fisheries Renewal BC (FsRBC),
- iii) Human Resources Development Canada (HRDC),
- iv) the Habitat Conservation Trust Fund (HCTF),
- v) Urban Salmon Habitat Program (USHP),
- vi) Pacific Salmon Foundation (PSF), and
- vii) Ecoaction 200.

How is SHIM used?

- Sensitive Habitat Atlas and map products,
- Internet access,
- Local government Geographic Information Systems (GIS's),
- Community GIS's,
- Senior government GIS's and data warehouses,
- Fish Protection Act Stream Side Directives,
- Official Community Plans (OCP's) and Development Permit Areas.

Why is SHIM Community-Based?

- Projects are initiated by communities,
- Products are used by communities,
- Data are managed by communities,
- Communities are responsible for field work and data processing.

What should be the role of DFO, MELP, and CWS?

- Write standard procedures,
- Provide training,
- Provide base maps and ortho-photography,
- Produce final atlas and internet products,
- Quality assurance and control,
- Identify priority areas,
- Help co-ordinate projects.

How do I make SHIM work in my community?

- Prioritize areas to be surveyed,
- Ensure adequate support and logistics,
- Ensure effective communication,
- Produce Sensitive Habitat Atlases and other products,
- Recognize the need for data management in the short and long term.

TOPIC:	BC Fish Protection Act
ORGANIZATION:	DFO
PRESENTER:	Mel Kotyk
E-MAIL:	kotykm@dfo-mpo.gc.ca
NOTE:	More information is available from the presenter.

In 1997, the Province of BC passed legislation to protect fish and fish habitat called the *Fish Protection Act*. The three main elements of the *Act* are:

- no new dams to be built on major rivers,
- designation of sensitive streams, and
- protection of streamside riparian areas.

The latter element of the legislation is focused toward local governments and regional districts, to ensure that streamside protection measures are in place when applications for residential, commercial, or industrial development are considered.

The regulations and standards for the *Streamside Protection Policy Directive* have been under development since December 1997, and it is anticipated that the directive will be presented to Cabinet in January, 2000. The directive will require that municipal governments protect the riparian vegetation of fish-bearing and non fish-bearing streams to the best extent possible. During the summer of 1999, as a test of the draft regulations, a pilot study was conducted with local governments on Vancouver Island, the Lower Mainland, and the Okanagan. Shortcomings were identified both in the directive and in the tools needed for local governments to apply the regulations.

A key requirement for the application of the directive will be for local governments to compile an inventory of the habitat and map the streams in their areas. Main elements of this inventory will be

- accurate locations of stream channels (especially in relation to property boundaries) and top-of-banks,
- an understanding of fish presence or absence, and
- existing and potential riparian quality.

Local governments do not presently feel that they have sufficient financial or technical resources to undertake this level of data collection and mapping exercises alone. They have called for senior agencies to develop standards for mapping and inventory collection, to provide training and certification, professional certification of biologists, and endorsement of the inventory and mapping conducted.

The timing for implementation will likely commence in 2000, thereby requiring resolution to these issues in the upcoming months.

TOPIC:	Proper Functioning Condition as an Indicator of Stream and Wetland Health
ORGANIZATION:	Aqua-Tex Consulting
PRESENTER:	Patrick Lucie
E-MAIL:	aqua-tex@islandnet.com
NOTE:	Reports concerning the USDA's PFC evaluation methodology, and Aqua-Tex Consulting's photogrammetric technique, are available from the presenter.

The US government has developed a set of 'diagnostics' for assessing the ecosystem health of streams, wetlands and riparian areas. These diagnostics evaluate the areas' *Proper Functioning Condition* (PFC).

Riparian-wetland areas are *functioning properly* when adequate vegetation, landforms, or large woody debris are present to:

- dissipate stream energy associated with high water flows, thereby reducing erosion and improving water quality;
- filter sediment, capture bedload, and aid floodplain development;
- improve flood-water retention and groundwater recharge;
- develop root masses that stabilize streambanks against undercutting;
- develop diverse ponding and channel characteristics to provide the habitat and water depth, duration, and temperature necessary for fish production, waterfowl breeding, and other uses (e.g., domestic water supply);
- support greater biodiversity.

The functioning condition of riparian-wetland areas is a result of interactions among geology, soil, water and vegetation.

Functional – At Risk riparian-wetland areas are in functional condition but an existing soil, water, or vegetation attribute makes them susceptible to degradation.

Non-Functional riparian-wetland areas are clearly not providing adequate vegetation, landform, or large woody debris to dissipate stream energy associated with high flows and therefore are not reducing erosion, improving water quality, *etc.* as listed above. The absence of certain physical attributes (e.g., the presence of a floodplains where one would normally be expected) are indicators of non-functioning conditions.

A standardized, photogrammetric technique is proposed for recording and storing data concerning PFC.

TOPIC:	Sensitive Ecosystems Inventory Project for East Vancouver Island and Gulf Islands
ORGANIZATION:	Conservation Data Centre, Resource Inventory Branch, Ministry of Environment, Lands and Parks
PRESENTER:	Jan Kirkby
E-MAIL:	jan.kirkby@gems9.gov.bc.ca
NOTE:	A more detailed report is available from the presenter.

The eastern coastal lowland of Vancouver Island and the adjacent Gulf Islands comprise a unique ecological region in Canada, with exceptionally high biodiversity values and many rare and endangered plants, animals, and plant communities. Intense development pressure in this area has resulted in the fragmentation and loss of these rare ecosystems. The Sensitive Ecosystems Inventory (SEI) of East Vancouver Island and Gulf Islands was initiated in 1993 in response to an urgent need for inventory information on remaining natural areas to support sound land use planning.

The Sensitive Ecosystems Inventory is a joint project of Environment Canada (Canadian Wildlife Service) and the BC Ministry of Environment, Lands and Parks (Conservation Data Centre and Vancouver Island Region), with funding support from the Habitat Conservation Trust Fund and several local governments. The purpose of the SEI project was to systematically identify, map and evaluate the ecologically significant and relatively unmodified sensitive terrestrial ecosystems remaining in this area, specifically, wetland and riparian ecosystems, older forests and woodlands, coastal bluffs, sparsely vegetated dunes, spits and cliffs and terrestrial herbaceous ecosystems. Seasonally flooded agricultural fields and large older second growth forests were also mapped for their general biodiversity values.

Sensitive ecosystems were first identified on aerial photographs. Over 30% of the identified sites were then field-checked to verify boundaries, classify, photograph and evaluate present conditions. Over 7,000 sites were mapped in an area of roughly 4,000 square kilometres. Sixty-six maps at 1:20,000 were developed using ArcInfo GIS, and are available in both digital and

hardcopy formats. These maps and accompanying database provide a user-friendly flagging tool for identifying remaining natural areas and important wildlife habitats.

The inventory results strongly support claims that natural areas and habitats are fast disappearing. Today, less than 8% of the entire study area can be considered relatively natural. Even many areas within this are substantially degraded by fragmentation, human use, and introduced species. An additional 0.7% of the study area was mapped as seasonally flooded agricultural fields, with another 10.9% occupied by second growth forests over 60 years old. The rest of the study area is under urban or rural land use, or comprises recent clearcuts or young forests of under 60 years of age.

SEI project staff are now working with local governments, landowners, developers and others to use existing tools and mechanisms to protect and conserve the sites identified. Two publications have been developed:

- a Technical Report describing the project and summarizing and analyzing the data,
- a Conservation Manual (in prep.) intended for use by local governments, developers, landowners and conservation agencies to engage and encourage their participation in the protection of sensitive ecosystems in their area..

TOPIC:	Status of Fish Habitat in Thirteen Small Watersheds on the East Coast of Vancouver Island
ORGANIZATION:	Urban Salmon Habitat Program, BC Ministry of Environment, Lands and Parks
PRESENTER:	George Reid
E-MAIL:	greid@nanaimo.env.gov.bc.ca
NOTE:	A summary of this presentation was not provided by Mr. Reid. However, a detailed report is available from the presenter.

The Vancouver Island boundary of the Georgia Basin is one of the fastest growing areas in British Columbia. The area has an abundance of small, second-order streams which originate on forested lands, then run through rural and urban environments. We examined the instream habitat of 14 watershed in that area. We found reduced pool area in 41% of the watersheds, a lack of large woody debris (LWD) in 93%, reduced instream cover in 50%, and excessive fine sediments in 88%. Our analysis shows summer low-flow problems in 155 or 165 streams examined. We found an average of 25.4% development in the 14 watersheds as a result of urban, agricultural, golf course, and/or residential land-use. We make a number of suggestions for improving the protection of east coast streams, including more public involvement in watershed planning, and the development of Official Community Plans and bylaws which provide for the protection of small stream habitat during and after development. We also recommend ways for volunteers to become involved in long-term protection and restoration of their watersheds.

TOPIC:	Shorekeepers
ORGANIZATION:	Shorekeepers Program, DFO Institute of Ocean Sciences
PRESENTER:	Linda Nichol
E-MAIL:	lnichol@islandnet.com
NOTE:	A <i>Shorekeeper's</i> manual is available from DFO, Pacific Region

Like their inland counterparts, intertidal shoreline habitats are threatened by development. The Shorekeepers program was designed to facilitate collection of long-term monitoring data for intertidal habitats, much like Streamkeepers does for stream habitats.

The Shorekeepers program is designed for use by community stewardship groups, and includes a *Shorekeepers Guide*, a training course, and an MS Access database. The easy-to-follow guide provides a collection of methods that can be used without expensive equipment. 'Shorekeepers kits' are available on loan from DFO.

The Shorekeepers methodology involves monitoring a small stretch of shoreline for 3-5 years. The study area is broken down into its component habitat types, and physical and biological measurements are taken of each habitat type. Physical dimensions of habitat units are mapped against a fixed baseline, which ensures the repeated measurements are made in a consistent spatial framework.

TOPIC:	Sensitive Habitat Inventory and Mapping for Intertidal and Riparian Areas
ORGANIZATION:	Independent, Ucluelet
PRESENTER:	Adrienne Mason
E-MAIL:	amason@island.net

This initiative provides a standardized methodology for mapping intertidal habitats on Canada's Pacific coast. The data collected provide valuable information to resource managers, community planners, marine researchers, environmental biologists and others who are interested not only in long-term monitoring, but also in having credible, spatially accurate data to use when making development and resource-related decisions.

The mapping methodology records specific physical characteristics (form, material, veneer, *etc.*), biological characteristics (cover and/or abundance of flora and fauna), resource features (e.g., oyster beds, *Zostera marina* habitat, *etc.*) and anthropogenic features. The data are collected in three ways: intertidal transects, polygon, line or point mapping using differential GPS, and backshore transects. The data are combined in a spatial database and will be used to create maps using a geographic information system (GIS) such as ArcView.

The manual for the initiative is divided into two sections: a mapping and survey procedure, and a protocol for data management and analysis using a spatial database.

A pilot project was carried out in Ucluelet Harbour and Pacific Rim National Park. Protocol was developed by Archipelago Marine Research, Fisheries and Oceans Canada, L.J. Nichol

Ecological Consulting, Pacific Rim National Park Reserve, and West Coast Sustainability Association.

TOPIC:	Streamkeepers' Report
ORGANIZATION:	Qualicum Beach Streamkeepers
PRESENTER:	Faye Smith, Co-ordinator
E-MAIL:	rosenblatt@bcsupernet.com
NOTE:	A more detailed report is available from the presenter.

The following presentation is a summary of activities undertaken by a variety of groups.

Stewardship Groups Contacted: Fanny Bay Salmonid Enhancement Society (7 creeks), Project 2000 (Nanaimo, 4 creeks), Englishman River Enhancement, Qualicum Beach Streamkeepers (2 creeks), Errington Streamkeepers, Shelleybrook Streamkeepers, Society for the Protection of the Englishman River Estuary, Craig Creek Enhancement, Lasqueti Island Streamkeepers, Nanoose Bay Streamkeepers, Lantzville Streamkeepers

Methods Used: Most groups had conducted *Streamkeepers* inventories and/or USHP mapping and inventory; a few had done the SHIM with GPS.

Training: Most volunteers had taken Streamkeepers course and the USHP mapping course(s), and some had taken the SHIM course given by the Ministry of Environment. In Qualicum Beach, volunteers had also trained with Bob Burkosky (professional mapper) and assisted during the GPS mapping of Grandon Creek and Beach Creek. Some creeks were mapped solely by professionals.

Problems Mentioned:

- The riparian components in both the Streamkeepers and USHP surveys are too simplistic.
- Not enough funding is available to pay for the Trimble GPS and crew.
- Participants need to be trained.
- Difficulty in engaging enough volunteers.
- Entering data is not attractive work for most volunteers.
- Some distances were too great for the volunteers.
- Access to ArcView equipment is out of the question for most groups.
- Data gathered may not be consistent when challenged (e.g., the USHP data were questioned and a legal survey was required).
- There is no single database for the information gathered.
- The Sensitive Area Atlas lacks credibility because of inaccurate placement of some features and photo-interpretation of streams.
- Lack of protection for streams on private land even when the mapping is accurate.

Some Suggestions:

- Speedy implementation of a strong Fish Protection Act.
- Co-ordinated methodology for the entire area.
- Give lots of professional and monetary support to volunteer groups who are willing to get involved because mapping is the best way to become familiar with the streams (the volunteers will be there long after the professional has moved on).
- A useful riparian survey could use elements of the Resources Inventory Committee, USHP, Forest Practices Code Fish and Stream Assessment and Watershed Assessment Procedures and the DFO Stream Survey Guide.
- A good project for entry-level streamkeepers might be to report on the photo-interpreted streams shown on the Atlas.

Conclusion: All groups agree that mapping and inventory is a crucial element to the preservation and protection of our streams.

Note: The Qualicum Beach Streamkeepers have begun a project to create a resource inventory and mapping capability which will provide information about natural processes, features and human activity within the area. We are developing a database which can be utilized by a geographic information system.

TOPIC:	Wetlandkeepers
ORGANIZATION:	Qualicum Bay Wetlandkeepers
PRESENTER:	Ron Speller
E-MAIL:	beron@nanaimo.ark.com
NOTE:	A more detailed report is available from the presenter.

Qualicum Bay Wetlandkeepers is a small stewardship group that arose following training sessions in the summer of 1998.

In collaboration with the Canadian Wildlife Service, we have worked on a longitudinal study of bird use in a local wetland complex, and are scheduled to undertake ecological studies of an estuarine area in the spring of 2000.

Another of our projects was to assist a local residents' group in enhancing the ecological value of their impoundment through aquatic flora plantings, and to develop it for year-round use by waterfowl. However, this project was found unfeasible when the group identified that a major hydrological problem, which was confirmed by a professional hydrologist.

Now this is where it gets interesting. In identifying the hydrological problem, it was confirmed that Alexander Creek, the stream that flows into the impoundment and then evacuates it into the Strait of Georgia, was an unmapped salmon stream. The course of the creek was ground-truthed and funding applications made for its – and the impoundment's – mapping by GPS procedures. Regrettably, these applications were unsuccessful. I am confident that other salmon streams remain to be mapped but, given the uncertainty regarding funding of GPS mapping projects, opportunities for successful habitat restoration and resource enhancement are limited.

The training of Wetlandkeepers commenced in 1997 to address the preservation and enhancement of this type of sensitive ecosystem. Wetlands are under constant threat of disappearance from urban development, farming and other causes. On the east coast of Vancouver Island, wetlands cover approximately 1.5% of the total land area. Under the aegis of the Canadian Wildlife Service, Langara College of Vancouver, is the designated partner for delivery of the outreach training program. As a result of the program's success, revisions in its delivery have been initiated, and from the spring of 2000 the program will only be available in post-secondary educational institutions.

3.2.4 Community Mapping Projects

TOPIC:	Sensitive Habitat Mapping
ORGANIZATION:	Alberni-Clayoquot Regional District
PRESENTER:	Jodi Hallworth
E-MAIL:	jhallworth@acrd.bc.ca

Goals: It is of major importance at the outset of a mapping project to have a very clear idea of how you expect the end product to be used. This affects a range of factors including:

- the type of expertise required in personnel being hired;
- the establishment of parameters for accuracy;
- design of a data base (e.g. what data should be collected; how will it be queried)

In our case, we identified two key uses for the data: land-use planning and habitat restoration.

Land-Use Planning: From the Regional District's perspective, accuracy and credibility are key factors if data are to be used successfully for planning purposes.

Bylaws are legal documents. They can be challenged and overturned if there are mistakes. Confidence in the accuracy is a MUST if we are defend this data. This ties in with credibility. Our bylaws must go through a public consultation process. If a property owner can look at his property and find a mistake in the location of the stream, the whole project is in question. It is not just the public that needs to buy in to this process; these bylaws need to be passed by a regional board or a municipal council. Angry constituents can have a lot of influence on how board members vote.

We feel the following factors in our project contributed to its success:

- *Steering Committee:*The project was overseen by a Steering Committee composed of potential end-users of the data. Decisions regarding issues such as work priorities, degree of accuracy, etc., were made by consensus. Regional District staff have a high level of comfort in the accuracy of the data precisely because of our ongoing involvement in the process through which it was collected.

Members of the field crew also attended committee meetings from time to time. We feel this is important in giving them an understanding of the overall goals of the project, particularly if they are going to be asked to go back into the field to verify accuracy.

- *Administration:* Day to day administration (including management of the work crew, overseeing the budget and equipment, and applying for ongoing funding) was handled by one individual who reported back to the Steering Committee. It is important to have this role taken on by a full time employee. In our experience, it cannot be done effectively by volunteers.
- *Technical Supervision:* A Fisheries Technician was hired to oversee the field crews. His role was crucial, particularly in the first half of the project, in training the crews, maintaining high levels of accuracy in data collection and establishing a close liaison between the field crews and mapping technicians in the City of Port Alberni and the Regional District.
- *Trained Field Crews:* We have been fortunate to be able to keep the same field crew over the lifespan of this current project. Turn over in crew members and the necessity for retraining can slow progress and create concerns in maintaining accuracy.

Roadblocks:

- *GPS units* – don't mess with the cheaper ones – use a Trimble.
- *Funding* – We need continuous funding to make these projects work, preferably from some provincial body. It is increasingly difficult to obtain funding, especially considering how many new projects are started each year.
- It is difficult to keep up with ongoing changes in database software and standards. Data becomes incompatible. Continual training of crews is not cost-effective.

TOPIC:	Regional Aquatic Management Society
ORGANIZATION:	West Coast Sustainability Association
PRESENTER:	Scott MacDonald
E-MAIL:	sustain@port.island.net

This presentation provided an overview of the rationale behind our sensitive habitat mapping project, its history, findings, information users and future directions of the project.

The West Coast Sustainability Association (WCSA) was formed to address the recent downturn in commercial fishing on the west coast of Vancouver Island. The WCSA's mandate is to build the capacity required for regional management. This has led to the formation of the Regional Aquatic Management Society (RAMS). Recognizing that there is little information available on small local streams in our area, RAMS initiated the West Coast Mapping and Inventory Project. The need for regionally-based management becomes more evident with each impacted stream or tributary that is mapped.

Partnerships are important to RAMS's effectiveness. Partners involved in our projects include: the WCSA, Fisheries and Oceans Canada, Parks Canada, Transport Canada, the Nuu-chah-nulth First Nations Tribal Council, International Forest Products, MacMillan Bloedel (Weyerhaeuser), the Regional District of Alberni-Clayoquot, the Municipalities of Ucluelet and Tofino, and the Long Beach Model Forest.

Our project contracted the services of a local forest engineering company to assist in training, and this has resulted in a large number of small streams and a high degree of data collection accuracy (especially GPS data collection) from the outset of our project.

End-users of this information include: municipal planners, forest companies developing cut-blocks, and property owners for subdivision planning and outlay

Our activities resulted in one land-owner in Tofino placing a protective legal covenant around salmon spawning and rearing habitat when he developed his property.

Of significant interest is the reaction and attitudes of the public towards our project. Reactions have ranged between a few “stay the hell of my land” types to those who are indifferent, interested, very interested and even those committed to using our data in their plans. The range and diversity of feelings in the community appear to match the range and diversity of impacts uncovered by mapping crews in the field.

The results of our project are providing a foundation for other projects currently being proposed or undertaken in the region, such as:

- the West Coast Inter-Tidal Mapping Project, that utilized the new-found skills of our crews and established new inventory methodologies, and
- a detailed Fry Distribution Survey funded by the Science Council of BC. This fry survey will commence almost immediately.

In addition to generating valuable information, our project is providing crew members with new employment opportunities based on their recently-acquired skill-sets.

TOPIC:	ICNRC's L IMM Project
ORGANIZATION:	Inner Coast Natural Resource Centre
PRESENTER:	Shannon Bleasby
E-MAIL:	icnrca@island.net

The Inner Coast Natural Resource Centre's Local Interactive Management Model (L IMM) project is sponsored by the Combined North Island Fisheries Centre (FsRBC) and Fisheries and Oceans Canada. The L IMM project has been divided into three phases. Phase 1 includes examining existing databases and gathering previous assessments done by government and other agencies, establishing methods for integrating data from diverse sources, and to begin setting criteria for prioritization of impacted areas. Phase 2 includes reviewing material gathered in Phase 1 for consistency and gaps, developing methods for receiving local input into the data library, and implementing the “Local Interactive” in L IMM using Internet access to the data library. Phase 3 includes summarizing the results of Phases 1 and 2, publishing habitat problem prioritization techniques and methods and to provide ongoing access to library for making land use decisions.

To date, known habitat information about streams in the Mount Waddington Regional District (MWRD) has been collected from local knowledge sources and government agencies. This data has been entered into an MS Access data table that includes information about the habitat

obstruction, the severity of the problem, and the proposed prescription, and problem sites are being mapped using Ministry of Environment, Lands and Parks standard mapping symbols.

The MWRD is a vast area including 10 different watershed groups and almost 24,000 km of streams. For this reason, the LImm project relies heavily on the input from local sources. The advantages of this include maximizing local knowledge in land use decisions, increasing observation scope, maximizing local involvement in land use decisions, and capturing valuable historical knowledge from elders. This is intended to be done through Internet web page access for public queries, Internet data capture for public input into the database, submission vetting to ensure database integrity, and submission rating to rank the significance of public submissions.

TOPIC:	Sensitive Habitat Mapping
ORGANIZATION:	Mount Waddington Regional District
PRESENTER:	Liz Harvey
E-MAIL:	mwmmaps@island.net

My comments were from a Map Technician's perspective of how the LImm project, and ICNRC in general, fit into the regional planning picture.

The Mount Waddington Regional District (MWRD) has a huge geographic area (17,000 ha) and a small population (15,000). Over 95% of the land base is held in forest tenure, and as a result we have very little marine planning data. At present, we are making planning decisions based on very limited information, and must take steps toward making informed planning decisions with improved resource information data.

There are two planning bodies within the MWRD: the Planning Department and the Resource Board.

Planning Department's tools:

- OCP & Zoning for our communities;
- Rural Land Use Bylaw (Bylaw 21 – set for revision in 2000 – inadequate for these changing times);
- Provincial Land Referral Process;
- two new Provincial Policies – Shellfish and Commercial Recreation – both will influence the Land Referral Process;
- Forest Recreation & Tourism Opportunities Study (FRTOS) – sector study – acknowledges geographic areas capable of supporting various activities – not zones, not site specific;
- Forest Inventory Info – lots done (e.g., licensee management plans and MOF studies) yet not easily accessible/useable for planning;
- First Nations Treaty Process – overrides all Crown Land Applications.

Resource Board:

- only has advisory role; with limited planning resources;
- awaiting higher lever plans (e.g., Vancouver Island Land Use Plan [VILUP]) and Central Coast Land and Resource Management Plan [CCLRMP]) to see the directions set, with the intent to integrate our own local planning concepts;
- great potential for integrating our planning through co-operative efforts (e.g., submitted preliminary application to LUCO to undertake Coastal Planning in cooperation with ICNRC).

In order to get to making Informed Planning Decisions:

- 1) Make better use of existing info (need to co-ordinate exchange of information and identify information gaps);
- 2) Develop public consultation process (assist with consultation and decision making processes);
- 3) Develop interim measures with First Nations in the context of treaty negotiations – without this, a huge percent of our planning is subject to being on hold;
- 4) Regional Rural Land Use Bylaw (set to take place in 2000) and undertake coastal/terrestrial planning at the local level. The coastal planning may well take place in 2000 as well, subject to LUCO endorsement.)

ICNRC has the potential to play a role in all of the above steps. Its LIMM project is critical to achieving step 1. It has the potential to facilitate steps 2-3.

In fact, then, we have begun the process of taking the steps needed to make more informed planning decisions. Our regional planning picture should get clearer over the next few years.

TOPIC:	Mapping a Course for Our Watershed
ORGANIZATION:	Comox Valley Project Watershed Society
PRESENTER:	Don Chamberlain, Program Co-ordinator
E-MAIL:	watrshed@mars.ark.com

Project Watershed Society's Mandate:

Established in 1993 to operate in the watersheds of the Comox Valley, from Oyster River to Deep Bay Creek, the Project Watershed Society seeks to “encourage people of all ages and cultures to become involved in community stewardship of watersheds”. During its brief seven-year history, the society has been building numerous partnerships among community organizations, citizens, industry and all levels of government in an effort to address its mission statement of: “promoting community stewardship of Comox Valley watersheds through education, information and action”.

Project Watershed is recognized locally and internationally for its ability to provide technical expertise, its ability to create ‘watershed wisdom’ among community members, and for its ability to involve volunteers in a diverse array of stewardship programs.

By promoting a community approach to watershed stewardship, Project Watershed is able to serve a population with a diversity of interests: resource industries and their workers, private

landowners, concerned residents, conservationists, and many other special interest groups. We are non-partisan and seek to involve and include the broadest possible sector of the community in our projects.

Streamkeeper Group Partnerships

Local Streamkeepers are involved in our project both as advisors and trained volunteers. The maps and reports generated through the project are utilized by Streamkeepers for awareness-raising and for project planning. We help local groups promote stewardship in their watershed by creating public display materials and assisting with community meeting facilitation and group formation.

Community Plans

Project Watershed also provides accurate watershed maps for regional planning purposes. SHIM data is presented in completed ArcView format to planners in regional and municipal government. The information has been used in some instances and is expected to be more in the future for development of Official Community Plan's, Development Permit Area designations, Liquid Waste Management Plans, Greenways Plans, and Watershed Management Plans.

Our community partners at present include: Comox Valley Naturalists, Local Streamkeeper groups, Landowners along streams, Regional District of Comox Strathcona, City of Courtenay, Village of Cumberland, Town of Comox, MELP, Fisheries and Oceans Canada, Canadian Wildlife Service, Human Resources Development Canada.

Planning Maps

A photo of the Comox Sensitive Habitat Atlas sheet was presented to demonstrate where our information has been used

Watercourse Review Maps

Our staff have created a special map for the agency partners to use to review stream location information prior to accepting data for Sensitive Habitat Atlas revisions.

Liquid Waste Management Plans

Our data has been used by Dougals Anderrson Engineering who developed the Phase 1 LWMP report for the Village of Cumberland. Flow data, watercourse (and wetland) locations and channel configuration information was utilized.

Stream Survey Summary Reports and Maps

Our staff are instructed to develop a summary report based on their research and surveying so that overview information is available that describes:

- watercourse locations,
- general condition of each watershed,
- issues with landowner contact,
- restoration/rehabilitation opportunities,
- priority opportunities for local Streamkeepers,
- additional mapping/inventory needs.

Advisory Committee

Our project advisors consist of government agency representatives, GIS experts, biologists, naturalists and Streamkeepers. These people assist us in priority setting for watershed mapping projects, partnership development, information dissemination and provide professional advice and project evaluation information.

Landowner Stewardship Projects

Built on the landowner contact and data collected from the mapping and inventory work, our Landowner Stewardship Program provides us with an opportunity to:

- present mapping and feature information to landowners,
- provide private land stewardship information and advice,
- facilitate Streamkeeper group formation and growth,
- gather additional information (historical, anecdotal, etc.),
- promote stream networking among neighbours.

History of Methods Used

Originally, we were involved in preparing summary reports on local watersheds using SISS surveys and 1:20,000 TRIM maps. Reach level summary reports were generated and these were used for getting initial Streamkeepers motivated into action. We assisted in development of the Streamkeepers Modules and have provided Streamkeepers training to over 200 local citizens.

“Greenways GIS Mapping” was the next level of surveying attempted, utilizing compass & hip chain technology to recording both biophysical and land-use information (a very frustrating experience when we tried to map on hand drawn cadastral maps and then digitize!). The accuracy of these maps were probably in the order of 5-100m.

We were then involved in the first SHIM surveys using Garmin GPS & a prototype SHIM Excel Spreadsheet. The accuracy with this approach was deemed to be 20m with a confidence of 95%, so we moved to Trimble Pathfinder technology as have been very impressed with the results. The accuracy of our linework is now within 5m with 95% confidence.

Mapping/Inventory Strategies

- Surveys are conducted in areas of past or future urban development pressure.
- Continual direction is provided by the Advisory Committee.
- Products need to be tailored to meet partners' needs.
- Maintain a separate Landowner Contact Database for confidential and anecdotal information.
- Crews act as a team to allow mentoring of newcomers and sharing in problem- solving.

GIS / Database Management Strategies

- All field staff utilize ArcView software to process and review data.
- GPS/GIS Technician has RIC ‘GPS Processor/Manager’ certification.
- Field crew members have RIC ‘GPS Operator’ Certification.
- Quality Assurance and Quality Control Program.
- Maps and reports generated by field crew to summarize findings.

Ideas For the Future:

- Produce an atlas of SHIM Data for each watershed.
- Develop user-friendly ‘Graphic User Interfaces’ for public viewing of SHIM on computers.
- Assist in developing Wetland Mapping/ Inventory extension to SHIM.
- Compile local Water Quality and Wildlife Datasets in GIS.
- Work with community on prioritizing regional watershed restoration activities.

TOPIC:	Sensitive Habitat Mapping
ORGANIZATION:	Regional District of Comox-Strathcona
PRESENTER:	Alison M. Mewett, BCSLA, Supervisor, Environmental Planning and Parks
E-MAIL:	amewett@rdcs.bc.ca
NOTE:	A more detailed report is available from the presenter.

History

Don Chamberlain, of Project Watershed, has given an overview of the Sensitive Habitat Atlas in our region. The first version was produced in 1995 primarily from the use of air photo interpretation. The 1998 update used more accurate information as Don has outlined. We have additional updated stream information however it is not clear how, or when, the next update will take place.

The Atlas covers a large area (104 1:11,000 map sheets) with hundreds of watersheds. However, there are still large areas of the Regional District that are not covered. Additionally, there are many streams which are missing in part or entirely, or are inaccurately located.

Use

The Regional District is the first line of defence in the protection of a stream.

For the past five years, every counter inquiry at the Planning and Building counters has resulted in opening the Habitat Atlas. Planners have relied on “moral-suasion” to encourage habitat-friendly siting, construction and site work.

The Regional District now has two Official Community Plans which have designated Development Permit (DP) Areas on all fisheries sensitive areas as identified in the Atlas. This provides us the ability to require specific development practices beside streams and along the coastline – or at least for those streams shown in the Atlas. DP’s additionally cover several other environmentally sensitive areas such as around eagle and heron nest trees, and some steep slopes.

Within the next year the Atlas will have been used by the RD (their consultants, or partners) in the preparation of a Watershed Management Plan, an Integrated Stormwater Management Plan, a Liquid Waste Management Plan and the beginning of groundwater studies. Other more long-term uses remain to be seen.

Accuracy

The Regional District needs the information to be accurate. Firstly, because the Atlas becomes a legal attachment to the bylaw which establishes the OCP and secondly because it is easy to lose

political buy-in to habitat protection when constituents begin to complain that the information is inaccurate.

Quality Control

The RD has a Memorandum of Understanding (MOU) with DFO and MELP to streamline and co-ordinate habitat protection referrals. Although RDCS has a general need for accuracy, the information must also satisfy the needs of senior governments (DFO/MELP).

Secondly (and most importantly), the information must be defensible. This means that some agency has put their professional, unbiased, stamp of approval on everything in the Atlas. This is what gives the entire document credibility and a broad base of support (political, bureaucratic and grass-root).

Importance

The primary importance of the Atlas for the Regional District is location, location, location. If a stream is not shown in the Atlas it is much less likely to be protected. If the stream is not shown in the Atlas then a Development Permit is not required.

Secondary uses of the Atlas for the Regional District is the background information about the stream (which will be used for stormwater management plans, for example).

What Next?

Our primary requirement is to (a) expand the coverage to other areas of the Regional District (e.g., Sayward Valley, Menzies Bay) and; (b) to obtain more accurate information about stream locations – with a secondary requirement for detailed stream information. A tertiary requirement is to expand the mapping base to include more accurate shoreline mapping, and groundwater mapping.

TOPIC:	Stream Mapping and Inventory Project
ORGANIZATION:	Nanaimo Regional District
PRESENTER:	Bonnie Blue
E-MAIL:	bblue@rdn.bc.ca
NOTE:	The editor did not receive a written summary of Ms. Blue's presentation. A more detailed report is available from the presenter.

The Nanaimo Regional District has developed an Environmentally Sensitive Area Atlas, which identifies sensitive aquatic and terrestrial habitats, as well as property boundaries and the road network. Many partners were involved. Most of the Atlas' data has been photo-interpreted, and requires ground-truthing.

The Atlas information has been important in the OCP process, to ensure recognition of sensitive areas. This, in turn, is used to guide the development permit application permit process.

Local governments can only achieve the amount of habitat protection that they can get the community to agree to. Accurate mapping is essential ensures credibility. This is very important in communities where buy-in for environmental protection is not great.

In the future, we need:

- a process for ensuring that maps are continually updated,
- inclusion of coastal resources and floodplains in the Atlas,
- a means of using Streamkeepers for ground-truthing Atlas data,
- a classification system for conveying stream importance,
- a standardized definition of a watercourse,
- more funding.

TOPIC:	Stream Mapping and Inventory Project
ORGANIZATION:	Community Fisheries Development Centre
PRESENTER:	Marci Leighton
E-MAIL:	mappers@island.net
NOTE:	The editor did not receive a written summary of Ms. Leighton's presentation

The Community Fisheries Development Centre employs displaced fishers to map urban streams and ground truth the Nanaimo Environmentally Sensitive Area Atlas.

Field personnel have identified many instances where streams indicated on TRIM maps and orthophotos differ from reality. They have also located and mapped many previously unknown tributary streams, which are important for coho rearing.

Ground-truthing is essential to sensitive habitat mapping.

They originally worked with the Garmin GPS, but now use the Trimble Pathfinder and find it greatly superior.

TOPIC:	Sensitive Habitat Inventory and Mapping
ORGANIZATION:	DFO
PRESENTER:	James Van Tine
E-MAIL:	vantineja@dfo-mpo.gc.ca

I, like many others recognized the need for accurate mapping and some level of inventory. There were numerous and obvious errors in stream locations from the photo interpreted trim maps. We needed accurate locations to protect and restore habitat. This is critical in urban areas. Users of this data would include local government- land protection, greenways, etc, the agencies and Streamkeepers.

There are many different methodologies for mapping but there is no standard approach. We discussed this with Brad Mason, as he is the only DFO employee who deals with most of the groups.

The technology is also evolving rapidly, from chain and compass to crude GPS, then better GPS units and most recently infrared photography. I fear many of us have wasted a lot of time and resources re inventing the wheel. Mapping and the equipment required is very expensive and funding is and will continue to be a major issue.

We have accurately mapped many of the small streams in the Campbell River area. To date the inventory data has not been processed and this data and the mapping results need to be more assessable.

We need a standard approach for mapping and assessment. Levels of accuracy for different circumstances should also be addressed.

TOPIC:	North Island Fisheries Initiative
ORGANIZATION:	North Island Fisheries Initiatives
PRESENTER:	Don Fish
PHONE:	(250) 287-4510

The North Island Fisheries Initiative (NIFI) started in January 1996 as a United Fishermen and Allied Workers Union (UFAWU) – sponsored federally-funded transition program for displaced and job-threatened West Coast salmon industry workers.

Late in 1997 we decided to become a BC-registered non-profit society and were registered in August 1998. By that time we had graduated in excess of 670 salmon industry workers and had managed budgets approaching \$5.65 million.

Throughout the previous year it had become apparent to us that stream and watershed data lacked in integrity in all but 1,200 of 300,000 systems in BC, and we are not to certain about the 1,200. In a worsening 1997 economy we recognized the need to be innovative in our approach to finding work experience and job placements for our participants. GPS mapping and assessment represented the potential, worthwhile year-round jobs/industry with huge pay-backs in fish, habitat and environment, both in the short and long term.

On Nov. 14, 1996, our Resource Assessment and Mapping (RAM) unit was created, with the goal to provide highly motivated trainees with the best equipment available (affordable) and combine those two aspects with excellent training. It was expected that this approach would result in:

- improved volume and quality of data;
- local access to useable data;
- elimination of duplication of effort to validate existing data;
- minimize duplication of effort to validate existing data;
- minimize duplication of effort on some easily-accessible systems, and increase effort on more isolated areas, through improved reliable funding.

In Nov. 1996 – Oct. 1997, experimentation with GIS mapping, processing and manual assessment was stimulated through a series of Streamkeepers courses. In Nov., 1997 we entered our first, non-government, cost-recovery contracts to gain practical field and laboratory experience. Five similar contracts followed and provided full-time employment for nine persons (all program

graduates) over 14 months. We had processed 16 people through our GPS training and 15 people through our GIS courses by March, 1999, and currently have 30 more in various stages of accomplishment.

We focused on four beliefs:

1. The first step on all systems was *mapping*, preferably using top-of-the-line GPS.
2. The second step was proper complete *assessment* of the mapped system, preferably using a comprehensive data dictionary in a first-line GPS unit.
3. The third step would be *prescription* to correct any assessed ills determined during step 2.
4. The fourth step was to obtain suitable funding to carry out appropriate *rehabilitation* as prescribed in step 3.

By spring, 1997, we had investigated available GPS equipment and chosen the Trimble Pro-XL TDC as our initial operating package, with the non user-friendly P-Finder download filing system. By fall, 1997, we had leased-to-purchase a Pro-XR TDC II unit combination and found a much-improved Pathfinder Office download support package. For over 1 ½ years we worked with one of each (Pro-XL and Pro-XR), recently purchasing both units outright through earnings they generated over that time.

Currently we are adding a third package, a Pro-XR with a TSC I data-logger, on which we have completed upgrade training.

In mid 1998 we acquired a second-hand Criterion 400 laser range-finder, which we integrated into our other packages within approved productivity in our forestry and aquaculture contracts. Recently, an Epson PC 700 digital camera was added, which allows us to collect visual assessment data to support field observations.

We hire only Trimble technicians to train our participants in the use of their equipment.

Simultaneously with the acquisition of our GPS inventory, we partnered with PCI Geomatics to provide use with their GIS software products, notably *ACE*, *PAM-MAP* and *FLY*. here again, all participants were introduced to GIS by fully-qualified PCI employees with advanced training provided to those who chose to concentrate on GIS post-processing.

The “bottom line” of our experiences is that people with integrity willing to work on the ground, provided with the best affordable equipment on the market, will achieve the highest standards of work ethics and meet or exceed all levels of objectives established or desired by the end-users.

We thank Jim Van Tine (DFO), Roger Balsler (MELP), Dave Clough (Clough and Associates), and Brad Mason (DFO) for their help, encouragement and support.

TOPIC:	Sensitive Habitat Mapping
ORGANIZATION:	District of Campbell River (DCR)
PRESENTER:	Michael Roth
E-MAIL:	michael.roth@dcr.bc.ca

Since 1996, the District of CR has been working in partnership with FOC and MELP to map and assess all streams and creeks within the Municipality.

This has resulted in a Habitat Atlas for Campbell River, now in Version 2, and expecting version 3. The Atlas is currently being used by both the engineering and planning staff during permit application reviews and infrastructure upgrades.

In addition, in 1997 the Municipality embarked on a Greenways planning process, one of the three cornerstones of the 1997 OCP (themes: Greenways, Neighbourhoods and Growth Management).

This work has enabled the Municipality to complete a number of mapping exercises, including:

- streams, creeks and their associated floodplains and drainage areas (SHIM);
- riparian habitat within the fisheries sensitive zone (SHIM);
- proposed Greenway corridors and network (recreational and ecological);
- existing trails and networks;
- sensitive area (ESA) inventory;
- wildlife trees including rare or threatened species; and,
- sites of cultural and archaeological importance.

SHIM mapping was completed using trained technicians working under FOC guidance and funding.

However, there are some shortfalls to the mapping process (not the methodology) and I hope that these are components of the program that can be addressed as part of the outcomes for this workshop:

- A standardized format for data collection, currently we have – FOC, MELP & Streamkeepers,
- Access to supplemental information collected during mapping phase needs to be linked to needs of user.
- Data are not readily available without GIS resources (Stewardship centres and FOC websites could provide this link in all communities);
- Accessibility of information for all users (NGO, First Nations, developers, consultants and local governments)
- Links through local community net, television, stewardship centres or FOC website. Increasing public knowledge of resources available (e.g., A developer will spend time and money preparing a proposal and take this for approval. The local government refers to maps and database, then responds to the permit applicant who has to go away, make changes, then resubmit his application. If we create a level playing field we will save (\$\$\$) for applicant and staff time.

- Additional data collection for second and third passes is reliant on Trimble GPS availability, technical support (GIS technicians) and access to FOC for sign off or final approval.
- There needs to be a formal process for long term planning, a work plan with timelines for:
 - Ongoing updates to the information database
 - Expected turn-around time for information to be available
- Information is viewable but currently not managed to provide best-case scenarios for land-use decisions (e.g., maximizing the developable land area while maintaining natural habitat values)
- Mapping of impervious surfaces in relation to development within a watershed (e.g., 18% rule)
- All components of process must be managed to the same level. (i.e., good ground-truthing, linked to well-surveyed legal plans, linked to good resolution orthophotos).
- Ensuring that the program capabilities do not exceed the programs expectations (database management)
- Limited utilization of information unless programmers (GIS technician) are on staff with various local government offices. GIS information works when it is used, not when it is lost inside a hidden database. Options for cost-sharing and partnerships should be encouraged and developed by FOC (often the link between local government and the groups completing the ground work on behalf of FOC).

In conclusion, local government has taken up the challenge of recognizing the role of watercourses and their ecological values, although sometimes it took some pushing, shoving and kicking to get it there). The next step is for local governments to incorporate this information into the land-use decision-making process, and make decisions that make sense to the developer, while protecting the ecological values that define the communities that we live in.

Flexibility and adaptability are key tools that will be needed. Drawing fixed lines in the dirt that say 15, 30, 50 or 100 m will only work if they reflect the known values that exist based on good, credible, ground-truthed data.

If we have to promote this initiative to the decision-makers that hold the purse strings, (locally, provincially, and federally) then perhaps we should look at the economic benefits that would result from good land use decisions (e.g., supporting our natural resource industries so that they last beyond the next millennium, and lifestyle opportunities that are not found anywhere else in this country).

TOPIC:	Sensitive Habitat Mapping
ORGANIZATION:	The Islands Trust
PRESENTER:	Tyrone Guthrie
E-MAIL/PHONE:	Not provided

The Islands Trust is a regional district that represents the southern Gulf Islands. The Trust is a user of data, rather than a producer, depending on other organizations (e.g., stewardship groups) to gather information about sensitive habitats and land use.

The Environmental Information Management System (EIMS) was created by the Islands Trust to collect all available land-use planning information (e.g., cadastral, stream locations, fish presence) into one database.

A lesson learned was the importance of defining standards for evaluating data before beginning to build a database (e.g., create a data management framework before entering data). Problems were encountered integrating attribute data and spatial features. For example:

- What is a feature? Where is it?
- What are the relationships between features?
- What are the spatial attributes?
- What is missing?
- How up-to-date are the data?
- How were the data collected (e.g., at what scale, by whom)?

Ad hoc mapping attempts led to a perception of inaccuracy, which led to a loss of credibility. It also led to redundant or missing features.

It is important to try and integrate any new data collection and storage effort with existing standards, so that data can be shared with other groups (e.g., the EIMS ecosystem classification used Conservation Data Centre ecosystem descriptions).

TOPIC:	Overview of Gambier Island Conservancy GIS Project
ORGANIZATION:	Gambier Island Conservancy
PRESENTER:	Maria Van Dyk
E-MAIL:	sn1539@sunshine.net

The project started in 1996 as part of the Conservancy's Streamkeepers project funded by the Urban Salmon Habitat Program.

Why?

Little detailed environmental data existed for the Island, and the Conservancy was concerned that without hard data and increased public awareness, the environmental values would not be protected both on the private and crown lands. Pressures to develop and log land have escalated in recent years, and the Conservancy wanted to take a pro-active approach to help the Land Use Planning processes currently underway (e.g., OCP review) by providing much-needed data.

How?

We collected all available digital data and analog maps in a central location. The digital data is readily available in a central computer to assist the planning process and other inventory work. We have collected TRIM data, Forest Cover mapping, orthophotos, and cadastral, geological and zoning information. Reviewing this information gave us the ability to identify gaps and start building new information

Benefits:

- The system has complemented more detailed inventory and mapping work, for example:
- mapping Gambier Island's watersheds;
- a project to describe Environmentally Sensitive Areas;
- identification of wetlands associated with Gambier Island's lakes;
- Old Growth Study;
- assisting the Streamkeepers stream mapping work.

Challenges:

- integration with the Streamkeepers/SHIM detailed stream-mapping data;
- recognizing the accuracy limitations within each set of data (e.g., Island outline);
- need an effective way to store meta-data;
- raises the level of technical skills required to capture and manipulate the data;
- logistics of doing detailed field work in a remote rugged island location.

Observations:

- need a central repository for data to avoid duplication and assist other initiatives;
- need standards for mapping and inventory work that will allow increasing levels of detail to build progressively without duplication;
- having standards would enhance share-ability and reduce redundancy.

TOPIC:	The Benefits and Challenges of using GPS in Mapping
ORGANIZATION:	Gambier Island Conservancy
PRESENTERS:	David Doyle and Tanya Yadao
E-MAIL:	sn1539@sunshine.net

The learning curve associated with using GPS and GIS in mapping natural resources can be overcome with training and perseverance. The use of an accurate GPS unit should not preclude the use of traditional survey methods. Hip chain, compass, clinometer and field book should always be carried. Data collected using traditional survey methods allows GPS data to be interpreted and additional information to be incorporated into GIS.

Benefits of GPS:

- Can collect a large volume of accurate spatial data during a field day.
- Can examine data daily and adapt data collection methodology.
- Can have confidence in the accuracy of the data collected.

Challenges of GPS:

- Gaining proficiency in using the technology.
- Organizing metadata.
- Adapting data collection methodology to seasonal conditions and satellite availability.

- Balancing the need to collect spatial data with the need for attribute data.

3.2.5 Watershed Assessment and Planning Requirements for Mapping and Inventory

TOPIC:	Comparative Analysis of Methodologies for Measuring Watershed Imperviousness
ORGANIZATION:	Institute for Resources and Environment University of British Columbia
PRESENTER:	Paul Zandbergen
E-MAIL:	pzand@interchange.ubc.ca
NOTE:	A more detailed report is available from the presenter.

Imperviousness has been identified as a key indicator of general watershed conditions, and numerous studies have documented the relationship between increasing levels of imperviousness and declining stream and river health. One of the advantages of using imperviousness as an indicator is that it can be measured relatively simply and at low cost using land-use information. However, the use of imperviousness as a tool in watershed protection and land use planning requires that the methodology for measuring imperviousness be sufficiently accurate and reliable. A study was carried out to contribute to the development and promotion of a sufficiently accurate method for measuring imperviousness, to be used in a consistent manner for watersheds throughout the Georgia Basin.

Available methodologies were reviewed, including ground surveys, stereo-photogrammetry, air photo interpretation, and satellite image analysis. A number of methodological issues were addressed, including: the importance of using a scale appropriate for the intended use; the distinction between land use and land cover; the use of (semi)automated image analysis in land use/cover mapping; the use of imperviousness factors; and the difference between *total* and *effective* imperviousness. A number of sample data sets for several small watersheds were obtained from local agencies and community groups. These data and their associated methodologies were reviewed and quantitatively compared to provide estimates of the accuracy and reliability of imperviousness estimates, as well as the cost, technology and skills required to carry out these methodologies.

The following factors were found to influence the accuracy of imperviousness measurements (in order of decreasing importance): selection of imperviousness factors; accuracy and scale of land use mapping; consideration of land cover in addition to land use; and watershed delineation. Selecting appropriate imperviousness factors is by far the single most important factor in determining the accuracy of the final estimates, suggesting the use of photogrammetry and/or manual analysis of high resolution orthophotos is required for a high level of accuracy.

Photogrammetric methods at 1:5,000 scale or larger provide the most accurate estimates of imperviousness, at the highest cost and highest level of skills and technology. Manual analysis of 1.0 m-resolution orthophotos can be used at scales from 1:5,000 to 1:20,000. At the 1:5,000 scale, the accuracy of the imperviousness results is very good, rivalling that of photogrammetric methods, at similar cost, but more moderate level of skills and technology. The availability of high-resolution digital orthophotos will keep the cost of land use mapping at 1:5,000 in the \$2 to

\$3 (Cdn) per hectare range, using either semi-automated or manual methods. At the 1:20,000 scale, manual analysis can provide fairly accurate results, at lower cost. Satellite image analysis provides the least accurate estimates of imperviousness, at the lowest cost and fairly high level of skills and technology. While it does not provide sufficient accuracy for imperviousness measurement at the sub-watershed scale for municipal planning purposes in the Georgia Basin, it does provide a moderate cost alternative for large areas where forested and agricultural land uses are also of interest.

Imperviousness is a very useful complement to stream and habitat inventories. Imperviousness information and can be used for:

- Regional comparisons of general watershed conditions
- Evaluating the possible impacts of future growth on stream health conditions
- Establishing and evaluation watershed health objectives
- Evaluation of alternative urban designs

TOPIC:	Millard/Piercy Watershed Mapping
ORGANIZATION:	Millard/Piercy Watershed Stewards
PRESENTER:	Angela Smailes
E-MAIL:	asmailes@island.net

The Millard/Piercy watershed is a low-lying basin on the mid-east coast of Vancouver Island that supports several salmonid species, the most abundant of which is coho. Urban and agricultural development and land-use in the watershed present an ever-increasing threat to the salmon and their habitat. In an effort to address this issue, the Millard/Piercy Watershed Stewards, a non-profit stewardship group, has led the community in an 18-month, participatory watershed planning process that is currently nearing completion.

A major component of the planning process was the accurate mapping of streams and land use, and gathering as much information as possible about crucial physical and biological aspects of the watershed. To this end two maps were produced. The first is a detailed stream and habitat map (SHIM) produced by Comox Valley Project Watershed Society. Using this information as a base, we were able to produce our eye-appealing (and very useful) Land Use and Cover Map. This map shows the broad areas of land use and vegetative cover. Most crucially, it provides accurate information about total impervious areas for specific basins and the watershed as a whole.

Both the accurate stream-lines and the copious amount of information collected by SHIM technicians will assist us with action plans for the watershed management plan. For example, data concerning culvert and stream dimensions, and the surface areas of sub-basins can, in conjunction with other data, be used to model various protection and development scenarios in our Integrated Stormwater Management Plan.

Riparian information provides the basis for determining priorities for stream restoration and landowner contact. The impervious area measurements and cover information can be used to calculate run-off coefficients; cover information also allows us to see the connectivity in our watershed and to preserve wildlife corridors. The other crucial aspect of SHIM maps is that the accuracy can be verified and used by local governments – the front line for habitat protection.

Based on our experience so far, the investment of time and resources into these maps is well worth it.

3.2.6 *Synopsis*

TOPIC:	Summary of Morning's Presentations
ORGANIZATION:	Independent
PRESENTER:	Brenda Kuecks
E-MAIL:	bkreuks@island.net

There are a wide variety of mapping methodologies that have been developed to map our water, terrestrial and wildlife resources. Each method serves different objectives, different terrains and different capabilities. Each has its own weaknesses and strengths, and its own advocates.

Over the past five years, the recognition of the importance of accurate resource mapping has grown considerably. The number of people, and the range of perspectives in the Nanaimo workshop are a signal of growth and maturity in the 'science of mapping' and proof that people see a need for documenting and recording our natural resources.

While mapping means and methods vary, there are some common 'themes' throughout the presentations that must be noted:

1. Perhaps we cannot ever agree on 1 common mapping method, but certainly we must agree to a common method of recording our data and storing it so that, over time, we are able to build up our knowledge base about an area. With each subsequent mapping exercise, we must be deliberate about our ability to relate one data set to another if we are to build a useable body of knowledge over time.
2. The data we collect, regardless of the subject or method, must be reliable if we are to garner the confidence of user groups and have our information used for a maximum number of purposes. This implies a need to invest in training, good equipment and excellent data storage and retrieval systems.
3. There are a variety of current and potential user groups for resource inventories. The 'product' must be developed and stored in a way that recognizes and respects the needs of the user groups. Deciding how data will ultimately be used, guides questions about its format, recall capabilities and storage/housing.
4. If we agree that the primary purpose of resource mapping is to record information so that we can monitor, manage and plan for our natural resources over time, then the role of First Nations and Local Governments becomes key. Their active engagement in the process and their endorsement of the product is fundamental.
5. Mapping, to be done well, requires a long term commitment of energy, focus and funding. How we secure this long term commitment when senior policy makers, both federally and provincially, are focussed less on conservation and more on social engineering of our resources, has to be a key concern for everyone involved in this type of activity.
6. To do inventory and mapping work well, what is the role that we need D.F.O, MELP, community conservation groups, paid professionals and volunteers to play? Within the

framework of a long term commitment and long term funding, these issues could be worked through to the maximum benefit of all.

7. In the collection of resource inventories, it is critical to recognize the importance of historical data, both as a baseline and as a record of what we have lost over time. The collection of historical data requires active engagement and partnership development with First Nations.

3.3 Breakout Sessions

Following the presentations, workshop participants divided into three “breakout groups” each of which discussed three main topics:

- i) SHIM Program Direction, Support, Co-ordination, Communication, and Priorities;
- ii) Methods and Integration of Methods (including wildlife, certification, tools);
- iii) Stewardship Centres
- iv) In many cases, key concerns identified during the breakout discussions mirrored those identified during the morning’s presentations.

3.3.1 *SHIM Program Direction, Support, Co-ordination, Communication, and Priorities*

FUNDING: These discussions highlighted the need for adequate, reliable funding for community stream mapping and stewardship in BC. Long-term planning by funding agencies is required to ensure continued funding for stewardship groups.

The funding application process needs to be harmonized among the different funding agencies (e.g., use a common application format for funding applications), in order to avoid duplication of effort by applicants applying to a variety of different funding sources.

ROLE OF GOVERNMENT: Workshop participants perceived a lack of communication and cooperation among different levels of government and among different government agencies. They felt that governments at various levels should work harder to form and facilitate partnerships.

Workshop participants felt that the role of senior governments should be to:

- i) provide funding for habitat mapping and stewardship initiatives,
- ii) develop and promote standards (e.g., SHIM),
- iii) encourage local governments to protect streams and other environmentally sensitive area,
- iv) verify data quality,
- v) serve a “warehousing” role for data.

Local governments have the mandate to control land-use, subdivision standards, *etc.* and therefore have a need for the habitat mapping data. To improve support of sensitive

habitat mapping initiative, the map data should be openly demonstrated to the public and to politicians.

3.3.2 *Methods and Integration of Methods*

STANDARDS: There is a need for standardized data collection. Development and widespread adoption of appropriate standards are essential to ensure consistency, accuracy, reliability and – ultimately – credibility of data. Data credibility is essential to gain the confidence of planners, governments, and the public.

Training programs are needed to properly implement standards.

DATA STORAGE: Long-term storage of fish habitat data is currently a problem throughout BC. There is a need for some consistent, easily accessible means of storing and retrieving habitat databases. It was suggested that a way of meeting this need is a central data repository (à la FISS), as well as more detailed regional databases.

The organization(s) charged with storing and maintaining databases must have longevity (e.g., senior government ministry, university).

A key problem with widely accessing and integrating disparate databases (e.g., ArcInfo, Access, Excel, AutoCad) is file incompatibility. A standard data storage format is needed, which incorporates different layers of feature information (e.g., SHIM, cadastral).

METHODOLOGIES: A core requirement of “first-pass” SHIM is the collection of data concerning the riparian zone and ‘top-of-bank’. Field photography is useful for describing the stream, features, etc.

QA/QC: Quality assurance and quality control standards need to be developed by a broad-based committee, and should be focused at the field level.

CERTIFICATION: Resource Inventory Committee GPS standard equivalency should be required of all GPS field mappers involved in SHIM.

3.3.3 *Stewardship Centres*

There is no single model for a community stewardship centre that will be applicable to all communities. Each community must define what it is that they want their Stewardship Centre to be. Permanence, accessibility, location, and form and content are important considerations in implementing stewardship centres.

PERMANENCE: Stewardship centres need to be funded on a secure, long-term basis, with full-time staff. They should have “buy-in” from all users, community stakeholders, and levels of government.

ACCESSIBILITY: Centres must be accessible to all members of the community, and the information contained in the centres should be free.

LOCATION: Where the centre is located will depend on the size and nature of the area that it serves. It could be located in local government office (although some participants thought that this where it should not be located), but it should certainly be non-partisan (not subject to local politics).

FORM AND CONTENT: The centre should provide a place for *Streamkeepers* and *Wetlandkeepers* to input and store information. However, its role should not just be in mapping and inventory. It should also promote stewardship and restoration, and could incorporate other types of information (e.g., wildlife, vegetation, etc.). It could have a “watershed” mandate.

The centre should be a physical place, to facilitate inter-personal contacts, and house the various stewardship groups active within the watershed or area. It could be a building containing a combination library and “service centre”

There should also be a “virtual” component to the stewardship centre, to allow online access to the data and facilitate information sharing.

4. ABBOTSFORD WORKSHOP PROCEEDINGS

4.1 Setting

This workshop was held at the Salvation Army Centre in Abbotsford on Dec. 16, 1999 from 9:00 to 16:30. The workshop was attended by over 140 participants from throughout the Lower Mainland.

4.2 Presentations

In morning sessions of the workshop, representatives of the federal and provincial governments gave introductory presentations about the workshop's objectives and government perspectives. This was followed by a series of presentations about various municipal, First Nation, and community mapping initiatives currently under way in the Lower Mainland.

The following pages present summaries of presentations made during the morning at the Abbotsford workshop. Presentations are grouped under the headings:

- Introductory Remarks,
- Municipal Mapping Initiatives,
- First Nation Mapping Initiatives,
- Community Mapping Initiatives
- Synopsis.

4.2.1 *Introductory Remarks and Overview of SHIM Objectives*

TOPIC:	Welcome
ORGANIZATION:	Sumas First Nation
PRESENTER:	Dalton Silver
PHONE:	(604) 852-4040
NOTE:	There was no text for Mr. Silver's presentation.

Mr. Silver welcomed all of the workshop participants to the Sumas First Nation's traditional territory, and thanked to organizers for inviting him. He eloquently expressed the Sumas First Nation's support for the concept of community-based habitat mapping efforts.

TOPIC:	Workshop Objectives
ORGANIZATION:	Habitat and Enhancement Branch, Fisheries and Oceans Canada, Pacific Region
PRESENTER:	Brad Mason
E-MAIL:	masonb@dfo-mpo.gc.ca
PHONE:	(604) 666-7015

We are losing many of our sensitive habitats to development because they are not accurately mapped or inventoried. We need to put these habitats on 1:5,000 scale maps.

The federal/provincial Sensitive Habitat Inventory and Mapping (SHIM) program is now in its 5th year, having begun on Vancouver Island. The program is very much as community-driven affair. This is because there is not much funding available, and the onus is on local government and stewardship groups to do the mapping of their own streams. SHIM is mainly to provide information for use in land-use planning, but it can also be used to identify restoration opportunities, *etc.*

At this point in the development of SHIM, it is time to take stock of what has been achieved, and what can be done to improve the program.

Methods and Standards:

- We need to discuss data resolution, inputting of data, training and certification, and QA/QC
- How do we use sensitive habitat mapping information for the Fish Protection Act, and OCP's?
- What types of data can be expected of community volunteers?
- What is the role of remote sensing *vs.* field data?

Connecting Communities:

- How can we share resources, expertise, and lessons learned
- Where should the data be put?
- Is there a need for regional *Stewardship Centres*? If so, what form should they take?

Products

Sensitive habitat data can be displayed in a variety of forms, such as atlases, large maps, internet products. The choice of final products is dependant upon the purpose they are to be used for.

TOPIC:	CWS Perspective
ORGANIZATION:	Canadian Wildlife Service, Pacific Region
PRESENTER:	Kathleen Moore
E-MAIL:	kathleen.moore@ec.gc.ca

The mandate of the Canadian Wildlife Service (CWS) is to protect migratory birds and endangered species. Because it is a relatively small agency, it is often involved in partnerships with other agencies and with community groups or local governments.

Although streams and riparian areas are important to wildlife, the CWS would like to see SHIM's focus expanded beyond its current fisheries focus to include more wildlife habitat parameters.

TOPIC:	Introductory Remarks
ORGANIZATION:	Ministry of Environment, Lands and Parks
PRESENTER:	Rob Knight
E-MAIL:	rknight@axionet.com

Brad Mason began SHIM five years ago on Vancouver Island. The initiative gained a foothold in the Lower Mainland three years ago as an outgrowth of the Fraser River Estuary Management Program (FREMP) GIS program. Following provision of HCTF funding two years ago, SHIM is currently in use by around 20 projects.

4.2.2 *Municipal Mapping Initiatives*

TOPIC:	SHIM Plus
ORGANIZATION:	City of Chilliwack
PRESENTER:	Jim Vickerson, City of Chilliwack, Municipal Development Department Robin Davey, Pacific Initiatives Peter O'Byrne, City of Chilliwack Engineering John Wiley, City of Chilliwack GIS
E-MAIL:	Vickersn@chilliwack.com

Introduction:

6 major watersheds/ 3 specific needs:

- Master Drainage Plan,
- Watercourse Setbacks for Development,
- Agricultural Ditch Maintenance Policy.

Information Objectives:

- survey and inventory all watercourses,
- map all watercourses,
- link SHIM database to GIS mapping,
- validate fish presence/absence/habitat,
- in-stream features and cross-sections.

Where We're At:

- known watercourses –600+ km /inventories to date 138 km,
- database – functional,
- field validation – one watercourse,
- focus- complete Chilliwack Creek by spring 1999,

Field Methodology (SHIM plus):

- identify centreline stream by GPS – UTM co-ordinates,
- obtain ground truth habitat information (SHIM),
- obtain typical hydraulic and riparian cross-sections,
- document information,
- Trimble Pathfinder,
- GPS system – data capture in progress.

Database:

- SHIM field survey sheets,
- Stream Truthing Survey – x-section,
- species identification – Pacific giant salamander,
- Microsoft Access data template,
- data processing – linked to GIS by unique tag no.,
- photos digitized and linked to database,
- elevation data interactive with database.

Mapping/Data Linkage:

- status of watercourse in GIS,
- development of 'Streamside Protection Policy',
- data integrity,
- Fisheries Sensitivity Classification Map,
- Agricultural Ditch Maintenance Map,
- Hydro Tec Viewer.

TOPIC:	Overview of SHIM and Modified SHIM
ORGANIZATION:	City of Coquitlam – Parks and Environment
PRESENTER:	Mike Esovoloff, Rod Stott
E-MAIL:	mesovolo@city.coquitlam.bc.ca
NOTE:	The editor was not provided with a written summary of this presentation.

1. *Introduction*

- a) Who we are and how we are involved in environmental mapping
- b) Objectives of presentation
 - i) summarize two inventory projects carried out in 1999: (i) SHIM and (ii) modified SHIM (GPS Inventory)
 - ii) discuss advantages /disadvantages of each, providing suggestions for improvement

2. *SHIM Overview*

- a) reasons for carrying out SHIM project
- b) Overview of area inventories – Hoy Creek watershed
- c) Advantages of SHIM
- d) Suggestions for improvement

3. *Modified SHIM (GPS Inventory) Overview*

- a) reasons for carrying out GPS inventory
- b) Overview of area inventories – Tributaries to Coquitlam River
- c) Advantages of GPS inventory
- d) Suggestions for improvement

4. *Conclusion*

- a) Comparison between two projects – methods and procedures
- b) Suggestions for adaptation between the two projects

TOPIC:	SHIM
ORGANIZATION:	City of Abbotsford/MCC Ecoworks
PRESENTER:	Christy Wright
E-MAIL:	christywright@yahoo.com

The following are SHIM mapping projects that I have been involved with through the City of Abbotsford and MCC Ecoworks. Included are project summaries as well as problems encountered. Solutions are also provided for each problem but are by no means the only solutions available.

Downes Creek

PROJECT SUMMARY In Spring of 1999, City of Abbotsford crews mapped the Downes Creek watershed. The watershed includes 4288.2 m of mainstem and 3892 m of tributaries. A total of 4 mappers were hired and they finished mapping the watershed in approximately 2 months. All of the mappers were previously trained in mapping in post-secondary institutions (e.g., BCIT).

Downes Creek is a small, shallow, low flowing system that starts in a newly developed area near Clearbrook and ends in the agricultural area on the Matsqui Prairie flats. Other adjacent land use includes residential, school zones, and parkland. The riparian vegetation band varies from more than 50 m. wide to 0 m. in the agricultural zone. Essentially, the riparian band was good in the park (Downes Bowl) and elsewhere it was either non-existent or poor.

<i>Problems:</i>	<i>Solutions:</i>
1. GPS was awkward in the field while SHIMing	-one pass with the GPS (tie in flags and features)
2. "leap-frogging"	-one crew does mainstem, one crew does tribs.
3. Cross-section info required (notes)	-set out exactly what is required from beginning (e.g. % per individual band or % of total band)
4. Data entry	-don't get far behind -fix field and note mistakes the next day
5. GIS/mapping	-involve crew and train them
6. Deep ditches	-use belly boats, kayak, or have safety line

Stoney Creek

PROJECT SUMMARY: In Summer of 1999, MCC Ecoworks' Operation Creeksave mapped the Stoney Creek watershed. The watershed includes 4973.9 m of mainstem and 5067.1 m of tributaries. A total of 12 people were involved in the mapping of the watershed over a period of 3 months. Crews worked in groups of 3 and all had little or no mapping experience, except for the supervisors.

Stoney Creek is a very shallow, low flowing system. In the end of summer, many areas were completely dry with only scattered ponds left with water. The headwaters of Stoney Creek are on Sumas Mountain near new housing developments and under a BC Hydro right-of-way. Adjacent land use includes grazing land, agricultural, residential, and parkland. Riparian band-widths were generally small (poor) but there were few areas of over 50 m. riparian vegetation.

<i>Problems:</i>	<i>Solutions:</i>
1. GPS was "a pain"	-Trimble GPS on a once-over pass
2. "leap-frogging" and the size of the crew	-1 crew on mainstem, 1 crew on Trib. X, and 1 crew on Trib. Y -cell phones, coordination
3. Data entry mistakes	-good notes from the beginning (check daily) -communication (what is expected)
4. Making up codes	-don't! -add only as a comment
5. Size of crew	-too many is a logistical nightmare -don't trample the stream (e.g. 2 per crew for experienced and 3 per crew inexperienced)
6. Data entry into computer (setup)	-make sure data is entered starting below the day before's notes, not on a separate sheet

Nathan Creek

PROJECT SUMMARY: In the Fall of 1999, MCC Ecoworks' Operation Creeksave mapped a portion of the Nathan Creek watershed. The mapped portion of the watershed included 3430.2 m of mainstem and 5472 m of tributaries. A total of 6 people were involved in the mapping the watershed over a period of 2 months. Crews worked in groups of 3 and all had little or no mapping experience, except for the supervisor.

The portion of Nathan Creek that was mapped by this crew is fairly shallow, wide and slow-flowing. The adjacent land use is predominately large-scale agriculture but also includes some small-scale hobby farms. The riparian vegetation band varies from more than 50 m. wide to 0 m along this portion of Nathan Creek. There was a major problem with cattle access to the stream in terms of bank erosion and high amounts of faecal matter entering the stream.

<i>Problems:</i>	<i>Solutions:</i>
1. Agricultural pollutants and erosion	-fencing and planting needed (recommended)
2. Dogs	-beware and carry spray
3. Training setup	-did own training (1 day classroom, 3 day field plus a small test)
4. Time of year	- summer only mapping
5. Volume of water	-have other projects ongoing -walk banks in bad areas

TOPIC:	Community Mapping
ORGANIZATION:	City of Langley Langley Environmental Partners Society (LEPS) Township of Langley City of Abbotsford/MCC Ecoworks
PRESENTER:	Roy Beddow, Marina Stjepovic, Sarah dal Santo
E-MAIL:	roy@city.langley.bc.ca marina_stjepovic@township.langley.bc.ca sarah_dasanto@township.langley.bc.ca

LEPS

- 1995 started collecting stream survey data
- problems with early surveys
- 1998 stream survey data evolved into SHIM with GPS technology, data
- needed for Fish Protection Act
- summary, plans for 2000

TWP of Langley

- Benefits and Usefulness
 - Continuous reach-by-reach assessment of watercourses.

- . Extensive and detailed watercourse inventories and fish habitat records.
- . Records of potential obstructions and barriers to fish access.
- . Lists potential sites for enhancement.
- . Integration of different fields/stream features of GIS-based data.
- . Lays the foundation for watercourse delineation, classification and mapping.
- . Comprehensive inventory coverage not just driven by NP or development processes.
- . Promotes understanding of watersheds and not just segments of watercourses.
- Difficulties and Limitations
 - . Accuracy of watercourse delineation with GPS
 - . Focus is on streams. Limited attention to ESA's, wildlife or wetlands.
 - . Currently too-many maps with different watercourse delineations.
 - . Need to distinguish between physical characteristics e.g. river versus ditch on WCC map.
 - . Need sign-off on data/maps from the agencies.
 - . Stream location still subject to professional survey.
 - . Vegetative cover, extent and type of riparian vegetation limited.
 - . Need to be very familiar with SHIM abbreviations and framework to understand the data.
 - . Missing link to get the data in a useable form to those who make land use decisions.
 - . Fish presence/absence information is not always collected.
 - . SHIM data paints a current picture, but not very conducive to baseline studies and ongoing monitoring.
- How the Township Uses SHIM Data
 - . Used by Township Environmental Co-ordinators in preparing inventories and assessments for Neighbourhood Plans and Master Drainage Plans.
 - . Used to provide preliminary (not definitive) environmental information on specific development sites or areas of environmental concern.
 - . Used indirectly by Environmental Co-ordinators and Operations staff through the WCC map in capital instream works applications.
- Data Management and Access to Information
 - . SHIM data is currently available through LEPS staff.
 - . Environmental Co-ordinators, and GIS Department also have access to SHIM database, (although GIS doesn't use the data).
 - . Data is also available/free to outside agencies, community groups, consultants, landowners, developers etc. through LEPS.
 - . Data is raw, with very little analysis or summary assessment (costs time and money).
- Adapting to Changing Environmental Focus and Needs
 - Watershed-based approach to environmental management needs:*
 - . Ready access to information summaries at the watershed scale.
 - . Identification of parameters to be used in baseline inventories and measurements of watershed health.

- Water quality sampling and invertebrate studies at strategic locations only.
- Extension of inventories to upland areas within the watershed (using aerial photos).

Fish Protection Act needs:

- Top-of-bank estimates.
- Detailed streamside vegetation information (using aerial photos).
- Identification of definite barriers (man-made versus natural) to fish habitat.
- Identification of especially vulnerable areas, and areas in need of enhancement or restoration (also for watershed-based approach).

Suggested Improvements for Data Collection and Presentation

- A routine method for rechecking/updating the information.
- Establishment of fixed testing stations for ongoing monitoring (e.g. invertebrate studies, water quality testing).
- Methods for synthesizing the large body of information so as to make it accessible to non-GIS staff and land use decision-makers

City of Langley

- history of ESA study
- ground verification with SHIM
- future plans

4.2.3 *First Nation Mapping Initiatives*

TOPIC:	Sensitive Habitat Mapping by the Cheam Band
ORGANIZATION:	Sto:lo Development Corporation
PRESENTER:	Ernie Victor
PHONE:	(604) 858-0009

The Cheam band is one of 19 Sto:lo Bands. Their traditional territory includes the Cheam Lake watershed, located between Mount Cheam and the Fraser River.

The band has undertaken two habitat mapping and inventory projects:

An *Overview Study* of the entire watershed was undertaken in partnership with MELP, DFO, and the regional district. Within the watershed boundaries, the project collected information from elders, biologists, governments and other stakeholders. However, the project lacked a mechanism to involve all stakeholders and user groups in all relevant issues, and generated too much information for the band to deal with.

A Mapping and Inventory Project included:

- spatial mapping (no GIS, GPS or technical expertise was involved)
- a downstream fish trap for collecting out-migrant coho
- water quality testing with a general water quality test kit over a period of one month

4.2.4 *Community Mapping Initiatives*

TOPIC:	Overview of Gambier Island Conservancy - Streamkeepers and Mapping Project
ORGANIZATION:	Gambier Island Conservancy
PRESENTER:	Lois Kennedy
E-MAIL/PHONE:	Not provided

Background

- Little detailed environmental data existed for the Island.
- The Conservancy was concerned that without hard data and increased public awareness the environmental values would not be protected both on the private and crown lands.
- Pressures to develop and log land have escalated in recent years.
- The Conservancy wanted to take a pro-active approach to help the Land Use Planning processes currently underway (OCP review) by providing much needed data.

Strategy

- Collect available digital data and analog maps in a central location.
- Digitize and make data more accessible (Arcview) for land use planning and field/inventory work.
- Data collected: TRIM, forest cover, orthophotos, cadastral, geological, zoning, biophysical inventories/projects.
- Identify gaps and prioritize projects.

Mapping Projects

- Streamkeepers: detailed fish habitat assessment and stream mapping.
- Mapping Gambier's watersheds.
- Environmentally Sensitive Areas Project.
- Study of the riparian zones around Gambier's Lakes.
- Old Growth Study.
- Wetlands Project.

Challenges

- Integration of data sets.
- Recognizing the accuracy limitations within each set of data (e.g., Island outline).
- Need an effective way to store meta-data.
- Increased level of technical skills required by local volunteers to manage the data.
- Logistics of doing detailed field work in a remote rugged island location.
- Availability/distribution of environmental information to interested agencies/groups/persons.

Observations

- Need a central repository for data to avoid duplication and assist other initiatives.
- Need standards for mapping and inventory work that will allow increasing levels of detail to build progressively without duplication.
- Having standards would enhance shareability and reduce redundancy.

TOPIC:	Burns Bog Inventory and Mapping Project
ORGANIZATION:	Burns Bog Conservation Society
PRESENTER:	Danielle Cobbaert
PHONE:	(604) 572-0373

Introduction

- Discuss how local stewardship groups can use Sensitive Habitat Inventory and Mapping.
- My experience with the Burns Bog Conservation Society project.
- My name is Danielle Cobbaert. I have worked with the BBCS for 5 years as a Stewardship and Education Co-ordinator.

Topics of Discussion

- Why we decided to initiate a Inventory and Mapping Project.
- How we did it.
- Problems/ Suggestions.
- Outcomes.

Why?

- Proactive approach to land use decisions.
- Assess state of fisheries and land development in the vicinity of Burns Bog.
- Increase the credibility of the BBCS - followed SHIM standards.

Steps- How we did it

1. Create objectives and plan.
2. Form Partnerships.
3. Acquire Funds.
4. Training.
5. Collect Equipment.
6. Conduct Field Work.
7. Computer Data Entry.
8. Write up final report.

Partnerships

- Ministry of Environment, Lands and Parks.
- Corporation of Delta, Environment and Engineering Department.
- Community Fisheries Development Centre.

Funding Sources

- Fisheries Renewal BC: \$10,000.
- Enviro-Youth Team Internships: \$13,600.
- ESRI Canada- ArcView software.
- HRDC work program.
- MoELP: maps, training, GPS.
- CFDC: Streamkeepers kit, training.
- BCCF: loaned camera.

Field work

- 3 person team, staff and volunteer.
- skills: vegetation id, fish id, id restoration needed, GPS experience, hard worker, consistent.
- cover 500 m /day average.
- Land owner permission.

Data Entry

- ArcView software.
- Access database.
- SHIM data entry tool.
- digital ortho photos.
- Timeframe: – 2 hours for every day in the field.
- Compile and interpret data for final report.

Problems

- Data entry tool.
- Lack of support.
- Corp. of Delta does not have ArcView software.
- follow up and monitoring difficult without steady funds.
- data limited by equipment, expertise of staff

Outcomes

- Mapped over 24,000 m - repeatable baseline data.
- Report/Data given to MoELP, Corporation of Delta, & BCCS.
- Contributed to Burns Bog Ecosystem Review.
- Followed up with riparian restoration project.

TOPIC:	SHIM Project
ORGANIZATION:	Bowen Island Forest & Water Management Society
PRESENTER:	DG Blair Whitehead
TELEPHONE:	

Project Overview:

- SHIM of Bowen Brook (Grafton Lake watershed) and Lee Creek (South Bowen), two watersheds under increasing development pressures;
- Bowen Island is a new "Island Municipality" within the Islands Trust – our land-use planners need accurate information for DPA's, Crown Land issues, our OCP, and other land-use development issues.

Products

- Map – to be made available to local planners, municipal council, local NGO's, and schools with accurate information about stream locations and habitat;
- Brochure – an educational brochure will be produced which will include maps of streams on the island as well as information on stream stewardship.

Methodology:

- Use of existing baseline data (compiled from Islands Trust, BIFWMS, MoELP);
- Modified SHM using Trimble Pro XRS, ArcView software;
- Creation of Geo-referenced database and ArcView maps of stream habitat.

Challenges:

- Determining the "right" level of SHM detail to best suit Bowen's needs and our current limited budget;
- Receiving satellite signals in gullies with steep south-facing slopes
- Maintaining centreline through areas of dense windthrow
- Combining GPS with GIS to produce desired products (e.g. To include UTM co-ordinates, must export GPS file twice and edit .dbf file)

Successes:

- Data gathered and mapped of the major stream (Bowen Brook) in Bowen's most sensitive watershed;
- Discovering unmapped tributaries and finding differences between current maps and newly mapped stream segments.
- Landowner contact along stream-side (support and approval given);
- Maps and brochure in process (shared data within Bowen Island – Islands Trust – MoELP)

Suggestions:

- Be realistic about the time it takes to train people and adapt SHIM to your community's needs;
- Do SHIM in phases that best suit you (e.g. GPS and record features all in one go, or

separately, focus on specific stream or watershed);

- SHIM/Mapping Centre: Provide a location for use of software/hardware, access to fisheries/stream/watershed data, technician to assist with questions regarding all phases of SHIM.
- Improve data entry methods for a variety of GPS units and software.

TOPIC:	Brunette Basin Stream Inventory Using GPS and GIS Technology
ORGANIZATION:	GVRD, BCIT
PRESENTER:	Trina Wong, Laurie Smith
E-MAIL	trina.wong@gvr.bc.ca, lsmith2@bcit.bc.ca
NOTE:	The editor did not receive a written summary of this presentation.

Introduction:

Background:

- What is the Brunette Basin Task Group (BBTG)
- Purpose of the watershed plan

Project Description:

- Project description
- Project location
- Data collection methodology (BCIT)

Summary:

- Difficulties
- Outcomes

TOPIC:	Sensitive Habitat Mapping (The Islands Trust)
ORGANIZATION:	The Islands Trust
PRESENTER:	Tyrone Guthrie
E-MAIL/PHONE	Not provided

The Islands Trust is a regional district that represents the southern Gulf Islands. The Trust is a user of data, rather than a producer, depending on other organizations (e.g., stewardship groups) to gather information about sensitive habitats and land use.

The Environmental Information Management System (EIMS) was created by the Islands Trust to collect all available land-use planning information (e.g., cadastral, stream locations, fish presence) into one database.

A lesson learned was the importance of define standards for evaluating data before beginning to build a database (e.g., create a data management framework before entering data). Problems were encountered integrating attribute data and spatial features. For example:

- What is a feature? Where is it?
- What are the relationships between features?
- What are the spatial attributes?
- What is missing?
- How up-to-date are the data?
- How were the data collected (e.g., at what scale, by whom)?

Ad hoc mapping attempts led to a perception of inaccuracy, which led to a loss of credibility. It also led to redundant or missing features.

It is important to try and integrate any new data collection and storage effort with existing standards, so that data can be shared with other groups (e.g., the EIMS ecosystem classification used Conservation Data Centre ecosystem descriptions).

4.2.5 *Synopsis*

TOPIC:	Comparison of Morning Presentations with those at Nanaimo Workshop
ORGANIZATION:	Aquatic Resources Limited
PRESENTER:	Paul McElligott
E-MAIL:	pmcelligott@aquaticresources.com

It is interesting to compare the Nanaimo presentations with those given this morning.

As was the case in Nanaimo, there are a broad range of groups and agencies doing sensitive habitat inventory and mapping and work in the Lower Mainland. These groups have different origins and histories, and consequently are at different stages of development and sophistication in their habitat mapping efforts.

There are several obvious commonalities which this morning's presenters share amongst each other, and which they also share with the Nanaimo presenters.

1. Sensitive habitat mapping efforts are invariably partnership-based.
2. There is a great deal of enthusiasm out there for this type of work, which stems from a realization that identifying sensitive habitats is critical to protecting them. This allows people to meet the challenges that the work entails.
3. There is a need for effective, standardized data collection methods and data storage tools. Standardized training and certification programs are also needed.
4. Data must be accurate and reliable in order for it to be perceived as credible by land-user planners, other decision-makers, and the public at large.
5. Sensitive habitat mappers must try and serve many masters as possible.

4.3 Breakout Sessions

4.3.1 *Connecting Communities*

There is a need to improve connections between the different individuals and groups living within a given watershed (e.g., various community groups, local governments, *etc.*), and those living within the area *affected by* issues relating to a given watershed. There is also a need to network the different groups who do similar work in different parts of the province, so that they can share experiences.

What worked?

- Establishment of common goals and themes that can be used as a catalyst to unite disparate groups (e.g., various community groups and individuals, local governments).
 - Finding topics everyone can identify with and using them to bring together separate community groups.
 - Overcoming conflicts between community groups through useful discussion regarding fundamental issues that everyone can relate to.
 - Creating partnerships between community groups and government to accomplish common goals (e.g., ties have successfully been created between stewardship co-ordinators at MCC Eco-Works and the City of Abbotsford).
 - Local governments starting to accept SHIM, seeing it is useful but wanting more.
- Sharing information among groups to promote partnerships and further common goals.
 - Lead by example and learn from mistakes made in the past by other community groups while doing similar work.
 - Share information on funding sources among community groups.
 - Create cooperation between various data-collecting groups to create confidence in the information collected.
 - Create data collection standards so community groups can share data.
 - Collect data on a set of common variables that are comparable from one source to another.
 - Determine the needs of both the data-users *and* data-producers to develop standards to increase confidence in the information collected.
- Educating the public about sensitive habitat issues and build credibility for SHIM in the community.
 - Educate the public about the SHIM process to empower citizens to participate in local efforts.
 - Concentrate on the positive aspects of SHIM to persuade those opposed to SHIM of the value of the information gathered.

- . Forge connections between community groups and citizens to allow for access to land and eliminate misconceptions.
- . Allow public access to information through a user-friendly database.
- . Allow existing databases to be used by everyone by creating data warehouses available to the public.
- . Build a credible reputation in the community.
- Focusing efforts on well-defined, attainable goals.
 - . Accomplish set goals one at a time.
 - . Advertise goals of the project throughout the community to educate the public of the SHIM process, eliminate misconceptions, and avoid unreasonable expectations.

What didn't work?

- Collecting unreliable data.
- Having unqualified people collect data in an unprofessional manner.
- Working in isolation without partnership and co-operation with other groups.
- Setting unrealistic goals.
- Conducting work without consultation with, or regard for, landowners.
- Charging unreasonable prices for use of existing databases.
- "Turf Wars" - conflicts between individual organizations protecting their own projects and funding.
- Paid vs. volunteer can cause problems and is a barrier.
- There are lots of umbrella groups, but little co-operation.
- Different rules in different communities.
- Too many co-ordinators.
- How do little groups know what other little groups are doing?
- Getting funding from different places-same stream done more than once.
- Different standards
- The public awareness of SHIM in local communities needs to be raised.

Recommendations for connecting communities:

- Improve networking within and among communities.
 - . Identify specific, isolated communities in different areas that are doing similar work, and work to dissolve gaps among them.
 - . Expand information transfer among the different districts in the Lower Mainland.
 - . Clarify why we're working together in order to sell the idea.
 - . Be more (or less) competitive and less fragmented.

- . Work more closely with First Nations and local residents, and/share information with them.
- . Improve partnerships between private industry and community groups.
- . Get communities together, encouraging each other, giving ideas (e.g., “This is what we did.”) Municipalities should give examples to each other. Small presentation to get word out to municipalities who haven’t heard of SHIM.
- . Letter to UBCM asking about environmental departments and about SHIM. Also First Nations about SHIM
- . Developing web sites for the cities with all the stewardship organizations, so everyone knows what everyone else is doing. This has been started and must continue, also a website which tells some good development examples.
- . Umbrella groups such as LEPS have proven effective in providing a common forum for diverse groups.
- Goal-setting
 - . Community groups need to have realistic expectations and set attainable goals
 - . Goals should be developed in consultation with various stakeholders
- Standardization of methodologies and data sets (e.g., habitat variables) collected by different community groups, and certification program for data collectors and managers.
- Improve accessibility of data
 - . Allow for an assessable common body of information that everybody in the community has contributed to.
 - . Interactive database (e.g., Internet) to share data between community groups
- Increase confidence in data sets
 - . Increase accuracy, reliability, and repeatability of survey data
- Improve access to equipment and expertise, especially by groups without much funding.
 - . Loan-out centre for GPS units
 - . Assist community groups with training and problem-solving.
- Improve public awareness of SHIM and stewardship of sensitive habitats
 - . Provide the opportunity for interested parties to express interest.
 - . Educate the community as to the benefits of SHIM, and the importance of, and locations of, sensitive areas.
 - . Make data accessible to the public. Make the information relevant to them (e.g., If their house was built on an altered stream they should know about it. This would put pressure on developers).

- SHIM information gathered to assist in land-use planning can also be used to promote a sustainable watershed.
- Community Stewardship Centre
 - Establish community based resource centre to guide and sustain SHIM efforts over the long term.
 - Develop a central resource centre, which can serve a support role (e.g., where all groups can: borrow equipment, get support if they encounter problems), a data storage role (e.g., all the data is together, and the group can find out if a stream even needs to be mapped before they even start).
 - Centre should be readily accessible to the public

4.3.2 *Information Management*

Problems with SHIM:

- Quality assurance
 - Need qualifications/expertise to obtain quality baseline data
 - Not enough consistency in data collection – inadequate training, standards vague and subjective, high crew turnover, *etc.*
 - Short training is not enough to ensure that crew can accurately determine top-of-bank, pools/riffles, good fish habitat, spawning habitat, *etc.*
 - Not enough quality control of data
 - Quality control of data in certain fields (e.g. fish presence vs. species identification – who is capable of providing more precise data?)
 - Groups want government to “sign off” on collected data – difficult for government agencies to do because of errors and omissions
- Need for “professionals”
 - Different levels of experience – have to respond by delineating roles of volunteers and professionals
 - Unfortunate reality of “professional” status being required for validity/recognition
 - Have to use paid professional personnel to meet contract agreements, *etc.*
 - With grant money, want to be able to hire professional biologists to ensure data quality
 - Not enough money to hire professionals, and its difficult to get the data on the maps when NOT collected by professionals
- Data collection
 - Too many options in some fields (e.g. vegetation type)
 - Much confusion about exactly what data we want to collect – Stream mapping/locations??? Fish habitat? Wildlife?

- SHIM must be done with a Trimble Pathfinder, not chain and compass or low-end GPS – data will simply not be accurate enough otherwise.
- Trimbles are needed, but expensive for those actually conducting the work
- Need money!!!! (for Trimbles, crews, etc.)
- Should the focus be on the stream centre-line (which can be irrelevant to land-use planning) or on other parameters
- Leaving the stream to collect cross-section data really slows down the data collection process
- Much of this information is irrelevant with regards to FPA – only need top-of-bank, riparian vegetation zones *beyond* top-of-bank, fish sensitivity, etc. Municipalities like Mission don't want to pay for "extra" data; they only want the bare minimum required to comply with the FPA. Otherwise it will take too long and cost too much
- Data entry
 - Problems with data entry – need more safeguards against pressing the wrong button, misreading the data cards, etc.
 - Data are unwieldy – from Excel to Access, to different kinds of GIS systems; uploading directly from GPS is much more efficient.
- Other considerations
 - SHIM is a supply-driven approach, instead of consulting with end users
 - Volunteers are frustrated because data is not being used
 - Why are community groups/stewardship groups taking all of this on without the support of the municipalities?

Recommendations:

- General
 - Need to aim for demand-driven approach, getting municipalities involved
 - Need to determine what is viable (e.g., economically, *etc.*)
 - Clarification of "due diligence" – municipalities want to ensure that the information collected will be perceived legally as constituting due diligence
 - Must emphasize partnerships to get more "bang for the buck" – what information one end user doesn't use, another end user may find valuable
 - Should we be looking at what other municipalities in other provinces and states are doing?
- Training
 - Adequate training of volunteers is critical
 - Should be standard training programs for collection of GPS data, habitat data, etc. (e.g., RIC Urban Standard)

- Need experienced/professional/paid crews for supervisory roles
- Need to train crews to use high-end GPS, and get them the equipment
- Training should be through educational institutions, e.g. BCIT, UNBC – get it out of the political sphere
- Data needs
 - Need to collect more useful data (e.g. both line *and* point data), and to ensure that the core baseline data are standardized – need to agree on core data fields
 - Need to supplement baseline data with additional data collected by stewardship groups, volunteers – this information can be customized.
 - Need to agree on the important core information that should be collected in SHIM, and choose our methods
 - Need to focus on data required for Streambank and Fish Protection Acts, such as top-of-bank, watercourse classification, riparian classification
 - Set up the system to have as much built-in flexibility as possible, so you can add features/fields at a later date
- Data collection
 - Need separation of crews (e.g., GPS/mapping, fish trapping, water quality/fish habitat features) to optimize use of GPS)
 - Need to make the core information adaptable so that it can be captured on one or more passes, depending on available resources, information requirements, *etc.*
 - Try and keep core data to that which can be obtained/estimated from in-stream, so that crews can proceed quickly
 - Perhaps a phased approach is needed (i) GPS/Trimble, (ii) core biological data (what he/she can see from in-stream so as not to slow crew down), (iii) riparian biological data. But each phase should require standardization and/or certification, and the riparian biological data should be broken into individual modules (e.g. wildlife trees, wetlands, birds, etc.)
 - Phased approach also helps to spare equipment – scarce Trimbles are not being wasted waiting for biological data to be collected.
 - Perhaps we should think about using remote sensing and orthophotos for determining some information (e.g., top-of-bank). What do we need to ground-truth?
 - Where you can't see stuff from in-stream, why not augment from detailed topographical maps and orthophotos
 - Photo-interpretation may save a lot of time and money – need to ground-truth the acquired data
 - As long as each data set is identified as to protocol, experience of crew, etc. (e.g., methods and implicit accuracy are clearly stated), all data can be valuable

- Should we have permanent control points along streams that will allow for future monitoring? Need to discuss future opportunities for monitoring
- Checking data immediately after entering it, in order to ferret out errors
- Photographs have to be part of the database – digital copies
- Data sharing
 - Need to look at the end products of each type of inventory
 - Municipalities emphasize that the end-products must be usable, since they are contributing a lot of in-kind support (e.g. data entry, management, etc.)
 - Let's create a common data dictionary that will be shared across the province. This can then be adapted/supplemented by data fields that are uniquely required for each municipality

4.3.3 Mapping Products

- Who are the products intended for?
 - municipal governments – planners, for use in land-use planning,
 - education – public, kids, scouts,
 - individual landowners – concerned with what they can do with their property,
 - stakeholder and community groups.
- What types of products are available?

Product	Pro(s)	Con(s)	Comment(s)
Stream classification maps	user-friendly presentation of data	static, interpretive, only as good as field data that form basis for maps, quickly become dated	commonly used
Stream Atlas	assembly of stream classification maps, overlain on orthophotos for entire watershed	static, expensive, not readily updateable, limited distribution	could increase availability by putting on Internet
Large format wall map	comprehensive, striking, easy to see entire stream network	static, expensive, not readily updateable, limited distribution, unwieldy	good conversation starter on municipal offices and stewardship group HQ office walls
Interactive maps or orthophotos	user-friendly access to geo-referenced data, dynamic (if linked to dynamic database)	data limited to points	potentially very useful as an internet interface for public access to databases
GIS Database	readily updateable, dynamic	expensive software, non user-friendly interface, training required for users	best for data producers and users who have necessary resources
Non-GIS Databases	dynamic, inexpensive, readily accessible	difficult or impossible to visualize data spatially	used mainly for data entry and management
Reports	data summary with some interpretation	static, interpretive, limited distribution	often contain recommendations for future study or restoration projects
Raw data	most common form of data from pre-GIS era	usually static, unwieldy, difficult to access and interpret, easy to misplace or lose data	useful only to hard-core data users (e.g., researchers, those seeking to verify data, etc.)
Calendar	user-friendly	static, limited coverage and detail, provides highlights	mainly a PR tool-
Brochures	user-friendly, issue-or area specific	static, restricted focus	good for promoting public awareness

- Desirable attributes of mapping products:
 - need to base maps on good, up-to-date data,
 - database should be dynamic and readily-updateable,
 - should enable user to access wide range of attribute data (e.g., stream location, dimensions, what's in it, *etc.*); user should be able to “pull out” and use what they want and produce custom products (e.g., fish distribution maps),
 - important to be able to quickly and easily get information from the data to show why a specific area is important,
 - data should be consistent, and error free,
 - user-friendly, using multimedia,
 - Internet-accessible.
- What products have worked in the past?
 - dynamic products are preferable to static ones, but are more expensive and technology-dependant,
 - visual products (such as maps) are more immediately understandable than text, since people are visual creatures,
 - map products should flag areas of importance
 - atlases have been successful
 - people are very comfortable with paper
 - touch screens and internet have a tendency to scare some people
 - can still represent something that is to be updated with an understanding that there will always be changes
 - print-on-demand – can have a dynamic database, but print out hard copies of relevant areas for landowners, developers and planners, as needed
 - need to take into account hard copies becoming too ‘busy’
- What products haven't worked?
 - static mapping becomes outdated in a few years; mass-producing static maps results in an abundance of outdated information in circulation,
 - just a line on the map may not work – people want the information that goes along with that line,
 - data and maps alone aren't enough; they need to be interpreted – reports need to be produced,
 - trying to squeeze in the many layers of data into one map that can become overwhelming,
 - separate maps that split up areas of interest so the data needs to be copied and pasted in order to understand a larger area,
 - shouldn't sell SHIM maps being as ‘the’ map product.

- General recommendations
 - mapping should be based upon databases that can be updated.
 - maps should be 'living documents', lifted from dynamic databases as needed.
 - Internet access, with – pan and zoom and ability to toggle on and off different layers.
 - data should be readily accessible and free to the public.
 - there is still a need for a hard-copy product that is customizable and polished,
 - different scales are required to work with for display use and informational,
 - maps should be produced to clearly present the data needed to apply the Fish Protection Act,
 - mapping should be based on watershed boundaries, not on political boundaries.
- Responsibility for updating database and maps:
 - someone must take ownership of the data and assume the responsibility for updating (currently different levels of government share liability and responsibility, and slap disclaimers on everything so nobody has to take responsibility since they are not involved in the collection of the data),
 - because of public perception – government should be the ones ultimately responsible.
- Mechanics of updating database maps
 - do you go back and look at only those individual areas that may have changed, or do you re-map the entire area after a specific amount of time?
 - possibility of using remote sensing “overview assessment” to identify areas that have changed since previous assessment, and concentrate efforts there.
 - update attributes of the stream by the different groups when the new information comes in
- SHIM
 - SHIM should concentrate on just data collection not on interpretation
 - DFO should do the interpretation on the SHIM data; they have the expertise
 - discussing with municipalities what will be using the information for and the SHIM interpretation is specific to the needs of the municipality – it will always be modified
 - core SHIM data given for interpretation – the core data required must be standardized.

5. SUMMARY OF RESPONSES TO SHIM WORKSHOP USER SURVEY

5.1 Respondents

Questionnaires were provided to all of the approximately 270 workshop participants. A total of 26 questionnaires were completed, for an overall response rate of around 9%. Four largely incomplete questionnaires were excluded from the analysis. Of the 26 responses, 16 (61%) were completed by community stewardship groups of associated individuals, nine (35%) were completed by representatives of local government, and one (4%) was completed by a senior government representative.

Community Stewardship Groups	Local Government	Senior Government
<ul style="list-style-type: none"> • Veins of Life Watershed Society, • North Shore Streamkeepers, • Chilliwack Fish and Game Protective Association, • Legacy Environmental Services (displaced commercial fishermen), • Islands Trust Fund, • ARMS, KEEPS, CRWS, NFSAP, PRAWN, • Bowen Island Forest and Water Management Society, • Project Watershed (3), • Gambier Island Conservancy, • CERCA, • Fish First Environmental Centres, • NIFI, • Lantzville Streamkeepers, • Colwood Greenways Advisory Committee. 	<ul style="list-style-type: none"> • RD of Comox Strathcona (3), • Cowichan Valley RD, • Corporation of the City of New Westminster, • District of Saanich, • District of Campbell River, • Corporation of the District of Central Saanich, • Town of Ladysmith. 	<ul style="list-style-type: none"> • MELP.
Total: 16	Total: 9	Total: 1

5.2 Summary of Survey Responses

Questionnaires were divided into 14 sections. Responses in 11 of these sections form the basis for the following summary. This summary focuses on quantitative results, rather than respondents' narrative comments. This is not to discount the value of the written comments, many of which were very useful and insightful.

In many cases, respondents did not complete all of the questions. Numbers of non-respondents to each question are given in the "Not Answered" row of each table. In some cases, a respondent "checked off" more than one category in a multiple-choice question. For this reason, the "Total Responses" row does not always provide the sum of the responses in the column above it.

5.2.1 *Training Needs*

Is more training needed?

	Stewardship Group	Local Gov't	Senior Gov't	Total
Yes	12	3	1	16
No	2	1		3
Total Responses	14	4	1	19
Not Answered	2	5		7

Is a formal certification program needed for SHIM practitioners?

	Stewardship Group	Local Gov't	Senior Gov't	Total
Yes	11	5	1	17
No	2	1		3
Total Responses	13	6	1	20
Not Answered	3	3		6

5.2.2 *Stewardship Centres*

Would you support the creation of a "Stewardship Centre" in your community?

	Stewardship Group	Local Gov't	Senior Gov't	Total
Yes	16	7		23
No		2		2
Total Responses	16	9	0	25
Not Answered			1	1

Where should the Stewardship Centres be located?

Location	Stewardship Group	Local Gov't	Senior Gov't	Total
Local government office	4	4		8
Independent stewardship group office	9	3		12
Community Fisheries Development office	3			3
Other	4	2		6
Total Responses	15	9	0	24
Not Answered	1		1	2

5.2.3 *Support*

What level of technical support from a biologist or qualified technician do you feel is required to effectively conduct field surveys?

Technical Support Level	Stewardship Group	Local Gov't	Senior Gov't	Total
Initial training only	4	3		7
Every day	4	1		5
Once per week	1	2		3
Twice per week	2			2
3 to 4 days per week				0
Other	3	2		5
Total Responses	13	7	0	20
Not answered	3	2	1	6

Is there a need for federal and provincial support of QA/QC

	Stewardship Group	Local Gov't	Senior Gov't	Total
Yes	12	7	1	20
No	3			3
Total Responses	15	7	1	23
Not Answered	1	2		3

What form of support should MELP and Fisheries and Oceans Canada provide (e.g., central data warehouses, data collection and training standards, funding, etc.?)

	Stewardship Group	Local Gov't	Senior Gov't	Total
Standards	9	6		15
Leadership	1	1		2
Technical support	10	4		14
Data Repository	8	5		13
Funding	12	5	1	18
Training	6	4	1	11
Equipment	5	2		7
Other	4	1		5
Total Responses	15	8	1	24
Not Answered	1	1		2

5.2.4 *Shim Program Integration*

Should SHIM be integrated with other ongoing inventory programs?

	Stewardship Group	Local Gov't	Senior Gov't	Total
Yes	13	7	1	21
No	2			2
Maybe	1			1
Total Responses	16	7	1	24
Not Answered	2			2

5.2.5 *Monitoring*

Is there a need for a [new] monitoring program to assess the health or integrity of aquatic habitats and watersheds?

	Stewardship Group	Local Gov't	Senior Gov't	Total
Yes	10	5	1	16
No	2	2		4
Maybe		1		1
Total Responses	12	8	1	21
Not Answered	4	1		5

5.2.6 *Employment*

To your knowledge, has any employment resulted from participating in SHIM mapping?

	Stewardship Group	Local Gov't	Senior Gov't	Total
Yes	13	6		19
No	1	1		2
Total Responses	14	7	0	21
Not Answered	2	2	1	5

Do you consider learning technical skills such as data entry, GPS, GIS, and surveying to be an asset to finding employment?

	Stewardship Group	Local Gov't	Senior Gov't	Total
Yes	14	8		22
No				0
Total Responses	14	8	0	22
Not Answered	2	1	1	4

Should people be asked to conduct SHIM mapping as volunteers?

	Stewardship Group	Local Gov't	Senior Gov't	Total
Yes	4	3		7
No	9	1		10
Maybe	1	3		4
Total Responses	14	7	0	21
Not Answered	2	2	1	5

5.2.7 *Shim Data Management*

What is your preferred method for data entry?

	Stewardship			
	Group	Local Gov't	Senior Gov't	Total
MS Excel Spreadsheet	8	2		10
Arc View tool	4	2		6
Directly via Internet	1	3		4
Through GPS	2			2
Other	1	1		2
Total Responses	13	4	0	17
Not Answered	3	5	1	9

What improvements are needed for data entry (e.g. standardized data entry tool)?

	Stewardship			
	Group	Local Gov't	Senior Gov't	Total
Standards and standardized tools	7	2		9
Training	1			1
QA/QC		1		1
Standard data dictionary	1			1
Flexibility	1			1
Other	4	1		5
Total Responses	12	3	0	15
Not Answered	4	6	1	11

Should more emphasis be put on GPS data dictionaries?

	Stewardship			
	Group	Local Gov't	Senior Gov't	Total
Yes	8	2		10
No	3	1		4
Total Responses	11	3	0	14
Not Answered	5	6	1	12

5.2.8 *SHIM Methods*

Stream cross sections are taken when there is a significant change in cross section attributes e.g., when there is a change in wetted width of the watercourse by 5 m, a change in riparian class, or a change in riparian slope by 10 to 15 degrees and a change of riparian band by 20 meters. Is this adequate?

	Stewardship			
	Group	Local Gov't	Senior Gov't	Total
Yes	5	3		8
No	5			5
Maybe	1	1		2
Total Responses	11	4	0	15
Not Answered	5	5	1	11

Is the SHIM method for mapping the riparian area adequate?

	Stewardship Group	Local Gov't	Senior Gov't	Total
Yes	10	2		12
No	2	2		4
Total Responses	12	4	0	16
Not Answered	4	5	1	10

Are SHIM methods adequate for local government's needs in general?

	Stewardship Group	Local Gov't	Senior Gov't	Total
Yes	9	3		12
No	1	2		3
Maybe		1		1
Total Responses	10	6	0	16
Not Answered	6	3	1	10

Should the use of a Trimble Pathfinder GPS or similar high-end system be made mandatory for mapping the centre line of streams?

	Stewardship Group	Local Gov't	Senior Gov't	Total
Yes	12	4	1	17
No	2	1		3
Total Responses	14	5	1	20
Not Answered	2	4		6

Are 1999 aerial photographs and orthophotographs needed for SHIM mapping?

	Stewardship Group	Local Gov't	Senior Gov't	Total
Yes	10	2	1	13
No	4	1		5
Maybe		1		1
Total Responses	14	4	1	19
Not Answered	2	5		7

Should SHIM mapping methods be replaced by a provincial RIC standard?

	Stewardship Group	Local Gov't	Senior Gov't	Total
Yes	5	1		6
No	8	1		9
Total Responses	13	2	0	15
Not Answered	3	7	1	11

Should any parts of SHIM be repeated on the same watercourse periodically?

	Stewardship			
	Group	Local Gov't	Senior Gov't	Total
Yes	12	6		18
No	1			1
Total Responses	13	6	0	19
Not Answered	3	3	1	7

Should field surveys include delineation of a "Top of Bank" \pm 5 m that would act as a preliminary reference for development setbacks?

	Stewardship			
	Group	Local Gov't	Senior Gov't	Total
Yes	9	7	1	17
No	3			3
Maybe	1			1
Total Responses	13	7	1	21
Not Answered	3	2		5

Should SHIM mapping be undertaken prior to restoration and enhancement activities?

	Stewardship			
	Group	Local Gov't	Senior Gov't	Total
Yes	8	4		12
No	3	1	1	5
Maybe	2	2		4
Total Responses	13	7	1	21
Not Answered	3	2		5

5.2.9 *Wildlife and Other Sensitive Resources*

Do you think that wildlife values are adequately represented using SHIM methods in your community?

	Stewardship			
	Group	Local Gov't	Senior Gov't	Total
Yes	2	3	1	6
No	7	2		9
Maybe	1			1
Total Responses	10	5	1	16
Not Answered	6	4		10

Is there a need to expand SHIM methods to include coastal foreshore areas?

	Stewardship			
	Group	Local Gov't	Senior Gov't	Total
Yes	10	7	1	18
No	1			1
Maybe	1			1
Total Responses	12	7	1	20
Not Answered	4	2		6

5.2.10 *Sensitive Habitat Atlases and Other Products*

Should a sensitive habitat atlas be produced for your community?

	Stewardship Group	Local Gov't	Senior Gov't	Total
Yes	14	6	1	20
No	1	1		2
Total Responses	15	7	1	23
Not Answered	1	2		3

5.2.11 *Public Awareness and Communication*

Is SHIM information being communicated and shared effectively in your community?

	Stewardship Group	Local Gov't	Senior Gov't	Total
Yes	1	1		2
No	10	8	1	19
Total Responses	11	9	1	21
Not Answered	5			5