Terminal Forest Products Ltd.: Mapping Applications for Integrated Resource Management Planning

Abstract

Integrated Resource Management Planning (IRMP) is an operationally based planning tool that allows the forest manager to direct development within a planning area. An operational plan will normally "nest" within a higher level strategic plan. The planning area is generally a watershed or a landscape unit, but can also be an operational area usually ranging between 10,000 and 100,000 hectares. An IRMP amalgamates all known resource values and inventory information within a planning unit. Aerial photos and maps are used to identify critical resource values and topographic constraints for road and bridge locations in the planning unit. Once the road infrastructure has been designed, a preliminary harvest plan can be developed for the entire planning area over time. This process reviews the entire area, not just available timber for harvest. Critical to the process is the inclusion of knowledgeable field staff that has a working sense of the area and on the ground expertise.

Harvest sequence, timing of operations and design pattern is based on available operational and inventory timber information. Following design, detailed field reconnaissance is completed for the area, ground verifying critical control points and operational constraints. Once the main road systems and harvest patterns are determined, other resource values are over-laid to determine potential conflicts.
Where resource conflicts exist, a detailed strategy is developed. When all known resource information has been collected, interpreted and strategies developed, the final plan can be created. In addition to the amalgamation of digital resource information and mapping, a comprehensive resource values database is created to assist resource managers and stakeholders, that allows for sustainable management of the planning area. further projects of this nature.

Background

Terminal Forest Products has been granted logging rights to a large area (approximately 15,000 hectares) of the Sunshine Coast peninsula ranging from Sechelt to Egmont. To manage their operations economically and on a sustainable basis, Terminal uses a sophisticated process of long and short range planning. Digital resource information is analyzed to develop future harvest plans that includes timing of the harvest and the type of logging methods to be used, while minimizing environmental impacts.

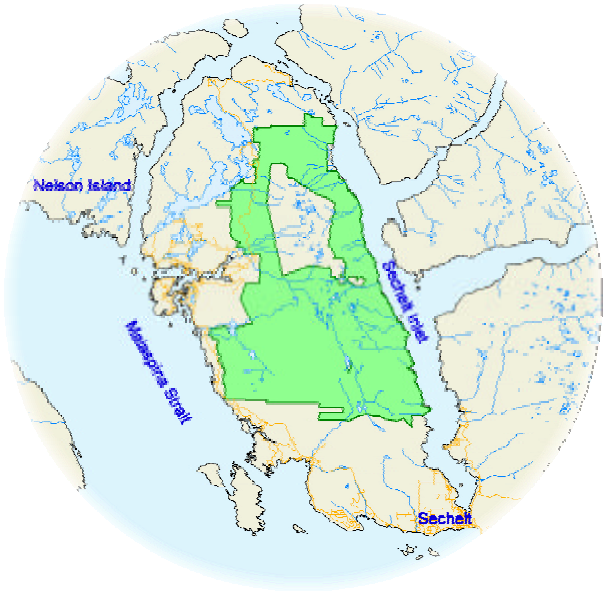

Figure 1. Map illustrating area of Terminal's logging rights on the Sunshine Coast Peninsula

Objectives

To achieve sustainable and integrated forest management through economically viable forestry practices.

Process, Partners, Costs

Terminal participates as a supportive partner in numerous projects. For example, it has made financial contributions to the Sensitive Ecosystems Inventory on the Sunshine Coast and a Marbled Murrelet Research Project currently being conducted by Simon Fraser University. Terminal endeavours to be a good corporate citizen through its practices and participation in many projects and stakeholder groups, including the sharing of resource information.

Accessing and utilizing enhanced technologies like GIS has required the commitment of financial resources by the company. However, this is considered an investment in the continued economic viability of the company as well as being indicative of a strong continued commitment to environmentally sensitive and sustainable forest management practices.

Actions

To achieve sustainable forestry management practices and environmental standards, Terminal has become third party certified under both the International Standards Organization (ISO) 14001 Environmental Management System and the American Forest and Paper Association's (AF&PA) Sustainable Forest Initiative (SFI^{SM}) Standard. Terminal adheres to tough standards of practice that often exceed those established by law and are routinely subjected to internal and external auditing. To maintain certification, Terminal has developed environmental programs and standard operating practices to ensure sustainability and minimize the likelihood of environmental risks and hazards (e.g. road failures). Loggers and field staff are trained in standard operating procedures that help to recognize and prevent potential environmental problems thus avoiding environmental impacts. Detailed operational maps (1:5,000) and aerial photographs provide vital information necessary to complete planning and assist in the identification of potential risk or hazard areas. Every logger is required to carry a copy of the map and understand critical issues involved when working on the block.

Strategic plans are developed to ensure sustainability and that other resource values are adequately protected for a planning unit. This type of planning utilizes 1:5,000 and 1:20,000 TRIM base maps and inventory information including the forest cover, visual quality objectives, recreation sites, terrain and wildlife.

Utilizing base TRIM map information each polygon has a site index that is analyzed and drives all cut levels. Digital inventory information is constantly being revised and updated as new information becomes available and is added to the database. Analyzing the various layers of information permits sustainable development in an area that takes into consideration numerous factors including protection of fisheries riparian zones, ecologically sensitive sites, old growth and other sensitive habitat site preservation.

Terminal has recently upgraded their mapping capabilities and have recently produced a new series of 1:5,000 scale maps using the latest information and technology. This has provided much greater detail than was previously provided by any other source. The increased level of detail and accuracy in the mapping allows for better

forward planning and decision making prior to any harvesting taking place.

Results

Utilizing GIS has allowed Terminal to strategically plan and commit to environmentally sustainable forestry practices while still remaining economically viable. Through this planning process, Terminal has established good relations and communication with all levels of government and various groups and organizations. Recently, delegations from the United Kingdom, Russia and Germany have visited forestry sites to view the exemplary forest practices that Terminal engages in.

Challenges

Creating a collaborative approach that sees all stakeholders working together, sharing information with a common goal. Standardization of collection methods, reliability and validity remain challenges for all user groups whether they represent industry, government or community groups.

Project Outcomes

Using GIS technology has provided Terminal with greater decision making tools that allow the company to make good "economical" business decisions. This same technology has enabled the company to engage in better forestry practices that are sustainable and environmentally sensitive. A detailed map of the whole region with several layers of detailed information provides the opportunity to plan with a "big picture" and long range future in mind. As well, any polygon area can be analyzed in minute detail to ensure that the best possible decisions are being made and implemented.

Recommendations for the Community Mapping Network

As per the challenges identified, an overall "champion" for community mapping would be ideal in terms of helping to standardize the work and ensure that the continuity and efficiencies are in place particularly at a point in time where human and financial resources are in scarce supply. Enhanced communication strategies between the various user groups would help ensure economies of scale and avoid unnecessary duplication of projects, fieldwork, etc.

Next Steps

Terminal is committed to an ongoing process of enhancing forest management practices and being an open and contributing partner to projects of this nature.

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Sunshine Coast Regional District: Sunshine Coast Habitat Atlas

Abstract

The Sunshine Coast Habitat Atlas is a Geographic Information Systems (GIS) database containing an inventory and mapping of natural areas and fish habitat for the SCRD; from Langdale to Egmont and north past the top of Jervis Inlet. The Habitat Atlas will provide comprehensive information that can be used by planners, developers, government agencies, non-government organisations, First Nations, local businesses and individual property owners. The information will assist these groups in making informed land use planning and stewardship decisions that will help protect, enhance and restore fish habitat. This three-year project will conclude in April 2003.

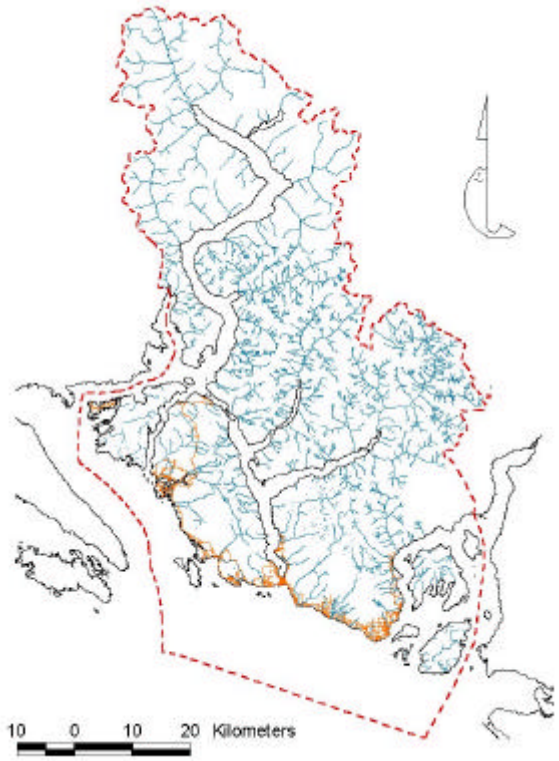

Figure 1. Sunshine Coast Habitat Atlas study area

The Habitat Atlas will contain forty different layers or categories of information. Currently, thirty-six layers of information have been collected and processed. Four layers are still being processed while two remain unavailable. A complete listing and status of these layers can be found at http://www.user.dccnet.com/ctrent/. All of these layers are stored at the SCRD office in Sechelt and will be made available as an Internet mapping website. Seven of these layers will be included in the published Habitat Atlas mapbook. Each page of the mapbook will contain a map illustrating features that include streams, roads, trails, land parcels, fish and wildlife habitat, parks and protected areas and aerial photographs.

Prior to the initiation of this project, this type of information was not included in the various maps that were used to make important land use decisions. This project will provide land use decision-makers with vital information that should be taken into consideration.

Background

The SCRD determined that there was a need to have more comprehensive and accurate environmental information to make land use and planning decisions. This data could be used to inform and educate the community about natural resource assets, revise and develop new Official Community Plans, develop new Local Resource Management Plans, revise or develop new Watershed Management Plans and implement the Streamside Protection Regulations.

Fisheries and Oceans Canada (F&OC) Habitat Conservation & Stewardship Program (HCSP) provided examples of how and where other Habitat Atlases were ful-

filling similar data requirements. The SCRD determined to proceed with the Sunshine Coast Habitat Atlas project. A partnership was formed through the F&OC Habitat Conservation and Stewardship Program. Funding was secured and a qualified consultant was hired to lead the project and liaise with all interested groups.

The project is now into its third year and the first draft of the Habitat Atlas was circulated in March 2002 for review. The final Sunshine Coast Habitat Atlas will be complete and available by March 31, 2003.

Objectives

The project was funded to achieve the following objectives:

- Produce and publish the Sunshine Coast Habitat Atlas with current and accurate maps and an inventory of aquatic and terrestrial habitat and fish species.
- Develop, strengthen and maintain partnerships with government organizations, land developers, First Nations, community organizations and local businesses.
- Compile existing data, identify gaps in the information and collect new data to fill these gaps.
- Engage in public outreach efforts to solicit input from interested parties, to generate project support from the community and to foster data sharing.
- Provide a knowledge resource to assist with the enforcement of local government regulations to protect and maintain fish and wildlife habitat.

Process, Partners, Costs

Funding for this project was made available through Fisheries and Oceans Canada, Habitat Conservation and Stewardship Program. Other agencies that provided funding include Fisheries Renewal BC, Sunshine Coast Regional District and the Urban Salmon Habitat Program. The SCRD also provides office space, various supplies and significant in-kind staff time. The Ministry of Water, Land and Air Protection also provides in-kind staff time and has donated a significant amount of data to the project.

Many community partners provided a source of support, expert knowledge, information, tools and funding. See Acknowledgement section for details.

Actions

The first step taken was to create a detailed work plan for the project, which was and approved by the SCRD and F&OC. Soon after, a Technical Steering Committee of 17 individuals was formed to enhance communication between key parties. The committee continues to meet three or four times per year.

Next, an exhaustive and extensive search was done to compile the existing information that was available for the Sunshine coast. With much of the data located at numerous sites under the jurisdiction of many levels of government, this process was time consuming. Accessing the information was challenging due to licensing issues, prohibitive costs and confidentiality clauses.

During the process of data compilation, missing information has been documented and prioritized for future data collection .

Funding proposals were submitted to several funding agencies that secured approximately $60,000:

Fisheries Renewal BC	$25,000
Urban Salmon Habitat Program	$20,000
F&OC Sunshine Coast	$10,000

These funds were used for colleting new data to fill the gaps identified during the data compilation phase. A two-person field crew was hired to map streams with a GPS receiver in selected areas. A Trimble Pathfinder GPS capable of centimeter accuracy was rented from Terra-Pro GPS Survey Ltd., who provided commendable service and support. This fieldwork was completed using provincial Resource Inventory Committee (RIC) GPS data standards and followed the Sensitive Habitat Inventory and Mapping (SHIM) guidelines. This mapping is still ongoing but funding cuts will make it difficult to continue.

Figure 2. SHIM stream mapping in Anderson Creek

A significant amount of "outreach" has been done over the past two years. Presentations have been made to local government planning committees, schools and numerous community groups in an effort to ensure the Atlas meets the needs of these groups.
The objectives of these outreach efforts are:

- To foster data sharing between organizations,
- To avoid duplication of effort,
- To increase public awareness,
- To solicit input from the community,
- To generate project support, and
- To ensure information is up-to-date.

A Habitat Atlas website has been developed and is kept up-to-date and an article has been published in a local conservation newsletter.

Results

The Sunshine Coast will soon have access to the Habitat Atlas. A draft format has recently been circulated for review. April 2003 is the target completion date for the final hard copy 200-page Sunshine Coast Habitat Atlas. Copies will be available for viewing / use at the SCRD, government offices, and the libraries.

As a large "warehouse" containing forty layers of information, the SCRD and various community groups are already using the data. A new website is under development to provide easy access to all of this data. The maps can be created and printed from a home computer. Numerous applications present themselves such as tourism oriented maps that accurately detail trails, bike paths, areas of interest, etc.

Challenges

Some of the challenges faced include:

- Obtaining existing digital data through data sharing agreements
- Negotiating "free" access to maps and data. Negotiating various exchanges for data.
- Investigating funding sources and writing grant proposals and obtaining the funding. Three of seven proposals written were successful. Each grant application proposal was unique and requested a complex array of information

that made this a time consuming process. Funding criteria varied making it impossible to simply develop a grant application template that could be used.

Project Outcomes

The project resulted in many positive outcomes. The consultative process resulted in enhanced information sharing and less duplication of effort by those involved in similar efforts. Meetings served to enhance the awareness between numerous community groups who work on similar projects in distinct areas.

The SCRD is utilizing this enhanced information to make more informed land use planning decisions. Questions about various land parcels can be answered with more confidence and in more detail. The map information serves as a benchmark to help in the review of applications for building permits, development permits, and bylaw amendments.

The project has assisted in the identification of areas that have been restored and need preservation and those that will need restorative action and protection in the future. The overall map provides an opportunity to assess what is happening in the entire area whereas previously, only one segment could be viewed at a time. This is useful when assessing land use proposals providing an opportunity to see what the impacts would be on adjacent lands.

Stream data information can be used to find efficient and expedient solutions to various water problems, environmental disasters and other potential emergency situations.

From an economic development perspective, the Habitat Atlas provides prospective buyers with detailed information that can be utilized for development permits, planning, zoning etc. and identify "green" tourism opportunities.

The quality maps can form the basis for promotional materials to be used by tourism umbrella organizations as well as individual business operators. The information may serve to make planning more cost-effective by preventing costly development errors, e.g. where NOT to locate buildings, roads etc.

Recommendations for the Community Mapping Network

The project is proving to be a "priceless" endeavor providing information that all local communities need. This type of information should be readily available at local repositories in addition to government offices since so much of the land use planning decisions occur at the local government level.

A long term source of funding to assist with these initiatives would provide the resources required to map sensitive habitat areas before irreversible damage may be done as might be the case when land use decisions are made in the absence of vital environmental information.

Next Steps

- Completion of the Habitat Atlas by April 2003
- Completion of a mapping web-site for the Habitat Atlas
- Initiate further "outreach" including presentations to various communities and groups on the coast to inform them about the Atlas, the information it contains and how it can be used.
- Host an open house training session in the winter of 2002-03.

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Acknowledgements

The Sunshine Coast Habitat Atlas initiative is made possible through the key financial and in-kind support of the following organizations:

- F&OC Habitat Conservation and Stewardship Program
- Sunshine Coast Regional District
- Ministry of Water, Land and Air Protection.
- Urban Salmon Habitat Program
- Fisheries Renewal BC

Figure 3. Sample page from the Habitat Atlas

Gambier Island Conservancy : Streamkeepers and Watershed Mapping Projects

Abstract

The Gambier Island Conservancy (the Conservancy) was formed by a group of local citizens who wanted to ensure that land use planning decisions were made based on accurate environmental information. Government maps that were being used did not include any detailed information with respect to streams, wetlands, trails, old growth ecosystems or other ecologically significant areas. Grant applications were submitted to secure funds for local resource mapping projects that would provide accurate information and maps with which to make objective, environmentally sensitive land use decisions. A number of projects have been successfully completed and many local residents are adopting a community stewardship attitude towards future development.

This case study is an excellent example of how a group of concerned residents can work together to access the funding and technical expertise to create a comprehensive and sophisticated environmental database for use in official community land use planning.

Background

The Conservancy was formed in 1995 by a group of residents concerned about the increasing human pressures on the natural habitats on Gambier Island and who believed that increased environmental knowledge and public awareness are the foundations of sustainable land use. A number of different projects have been completed resulting in maps being included in the newly revised Gambier Island Official Community Plan (OCP) with detailed and accurate environmental information that now serves as a basis for land use decisions. Prior to the Conservancy's projects, OCP maps contained no environmental information and development applications were approved without consideration of the potential damage to sensitive ecosystems.

Objectives

The Conservancy is dedicated to enhancing and sharing knowledge of Gambier Island's ecosystems and to developing appropriate management strategies to preserve and restore its biological diversity.

To accomplish these objectives it was recognised that current and accurate environmental information is necessary to inform those making land use decisions. Such environmental data will provide key information necessary for restoration, preservation and future land use planning for the Gambier Island community.

Actions

The Conservancy has initiated and overseen the following projects:

Streamkeepers Project: This project began with the detailed description and mapping of fish habitat in six known fish-bearing streams and included other biophysical inventories such as water quality, spawner surveys and species presence. Desmond Paine transcribed the field notes and measurements into maps and attribute tables. There was significant local volunteer efforts and several residents were sponsored to do their Streamkeeper's training. More de-

tailed mapping (overview maps) and fish habitat assessments (FHAPs) were completed later on all stream reaches that were candidates for rehabilitation or habitat enhancement work. Significant effort was given to increase local volunteer participation through public information and awareness activities. Because of the demographics of Gambier Island, however, there was an increasing reliance on grant-funded stream technicians and biologists to do this work. To date, detailed fish habitat assessments and stream mapping, as well as habitat enhancement and stream rehabilitation work have been done for seven streams on Gambier. The project Coordinator is Lois Kennedy.

Figure 1. Stream restoration on Manion Creek, Gambier Island

Geographic Information Systems (GIS)Computer Mapping Project: All existing environmental information for Gambier Island was collected and digitized into the computer. These maps included TRIM, terrain hazards, forest cover, cadastral, and a 1998 color orthophoto created from aerial photographs. Updated information can be added to this baseline data in layers to show various ecological and environmental data. This project was funded with the USHP Streamkeepers grant. Maria Van Dyk was the GIS Project Coordinator.

Trails Project: Existing roads and trails are being marked, upgraded and sometimes rerouted to protect sensitive areas, and then included in the GIS database. The focus is upon public properties given that 60% of Gambier's landmass is Crown Lands. The Conservancy is hopeful that eventually a network of environmentally sensitive trails will provide walking access throughout Gambier. This network will not only provide land links between isolated communities on different parts of the Island, it will be a strong physical example of the community's recreational and ecological preservationist values. Accurate and detailed trail maps help keep people on proper trails rather than getting lost, keep the public from venturing onto private property or into hazardous areas, and assist Search and Rescue groups to more easily access remote areas. Wolf Weideman is the Trails Project Coordinator.

As a result of this information and further community planning, CANFOR, who have been given logging rights to Gambier's Crown Lands, have agreed to respect the local community's conservation and recreation values. For example, in bays where kayakers and campers use the beach areas, or where cutblocks are in close proximity to trails, CANFOR will leave buffers and adequate green spaces.

In addition, when developers are submitting subdivision applications, public access trails and parks will be dedicated, which will connect into the trail network. These strategies are viewed by some developers as adding value to their subdivision proposals since many people appreciate the recreational value of trails and parks as a desired lifestyle component. Developers are also required to ensure that there are green

space corridors providing connectivity for wildlife.

Environmentally Sensitive Areas Project: Capilano College Environmental Sciences Students have joined with the Conservancy in a unique partnership to complete a number of valuable projects which have been funded by the Real Estate Foundation. Capilano College Faculty member Victoria Troupe, who initiated these partnerships has since passed away, but these joint projects are being continued in her memory. A total of four sets of students have worked with the Conservancy on a variety of projects. All phases of the project have provided information vital in the consideration of any land use proposals that may impact sensitive ecological systems. The students' enthusiasm and expertise has been a great inspiration for the Conservancy. A number of projects coordinated by Maria Van Dyk and Wolf Weideman, have been completed during the past four years:

Year One: Students conducted a broad-brush study of Gambier Island to locate and survey the various types of ecosystems through ground-truthing, inventories and the use of aerial photos.

Year Two: Students completed a detailed analysis of the riparian zones of five lakes. This included the identification of plant species, heavily used/impacted areas, and recommendations for protective buffer zones and re-routing of trails.

Year Three: Students identified, inventoried and located the remaining intact old growth ecosystems on Gambier. Coring samples identified trees up to 1400 years old. These students subsequently continued on for two years to work with the Streamkeepers on the Watershed Mapping Project.

Year Four: This phase is "in the works", with the objective being the beginning of a sensitive plant species inventory.

Watershed Mapping Project: This project involved the mapping of streams, tributaries and wetlands in fourteen watersheds and included the documentation of existing human impacts. Ground-truthing was done by GPS (global positioning system) and integrated with the digitized TRIM and orthophoto maps. All watersheds, sub-basins, streams and tributaries on Gambier have now been delineated and enumerated according to provincial code. All environmental information in the existing GIS/computer mapping system was reorganized on a watershed basis and previous Streamkeepers'spatial and attribute data was included.

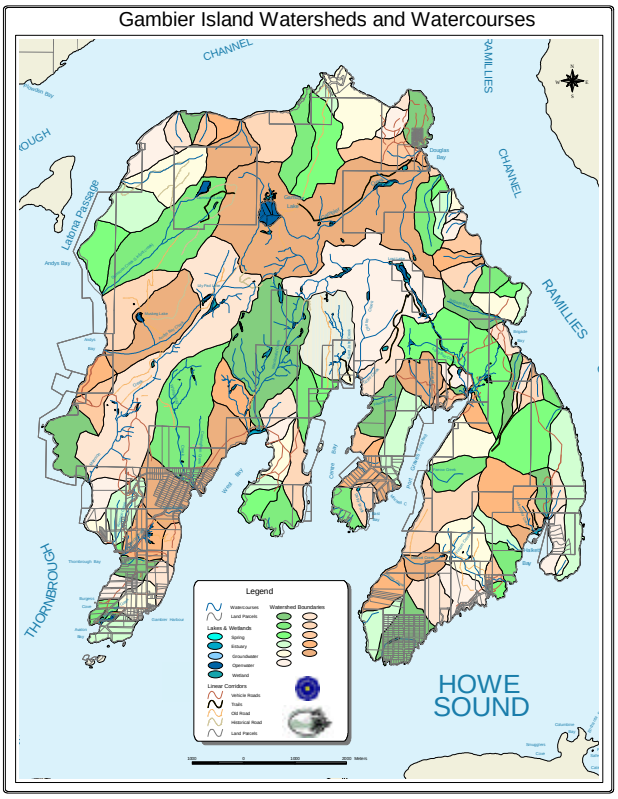

Figure 3. Gambier Island watersheds

Watershed reports have been produced which document this information for eight

major streams. This project has made it possible to analyze existing and potential human impacts on a watershed basis. The Project Coordinator is Lois Kennedy.

Data Sharing Project: The various project reports can be obtained from the Project Coordinators in hard copy. The digital data is available upon signing a limited use contract with the Conservancy. Islands Trust and SCRD have already used this database for the production of new maps for the Gambier Island OCP and Habitat Atlas for the Sunshine Coast. Hard copies of the watershed reports will be distributed to all government agencies involved in land development issues such as provincial Ministries of Transportation, Water, Land and Air Protection, Federal Fisheries and Oceans, and to private individuals and corporations as requested.

Results

When the Conservancy was formed there was no accurate environmental information available for making environmentally sensitive land use decisions. The Conservancy members all share a great love of the outdoors and treasure the natural beauty of Gambier Island. The resulting maps and data have helped create a benchmark of information to help preserve and protect the environment for future generations.

Conservancy members remain active and vigilant as members of the local Advisory Planning Commissions (APC) for the Island Trust, the SCRD Recreation and Parks Committee, West Howe Sound Stakeholders Association, Sunshine Coast Watershed Stewardship Society, the Sunshine Coast Salmon Enhancement Partner Group and Sunshine Coast Conservation Association to ensure that any land use planning and decisions respect the natural habitat and environmentally sensitive areas on Gambier Island.

Challenges

Vigilance: Remaining forever alert in the face of on-going human pressures for development on Gambier.

Funding: Support for future and on-going projects is a major challenge and requires significant time and effort by Conservancy members.

Patience, Endurance and Faith: At several times the Conservancy activities have been met with hostility and suspicion by some members of the community. To help defuse the misinformation, misunderstandings and resolve conflicting points of view issues, the Conservancy has hosted open houses to display and discuss projects, posts all meeting agendas and minutes and writes frequent articles in the Gambier Island newsletter. The benefits of the work are becoming increasingly clear to everyone with the publication of the new OCP and the consultations with CANFOR regarding the impending logging on Gambier's Crown Lands.

The Streamkeepers have been surprised and dismayed by F&OC's reluctance to enforce the Federal *Fisheries Act* in spite of detailed documentation and evidence of severe and deliberate destruction of fish habitat.

Project Outcomes

Gambier Island now has one of the most sophisticated and comprehensive tools possible for environmentally-sensitive land use planning and an informed and vigilant community to make good use of it. The Conservancy is increasingly being recognized and respected for its contribution to the community and to the Island. People

now recognize the incredible value of the work that has been completed. The mapping work has made it easier for various government departments, forestry companies, land developers and local residents to work together to make informed decisions. The data facilitates informed and objective land use planning based on the shared and integrated values of wildlife and habitat conservation, aesthetics, economic/industrial activity, recreation, and settlement.

Companies like CANFOR are utilizing the information in their planning. The Official Community Plan has a very strong environmental policy statement and detailed supporting maps. Through sharing of information and resources, strong networks of people have been created throughout B.C. to assist other similar projects achieve their success.

On a qualitative basis, the Streamkeepers can already see the results of their efforts to enhance fish habitat and rehabilitate streams. New log shelters and other fish habitat features have resulted in the return of fish to these areas. They are observing the fish now using these areas and how the streams are starting to "heal themselves". Once streams were mapped, people came to realize that streams had "legal rights". As another example of progress, the Fircom camp had been running people through a nearby stream in an obstacle race. With the encouragement from the Streamkeepers they are now looking at using the stream as an educational project.

The Conservancy has faced many challenges and has worked hard at community building. It is gaining widespread recognition as a model of community stewardship. For example, a recent bank slide into a small roadside stream brought together the Ministry of Transportation's maintenance person, a F&OC stream technician, the Streamkeeper's Coordinator, a local excavator operator, a contractor and a private property owner. They engaged in a consultative process to resolve how to repair the road while protecting and even enhancing the stream. This type of consultation would have been politically impossible until now. It is an extremely gratifying example of building healthy communities and healthy watersheds through public awareness.

Recommendations for the Community Mapping Network

The Conservancy hopes that their projects and other similar projects maintain their momentum to continue the work. Funding for these worthwhile stewardship projects is vital. Connections to the technical expertise of the various resource management individuals are also a vital component of success. They are the "glue" that helps hold these projects together and their input is gratefully acknowledged.

Next Steps

Now that the information has been collected there is a need to facilitate the ongoing local stewardship, expand the volunteer base and help the local communities take ownership of the land around them. The information must now be managed. Knowledge is a source of empowerment, influence, and of community pride in "taking ownership".

The Conservancy hopes that their work will help to identify, preserve and protect the delicate environmental balances that are present on Gambier.

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Acknowledgements

Generous funding has been received from the Urban Salmon Habitat Program (USHP) and from Fisheries Renewal B.C. (FsRBC) in support of the Streamkeepers, GIS (computer) Mapping and Watershed Mapping projects. The Real Estate Foundation provided funds in support of the Capilano College / Conservancy Environmentally Sensitive Areas project. The Sunshine Coast Regional District (SCRD) has contributed to the Trails Mapping and Marking Project. ESRI donated the ArcView computer software and BC Hydro's Corporate Donations Department donated a much-needed computer to the Streamkeepers to facilitate the data organization for the Watershed Mapping project. The funds secured were used primarily to hire biologists, technicians and other qualified individuals to complete the technical work. The Conservancy Project Coordinators became a sort of "command central" for the various projects.

In addition, Grant McBain, the Community Advisor for the Fisheries and Oceans Canada (F&OC) provided the necessary technical support, equipment and some crew for the stream rehabilitation projects.
Cheryl Trent, the Habitat Steward for the SCRD regularly provides maps that are needed for land-use planning. The Islands Trust generated the official maps for the new Gambier Island OCP. Several local businessmen including Ken Sneddon of Sechelt Creek Contracting, John Cosoluch of Rivtow and Barry Proknow have provided much appreciated on-site support for the stream projects. Dr. Bob Newbury provided valuable advice at the beginning of the Watershed Mapping Project. Most property owners of large and small tracts of land have been generous in permitting access.

The Conservancy also extends its thanks and appreciation to Rob Knight (USHP), Marion Towne and Angus McKay (FsRBC), Victoria Troupe (Capilano College) and Margaret Lamarche (CFDC) for their support of this work.

Sensitive Ecosystem Inventory of the Georgia Lowland and Islands in the Northern Strait of Georgia

Abstract

April 2002 marks the commencement of the fourth year of the Sunshine Coast Sensitive Ecosystems Inventory (SEI) which will identify and map rare and fragile terrestrial ecosystems. The SEI study area is approximately 1,800 square kilometres and comprises the mainland portion of Georgia Basin Lowland, between Desolation Sound and Howe Sound, and includes adjacent islands within the Strait of Georgia Ecosection, such as Texada, Harwood, Hernando, Savary, Cortes and the southern part of Quadra Island. Biogeoclimatic Units included in the study area are Coastal Douglas-fir Moist Maritime (CDFmm), Coastal Western Hemlock Very Dry (CWHxm1) and Coastal Western Hemlock Dry Maritime (CWHdm).

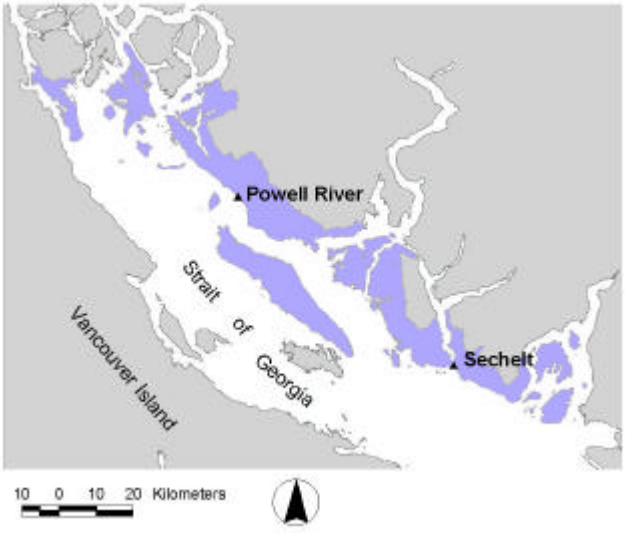

Figure 1. Sunshine Coast SEI study area boundary

The inventory data was derived from aerial photography (photo-interpretation) at scales between 1:10,000 and 1:16,000 and verified using selective field checks (ground-truthing). The information is being captured using Arc/Info GIS (Geographical Information System). The maps will be available in both hard copy (1:20,000) and digital formats by March 2003.

This project has led to the identification of numerous unique and sensitive ecosystems. Unlike the Vancouver Island study where only 7.9% of the entire landscape contained rare and fragile ecosystems, preliminary findings suggest that the percentage is higher on the Sunshine Coast thus providing an opportunity to maintain and preserve these sites for future generations.

Background

The mild climate and long growing season of the Sunshine Coast supports many rare plants, animals and plant communities – including several "at risk" species. Rapid development along the coast is resulting in the fragmentation and degradation of terrestrial ecosystems. The Sensitive Ecosystems Inventory is a "flagging" tool that identifies these systems and provides scientific information and support to local governments and others who are trying to maintain biodiversity.

The Sunshine Coast project builds on the success of the East Vancouver Island SEI. Vancouver Island and Gulf Islands mapping was completed in 1997 and a variety of support materials and services were developed over the following few years, including one-on-one user support, a 300-page Conservation Manual, pamphlets and workshops. Local governments on east Vancouver Island and adjacent Gulf Islands

are now using the SEI data in regional growth strategies, official community plans and greenways/parks plans. The information also assists in making site-specific decisions on land use planning issues. The Vancouver Island SEI can be seen at http://srmwww.gov.bc.ca/cdc/sei or at www.pyr.ec.gc.ca/wildlife/sei.

Objectives

Through the completion of a systematic, scientific inventory of the remaining sensitive (rare and fragile) terrestrial[1] ecosystems the project will identify, classify, evaluate and map remnant native wildlife habitats including those supporting species at risk. The SEI will help increase the understanding of and respect for the ecological values of these sensitive ecosystems and encourage land use decisions that will conserve the sensitive ecosystems. The SEI information will provide mapped data for use by local government, environmental and other community and economic groups with an interest in land use, conservation and preservation. Once completed the maps and information will be available for use and presented in "Community Outreach" educational programs that would assist others in using the data and communicate the value and uses of this information by the community.

Process, Partners, Costs

Major funding for the SEI is provided by the Georgia Basin Ecosystem Initiative (GBEI), with contributions from the Habitat Conservation Trust Fund, the Sunshine Coast Regional District, Comox-Strathcona Regional District and Terminal Forest Products Ltd. The project is jointly managed by Environment Canada (Canadian Wildlife Service) and the B.C. Ministry of Sustainable Resource Management, with assistance from a multi-agency steering committee that includes federal and provincial agencies, local governments, First Nations and industry. A total of $400,071 was secured over the first four years of the project with approximately 875 days of "in-kind" labor contributions.

A "Memorandum of Understanding" (MOU) is in the process of being signed by various partners involved in the use of the Sensitive Ecosystems Inventory of the Georgia Lowland and adjacent islands. The MOU is between Environment Canada and the following parties to the agreement: BC Ministries of Sustainable Resource Management and Water, Land and Air Protection, Sechelt Indian Band, Sunshine Coast Regional District, Powell River Regional District, Regional District of Comox-Strathcona, Terminal Forest Products Ltd., and the BC Conservation Foundation. The MOU is a demonstration of interest and of intention to co-operate on matters related to the use of the data. It is an acknowledgement by all parties of the value of the information for land use planning.

Actions

Year 1(1999-2000): Startup and Air Photo Interpretation - A Steering committee was created with joint partners to oversee the direction of the project and ensure good communication. The classification criteria and inventory methodologies were developed. Air photo interpretation was conducted for most of the study area.

Year 2 (2000-2001): Air photo interpretation was completed, identifying 5,511 sites. Groundtruthing field visits, with high qual-

[1] Wetlands (bog, fen, marsh, swamp, shallow water, wet meadow), Riparian ecosystems, Woodlands, Older coastal forests (structural stages 6 & 7), Herbaceous ecosystems, Cliffs and Seasonally flooded agricultural fields.

ity assurance strategies in place, were conducted for selected sites identified during air photo interpretation. Field data was entered into attribute files. Lack of full funding prevented the completion of groundtruthing this year.

Year 3 (2001-2002): Groundtruthing was completed, although due to a lack of funding, only a limited number of field visits were conducted on Texada Island. Map and database development: Digitizing of 5,511 polygons was completed, but database linking, plotting and quality control was postponed until Year 4.

Year 4 CURRENT (2002-2003): Map and database development: Digitized polygons will be linked to an attribute file and draft maps will be produced. All maps and databases will be subject to thorough quality assurance.

Map production and distribution: digital and hardcopy maps will be published and distributed to all local governments and resource agencies.

Extension Materials: A report will be prepared and published describing inventory methods, ecological characteristics, and summarizing / analyzing inventory results. The report will also present management guidelines and conservation tools. Further outreach products such as pamphlets, display materials and workshops will be dependent on the availability of funding.

Results

Not all of the data is ready yet for analysis or publication. When the data is processed, it will be possible to tell what percentage of Sunshine Coast land is considered to be ecologically sensitive. They have accumulated significant scientific data that supports an accurate interpretation.

Challenges

Most challenges were financially related. Due to funding shortages the amount of groundtruthing for Texada Island was reduced. Ensuring good communication between the various agencies and partners was time consuming but there was good support and cooperation.

Coordinating with other studies and sources of data presented some challenges. For example, the SEI information will be included as a single layer of the Habitat Atlas mapbook, causing some users to think that SEI information is limited to what is presented in the Habitat Atlas. Users need to be made aware of the depth of additional SEI information available to them, including secondary and tertiary ecosystem components, and detailed ecosystem information on plant communities, stand structure, and site condition. Our experience has shown that many users think they “have it all” once they have looked at the atlas maps. For the Sunshine Coast Habitat Atlas, this will be explained in the report accompanying the mapbook.

Another challenge faced is that terrestrial inventories require specialized scientific expertise to identify in the field. The SEI data records plant communities and this ecological data is incorporated into the Conservation Data Center databases where it contributes to the development of the “red” and “blue” conservation lists for plant communities.

Project Outcomes

Once completed, this information will serve to alert local governments, resource agencies, First Nations, landowners and other citizens as to the existence and importance of these remnant ecosystems. It will encourage land use decisions that will help

conserve these systems. This project is considered to be an essential component of the Georgia Basin Ecosystem Initiative that is fully supported by both Provincial and Federal governments in their efforts to assist local governments and communities in preserving and improving the quality of the environment.

Due to increasing development pressures throughout the Sunshine Coast and adjacent islands, as in most areas of the Georgia Basin lowlands, there has been a loss and fragmentation of the natural ecosystems upon which many species and communities depend. Further habitat loss is expected unless Official Community Plans, Growth Management Strategies and various day-to-day land–use decisions can direct growth and development away from these sensitive areas.

The combination of a broad ecosystem approach and plant community identification used by the SEI is new to most land use decision-makers. As a result, an outreach educational strategy is a vital component of the project that will help to ensure wise use of the inventory data.

The SEI website contains some descriptive material about the Sunshine Coast SEI, but it primarily describes the Vancouver Island SEI project, presents ecological information on the ecosystems of concern, and provides access to its publications. Once the Sunshine Coast SEI is completed, more comprehensive information will be posted on that site.

Currently, the SEI maps for Vancouver Island and Gulf Islands can only be accessed through the Internet on the Community Mapping Network (CMN) website at http://www.shim.bc.ca/sei/seimain.html. However, the B.C. Ministry of Sustainable Resource Management is currently developing an interactive mapping site that will include the SEI data layer.

A final report is being written which will detail the findings of the inventory, describe the values of the plant communities in detail and will provide management guidelines. A "conservation tools" section will provide details with various models or sample clauses that could be used in Official Community Plans and Development Permit Area Guidelines. While the information is of significance to all levels of government it is at the local government levels that many of the land use decisions are taking place, so these guidelines will be of extreme importance to these user groups. The target date for completion of this manual is April 2003.

Recommendations for the Community Mapping Network

There is a need to ensure that all data can be overlaid on top of one another on the various maps. Compatibility of data from one map to another is important to allow for comparisons and other analysis of data.

Mapped information should be readily available to anyone. The maps are relatively inexpensive and the digital information can be accessed by those with GIS capability.

It is important that groups who are considering mapping projects assess what has already been done and adhere to standard and approved methodology as opposed to "seat of the pants" mapping. Some data generated simply cannot be used since there is no scientific level of confidence in the methodology and protocols as dictated by the province.

Next Steps

See year four of "Actions" section. Once the maps are produced a report will be prepared and the various community outreach projects will be initiated, pending funding. The target audience for these workshops will be the local government staff and politicians, community groups, resource agencies and other entities including private business groups like logging companies, land developers etc.

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- Sunshine Coast Regional District
- Comox-Strathcona Regional District
- Terminal Forest Products Ltd.
- Environment Canada (Canadian Wildlife Service)
- Ministry of Water, Land and Air Protection,
- Sechelt Indian Band,
- Powell-River Regional District,
- Ministry of Sustainable Resource Management.

Sechelt Indian Band Mapping: Vancouver River Spawning and Rearing Channel Development

Abstract

The Sechelt Indian Band (SIB) successfully undertook a three year project to increase the number of fish spawning and rearing in the off-channels of the Vancouver River located in Jervis Inlet on the Sunshine Coast. A total of eight channels consisting of approximately 7,000 meters, were excavated. Water flow was connected through the channels and fish habitat features were added. Fish returned almost immediately to these sites. Using a Leica GS50 GPS backpack unit, the channels were mapped and are now available as a resource to ensure that any subsequent logging or development does not destroy the rehabilitated fish habitat. The site is now an excellent place to study fish biology.

Construction of a town site and access roads had destroyed or cut off many of the channels from the river system. As a result, most of the channels were dry and void of fish habitat. The three-phase project undertaken in this area is likely one of the largest rehabilitative projects done in B.C. It has helped establish a track record of success and protocol for further projects of this nature.

Background

The Vancouver River watershed had at one time sustained large populations of fish. Fish stock monitoring done over the past ten years at the Vancouver River site indicated drastically falling numbers of fish. In recent years, Vancouver Bay fish populations were almost extinct, down from approximately 8,000 chums in 1973, 13,000 pinks in 1987, 5,000 coho in 1979 and 24 sockeye in 1985. The cause was readily identified. Logging and ancillary development had led to the destruction of most of the off-channels of the river that are such a necessary component of healthy fish habitat.

The water level in the Vancouver River fluctuates severely. Without off-channels, the fish stock had no refuge from the torrent waters that result during periods of high rainfall and thaws and there were no sites to give young fry a place to develop.

SIB determined that drastic measures were needed to rehabilitate the Vancouver River to bring back the fish stocks.

Figure 1. Vancouver River

Objectives

The objective of the project was to increase the fish populations in the Vancouver River Watershed. Achieving the objective would result in increased fish stocks for community enjoyment, harvesting and to correct

for the past physical decimation of the watershed.

Process, Partners, Costs

The SIB Resource Management Department in conjunction with the Community Fisheries Development Center and Fisheries & Oceans Canada (F&OC) applied for funds for this extensive project. Funding was secured through the F&OC Habitat Restoration and Salmon Enhancement Program (HRSEP), Fisheries Renewal BC, and International Forest Products (Interfor). In addition, "in-kind" contributions were made by SIB in the form of providing labour, boats, trucks, office and administrative support. This project was a joint venture between SIB and F&OC HRSEP.

Actions

The project work was conducted in three phases, as funding became available.

Phase I (1998): Previous channels of the Vancouver River that had been cut off from the river and had either been filled in or had dried up, were re-excavated. The channels were connected with the main river through flow pipes that had control valves. A total of eight channels representing some 7,000 meters of new stream were dug deep enough for ground water feed and river water to flow into them. Once dug, the water flow was reconnected and small logs / wood was put in place to provide shade and shelter for returning fish. This phase took approximately five weeks and provided employment opportunities for eight people.

Phase II (1999): A berm was constructed that allowed for water to be piped through it so it did not interfere with the main river flow yet kept the river from eventually eating into the channels that had been reconstructed. A large excavation cut through the logging road and provided a feed to Jitco Creek. The river had previously shifted and cut off the water supply to Jitco Creek which was nearly void of water.

Phase III (2000): Two parallel channels were excavated on either side of the main logging road near the Vancouver Bay Lodge. A culvert was added to connect the two channels that fed another 1000 meters of channels that eventually drain back into the main Vancouver River.

During Phase III mapping was completed. Using a backpack GPS unit the channels were walked and mapped. This was converted into digital format on 1:20,000 scale TRIM maps. Maps now show all the reconstructed and rehabilitated channels along the Vancouver River area.

The work for all three phases included the use of excavators and backhoes with fill being provided by dump trucks. Some minor access roads were created. Native vegetation re-planting was done. Throughout the construction the process was designed to minimize siltation and further damage to the areas.

Results

The project is considered to be a great success. "If you build it, they will come." Adult fish have returned to all the channels. Juvenile salmon came in faster than the channels could be constructed, apparently just waiting for the off-channels to be finished to provide shelter and a place to hide. Numbers of fish have been recorded through foot surveys, trapping programs and the assessment of smolt migration patters.
The area now provides an excellent outdoor laboratory to study fish biology, water chemistry, logging impacts and soil analy-

sis. It is a controlled environment that allows for the mimicking of the natural processes in a watershed. There are facilities on-site that make it easier for crews to study and monitor the river system as well as do repairs and maintenance.

Interfor is actively logging in the valley and contributed to the funding for the project. They have been very supportive of the project and are sensitive to maintaining the rehabilitated area.

Figure 2. Coastal Cutthroat Trout in intake pool.

Challenges

Funding securing ongoing funding was the biggest challenge. The project was run on a phased basis since there were no guarantees that funding would be provided from one phase to the next. The application process was time consuming and cumbersome.

Remote Location: To access the site requires approximately 30 nautical miles of travel (or approximately 25 minutes from Egmont) by water. However, SIB owns the Vancouver Bay Lodge located at the mouth of the Vancouver River that provides overnight accommodation and shelter during foul weather.

Weather/seasons: The ideal time for channeling was during the "low flow" months of summer that restricted work on the project to mostly late August and September.

Equipment: The GPS unit back pack (Leica GS 50) was found to be superior in mapping capability especially when under tree canopy cover.

Natural Destruction: Ongoing problems included some siltation, pools and channels filling in from natural run-off or collapsing banks.

Ongoing resources to provide monitoring and maintenance remains a challenge.

Project Outcomes

The Vancouver River and the off-channels have now been mapped. The information has been layered onto existing SIB maps. Developers are required to consult with SIB, Resource Management Department, before proceeding with any development in an effort to help ensure there will be no negative environmental impacts in the area. Prior to the updated mapping, there was no official record of where the various channels existed and development of logging roads and actual logging practices were done with minimal regard for the ultimate damage to the surrounding eco-systems.

Reports are being written to identify the various project results and will be submitted to the funding agencies. SIB may eventually publish the project details in appropriate publications or on a web-site.

SIB keeps the newly mapped stream data available in digital format and F&OC also has this as part of its HRSEP program.

Most importantly, fish are back to the Vancouver River site and off –channels in increasing numbers. The site is now a place to study and provides a legacy for future

generations. The experience gained by the project workers and supervisors can be used to expedite and complete future projects of this nature in other watershed areas that are in need of rehabilitation.

Recommendations for the Community Mapping Network

The updated maps provide some form of insurance that any development in the area will not damage the restored fish habitat areas. Mapping has provided a historical benchmark that can be used to track river system changes in the decades to follow. Any development in the area will now have access to the information to ensure that plans are developed in accordance with preservation standards.

If funding had been available it would have been ideal to map the river and channels prior to the reconstruction work. This would have provided information that would have made it easier to do a cost-analysis and to plan the project in more detail in advance. This may have resulted in more cost-effective procedures. In the absence of maps the work proceeded using an "eye ball" method to determine what should be done.

Next Steps

Phase III reports are being completed. Access to funding will determine what "next steps" can be taken. Ideally SIB would like to "turn the clock back" on a number of watershed areas with a process similar to that used on the Vancouver River area. There are five major watershed areas in the region; all of which have sustained various degrees of damage as a result of previous logging practices.

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- Community Fisheries Development Center

Capilano College, Sechelt Campus: Training, Data Collection and Interaction with Community Mapping Projects

Abstract

For fourteen years Capilano College has been training students through a variety of programs on Fisheries and Community Stewardship like the Streamkeepers program. As part of the training, students have conducted a wide range of streamkeeping mapping and restorative projects in local watershed areas. Streamkeepers students have provided a "volunteer" labour force to map many of the local streams and tributaries and participate in restorative activities. The data collected has been shared with relevant agencies and has formed the basis of many further studies and projects. The College (Dave Bates) continues to serve on a number of advisory committees in the community and as a consultant to various projects including significant involvement in the various Sechelt Indian Band Resource Management Department projects. Graduates from the program are now working with a number of different agencies, providing technical and academic skills in the field of fish habitat stream enhancement, restoration and conservation. This case study is an excellent example of academic institutions working with community partners on projects that enhance the overall preservation and conservation of fish habitat.

Dr. Bates developed the delivery model and parts of the content of the Streamkeepers program that is now used throughout BC and is being adapted for use in other countries.

Figure 1. Capilano College, Sechelt Campus

Background

Capilano College located on the Sunshine Coast in Sechelt, B.C., through the Department of Applied Fisheries and Forestry Science offers a Watershed Restoration Technician Certificate Program and Stewardship Training (Streamkeepers) programs. Students registered in these programs have participated in numerous local initiatives that involve stream mapping, restoration, enhancement, and collection of fish data. The projects and data collected have been shared with relevant agencies and have been used in other projects, such as the Sunshine Coast Habitat Atlas. Many skilled technicians who have graduated from the various programs are now working in the field. Those working in the Resource Management offices of the Sechelt Indian Band have received their training through the College and continue to work together closely on various watershed projects.

Watersheds of the Sunshine Coast offer world class "real life" laboratories that provide practical excellent "hands-on" training options for the program participants. Since

the College coordinates its projects with various community groups, the projects undertaken by the students and the program in general provide valuable data and work that assists these other agencies. The high standards and quality of work ensures that the project data is "useable" in the scientific community and meets high standards and quality assurance measures.

Objectives

The objectives of the program are to provide skilled technical people who can collect reliable and reproducible information. The data collection process and methodology used will help ensure the conservation and protection of local salmonid populations and resources.

Process, Partners, Costs

The College has developed a close working relationship with the Sechelt Indian Band. They have partnered on numerous projects where the College students have provided the labour and technical expertise while SIB has provided access, equipment and other associated project costs. The College also maintains an excellent working relationship with Fisheries and Oceans Canada.

Actions

During the course of the various programs offered by the College, students have taken on a number of field projects under the supervision of Dave Bates. Some of the projects that have been undertaken include:

- Stream assessments: fish population surveys, students or graduates have surveyed almost every Anadromous stream on SIB lands;
- Two students (graduates) completed the early SHIM surveys and trained SHIM crews in Powell River;
- Developing field programs, field work into student exercises;
- RIC approved watershed restoration surveys;
- Watershed or stream assessments to identify, rehabilitate and restore fish habitat;
- Establish goals and project design for various projects ;
- Adult and juvenile salmon and trout assessments – annually enumerate and survey Chum salmon returns in Anderson Creek and Pender Harbour (Information forward to F&OC);
- Mapping projects is a large part of the Streamkeepers Program that involves students using tapes, compasses and other assessment programs to map various streams, channels and tributaries;
- Completion of small demonstrative restoration projects. E.g. Ouellett Creek;
- Assisting with the writing of funding proposals;
- Assisting with the writing of Technical reports; and,
- Finding employment opportunities for trained Applied Fisheries graduates.

Results

Significant data and mapping information has been compiled and shared with local government, the SIB, and resource management organizations. The "real life" training exercises have helped train world class technicians, many of whom are working with various projects and agencies. The projects completed have provided much needed data that have been used for the planning and initiation of a variety of watershed restoration projects.

Challenges

Challenges for the program include securing sufficient students and funding. Although the local outdoor classroom settings provide an excellent learning environment, potential students may not want to temporarily relocate to the Sunshine Coast. Finding local year round employment opportunities has been frustrating to program graduates forcing many to relocate for work. Cooperation between the College and local groups has been excellent and has proven to be a long lasting mutually beneficial arrangement.

Project Outcomes

The College's Streamkeepers Workshop has formed the basis of the model being used by numerous training institutes. The work of the College and its students has led to numerous publications and distribution of information that is relevant and important to the protection of local watershed resources. Dave Bates has taught and delivered many workshops in Canada and internationally. In the spring of 2002 he will be traveling to Malaysia where they want to adapt the Streamkeepers model to meet their local environmental needs.

Recommendations for the Community Mapping Network

Groups or organizations engaged in Community Mapping projects should consider the possibility of partnering with College's and other educational institutes. The collaboration can be mutually beneficial and rewarding. Communication amongst these various groups can lead to new ideas, projects and possible collaborative efforts.

Efforts to diffuse quality control controversies by assisting with the standardization of techniques and methodology would be welcome. There have not been a lot of standards developed for foreshores and upslope terrain.

Next Steps

The program is somewhat at risk due to funding uncertainties and enrolment issues. The College hopes to continue the program to supply the technically qualified personnel who can then form the basis of a reliable labour pool to work on projects in BC, Canada, and internationally. Without well-qualified individuals, many community mapping and stewardship programs would be at risk.

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