

# Fraser Salmon & Watersheds Program



Fraser Basin Council



## 2008 Final Report Template

FSWP File Number\* **07350-35/FSWP 08 LR 101**

\*Please use the FSWP File Number provided in previous FSWP 2008 project correspondence

### Contact Information

#### Sponsoring Organization's Legal Name

Nature Conservancy of Canada

Are you a federally registered Charity, Non-profit organization or Business (Yes /No)? **Yes**

If yes, please indicate which.	<input type="checkbox"/>	Charity	<input type="checkbox"/>	Charity	<input type="checkbox"/>	Non-profit organization	<input type="checkbox"/>	Business
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Registration number	11924-6544-RR0001	GST number	
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Are you a registered Society (Yes / No)?	<b>Yes</b>	Society Registration number	XS0033684
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<sup>1</sup> All correspondence will be directed to the Project Manager.

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## Project Information

### Project Title

**Watershed Assessment and Evaluation Decision Support Tool, Fraser Basin Pilot**

### Project Location

**Upper and Middle Fraser Basins, Fraser Canyon**

<b>Amount Requested</b>	\$125,000	<b>Total Project Value</b>	\$397,780	<b>Non-FSWP funds<sup>2</sup></b>	\$272,779
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<sup>2</sup> Non-FSWP funds include both cash and in-kind funding. In-kind funding refers to all non-cash contributions such as equipment, supplies, labour, etc. Please refer to Budget Section for further details.

## Project Summary

Please provide a single paragraph describing your project, its objective, and the results. As this summary will be used in program communications, clearly state the issue addressed and avoid overly technical descriptions. Do not use more than 300 words.

The Watershed Evaluation and Decision Support Tool project focused on the development of data and technical models needed to support the assessment of threats to aquatic values, and the analysis of alternative management scenarios in order to guide responses to those threats. The project included a synoptic overview and assessment of threats to aquatic values found in the study area. Analysis was facilitated through GIS processing of several datasets to explore their spatial relationships, and the development of a watershed prioritization and decision support tool, intended for use at a regional watershed scale. The tool enables decision makers to define the current state of aquatic resources within watersheds, explore various management options, and evaluate the threats and examine potential future scenarios. The project's goal was to prioritize watersheds for conservation action in order to help focus efforts in conserving and enhancing salmon and salmon habitat in the Fraser Basin to where it is needed most. The emphasis was placed on the benefits to salmon; however, other aquatic and terrestrial species and ecosystem information was incorporated into the analyses, supporting an ecosystem-based management approach. The key result of the project has been a watershed ranking system that is based on the greatest salmon values (by species and conservation unit), threats to ecosystems and species, and various watershed attributes such as road density, stream crossings, and water extraction. This ranking system has been made accessible online in order to provide information to governments, industry, and communities for consideration in MBP harvesting plans, industry development, and fisheries activities. The watershed prioritization and decision-support tool will allow users to define the current state of aquatic resources within watersheds, explore various management options, evaluate the threats and examine potential future scenarios. Refer to Attachments 1 and 2 for details and screen captures of the decision-support tool.

**OPTIONAL** If your project lends itself to sparking interest through a compelling sound bite (for potential use in FSWP media communications), please tell us what that sound bite would be. Do not use more than 150 words.

Interested parties can find out all about the project via the project website at:

[http://science.natureconservancy.ca/centralinterior/NCC\\_intro.php](http://science.natureconservancy.ca/centralinterior/NCC_intro.php)

All of the analyses and results are available to the public via the project website and the Hectares BC website:

<http://www.hectaresbc.org/app/habc/HaBC.html>

We encourage interested parties to use this decision-support tool, review the data, conduct queries and incorporate this work into their fields/areas of expertise.

### Species and life stage(s) the project targets: please list

The project, by working at the watershed level, effectively targets all species at all life stages in the targeted drainage units.

### Watershed(s) the project targets: please list

The project targets the Fraser Basin above the Fraser Canyon. NCC has used the ecological drainage units (EDUs) from the Ecological Aquatic Units for BC classification as a stratification unit for study area boundary delineation.

There are four ecological drainage units within the Fraser Basin: Middle Fraser, Upper Fraser, Thompson, and Lower Fraser. The Lower Fraser was deemed outside the scope for this project due to the differences in threats within that drainage unit, largely related to population pressures and urban expansion not faced in the interior drainages. Therefore, the three EDUs within the project's area are: Middle Fraser, Upper Fraser, and Thompson.

## Project Deliverables and Results

- Paste in the deliverables outlined in your Detailed Proposal (question #3 under project 'relevance and significance' heading) into the table below. Then, please list the results associated with each deliverable.
- Please include copies of any relevant communications products (brochures, posters, videos, website addresses etc.) resulting from this project.

Deliverable	Result
Project Management	Successfully managed teams and analyses in completing project. Set up project website to provide information about project and access to documents and spatial data: <a href="http://science.natureconservancy.ca/centralinterior/fraser.php">http://science.natureconservancy.ca/centralinterior/fraser.php</a>
Analyses and Scenarios	Developed numerous analyses for use in queries/ scenario development. Analyses include freshwater systems classification, fine-filter species identification, use of the provincial Conservation Framework, ecosystem services, and climate change. Users are able to ask "What if?" questions within the decision-support tool using these analyses.
Decision Support Tool (Watershed Prioritization)	All of these analyses and datasets were loaded into the web application (Hectares BC) for use in queries. This information is publically accessible at <a href="http://www.hectaresbc.org/app/habc/HaBC.html">http://www.hectaresbc.org/app/habc/HaBC.html</a> Users are able to overlay datasets, combine them and undertake sophisticated queries with the information.
Pilot Implementation and Workshops	Numerous workshops were undertaken at the beginning and during the project. Final workshops are being scheduled to present the entire project and include demonstrations of the decision-support tool.

## Project Effectiveness

Please evaluate the effectiveness of the project, using the objective standards, quantifiable criteria and/or quality control measures identified in your Detailed Proposal (under question #1 in the 'performance expectations' heading).

Collaboration and integration with partners and potential users was critical to the success of this project. To this end, indicators of success included workshop participation, and diversity of projects and initiatives interested in using our results. Performance was also assessed against the completion of tasks by the dates outlined in the project's timeline. An online counter for visitors to the Watershed Prioritization and DST site gives some indication of the use of the tool. Our hope is that the DST will influence land-use decisions to better protect salmon in the Fraser Basin. Only time will tell. The following table outlines the project effectiveness:

Indicator:	Data
Workshop participation	Workshops were well attended. We had a great deal of interest and feedback on the project. Notes from workshops: <a href="http://science.natureconservancy.ca/centralinterior/docs/CI_June_5-7_Workshop_Notes_for_Distribution_.pdf">http://science.natureconservancy.ca/centralinterior/docs/CI_June_5-7_Workshop_Notes_for_Distribution_.pdf</a> # of workshop participants: 30
Diversity of potential users	We have had interest and collaboration on the project from all levels of government, First Nations, community groups, environmental organizations, and individuals who see a need and use for the outcomes of this project.

	Different organizations represented at workshops: 20 User needs: refer to workshop notes.
<b>Task completion</b>	
Determination of scenarios (April -June 2008)	Completed list of scenarios based on user needs input. Refer to workshop notes and Attachment 1.
Development of online tool (April - September 2008)	Alpha version completed within this timeline. However, numerous “bugs” and functionality issues were identified which required further development and testing. However, we experienced a delay of about a year because we fired the first developer, “scrapped” the alpha tool and hired a new developer to build a new tool. Refer to Attachments 1 and 2.
Testing tool and peer review (July-October 2008)	The original tool was reviewed and tested by potential users (we had the alpha version “live” online and invited people to test it and use it in their work). This garnered a lot of feedback and as a result we were able to modify the technical specifications and functionality of the tool. However, because of previously mentioned delays we did not meet this timeline and were a year behind schedule.
Tool release (December 2008)	As note previously, we changed course on tool development and “scrapped” the previous version and had to start over with a new developer. As a result we were a year behind on tool release.
Submit report (March 15, 2009)	We have not completed the final report within this timeline. Due to the previously mentioned changes and delays, the project is about a year behind. We currently have a draft report that we are working with FORREX to develop into a special edition of the BC Journal of Ecosystem Management which will feature chapters on the different analyses and outputs from the project. FORREX has indicated that it will be a 3-4 month process of editing, formatting and peer review before the journal edition is published.
Online traffic to date	The project website has received numerous enquiries and “hits”. All of our partners/collaborators have used the project website. We are not able to generate stats for online traffic for Hectares BC at this point but can provide this information at a later date.

**What are the top three lessons learned from this project that would be important to communicate to others doing similar work throughout the Basin?**

1. Do not underestimate the amount of work and trial and error associated with developing the types of analyses and tools we undertook. Even with all of our experience undertaking similar work, numerous delays, analyses taking longer than anticipated, data issues, and tool development issues, caused the project to take over a year longer than we had anticipated.
2. Put a lot of effort into finding out who the potential users of the information are, what they would use it for, what format they need it in, how can it be packaged to be most effective, etc. Undertake a proper user needs assessment, involve potential users throughout the process, develop an alpha model of the tool and have people run it through “real world” use and scenarios.
3. From the beginning, understand and account for the life of the data and tool. Who is going to maintain the data and tool? At what frequency is maintenance and upkeep going to happen? Where are the funds going to come from? One of the reasons we “scrapped” the first tool is because it was based on proprietary software, there was an expensive yearly licensing fee and we would have to rely on the developer for changes and data refreshes. The second tool, Hectares BC, is for the most part open-source and has the endorsement of several organizations and agencies. The provincial government has put their support and resources behind the tool so we know it will be updated and maintained in the future.

**Project Effectiveness**

Please describe how your project has addressed each Priority Activity identified in your Detailed Proposal.

Priority Activity <sup>1</sup>	How the Priority Activity has been Addressed
Safeguard the genetic diversity of wild Pacific salmon	The Watershed Prioritization and DST helped to protect genetic diversity through analyses at the 3 <sup>rd</sup> order

	watershed scale of both salmon species and salmon conservation units (CUs). This allows for the identification of watersheds with species and CUs at the greatest risk. Once priority watersheds are identified there will be more justification for decision makers to support and develop initiatives that protect salmon and salmon habitat.
Maintain habitat and ecosystem integrity	This project is a first step in the process of determining priority watersheds to focus conservation efforts. The results of the project and the DST will be used in determining where to acquire fee-simple land and water, place conservation covenants, acquire tenures and leases, and utilize other conservation mechanisms.
Manage fisheries for sustainable benefits	Managing fisheries relies on accurate data and information. The Watershed Prioritization and DST brings together numerous data sets, expert input, and sophisticated analyses, with results easily available to decision makers and other users. Results from the project also support other innovative work, such as the proposed ESSA project to develop adaptation strategies and recommendations to fisheries managers for wild salmon in light of climate change.

Please paste each priority activity identified in your Detailed Proposal in the space provided.

### Further Comments

Please provide any further comments including recommendations for future conservation efforts and suggestions for helping partners to meet the goals of the Fraser Salmon and Watersheds Program. If your project produced a narrative or scientific report or additional project products (e.g. maps, photos), attach them as an appendix.

The concept behind this project is still very valid and relevant. That is, in order for an integrated watershed management governance model (or ecosystem-based management model or any similar holistic concepts) to work, there has to be an underlying information support system that houses common data and provides the ability for users to examine different management scenarios. This support system has to be accessible to all users and has to be relevant for their day-to-day decision-making processes and information needs. We feel that in the end, we have achieved this result through this project. We encourage those involved in conservation of salmon and other watershed values in the province to access the project website, utilize the Hectares BC tool in their work and to acquire a copy of the special edition of the BC Journal of Ecosystem Management devoted to this project to learn from our experiences and to build on them.

## **Attachment 1. Watershed Evaluation and Assessment Decision-support Tool Functionality**

The following functionality will be added to HectaresBC.

### **1. Advanced evaluation and query capabilities**

The existing HaBC query capabilities have a very easy to use interface that supports value comparison operators (=, >, etc.) as well as *and* and *or* logic. Nevertheless, the overall query amounts to a strict boolean operation. Either a given cell meets the criteria or it does not. This capability is augmented by the ability to summarize on predefined areas. In its current form, HaBC does not support mathematical expressions or the development of rankings. These limitations make it difficult for example to use the tool to help prioritize watersheds for rehabilitation or compare areas for potential purchase.

HaBC will be extended to support basic mathematical operations and case statements. The impact will be as follows:

- Ratings, indices or other attributes will be able to be calculated as numeric values based on the values of existing attributes for each individual hectare, using equations, boolean expressions and the equivalent, if desired, of multiple *if* statements.
- Rankings associated with model criteria will be able to be implemented directly as defined above or as a further evaluation based on such newly defined attributes. The rankings will be evaluated for each hectare based on existing or calculated values for that hectare.
- Queries will be able to be made using the ratings and rankings.

These advanced capabilities will be implemented in a separate tab so that current usage is not changed in any way.

The way in which the expressions and advanced queries will be formed will be made with consultation from NCC personnel. Drag and drop, pull down menus, direct text entry, and copy & paste or all possibilities to be considered. Regardless of the approach taken, the logic will operate on a row by row basis. The query, rating or ranking will be stored and will be reusable, either directly, or as embedded in another query.

### **2. Enhanced display**

Currently HaBC does a good job of displaying the results of a boolean query. However, the display capabilities will need to be enhanced to be suitable for use with the advanced query capabilities described above.

Three improvements will be implemented. The first two relate directly to the advanced queries.

- Multiple values or ranges of values will be able to be displayed simultaneously, using either predefined or user-defined color schemes. The user will define the values or ranges corresponding to each color.
- A variation of the above will allow for the straightforward display of rankings, such that the rank of each cell will be visible through a color assignment. Here as well the relationship between value and color will be able to be defined using either a predefined or user-specified color scheme.

The third improvement pertains to visual overlays.

- Following the WMS specification, HaBC will allow for specific themes to be overlaid on the display. The current work will include three themes, the NCC 500 ha hexagonal grid, the NCC freshwater units, and the salmon conservation units. In each case the boundaries and labels will be able to be turned on or off as a single layer. The interior of the polygons will always be transparent, so that the background or results will be visible for each grid cell or unit.

Vector versions of the three datasets will be provided by NCC. Each will be converted for fast display, by creating a tile cache and employing reverse tile caching software to make the grid appear as a typical WMS layer for display purposes. The user will perceive these themes as vector overlays. Display of the overlays will be controlled in the same way as what is done now with the base layers and other themes, but with the exception that the overlays will sit above other content as boundaries and labels only.

### **3. Additional columns**

Three columns will be added to the HaBC dataset. These additional attributes will then be able to be used for display and analysis, as separate functions to the WMS display described previously.

- NCC 500 ha hexagonal grid, with the identifier as the attribute value, as supplied by NCC
- NCC freshwater units, with the identifier as the attribute value, as supplied by NCC

- salmon conservation units, with the identifier as the attribute value, as supplied by NCC



## Attachment 2. The Hectares BC Decision-support Tool

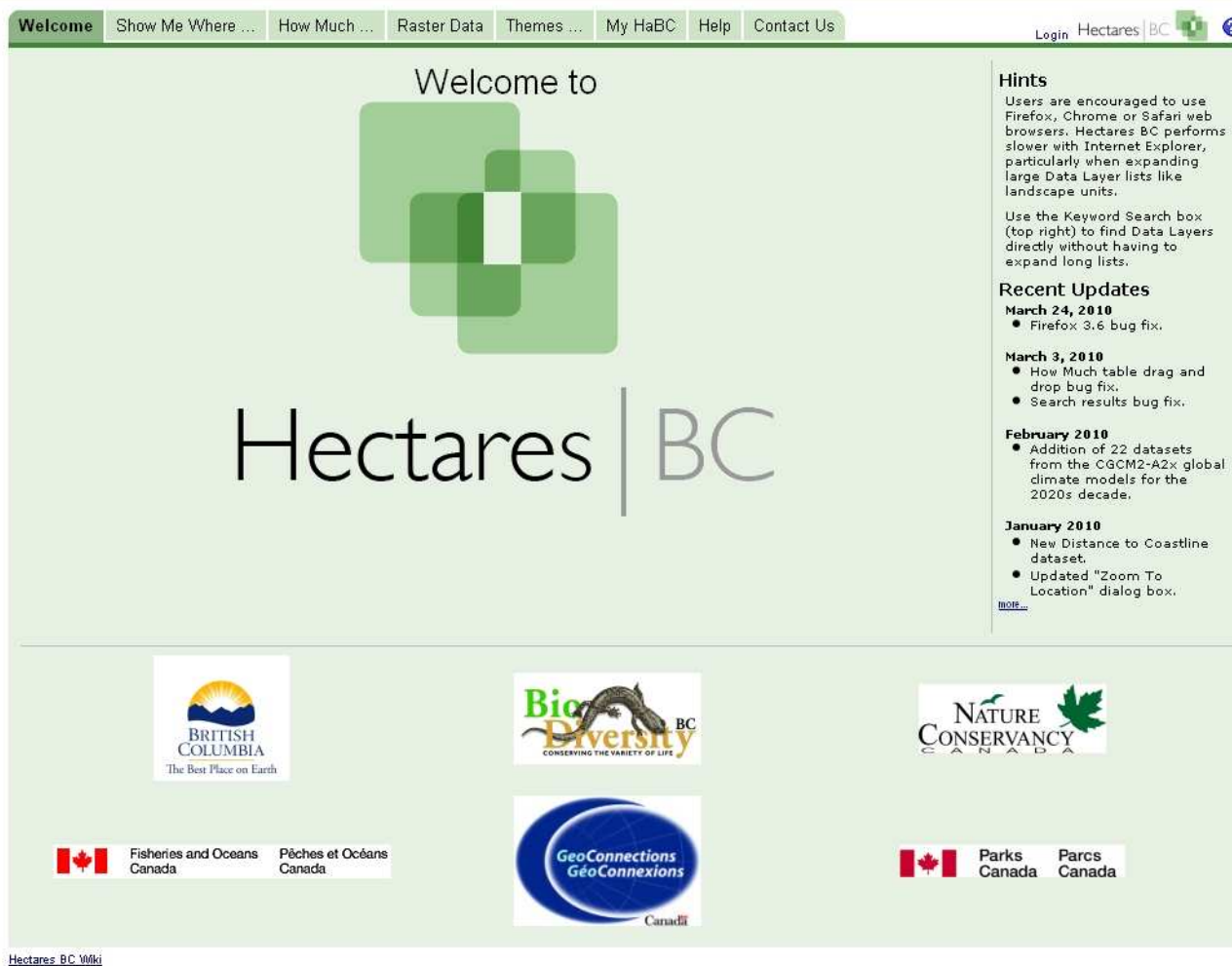
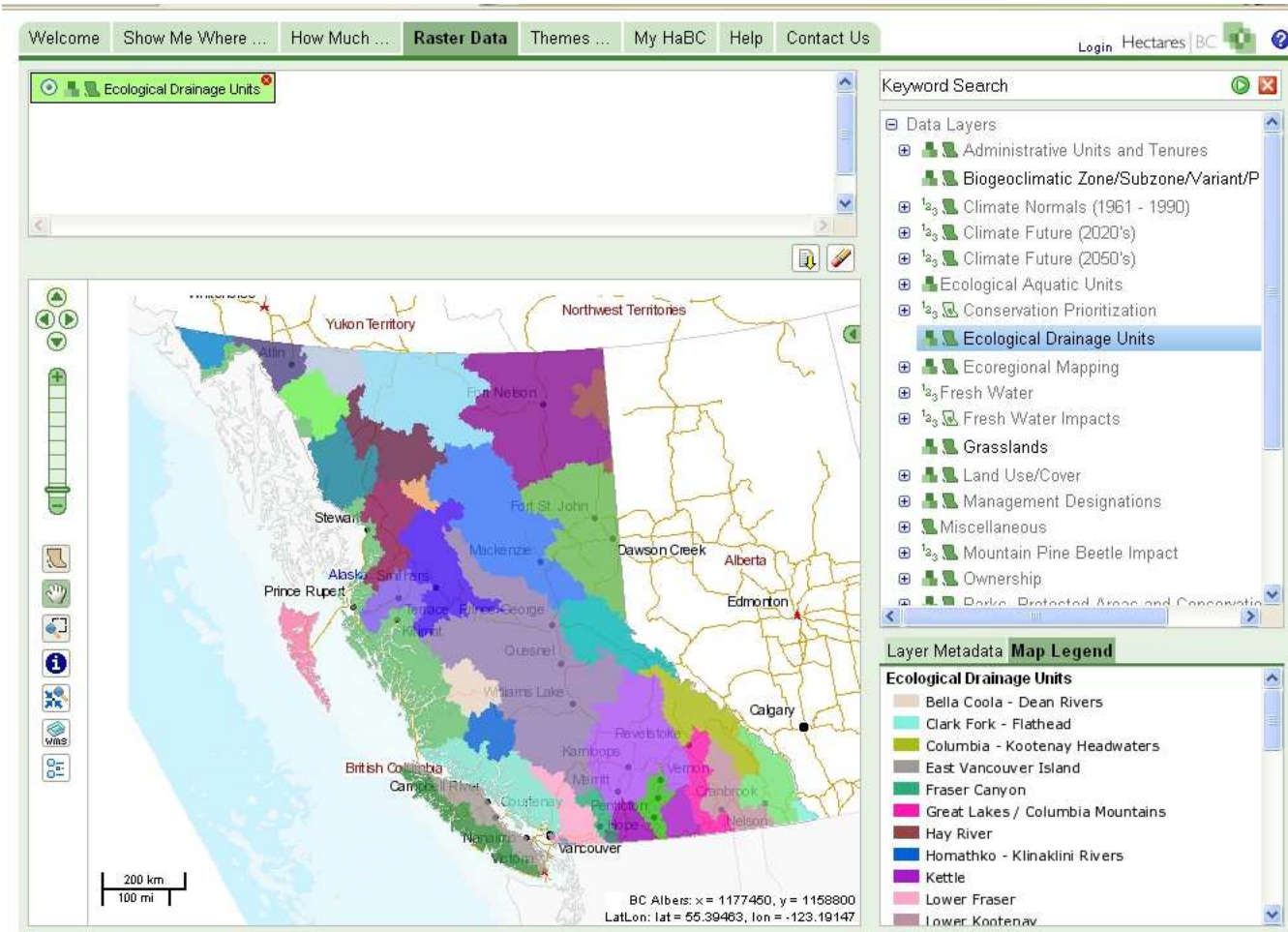


Figure 1. The Hectares BC web application



Hectares BC Wiki

Figure 2. Ecological Drainage Units (EDUs)

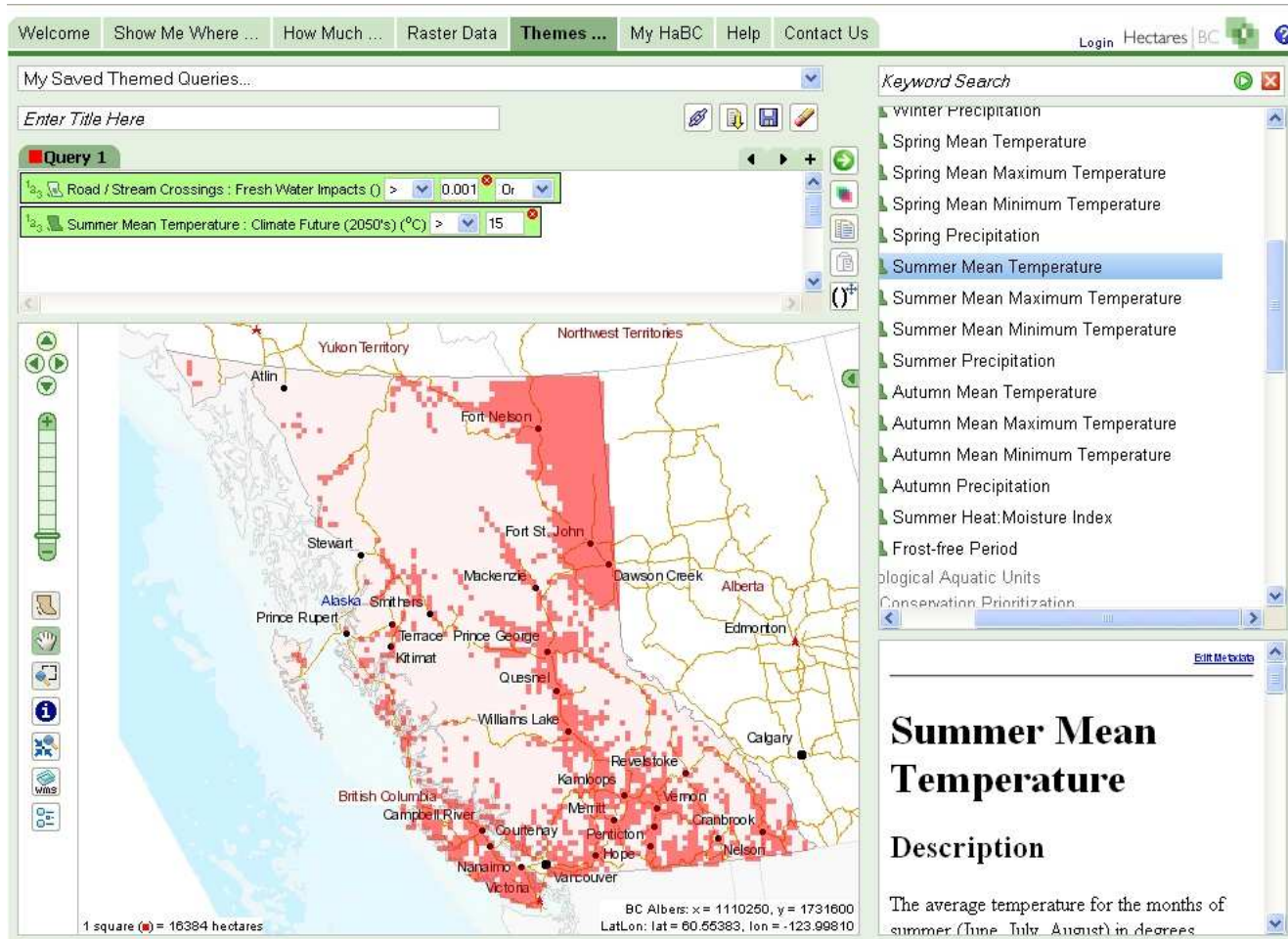


Figure 3. Example of data and query function.

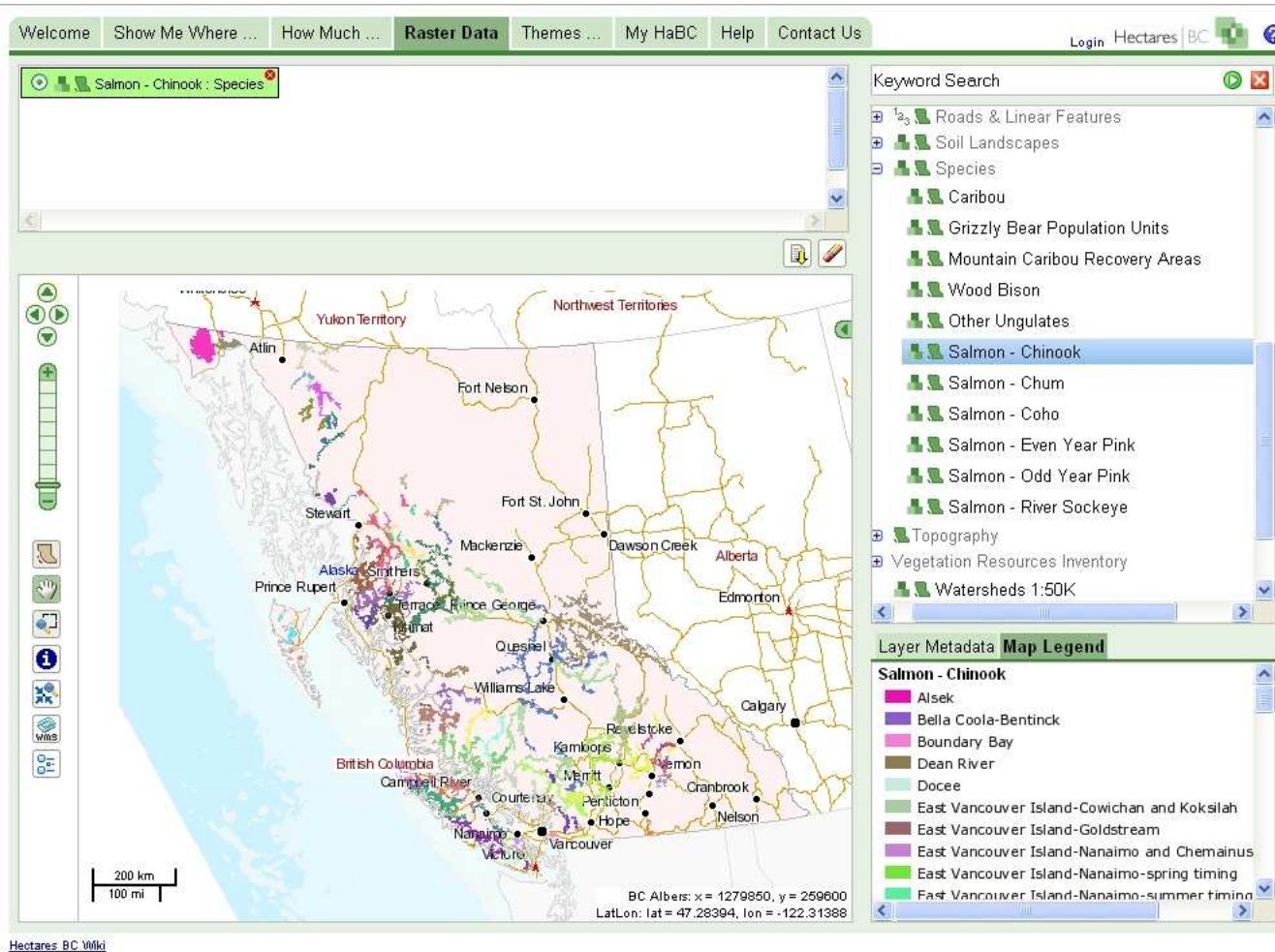
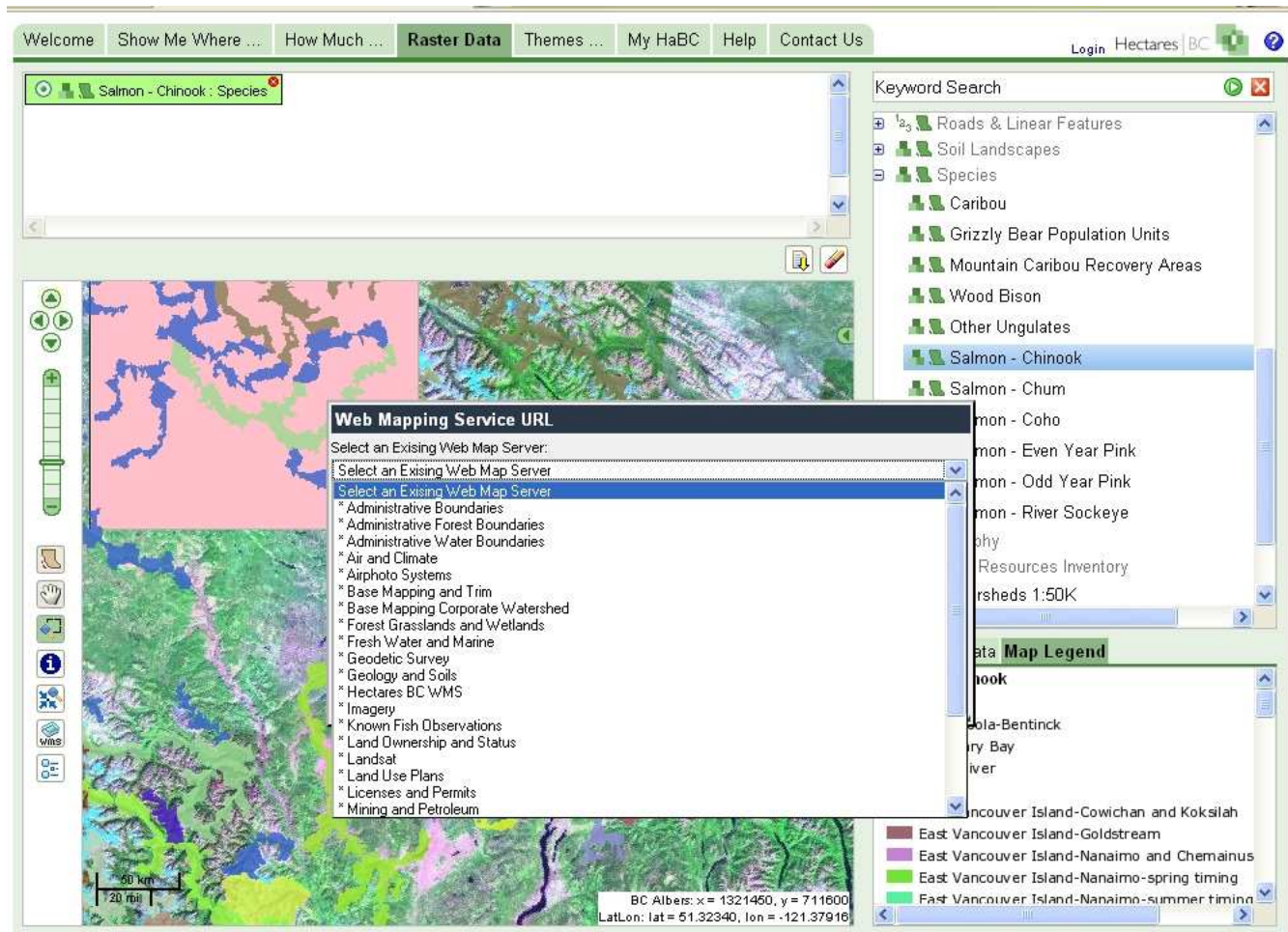


Figure 4. Example of Salmon Conservation Units.



Hectares BC Wiki

Figure 5. Example of ability to include data from other applications, websites, data sources.