

# 2010 & 2011 Flood Mapping Inventory Bella Coola Valley

Prepared for: **Bella Coola Watershed Conservation Society**  
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**Bella Coola Valley**

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## Attachments

- Site Cards S001 to S020
- Site Cards S021 to S040
- Site Cards S041 to S060
- Site Cards H001 to H015
- Site Cards N001 to N010
- Site Cards F001 to F006
- Overview Map: Entire Study Area 1:110,000 scale
- Project Map A to Map H: 1:15,000 scale

## 1.0 Introduction

In September of each of the years of 2010 and 2011, significant flooding associated with heavy precipitation occurred in Bella Coola Valley and tributary watersheds. These flood events caused damage and destruction to infrastructure, property, homes, fish habitat, stream channels and banks. Significant repair and restoration of infrastructure has been undertaken and implementation continues by various agencies, regional government and First Nations, individuals and the communities of Bella Coola Valley. The September 2010 flood was recorded as a 200 year flood event, and the 2011 flood recorded as a 150 year event.

This mapping inventory project was developed and funded by the Department of Fisheries and Oceans Canada (DFO) for implementation and delivery by the Bella Coola Watershed Conservation Society (BCWCS). Kynoch Resources was subsequently awarded a contract to complete this project on behalf of the BCWCS; Kynoch Resources partnered with JKL Research for this project. The project's intent is to inventory areas of recorded damages to infrastructure/development, ecological features and fish habitat affected by 2010 and 2011 flood events.

### 1.1 Project Background & Scope

As stated in the Statement of Work for this project (DFO, February 2012) there are a number of groups/agencies that have been working independently to address damage from the floods and planning for the future. However, each group or agency does not have the same resources or information and tools to enable a more coordinated and strategic community approach. This project was developed by DFO to compliment their Policy for the Management of Fish Habitat, allowing increased collaboration between partners and the public and streamline the habitat referral process.

Between February 27, and March 31, 2012, Kynoch Resources completed to the greatest level feasible the key objectives outlined in the SOW, including:

1. Compiling a list of documents and useful resource material related to the floods and subsequent flood work.
2. Compilation of existing digital mapping of river systems and immediately adjacent lands within the study area, and integration of this base layer with existing data from local agencies such as CCRD, DFO, MOTI, Nuxalk Nation and other professional sources. Mapping and reporting sites of known and potential flood and erosion threats to fish habitat, and threats to property and infrastructure from existing professional sources.
3. Convened an open house as a means of communication to collect and review information from stakeholders, and solicit community input through public notice - to an electronic and physical mailbox and Fax line.
4. Compilation and mapping of information received through public input regarding perceived flood and erosion threats within the study area. This information will be considered anecdotal and the accuracy unverified. The purpose for collecting this information was to show areas of concern identified by the public; Kynoch Resources or affiliates were not required to make any professional determination regarding validity, type or level of threat identified by the public.
5. Preparing the materials for posting on the BCWCS website and making them available to CCRD and other agencies. Providing digital and hardcopy deliverables as stated in the SOW.

The study area included:

- Bella Coola River from Burnt Bridge downstream to the estuary
- Burnt Bridge Creek below Hwy 20 bridge to mouth
- Cachootin Creek from Canyon to mouth
- Noosgulch River from Canyon to mouth
- Nusatsum River from mouth to 4km upstream
- Saloompt River from canyon to mouth
- Nooklikonnik Creek from canyon to mouth
- Snootli Creek form Canyon to mouth
- Thorsen Creek from canyon to mouth

In addition to these areas stated in the SOW, Tastsquan Creek, areas of the Bella Coola River upstream of Burnt Bridge, and various other point sources outside of the defined study area were included where identified and feasible (e.g., small tributaries and upslope events, etc.).

## 1.2 Methods & Limitations

This section describes general methods of collecting, sorting and mapping data, as well as limitations on those data and their analysis.

### 1.2.1 General Methods

This project was considered primarily as a data inventory, not a physical survey or mapping exercise. Reporting has been presented in two major components:

1. Site Cards, used to identify locations, provide a geographic location coordinate, and present available site specific data (where available); and,
2. Project Maps, used to show the location spatially within the study area.

Identification of sites on the maps was broken into various data series, depending on factors including: source of information and date of availability; agency or group providing data; and, field observation. Users can refer to the map for a physical location and subsequently review the Site Card for that location, or in certain cases can use the Data Series to identify a site or series of interest and locate it on the map with the geographic coordinates. Mapping methods are further described in sections below.

### Data Collection Methods

To implement this data inventory project Kynoch Resources completed the following chronological procedures from February 27 to March 31, 2012.

- February 27. Contracted awarded.
- February 27-to March 3 (then ongoing). Initial contact via e-mail with agencies/companies identified as having an interest in, or data relevant to this project, those agencies included:
  - Central Coast Regional District** (CCRD);
  - Department of Fisheries and Oceans** (DFO) Habitat, Hatchery, Community Advisor;
  - Ministry of Forests and Natural Resource Operations** (MOFNRO);
  - Flood Response Advisory Committee** (FRAC, via CCRD)
  - Bella Coola Community Forests Ltd.** (BCCFL);
  - Nuxalk First Nations** Capital Works Coordinator, Fisheries, Natural Resources;
  - Ministry of Transportation and Infrastructure** (MOTI);
  - Bella Coola Watershed Conservation Society** (BCWCS);
  - BC Hydro** Corporation.
  - Interior Roads Ltd.** (IRL) Bella Coola.
  - Triton Environmental Consultants Ltd.** Kamloops
  - Golder and Associates Engineering Ltd.** Kamloops

- March 1-4 Development and review of a Public Data Submission Form (Questionnaire) to be distributed to Valley Residents as requested. Creation of a project specific e-mail account for receiving input ([reply@kynochresources.com](mailto:reply@kynochresources.com)).
- March 5 deliver brief project overview and project introduction at well attended Community Open House present by the Central Coast Regional District (CCRD) regarding flooding issues in the community. Extensive notes and data references were collected by project members.  
The flood Questionnaire was made available to public at this forum (first intake). Establish a physical Post Office Box (BCWCS) address, e-mail, and FAX to receive public input.
- March 6-9 review existing data made available from the CCRD (Flood Response Advisory Committee- FRAC), MOTI and arrange meetings with other agencies. Send second call for input via-email to agencies listed above. Discuss this project personally with members of the Nuxalk First Nations Integrated Resource Office, and Tribal Council Fisheries, then send e-mail to solicit date for meetings. Submit advertisement to local (bi-weekly) newspaper of planned Open House for community to review maps and provide data. Arrange meeting location and time (March 19, Airport Meeting Room).
- March 10, post information bulletins and Questionnaires for public input (second intake) at Bella Coola and Hagensborg Post offices. Post advertisements of project scope and Open House at other prominent locations in community.
- March 11-15 prepare a 1:50,000 base map of the study area for public review.
- March 15. Newspaper article and notice of open House published in Coast Mountain News. Invite DFO (Habitat and Community Advisor) to Open House to discuss project progress (via e-mail).  
Field truth all available data points from those agencies and individuals that submitted information to date.
- March 19. Host Open House to meet with public and discuss project.
- March 20. Send final requests for additional information to select agencies (MOTI, Golder and Associates, Bella Coola Sustainable Agriculture Society).
- March 21 meet with Nuxalk First Nations Capitol Works Manager to seek data input. Meet with DFO (Habitat) to review project progress and discuss scope. Set this date as final day for data input to allow project mapping and reporting to proceed.
- March 22 – 31. Project mapping and reporting.

Data collected during this process were assimilated into Site Cards, presented in this report. Site Cards were developed specifically for this project to allow for simple and varied data types and detail. Typically a Site Card contains a Site Number, UTM Coordinate, Site Name (general), and, general or specific site information and a photograph if relevant/available.

### **Mapping Methods**

The most recent orthographic photos of the study area were used as base layers for the mapping project. Unfortunately the orthographic data were derived from aerial photos taken in 2006 and show the Bella Coola River, associated tributaries and surrounding regions in pre-flood condition. In addition to the orthophotos, Terrain Resource Information Management (TRIM II) shape-files were utilized in determining position of a limited set of site locations. However, as the existing Provincial TRIM II data were also created from measurements taken prior to 2010, they were determined to be misleading in a number of changed locations along the river. As such, inclusion of the TRIM II shape files in the final map products was deemed unnecessary.

The absence of current GIS data created challenges for locating certain points and features in post-flood periods. For a large number of sites, ground truthing was required for the collection of geographic location, site data (observations and photographic record), and confirmation of features indicated by input from various agencies and individuals. Since all of the sites included in this study are large areas represented by identifier waypoints, a handheld GPS unit (Garmin

GPSmap 60CSX) was deemed sufficient to record site locations. Measuring the physical layout or dimensions of features at each site location was beyond the scope of ground truthing for this project, and left to the various contributing agencies.

- In total nine 11"X17" tabloid maps (eight project maps plus one index map) were produced for this project using the software package Quantum GIS (QGIS).
- Shape files produced with QGIS software are compatible with other GIS standards and software.
- Data collected during field work was imported into QGIS and additional site locations were also generated as shape files.
- The coordinate reference system chosen for the map deliverables used the WGS84 datum and the zone 9 UTM geographic projection.
- The main orthographic photo layers included in the project map sheets were 93d037, 93d038, 93d048, 93d049, 93d050 with several other photos included in the index map sheet (resolution of the base map layers is given as 0.5m per pixel with compilation scale 1:20 000).

The eight project maps were produced as digital and hardcopy segments to portray the entire study area. These maps are identified by incremental lettering as *Map A* through *Map H* and are included with this project at 1:15 000 scale. The ninth map, a 1:110 000 scale map of the whole study region, is an index to show the location of all project maps. Final map data were overlaid as shape files on the orthographically rectified aerial photography. Digital data deliverables for map layers are also provided with this report.

### **Data Series**

For mapping, data management, and clarity, the following data series have been compiled to present data. Data series do not necessarily reflect importance, accuracy, or specific significance of a site, they were assigned internally by the project team to better manage data being collected from a variety of sources. Often one Site was identified by several individuals or agencies. For most accurate detail of a site source, refer to the specific Site Card.

- Data Series S – refers typically to sites that were identified from a variety of sources (public, agencies and government) and could be ground truthed. Identified by Orange map points.
- Data Series H – refers typically to an area where known or potential fish habitat degradation has occurred. Identified by Yellow map points.
- Data Series F – refers typically to Sites identified in interviews with MOFNRO. Identified by Pink map points.
- Data Series N - refers typically to Sites identified during interviews with the Nuxalk First Nation. Identified by Green map points.

### **1.2.2 Project Limitations**

Limitations to this project were apparent in data collection and mapping. Certain agencies provided abundant data, while others provided little or no data or referred to other agencies for data acquisition. Of the agencies that provided data, there was little or no ability for the project team to determine if those data were complete or if more data may have existed. The short project completion time (1 month) also proved difficult to acquire data in a reasonable timeframe for collection and use in this report.

### **Data Acquisition Limitations**

Public input to the process was limited, with a total of only nine (9) sites being reported by eight (8) individuals throughout two (2) Questionnaire Intakes. These individuals mailed or faxed Questionnaires to the specified addresses. The open House ran for 3.5 hours in the evening of March 19, and only attracted two (2) visitors, that visited as a couple, resulting in one (1) unique

visit. These participants were not from within the study area, residing outside of the boundaries, but being interested in the overall project.

Local government agencies provided the most input (CCRD/FAC) and MOTI and MOFNRO provided information in written form when requested. Additional interviews with MOFNRO and Nuxalk First Nations provided specific data. BCCFL deferred to MOFNRO. Consulting companies that were contacted (Triton Environmental Consultants Ltd., Interior Roads Ltd., and Golder and Associates) deferred to MOTI.

This general lack of available written or digital documentation made it very difficult to compile 'a list of documents and useful resource material related to the floods and subsequent flood work' as stated in Point 1 of the SOW within the allotted timeframe and scope of this project. There likely remain a variety of reports, files and site descriptors available from certain agencies, but these documents were not obviously available or mentioned by agencies or companies as being available in the context of this project.

### **Digital Data Limitations**

No digital mapping data, site coordinates, physical plans, drawings, or prescriptions were provided in the data from any source/agency. This resulted in considerable ground truthing by the project team to establish site locations. Other than written descriptions of lengths and dimensions of some sites, there were no tangible data that could be accurately portrayed on the project map to indicate site dimensions, extent, elevation or other geographic context. For these reasons, sites are indicated with a point reference only on the project map.

### **Map Limitations**

Map baseline data (TRIMII) and orthographic photos used in this report were captured in 2006 (air photos) prior to flood alterations to the rivers, streams and overland areas, which occurred in 2010 and 2011. It was beyond the scope of this project to survey or assess any areas of reported damage or alteration to quality and accuracy levels sufficient for mapping or map amendments. Where lineal changes in stream channel were identified by agencies or individuals, efforts were made to digitally obtain a location of 'upstream' and 'downstream' endpoints, but it was not possible to indicate lineal path or route of the channel avulsion or changes. Physical field-mapping or ground-truthing of these locations was beyond the scope of this project. This was similar for other lineal or spatial areas that were not simply a single point. For example an area of new or altered bank armouring or dike, could not be digitally portrayed on project maps based on the limited information typically provided. These areas are indicated with a reference point and lineal dimensions noted on the Site Card, where available.

## 2.0 Summary & Results

Results of this mapping and data inventory project are presented in this report as Site Cards and Project Maps. A total of 91 sites were uniquely inventoried and mapped during this project. This number includes sites identified by those agencies listed in this report, as well as limited field observations from project team members and input from the public through questionnaire and open house forums.

It was beyond the scope of this project to assess priority, risk, ranking or impact of reported data. Data are presented as geographic reference points and substantiated with additional material as was available. It was also beyond the scope of this report to amend, correct, or otherwise survey or update geographic features on base maps used in this report (originating from 2006 air photos), therefore mapping errors or discrepancies may be present.

Maps in this report are identified as Map A through Map H with an index map also provided. Accompanying Site Cards are presented as Data Series S (Files S001 to S060), Data Series H (H001 to H015), Data Series F (F001 to F006), and Data Series N (N001 to N10). Digital materials accompany this hardcopy report with appropriate appended digital files in PDF format available for internet posting.

## References

- BC Hydro, 2012. Personal Communications.  
March 12 e-mail communication with V. Lewensky soliciting project input.
- BC Ministry of Forests and Natural Resource Operations. 2012.  
March 16 Personal Communication, Meeting with K. Phillips, Hagensborg MFNRO Office.
- BC Ministry of Transportation and Infrastructure (MOTI). 2012.  
February 27 and March 19 Personal Communications. E-mail messages L. Illniki, soliciting input and receiving files.
- BCWCS, 2012. Personal Communications  
March 9 E-mail communication sent to various member/directors soliciting input.
- Bella Coola Community Forests Ltd. 2012. Personal Communications.  
March 3 e-mail discussions with H. Granander soliciting input.
- Golder and Associates Engineers. 2012. Personal Communications.  
March 19 and 20 e-mail discussions with M. Sullivan and M. Bender soliciting survey data. March 28 data received via e-mail.
- Kynoch Resources, 2008.  
Bella Coola Watershed-based Fish Sustainability Plan Stage III Final Report. Prepared for BCWCS, International Forest Products & the Midcoast TSA Group of Licensees (FIA Project # MC6603009-07). Bella Coola.
- Nuxalk First Nations, 2012. Personal Communications.  
March 9 e-mail communications with I. Tallio, J. Moody, and, A. Pootlas. Subsequent site meeting with A. Pootlas (March 21) to solicit project input.
- Triton Environmental Consultants Ltd. 2012. Personal Communications.  
February 27 e-mail communication with J. Dorey, soliciting data and project input.