The Essential but Often-Neglected Plan for Data Collection and Management: Lessons Learned

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In the Okanagan, a collaborative approach to quantifying EFNs was adopted. The aim of the project was to define EFNs for 19 sub-basins within the Okanagan River watershed. A critical part of this project was the collection of new field data.

I want to share some of the successes and challenges we've experienced in collecting and managing data for the Okanagan EFN project, with the intention that if other organisations want to go down the same path they can glean a few lessons from our experience.

(This was work completed as a consultant for the Okanagan Basin Water Board, though I now work for the provincial government.)

The Data Plan

- Identify partners
- Define objectives
- Identify data needs
- Standardise field methods
- Standardise data management
- Provide training
- Archive data

Data management is not a ‘sexy’ topic, but it’s critical to have a conversation about HOW data is going to be collected and corrected so that project partners can spend more time discussing EFN and critical flow thresholds instead of questioning the data used to generate the values.

Overview of this presentation – the components of the data plan used for the Okanagan EFN project. This presentation does not provide details on the methods used – for more information see the Collaborative Development of Methods document at https://www.obwb.ca/efn/

Identify Partners

- Statutory decision-makers
- Fish, fisheries and aquatic habitat experts
- Hydrologists and hydrogeologists
- Water management specialists
- Academics
- Advisory committees
- Project manager(s)

Identify the partners that will ensure the success of the project.

Identify experts, both local and from away, who can act in either advisory roles or who will participate in the data collection and application. This should include experts in aquatic habitat, hydrology, groundwater, and water management. Experts may come from academia, First Nations, consulting, non-governmental groups (naturalist clubs or fish and game clubs) or local/provincial government partners.

In BC, provincial government staff needed to be engaged because they would be using the EFN values to inform such things as water license allocation decisions and when to implement orders to stop water use under drought conditions.

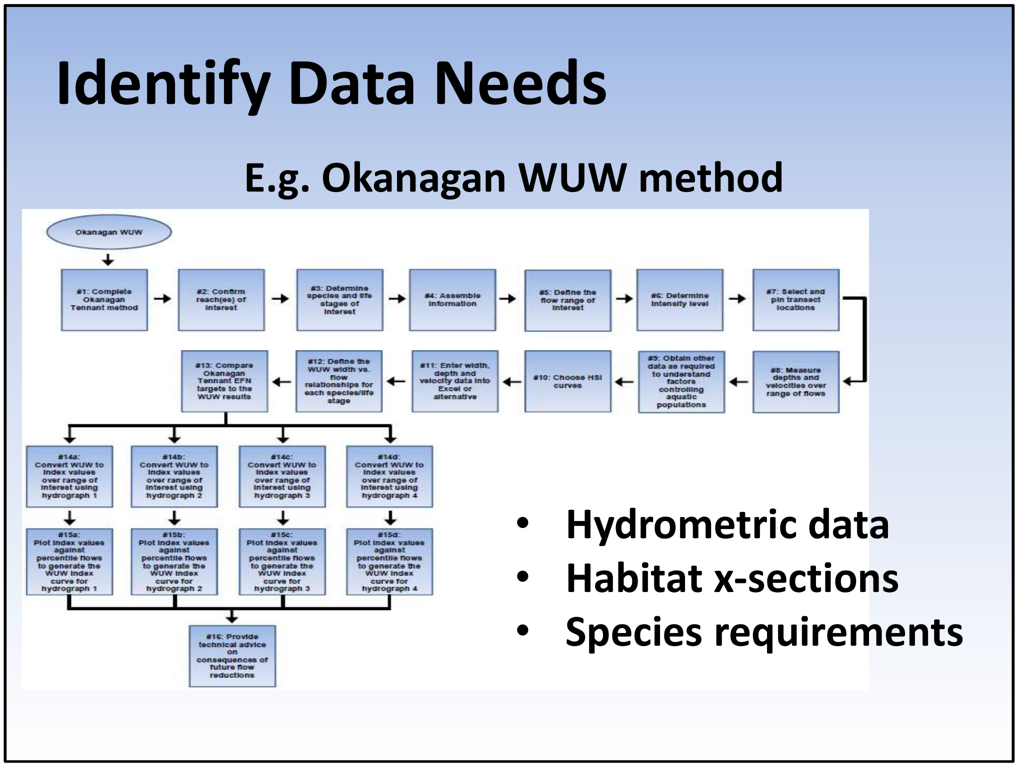
In the Okanagan the Okanagan Basin Water Board is a regional government agency with a mandate to support local and regional governments in managing water resources at the watershed scale. In this project they provided critical logistic support, including fundraising, networking support, project management and communication.

Define Objectives

- **High quality, defensible, robust data**
  - **Standardised methods**
  - **Transparency**
- **Foster communication and collaboration**
- **Data and information sharing**
- **Ensure legacy**

The objectives for the data plan were informed by the overall project objectives, and in the Okanagan EFN project they included:

- The collection of high quality hydrometric (streamflow) and habitat data, with clearly described field methods and data management practises.
  - This was critical because there was the potential for legal challenges around water management decisions that relied on the EFN values.
  - It also ensured that the conversation and debate between partners could focus on the EFNs, not bias or errors in the data.
- Foster communication and collaboration between partners and interested groups
  - Required transparency of methods
  - Trust in the data facilitated relationships between partners.
- Ensure that the data was available to all partners in the methods application process, and that it will be available for future projects.



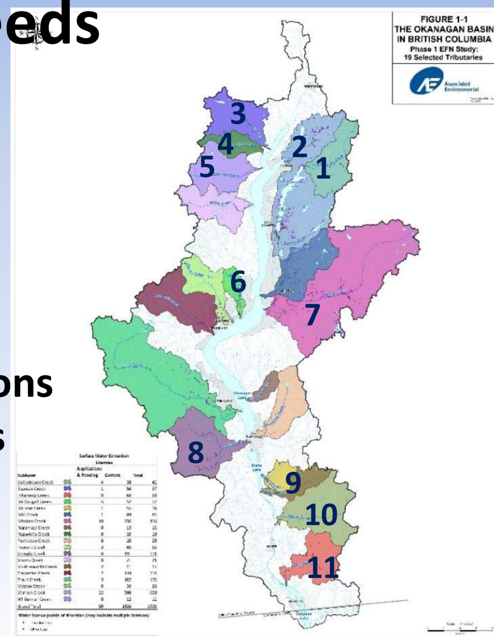
Two methods were developed in an earlier phase of this project, and were used to identify the data needed to meet these requirements. This included new field data (streamflow and habitat cross-section measurements) as well and species- and population-specific habitat needs at different life stages that are required for the models. This presentation focusses on the new field data that was needed.

The habitat requirements were decided on collaboratively using information from the literature, the provincial database, and locally-collected data from the Okanagan Nation Alliance.

Identify Data Needs

- 2 methods
- 11 streams

→ 20 hydrometric stations
→ ~50 habitat transects



Identify the scale of the data collection – how much data is expected? Can it be handled using spreadsheets or will specialised software be needed?

Of the original 19 sub-basins identified, eleven were chosen for field data collection. One or two hydrometric stations were installed in each stream, and approximately 50 habitat cross sections identified in different habitats (primarily riffles and glides).

Identify Data Needs

- **Select software**
- **Programming needs**
- **Data manager**
- **Ancillary data**

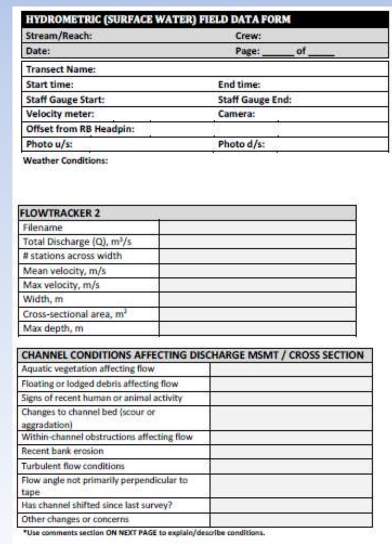
McDougall Creek

Some considerations once the type of data required has been identified include:

- Is specialised software required? Numerous packages are available with variable licensing costs and training requirements. The Okanagan Basin Water Board already had a license for Aquarius, a software package developed to manage hydrometric data, so this was adopted. The OBWB also already had a database manager with Aquarius experience.
- Specialised programming may be needed to adapt existing software, so there may be a need to bring in IT support from a partner or consulting company.
- This is also the time to determine what ancillary data might also be needed to ensure the production of high quality hydrometric and habitat information. This will include things like cross-section photos to document visual changes in habitat at different flow rates, for example (lower photos show McDougall Creek at different flow rates; arrows point to the same boulder).

Standardise Field Methods

- Equipment
- Field practises
- Note-taking


HYDROMETRIC (SURFACE WATER) FIELD DATA FORM

Stream/Reach:	Crew:
Date:	Page: _____ of _____

Transect Name:	
Start time:	End time:
Staff Gauge Start:	Staff Gauge End:
Velocity meter:	Camera:
Offset from RB Headpin:	
Photo u/s:	Photo d/s:

Weather Conditions:

FLOWTRACKER 2	
Filename	
Total Discharge (Q), m³/s	
# stations across width	
Mean velocity, m/s	
Max velocity, m/s	
Width, m	
Cross-sectional area, m²	
Max depth, m	

CHANNEL CONDITIONS AFFECTING DISCHARGE MSMT / CROSS SECTION	
Aquatic vegetation affecting flow	
Floating or lodged debris affecting flow	
Signs of recent human or animal activity	
Changes to channel bed (scour or aggradation)	
Within-channel obstructions affecting flow	
Recent bank erosion	
Turbulent flow conditions	
Flow angle not primarily perpendicular to tape	
Has channel shifted since last survey?	
Other changes or concerns	

*Use comments section ON NEXT PAGE to explain/describe conditions.

The purposes of adopting standard field methods and procedures are to (a) increase transparency and trust in the data and (b) increase the probability of producing high quality data.

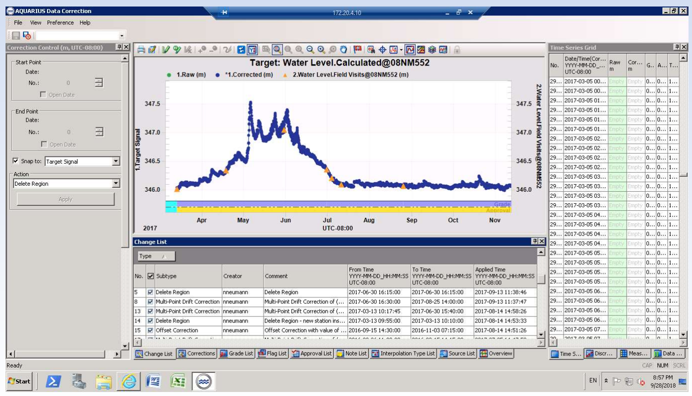
The BC Resources Information Standards Committee (RISC) methods were adopted in the Okanagan EFN project. (RISC standards detailed in: https://www2.gov.bc.ca/assets/gov/environment/air-land-water/water/science-data/man_bc_hydrometric_stand_v10.pdf)

The RISC guidelines specify equipment and field practise requirements, such as the accuracy of the instruments used to monitor water level and the number of times that data should be verified by surveying to benchmarks. This information plus the extensive experience of the projects partners was used to develop field sheets for note-taking. This was a collaborative effort to optimise the time of the field staff while ensuring that the data manager would have adequate ancillary information to use in the data correction steps.

By this step in the process the amount of labour required to conduct the field data collection was clearer, so duties and geographic areas were assigned to different parties.

Standardise Data Management

- Software
- Reproducible methods
- Data grading



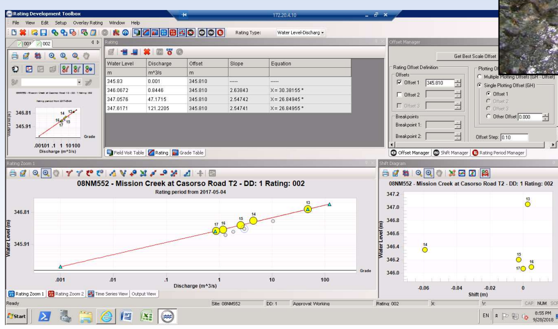
This is not a step to be overlooked! The collection of field data is only one part to the production of quality data – it must then be corrected and additional datasets derived.

Software should be chosen based on cost, accessibility and ease of use. The Aquarius software provides tools for time series data upload and correction and rating curve development, and requires a moderate level of training to use.

The data manager should then work with partners to document procedures for data correction and how data quality will be graded. Quality grading of hydrometric data is standard practise, and the BC RISC grades were used in the Okanagan EFN project.

Training

- **Field methods**
- **Data management methods**
- **Assign tasks**



A critical component to the success of the Okanagan EFN project was bringing the partners together for training on field and data correction methods. This achieved multiple purposes: (a) field staff understood the reasons behind the field standards so there was less chance of straying, (b) it provided opportunities for partners to discuss best practises and learn from each other, and to develop or improve specialised skills, and (c) it increased trust in the data collected.

Once partners were adequately trained, duties were assigned. Duties included the collection of the field data, uploading data to the Aquarius database, correction of the data, development of rating curves, statistical analysis using R software, etc. Because of the geographic extent of the Okanagan basin, the field staff divided up the sub-basins to optimise travel time.

Archive Data

- Software
- File types
  - Data files (raw and processed)
  - Field notes
  - Photos
  - Model output

The final step was to store the data so that it would be available for current partners and future projects. Consultation with an IT specialist was essential – technology changes quickly and there are different approaches to organising and searching for files. A specialised product may be needed.

One consideration is the types of files that are expected, including data files from field equipment, notes and photos, and processed and model results. Unfortunately the Aquarius software is a poor platform for managing non-data files, but a library had been created for the Okanagan EFN project in SharePoint that contained all of the sub-basin reports that had been collected from a variety of archives. This library is accessible to the project partners and provides a 'one stop shop' to find hydrologic and fisheries reports for all of the sub-basins. This SharePoint site was customised to also archive all of the non-Aquarius data collected.

Lessons Learned

- **Leverage partner expertise**
- **Collaborate on field and data management protocols**
- **Take time to train partners and communicate protocols**
- **Collect ancillary data**
- **Have a data manager**

- A key to the success of the Okanagan EFN project is the engagement of partners with the required experience – including hydrologists, hydrogeologists, fisheries and aquatic habitat scientists, water resource managers, and policy experts. Knowledge gaps were easily filled by engaging consultants, academics and technical specialists as needed.
- The collaborative approach to collecting and managing field data meant that partners could focus on discussing EFN values., because there was a reasonable level of trust in the data used to generate them.
- The field and office teams worked together to ensure that high quality field measurements were made, and that there was adequate ancillary data to support correction and produce derived data (e.g. streamflow). Having a designated data manager ensured that these connections were made.
- Side benefits of the training were that partners were exposed to each others specialties, and that participant skills were enhanced.

Lessons Learned

- **Optimise use of software to generate good data (leverage existing software)**
- **Access IT/programming experts**
- **Have a plan for data sharing and archiving**

- Specialised water data management software (Aquarius) was already being used by one partner, and it was easy to adopt for this project. The scale of the Okanagan EFN project meant that there was some funding available to engage IT specialists to customise software as needed (e.g. the SharePoint data archive), and to support technical requirements of database management (e.g. firewall security).
- An objective of the data plan was to facilitate collaboration between partners through data sharing. These were achieved through the software packages used (Aquarius for water level and streamflow time series data, and SharePoint for all other data types). Unfortunately the two software packages do not communicate or link, and the existing Aquarius database cannot be accessed remotely. However, the streamflow data produced in this project has been contributed to the provincial Aquarius database and is publicly available (http://aqrt.nrs.gov.bc.ca/).