

2014 Annual Report

from the

Integrated Watershed Research Group

at the

University of Northern British Columbia

submitted to

Nechako Environmental Enhancement Fund
Project Manager: Dan Boudreau

for

February 15, 2015

General Project Introduction

The University of Northern British Columbia (UNBC) houses an Integrated Watershed Research Group (IWRG) comprising four research chairs: Stephen Déry (Canada Research Chair in Northern Hydrometeorology), Philip Owens (Forest Renewal BC Chair in Landscape Ecology), Ellen Petticrew (Forest Renewal BC Chair in Landscape Ecology), and Margot Parkes (Canada Research Chair in Health, Ecosystems and Society). The chairs have worked collaboratively for several years on integrated watershed-based research with an emphasis on the Fraser River Basin and other northern BC watersheds including the Nechako River Basin (NRB). The researchers view integrated watershed research as linking biophysical, chemical, social, and human-health processes to address important environmental, landscape ecology, and community issues. This group has begun a four-year research program in the NRB comprised of three foci that address specific questions.

1 – Water security and climate change (Déry and students): Is a warming climate leading to more or less surface water availability in the NRB? What is the impact of anthropogenic versus natural influences on the basin's water resources, including streamflow amounts and timing?

2 – Sediment sources and dynamics (Petticrew, Owens and students): Fine-grained sediment has been identified as one of the main concerns within the NRB, and some key questions are: Where is the sediment coming from? If we identify the sources of the sediment, can we implement watershed management strategies to help control these sources and limit their detrimental effects? Given anticipated future changes in climate and land use in the watershed, how will sediment sources respond to these changes?

3 – Tools for integration in watershed management and governance (Parkes and students): How do decision support tools such as watershed report cards, indicator frameworks, and tools to integrate spatially referenced watershed information feed into broader processes of watershed management and governance? How do we build capacity for developing, managing and maintaining decision-support tools that integrate health, ecological and socio-economic parameters to inform watershed management and governance? How do we better understand the relationship between these decision-support tools and ongoing watershed-based science, given their different timelines, orientations and processes?

Timeline

The IWRG at the University of Northern British Columbia was awarded a \$500,000 contract from BC Ministry of Forests, Lands and Natural Resource Operations via the Nechako Environmental Enhancement Fund (NEEF) in late March of 2014. This contract was backdated to January 6th, 2014 since the IWRG-NEEF discussions regarding the project contract had been under discussion since September, 2013, and the initial proposal indicated a January 2014 start date. This arrangement allowed for some work to begin early in 2014 such as the hiring of a project manager (Barry Booth) and the continuation of a Nechako-based post-doctoral research project (Ian Picketts). However, due to the late commitment of funds some components of the first year's plans were not realized, specifically the acceptance of graduate students to be involved in 2014 summer field work.

While we have been able to initiate many components of the first field season we are expecting to carry over some of the planned efforts into the second year. The following represents the work we have accomplished in 2014.

Overall Project Management

- Hiring of Barry Booth as the project research manager
- Establishment of an office for the research manager at UNBC
- Introduction of the proposed IWRG research program to 50 individuals and their organizations (see appendix 1 for list of people contacted)
- Public launch of IWRG program at UNBC. Launch included the following material in local media (<http://ckpg.com/unbc-receives-1-million-for-nechako-basin-research-video>, <http://www.pgfreepress.com/unbc-research-teams-set-to-tackle-nechako-river-basin/>, <http://www.princegeorgecitizen.com/news/local/river-basin-research-gets-1m-grant-1.1073674>)
- Building a library of pertinent documents

We have begun to collate past research reports pertaining to work in the NRB – this will feed directly into Theme 3.

- a) Apart from locating documents from the traditional sources we have been able to secure additional material from consultants (e.g., Northwest Hydraulic Consulting provided us with appendices and photos from reports not posted on the NEEF website). In addition, we have been able to secure documents in draft form with the help of Dave Levy, Nechako Fisheries Conservation Program;
- b) Secured Richard Krehbiel's files from his time on the Nechako Watershed Council (we are currently looking into finding a permanent home for these files);
- c) Accessed a substantial amount of digital data pertaining to soils in the Nechako River Basin; and
- d) Secured research documents from Ducks Unlimited, Canadian Wildlife Service and UBC relating to climate change and wetlands in central BC.

We have provided access to Richard Krehbiel's files from his time on the Nechako Watershed Council to Natalya Melnychuk, a PhD student from the University of Waterloo. Natalya's dissertation relates to watershed governance. She will provide us with a summary of the content of Richard's files with some recommendations as to how they could be effectively archived.

- Presentations to, and meetings with, potential project partners
 - a) Presentation of the IWRG research program at the Nechako Watershed Alliance meeting; Prince George, May 26, 2014;
 - b) Met with Olin Albertson, biologist, Avison Management Services, to discuss Avison's riparian assessment of Stoney Creek. Vanderhoof, June 12, 2014;
 - c) Met with Cory Williamson, Freshwater Fisheries Society of BC & Northern White Sturgeon Recovery Initiative Conservation Facility Development Manager, Vanderhoof, to discuss integration of IWRG research with other, on-going sediment research in the Nechako River. Vanderhoof, June 12, 2014;
 - d) Presentation at the Upper Fraser Fisheries Conservation Alliance general meeting (www.upperfraser.ca), Ft. St. James June 19, 2014;

- e) Met with Bruce Harrison, Ducks Unlimited, to discuss wetlands modeling project and have received background documents from Bruce related to this project. July 21, 2014;
- f) Met with Zsolt Sary, Regional Aquatic Ecologist, FLNRO, to discuss potential collaboration between IWRG and Nechako White Sturgeon Recovery Initiative, July 28, 2014;
- g) Attended Knowledge Exchange and Exploration Conference at UNBC. October 16-18, 2014;
- h) Presentation of the IWRG research program at the Nechako White Sturgeon Recovery Initiative Conservation Technical Working Group meeting, October 20, 2014; and
- i) Attended NEWSS meeting in Vanderhoof to discuss the restoration plans of Stoney Creek. December 8, 2014.

Theme Updates

Theme 1: Water security and climate change (Déry and students)

We have made tangible progress on climate research in the Nechako River Basin (NRB). One new doctoral student (Aseem Sharma) has been accepted for January 2015. We have also secured one year of matching funds for Aseem from the UNBC Office of Research and we have applied for additional funding for his work through the Pacific Institute for Climate Solutions (<http://pics.uvic.ca>). Our progress so far is summarized below.

- Continue to work on research related to climate change and resource development in the NRB:
 - a) We have released a final report and accompanying summary document entitled, “Changing Landscapes Changing Lives: Exploring climate change impacts in the Nechako Watershed, and implications to natural resource development” – a paper was also presented at the annual Resources North conference held in Prince George in June;
 - b) Have had an article accepted in Canadian Geographer that looks at climate change and water at Stelat’én First Nation, near Fraser Lake;
 - c) Have a paper under review at the Canadian Water Resources Journal looking at flooding in the NRB;
 - d) Have developed a data sharing agreement with Rio Tinto Alcan (informal at present) relating to new hydrometric sampling equipment that is being installed in the Nechako watershed;
 - e) Are in the planning stages for possible deployment of a weather station in the watershed, although a specific site remains to be determined; and
 - f) We hired Aseem Sharma as a part-time Research Assistant for September to November 2014. He has been working on collating and summarizing historical climate and precipitation data in the Nechako Basin from 1950-2010 and projecting climate and precipitation changes under different scenarios until 2050. To date, Aseem has completed the following tasks:
 - Developed a topographic map of the watershed that shows, elevation, major settlements, and important places within the watershed;

- Analyzed average hydroclimatic condition for last about six decades using ANUSPLIN observation based gridded dataset;
 - Analyzed average monthly hydroclimatic variation over the region.
 - Calculated linear and spatial trends of annual minimum, maximum, and mean air temperatures, and precipitation over the basin for the period of 1950-2010 using ANUSPLIN observation based gridded dataset;
 - Calculated linear and spatial trends of seasonal (all four seasons) minimum, maximum, and mean air temperatures, and precipitation over the basin for 1950-2010 using ANUSPLIN observation based gridded dataset;
 - Separated the snow and rainfall from the total precipitation over last six decades and analyze the trend of the snowfall in the watershed;
 - Calculated the linear and spatial trends of annual minimum, maximum, and mean air temperatures and precipitation for the period of 2010-2050 using modeled dataset; and
 - Calculated the linear and spatial trends of seasonal (all four seasons) minimum, maximum, and mean air temperatures and precipitation for the period of 2010-2050 using modeled dataset.
- g) We worked with our post-doctoral fellow, Dr. Ian Picketts, through to September 17, 2014. Ian is now an adjunct faculty member at UNBC and will continue to work with the IWRG in the coming years. Ian continued his work on climate change scenarios and natural resources development in the Nechako watershed throughout the summer and into this fall. This work was co-led by Stephen Déry and Margot Parkes (see Theme 3), was supported by matching funds from the BC Real Estate Foundation Partnership Fund and has included:
- Release of document entitled: “Changing Landscapes, Changing Lives: Exploring climate change impacts in the Nechako Watershed, and implications to natural resource development” for which an executive summary was also produced (the full report is available online at the following website: http://nhg.unbc.ca/datafiles/ChangingLandscapes_FINALDRAFTforPUBLICATION.pdf). Ian has also been developing a journal article on a similar topic that we intend to submit to “Global Environmental Change”.
 - A Multi-stakeholder workshop on Monday, October 27th on the UNBC campus, which was led by Ian and coordinated by our part-time Research Assistant Carling Matthews. The workshop brought together 32 stakeholders who live and work within the Nechako Watershed in an intensive workshop. Participants sought to create multiple future scenarios based on projected levels of change in climate-related variables and their associated impacts, and projected levels of natural resource development. These scenarios will form the basis for in-depth descriptions of the potential future states of natural ecosystems, water budgets, socio-cultural health, food security, and economic well-being in the watershed.

Next steps include:

- Consolidation of the results of the scenario narratives articulated in the

- workshop to assess the interrelationships between levels of change and development and impacts on communities and the landscape, and;
- Production of a report and related research article communicating the process and results of the scenarios exercise.

Theme 2: Sediment sources and dynamics (Petticrew, Owens and students)

As dedicated graduate students for this project did not have committed funds by February 15, 2014 we were not able to take on MSc or PhD students to work during the 2014 field season. However we did complete a scoping project to prepare for an intensive 2015 season and we have collected sediment samples for analysis this winter. For this scoping project we secured funds from BC Real Estate Foundation Partnership Fund.

- Work relating to sediment sampling within the watershed included:
 - a) Visiting most of the sub-basins in the Vanderhoof area and have conducted a coarse overview of each watershed in terms condition of riparian areas, extent of land clearing, and accessibility in order to prioritize future sampling locations;
 - b) Pilot testing fine sediment sampling protocols and have decided and ordered equipment required;
 - c) Collection of initial fine-grained sediment samples from the main stem of the Nechako (at Vanderhoof) and some tributary streams;
 - d) Collection of samples along Stoney Creek at a major area of sediment deposition in proximity to a problematic road crossing. This sampling was in response to a request by NEWSS because they are exploring the feasibility of removing this sediment plug to facilitate fish passage. We are providing an analysis of metal content of the creek sediment for NEWSS to help inform the disposal of this sediment. This analysis also provides valuable information for our sediment finger-printing work within the watershed;
 - e) Collection of flood plain core samples at Stoney Creek and along the main stem of the Nechako upstream of the Burrard Street Bridge; and
 - f) Dr. David Gateiulle, Post Doctoral Research Associate from France, arrived in Prince George in late November. David and Barry Booth travelled to the NRB to collect sediment from six additional creeks for our fingerprinting work. These samples are currently being processed and prepared for analysis. David is also preparing sediment cores for analysis.

Theme 3: Tools for integration in watershed management and governance (Parkes and students)

Building on past work, the main focus has been on the next phase of development of a spatially referenced watershed portal tool to create a platform to bring together existing knowledge and new watershed research. Progress for this theme continued to focus on design and collaborative activities required to develop and test new tools to integrate and share information in the watershed. The development of this theme has been directly informed by the projects described in Theme 1 relating to climate change and resource development in the Nechako and will continue to be informed by the research and results emerging from Theme 2. In addition, we continued to work on watershed governance through our activities with the Nechako Watershed Alliance. Please note

that Theme 3's activities, in part, overlapped significantly with Theme 1. Details of this overlap are noted below.

- Development of the watershed portal included:
 - a) UNBC undergraduate student (Blake Hawkins) collected, archived and spatially referenced a range of materials (research papers, videos, newspaper articles, etc.) related to the Nechako, using a combination of reference software (Zotero), and in alignment with emerging features of the watershed portal tool;
 - b) Met with UNBC Library staff to discuss integration and synergies between portal development and the UNBC library Digital archiving strategy, and related Library services;
 - c) Worked across IWRG team members to establish mechanisms for archiving of resources relating to Theme 1 and 2, that will inform development of the watershed portal tool;
 - d) Continued work with Scott Emmons (UNBC GIS lab) and his lab-team to develop and adapt existing watershed portal technologies to the context of the Nechako and the needs of the IWRG;
 - e) Continued collaborations with national research partners (Martin Bunch, York University) who are developing open-source watershed portal technology that may complement and work synergistically with what is being developed in in the Nechako;
 - f) Submitted funding application to the BC Foundation on October 23, 2014 to further develop portal in conjunction with the UNBC GIS lab and York University. In December of 2014 we were informed that our proposal was accepted and fully funded. With the announcement of this funding we have held preliminary discussions with core members of the group to begin the process establishing funding transfer agreements, determining regular working group meetings, and the hiring of pertinent support staff and recruitment of students; and
 - g) Established a relationship with the Integris Credit Union (Prince George and Vanderhoof) to explore potential funding opportunities

- We also continued our collaborative work with the Nechako Watershed Alliance partners, both from a project and a governance perspective. Here our work in this area included the following:
 - a) Hosted a webinar at UNBC to help facilitate discussions between the FBC's indicators project, the BC Ministry of Forest, Land, and Natural Resource Operations' Omineca Watershed Health Project, and the IWRG's work on indicators as they pertain to Health, Environment & Community Objectives in Watersheds;
 - b) Co-hosted a workshop with the Fraser Basin Council (part of the Scenarios Workshop described in Theme 1 above) that enabled the FBC to further develop their watershed indicators project; and
 - c) Continued work refining the governance structure of the Nechako Watershed Alliance. In November, we formed a sub-committee with partners of the NWA to work towards a model of governance for the NWA as a whole. This sub-committee, to be chaired by Margot Parkes and includes representatives from First Nations, local and provincial government, and the eNGO community, will discuss, develop and write-up a proposed governance structure, and the core features of a terms of reference for the proposed structure. The results of the committee's work will be submitted to the NWA in advance of their February meeting, with the intention that the NWA would proceed with deciding about this proposed governance structure.

Appendix 1. Name and affiliations of individuals who received our introductory letter

Name	Affiliation	City
Chief Martin Louie	Nadleh Whut'en First Nation	Fort Fraser
Chief Dominic Frederick	Lheidli T'enneh First Nation	Prince George
Jennifer Pighin	Lheidli T'enneh First Nation	Prince George
Terry Teegee	Carrier Sekani Tribal Council	Prince George
Christina Ciesielski	Carrier Sekani Tribal Council	Prince George
Chief Richard Peters	Cheslatta First Nation	Burns Lake
Chief Stanley Thomas	Saikuz First Nation	Vanderhoof
Cora McIntosh	Saikuz First Nation	Vanderhoof
Chief Archie Patrick	Stellat'en First Nation	Fraser Lake
Chief Justa Monk	Tl'azt'en First Nation	Fort St. James
Chief Wesley Sam	Ts'il Kaz Koh First Nation	Burns Lake
Chief Fred Sam	Nak'azdli First Nation	Fort St. James
Chief Anita Williams	Takla First Nation	Takla Landing
Keith West	Takla First Nation	Takla Landing
Mike Robertson	Cheslatta First Nation	Burns Lake
Gord Sterrit	Upper Fraser Fisheries Conservation Alliance	Williams Lake
Jordan Point	First Nations Fisheries Council	West Vancouver
Michelle Tung	First Nations Fisheries Council	West Vancouver
Terry Robert	First Nations Fisheries Council	West Vancouver
Chelton van Geloven	Min of Forests, Lands, and Natural Resource Operations	Prince George
John Rex	Min of Forests, Lands, and Natural Resource Operations	Prince George
Guy Scarf	Department of Fisheries and Oceans	Prince George
Phil Taylor	Department of Fisheries and Oceans	Prince George
Mayor Shari Green	City of Prince George	Prince George
Dan Adamson	City of Prince George	Prince George
Mayor Rob MacDougall	District of Ft. St. James	Fort St. James
Mayor Jerry Theissen	District of Vanderhoof	Vanderhoof
Tom Greenaway	Regional District of Bulkley-Nechako	Fort St. James
Lara Beckett	Regional District of Fraser Fort George	Prince George
Jim Martin	Regional District of Fraser Fort George	Prince George
Art Kaehn	Regional District of Fraser Fort George	Prince George
Mayor Luke Strimbold	Village of Burns Lake	Burns Lake
Mayor Dwayne Lindstrom	Village of Fraser Lake	Fraser Lake
David Marshall	Fraser Basin Council	Vancouver
Steve Litke	Fraser Basin Council	Vancouver
Wayne Salewski	Nechako Environment and Water Stewardship Society	Vanderhoof
Cory Williamson	Nechako White Sturgeon Conservation Centre	Vanderhoof
Kathi Zimmerman	Resources North	Prince George

Name	Affiliation	City
Bruce Harrison	Ducks Unlimited	Kamloops
Cathy Ulrich	Northern Health	Prince George
Ronald Chapman	Northern Health	Prince George
Lucy Beck	Northern Health	Prince George
Nichole Cross	First Nation Health Authority	West Vancouver
John DeGagne	Min of Forests, Lands, and Natural Resource Operations	Vanderhoof
Norm Bilodeau	Min of Forests, Lands, and Natural Resource Operations	Prince George
Jun Yin	Min of Forests, Lands, and Natural Resource Operations	Prince George
Zsolt Sary	Min of Forests, Lands, and Natural Resource Operations	Prince George
Laura Grafton	Environmental Farm Planning Advisor	Prince George
Terry Robert	Fraser Basin Council	Prince George
Dave Warburton	Triton Environmental Consulting	Prince George
Derek Ray	Northwest Hydraulic Consultants	North Vancouver