



“protecting Canada’s valuable water resources”

# HYDROECOLOGICAL LANDSCAPES AND PROCESSES

# HELP *News and Notes*

## HELP workshop: November 9-11, London, Ontario

HELP project members and interested parties held a very well received two day workshop in November at the University of Western Ontario. The



Dr. Jim Buttle, project director, opened and convened workshop.

broad goal of the workshop was to start a discussion on what a watershed classification would look like at the national scale and how this classification would help in quantifying the effect of forest management on hydro-

ecological processes using various criteria and indicators. The workshop highlighted three plenary speakers, Drs. Paul Barten, Thorsten Wagener, and Jim Buttle, who presented engaging ideas on the history, science, and application of watershed classification. Presentations were also made by various representatives of federal and provincial governments and industrial partners. The importance of KETE was emphasized by SFMN representative, Margaret Donnelly. “Thought experiments” were conducted in small groups in order to get participants to identify key hydrological processes and the way they might be affected by forest management activities in various ecozones of Canada (see page 3 for your chance to contribute to this thought experiment).

### KEY WORKSHOP OBJECTIVES:

- (1) **PRESENT** different watershed classification schemes relevant for Canada’s forests;
- (2) **IDENTIFY** keystone hydroclimatic / hydrogeomorphic / hydroecological (HC/HG/HE) processes within the classification schemes;
- (3) **IDENTIFY** HC/HG/HE processes that are potentially susceptible to forest management activities;
- (4) **CONSIDER** how HC/HG/HE processes scale from headwaters to drainage basins;
- (5) from 1-4, **IDENTIFY** the constitutive elements of a classification scheme that can be applied across the range of hydrologic conditions encountered in Canada’s various forest landscapes.



Workshop participants in discussion. Twenty people gathered for the two-day workshop held at Western.

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### Workshop feedback:

“Very nice workshop overall and very appropriate for its intended purpose.”  
“A good first meeting for the group.”

# Inside the HELP workshop: Addressing our objectives

## 1a. PRESENTING DIFFERENT PERSPECTIVES ON WATERSHED CLASSIFICATION SCHEMES RELEVANT FOR CANADA'S FORESTS: PLENARY TALKS

**Dr. Paul Barten** of the University of Massachusetts started from first principles of hydrology and gave a convincing overview for the need to classify landscapes both for broadening our understanding of hydrological systems and also to help us manage



Dr. Paul Barten,  
U of Massachusetts

our forests more effectively. He highlighted the importance in considering the historical context, the legacy effects of previous land uses when classifying landscapes. **Dr. Thorsten Wagener** presented a simple climate-runoff based methodology that could be used to classify watersheds. He stressed the importance of considering the hydrological

response we are trying to classify using various measures of watershed form. **Dr. Jim Buttle** presented a recently published hierarchical watershed classification



Dr. Jim Buttle,  
Trent University

system (Devito et al., 2005, HP Today). The paper by Devito et al. (2005) challenges the mainstream thinking of ubiquitously using topographical information for management. The paper served as a useful starting point for a group discussion on made-in-Canada classification systems.



Dr. Thorsten Wagener,  
Penn State University

## 1b. PRESENTING DIFFERENT PERSPECTIVES ON WATERSHED CLASSIFICATION SCHEMES RELEVANT FOR CANADA'S FORESTS: PARTNER'S EXPERIENCES

Industrial and government partners of the HELP project expressed great interest and appreciation for a national classification framework. **Dr. Eric Butterworth** (DUC) commented that DUC already uses classification to help in their site selections. He introduced the idea of using non discharge based indicators of key hydrological processes, such as extent of wetlands. **Kim Green** (Tembec) stressed the heterogeneity of watershed response. For example, interior montane watersheds in British Columbia are very different from watersheds in the wet coastal ranges. Therefore



Dr. Eric Butterworth,  
Ducks Unlimited  
Canada

a classification system must be carefully developed considering spatial heterogeneity and scale effects. **Margaret Donnelly** (representing Louisiana Pacific) further stressed the scale issue and how LP has tried to incorporate hydrology in their management plans. She presented industry's need for science-based guidelines in considering hydro-



Kim Green,  
Tembec

logical effects of forest managements. **Rob Mackereth** from MNR in Ontario gave an example of how hydrological thinking is entering policy through anglers trying to save streams affected by forest management activities. **Peter Hearn**s from MNR in Newfoundland underlined the great need for fundamental hydrological research for the forests they are trying to manage. **John Hall** representing the federal government commented on the fact of lack of hydrological awareness in federal policy circles. He suggested that one way to get "water" in policy documents more effectively is by focusing on the classification of hot spots across the country (i.e., areas experiencing acute water problems such as the western prairie provinces).



Rob Mackereth,  
Natural Resources,  
Government of Ontario

classification of hot spots across the country (i.e., areas experiencing acute water problems such as the western prairie provinces).



Margaret Donnelly,  
Louisiana Pacific



John Hall,  
Canadian Forest Service

# Inside the HELP workshop: Addressing our objectives

## 2 & 3. IDENTIFYING KEYSTONE HYDROLOGICAL PROCESSES THAT ARE POTENTIALLY SUSCEPTIBLE TO FOREST MANAGEMENT ACTIVITIES: THOUGHT EXPERIMENTS

ECOZONE: BOREAL SHIELD	Forest management activity	
Hydrogeomorphic response	<i>Clearcut</i>	<i>Roads</i>
<i>Annual water yield</i>	↑ 2 M	↑ 3 L
<i>Annual peak discharge</i>	↑ 2 H	↑ 1 H
<i>Timing of peak discharge</i>	↓ 1 H	↓ 1 H

**Matrix 1:** Example of management—hydrogeomorphology matrix for the Boreal Shield. Legend: ↑ - expected increase; ↓ - expected decrease; - - no anticipated change; ? - unclear; NA - not applicable in this landscape; 1, 2, 3 - priority ranking for region, where 1st implies great significance or large magnitude; degree of confidence in assessment: H—high, M—medium, L - low.

Participants worked in small groups to apply their hydrological and forest management knowledge and conduct “thought experiments” by filling out two matrices for major ecozones of Canada.

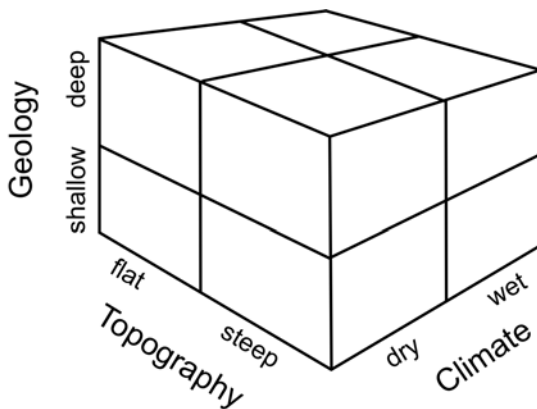


ECOZONE: BOREAL SHIELD	Hydrogeomorphic change, Forest management activity impacts independent of hydrogeomorphic change	
Physical, chemical, biological response	<i>Annual peak discharge</i> ↑	<i>Timing of peak discharge</i> ↓
<i>Water temperature</i>	-	-
<i>Nutrient export</i>	↑ 2 H	?
<i>Benthic indices</i>	?	?

**Matrix 2:** Example of hydrogeomorphology—physical/chemical/biological matrix for the Boreal Shield. Refer to Matrix 1 for legend.

**WATCH FOR A REQUEST FOR YOUR PARTICIPATION IN THOUGHT EXPERIMENT TO BE SENT SHORTLY.**

## 4 & 5. CONSIDERING SCALING OF HYDROLOGICAL PROCESSES & IDENTIFYING THE CONSTITUTIVE ELEMENTS OF A CLASSIFICATION SCHEME : GROUP BRAINSTORMING



One of the key ideas that emerged from our discussions was the close relationship between scale and the constitutive elements (e.g., climate, topography, substrate, vegetation, etc.) of a watershed classification system. **Brad Graham** (PhD, Western) offered the idea of placing watersheds in a three dimensional space (see figure on left). At broad scales (i.e., classification of regional watersheds), perhaps the three most important classifying elements would be climate, geology, and topography). As one narrowed scale (i.e., moving towards low-order catchments), further cubes would be used, where the constitutive elements would differ based on dominant processes.

### KEY WORKSHOP OUTCOMES:

It is reasonable (feasible) to develop a watershed characterization scheme nationally.

However, watershed classification schemes need to be adaptive both in terms of their constitutive elements (e.g., climate, geology) and their treatment of scale (hierarchy of scales from regional catchments to forest stands).

Best way to go forward is to include outside (i.e., national, international) communities (in academia, government, industry, aboriginal communities) in iteratively developing classification system (using online forums, etc.).

The scientific knowledge generated by this work needs to be effectively communicated to partners *via* websites, short articles.

# HELP news:

## I. Collaborative workspace

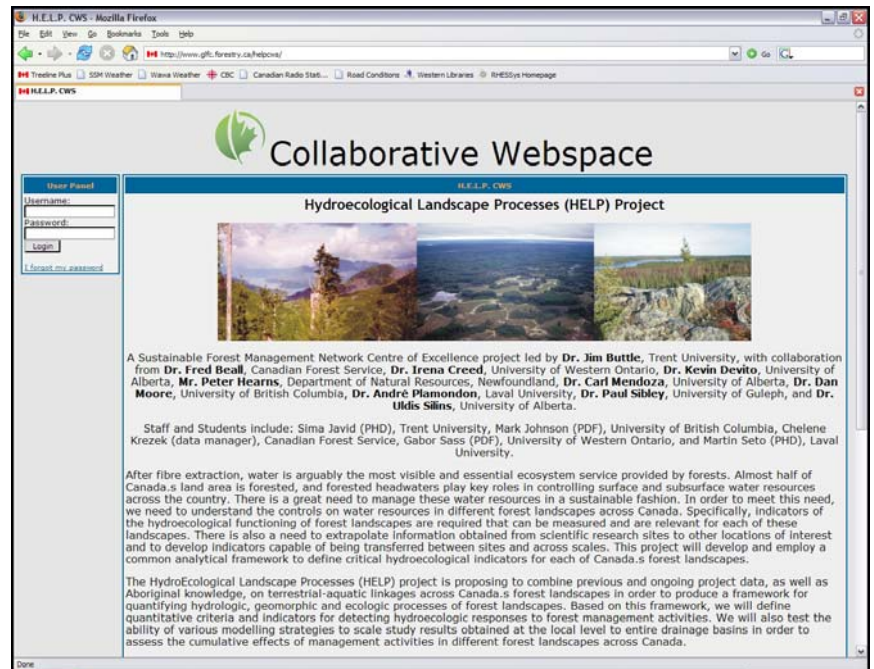
**Chelene Krezek** (Data Manager) has built a collaborative workspace for project members. The workspace will be used for:

- (1) file exchange and transfer (secure groups can be set up to limit access)
- (2) discussion forums
- (3) members contact information
- (4) news postings

The workspace will be expanded to include a public space where we will solicit the participation of outside interests in developing a national watershed classification system. Here we will be posting project updates, relevant articles, thought experiments, etc.



Chelene Krezek  
HELP data  
manager



<http://www.glfc.forestry.ca/helpcws>

## II. Data sharing agreements

Data have been received either through team members, or data sharing agreements signed with partners for the following research sites: Hydrology, Ecology and Disturbance project, AB; Experimental Lakes Area, ON; Mar-mot Creek, AB; Turkey Lakes Watershed, ON; Scalable Indicators of Disturbance sites, ON; and Triton Brook, NF. Discussions are ongoing with Louisiana Pacific for Duck Mountains, MB.

Once a complete list of research sites is compiled further data sharing agreements will be pursued.

A total of 36 research sites have been identified through the literature. Three sites are from the United States including: Marcell, MN; H.J. Andrews, OR; and Hubbard Brook, NH. The remaining 33 sites are within Canada. Of these sites six do not have discharge measurements and are either water quality or limnological studies. Eight of the 33 are undisturbed forested systems. Metadata regarding research design, forestry operations and hydro-logic impacts have been compiled for all sites.

## III. Last but not least...

- **Drs. Jim Buttle and Irena Creed** presented invited talks at the American Geophysical Union's fall meeting in San Francisco in December 2006. Dr. Buttle presented a talk titled: "Characterizing Hydrological Pathways in the Context of Sustainable Forest Management". Dr. Creed's presentation was titled: "Hydrologic Controls on the Trophic Status of Shallow Lakes on the Boreal Plain of Alberta, Canada"
- **Dr. Mark Johnson** (Post-doctoral fellow) is pleased to announce the birth of his son, Noah, who was born at home a little ahead of schedule on October 28th, at 8:57 am and weighing in at 7 lbs 14 oz.

## Contacting HELP researchers and partners

The HELP project is a large collaborative project with 9 Principal Investigators, 1 Data Manager, 2 Post-Docs, 2 Ph.D. students and SFM Network partners comprising aboriginal groups, governments and industries. If you are interested in exploring collaborative work within HELP, please contact project director, Dr. Jim Buttle.

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### Hydroecological landscapes of Canada's forests

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### HELP - us make this newsletter better

We are publishing this newsletter to provide detailed information about progress in the HELP project. Submissions to this newsletter, suggestions about content and corrections to previous editions are always welcome. If you are interested in contributing materials, please call or send email to: Dr. Irena Creed [icreed@uwo.ca; (519)-661-4265] or Dr. Gabor Sass [gabor.sass@uwo.ca; (519)-661-2111 ext.81023].