A Balanced Approach to Managing the Trent Watershed Water Budget

The Coalition for Equitable Water Flow (CEWF) believes that the well-established concept of a water budget will be helpful in developing a more inclusive and comprehensive approach to water management in the Trent River watershed.

The Coalition supports:

- an integrated approach to water management at the watershed level;
- protection and enhancement of water quality;
- water conservation;
- assuring integrity of the watershed environment – including preservation of wildlife habitat;
- recognition of different requirements of multiple stakeholders and the resulting need for a balanced approach to priority setting in terms of water 'allocated' to: navigation on the canal; municipal drinking water; navigation elsewhere in the watershed; hydro-electric power development; agriculture; industry etc.; plus flood control and the ability to manage extreme variations in precipitation (both high and low).

What is a water budget?

A water budget is a quantitative summation of the inputs, outputs and net changes to a particular water resource system over a fixed period, such as a year.

A water budget should take into account the amount of water travelling through the watershed, while indicating where that water is, and how it is being used.

Water budget analysis can be carried out to predict the effect of stresses on extreme flows (both high and low) and groundwater discharge to streams.

What do we know about the Trent watershed?

The Trent River Basin is the largest watershed in Southern Ontario, excluding the Ottawa River watershed, with a drainage area of approximately 12,500 km^2.

The Trent River watershed contains 218 lakes in the "Haliburton Sector" which includes lakes in northern Peterborough County as well as throughout the Haliburton Highlands area. The largest tributaries that drain into the Kawartha Lakes from the Canadian Shield are the Gull, Burnt, and Mississagua Rivers as well as Eel's, Jack, and Nogies Creeks.

The main channel of the Trent River is 253 kilometers long and stretches from Balsam Lake to the Bay of Quinte. It forms the eastern half of the Trent-Severn Waterway, a national historic site that is operated and administered by Parks Canada. The Waterway connects a chain of lakes and canal cuts controlled by dams and navigation locks, including 35 conventional, flight and hydraulic lift locks.

Throughout the system, there are more than 100 water control structures including 50 within the northern reservoir system of lakes in the Haliburton Sector. These structures were originally designed to help maintain navigable water levels on the canal. They also control flow for the generation of hydro-electricity and play a role in flood control.

What do we know about the Trent water budget?

A key focus of Ontario's source-water protection legislation is the production of a water budget for local watersheds. In March 2007, the Trent Conservation Coalition (TCC) produced a Conceptual Water Budget for the Trent River Watershed. This provides a basic understanding of water availability within the watershed.

The TCC noted that overall "there appears to be a sufficient quantity of water available in the basin to meet anthropogenic (human) water use and ecosystem requirement needs for the Trent River and for (its) eight sub-watersheds. These conclusions are based on the current operational practices of the TSW (in 2006).

Based on estimates provided in the TCC report, the Kawartha Lakes West and Rice Lake sub-watersheds are the only two that have a negative water balance. This negative water balance is compensated for by the operation of the TSW dams to facilitate navigation. Although the estimations for the other sub-watersheds show a net gain in water that does not preclude the possibility of local critical low water conditions and groundwater supply shortages.

Factors to consider:

The hydrological regime of the watershed region is highly variable from year to year. The magnitude of the spring runoff peak, for example, depends on both the amount of snow accumulation over the previous winter and the weather conditions during the snowmelt period itself. Also, in some years, the snow melts relatively slowly and steadily and causes no flooding problems in the system. In other years, the melt may be very rapid and may also be accompanied by heavy rain, and under these circumstances severe flooding is much more likely.

Examining maximum usage is important when considering extreme climate (drought) periods where groundwater tables decline, lake water levels are lowered and minimum flows are sustained in our rivers and streams.

Another consideration in low flow periods is to preserve the minimum flow necessary to maintain the ecological integrity of the water body. Water table levels may also decline during summer droughts. The combination of higher demands and reduced aquifer storage could potentially result in water shortages.

Water Use:

The greatest portion of water removed from the watershed is from Municipal Surface Water Intakes. This is largely concentrated in the *Rice Lake, Kawartha Lakes West* and *Lower Trent South Watersheds* and is a direct result of the large municipal

serviced populations in Peterborough, Lindsay and Trenton. It should be noted that much of this water is returned to the system as treated sewage effluent and therefore municipalities are not major net users of water from the system

Unless water is brought into storage prior to use, the agricultural community does not require any permits to take surface or groundwater and therefore data are not readily available for these uses which represent a net loss of flow.

Other uses that involve significant removal of water from the system require a provincial "Permit To Take Water". These uses often involve a net reduction of flow in the system. The issuing of Permits To Take Water (PTTW) varies significantly between sub-watersheds with over 37% of the total PTTW use in the Kawartha West Sub-watershed. 50% of the total PTTW water use is for dewatering pits and quarries and in washing aggregates. Golf courses and aquaculture account for an additional 30% of the total volume of water used. PTTW withdrawals may have important water use effects at a local scale, particularly in summer periods. The affect of the larger withdrawals for aggregate washing and dewatering pits and quarries are of particular concern as they extract the largest volumes of groundwater and surface water.

<u>Value of a balanced approach to managing the water budget:</u>
The TCC water budget summary for the *Trent River Watershed* shows that the watershed receives a sum of 919mm/year water as precipitation (sum of all sub-watershed precipitation), of which 56% is returned back to the atmosphere as evapo-transpiration (ET). (Put another way, there are, on average, 36 inches of precipitation per year of which some 16 inches remain on the land and may enter the streams and rivers and recharge groundwater). The TCC estimates that slightly less than 1% of this 'surplus water' is removed for agriculture, municipal water supply, un-serviced areas and PTTW uses. On average 94% of the surplus water (41% of all precipitation) is recorded as stream-flow at the final outlet, Trenton.

A balanced approach to managing the water budget would include:

- Setting quantitative hydrological targets (e.g. for water allocation, in-stream ecosystem flow requirements, aquifer recharge rates, etc.);
- Using water budget data to aid in decision-making relative to established targets;
- Evaluating the cumulative effects of land and water uses;
- The provision of a sub-watershed scale framework for site-scale studies (e.g. sewage treatment plans, or water supply plans);
- The design of environmental monitoring programs;
- Setting targets for water conservation;
- Establishing long-term water supply plans;
- Identifying data and knowledge gaps;
- Investigating the impacts of climate change; and
- Monitoring excessive nutrient enrichment due to phosphorus contamination from agricultural operations.

CEWF sees value in using the water budget concept to develop a comprehensive, priority-based water management model, capable of better-managing supply and demand under a wide range of climatic conditions thereby optimizing the water resource for all uses including navigation, flood control, reservoir functions, power generation and ecosystem integrity.

CEWF believes that such an approach would benefit shoreline residents of the RAFT lakes in the Haliburton sector of the TSW as follows:

- reduced water-level fluctuations;
- more reliable predictions of water levels;
- more water in the summer and fall as a result of a conservation approach;
- better flood control;
- a healthier ecosystem.

Terminology:

Evapo-transpiration (ET): The sum of evaporation and plant transpiration from the Earth's land surface to atmosphere. ET often exceeds the annual stream-flow in a region.

Water Balance: The relationship between precipitation, evapo-transpiration and storage (in the form of soil moisture and groundwater). A water balance graph shows precipitation and potential ET as line graphs thus allowing a comparison to be made between the supply of water and the (natural) demand for water.

Water Budget: A quantitative summation of the inputs, outputs and net changes to a particular water resource system over a fixed period.

Watershed: The area drained by a river and its tributaries.

Watershed integrity: The ability of a watershed to maintain its characteristic diversity of biological and physical processes such as nutrient cycling, vegetation succession, species adaptation. Watersheds with integrity are resilient and capable of self-renewal within the cumulative effects of human and natural disturbances.

Watershed Management: Managing all the natural resources of a watershed to protect, maintain or improve its desired water budget, both quantity and quality, over time.

References and Further Reading:

Glossary of Terms: Lasting Forests. http://fwie.fw.vt.edu/rhgiles/appendices/glossW.htm

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Conceptual Water Budget: Trent River Watershed (Final Draft) March 2007. Trent Conservation Coalition.

Water Budget - Saugeen, Grey Sauble, Northern Bruce Peninsula Source Protection Region http://www.waterprotection.ca/plan/p-budget.htm