SOURCES OF DRINKING WATER

HIGH CONSERVATION VALUE 4, QUESTION 12

Does the forest provide a significant source of drinking water?

BACKGROUND

The HCVF Framework for Canada recognizes that the potential impact to human communities of loss or damage to sole drinking water supplies is "so significant as to be 'catastrophic' leading to significant loss of productivity, or sickness and death".

Forest areas play an important role in maintaining ecosystem services, including water quality and quantity (MEA 2005). Water quality and quantity are important for sustaining aquatic life and are influenced by the properties of the watershed, including geology, topography, soils, vegetation, and the presence of wetlands. Wetlands provide flood mediation, sediment trapping, nutrient trapping and release, and can play critical roles in both groundwater recharge and discharge. Riparian areas play an important role in regulating water temperature and sedimentation, and in accumulating and releasing nutrients from and to the surrounding forestlands. Water quality and quantity have been used as federal environmental indicators (NRTEE 2003; CCFM 1997); water and the hydrological cycle are clearly important ecological features of boreal forests.

We have identified four principal issues related to how this question has been addressed in HCVF assessments to date:

1. Understanding regional and local hydrology: Determining what water sources are potentially at risk to direct, indirect and/or cumulative impacts from forest management and other activities first requires an analysis of the local and regional hydrology. A hydrological assessment should be the first step toward fully addressing Question 12.

2. Scale of analysis: As with most HCV analyses, evaluations of forests providing a significant source of drinking water should be conducted at multiple scales (*e.g.*, primary, secondary, tertiary, quaternary watersheds).

3. Spatial analysis and maps: A spatial representation of watersheds (including wetlands and drinking water catchment areas, where possible) is important for both understanding and conveying information on hydrology within a forest area.

4. Address water quantity and water quality: Analyses must consider both water quantity and water quality issues associated with forest cover and management.

DATA SOURCES

The HCVF Framework for Canada recommends that forest practitioners consult the relevant authorities (resource management studies, relevant economic development studies, traditional occupancy studies, regional land use plans, *etc.*) to determine if forest management practices could cause serious cumulative or catastrophic impacts on these basic services.

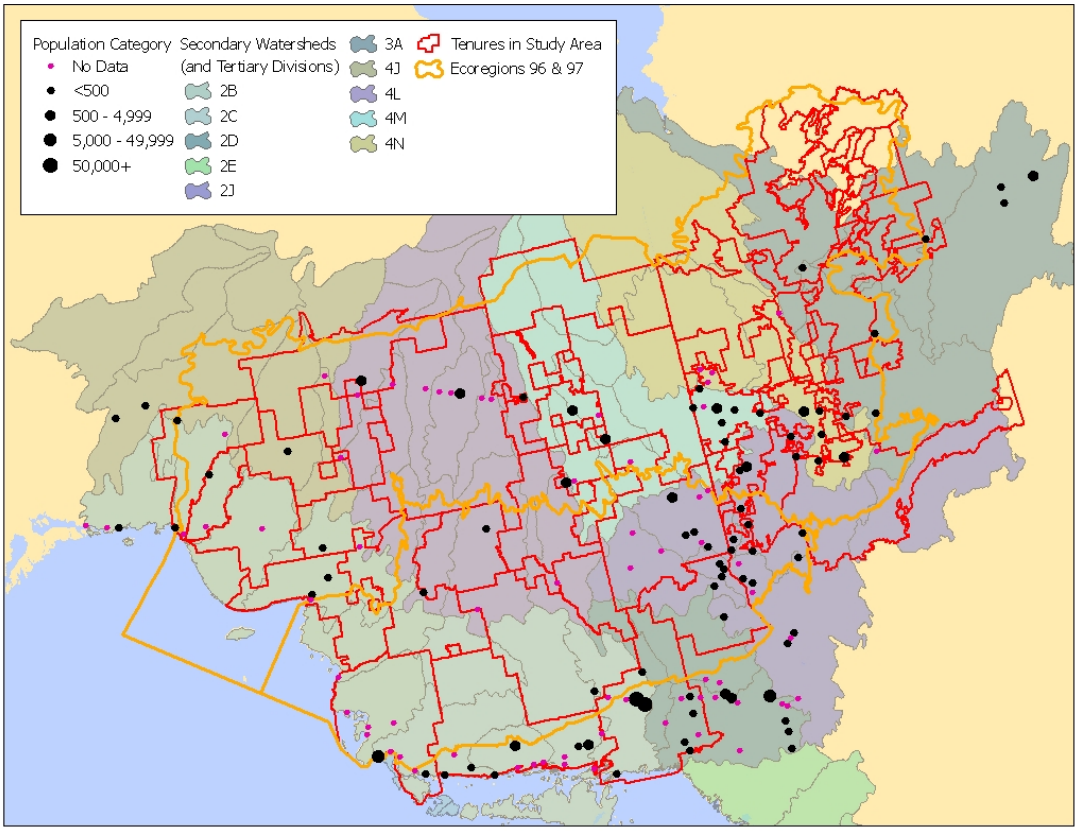
Additional data sources relevant to addressing the issue of drinking water protection include:

- Headwater watersheds from 2nd order streams (Available in Ontario from the OMNR's Water Resource Information Project)
- Canadian Federation of Municipalities – information on wells and other water sources
- Local terrain mapping and base maps showing topography
- Regional watershed plans
- Provincial watershed maps
- Provincially Significant Wetlands (Ontario)
- Ontario Ministry of Environment water well and groundwater information (http://www.ene.gov.on.ca/envision/water.htm)
- Alberta Environment groundwater information (http://www3.gov.ab.ca/env/water/groundwater/index.html)
- BC Ministry of Water, Land and Air Protection

Table 12.1 Population centres by watershed in Gordon Consens Forest.

3' WATERSHED	4' WATERSHED	TOTAL AREA OF 4' WATERSHED (HA)	PROPORTION OF 4' WATERSHED IN GORDEN COSENS	COMMUNITY	POPULATION	TOTAL POPULATION IN 4' WATERSHED
4LD	4LD-01	198,389	98.0%	Fauquier	678	678
4LF	4LF-01	264,997	100.0%	Val Rita	511	9,749
				Kapuskasing	9,238	
	4LF-02	34,857	100.0%	Moonbeam	1,201	1,201
	4LF-03	106,712	100.0%	Harty	511	511
4LJ	4LJ-01	174,336	81.5%	Mattice	900	900
4LL	4LL-01	208,634	84.4%	Opasatika	325	325

Figure 12.1 Centres of population and secondary and tertiary watershed boundaries.



- water well, aquifer and groundwater information (http://wlapwww.gov.bc.ca/wat/gws/)
- Manitoba water information maps (http://www.gov.mb.ca/waterstewardship/water_info/maps/index.html)
- Saskatchewan Water Authority information on groundwater assessments, mapping and wells (http://www.swa.sk.ca/WaterManagement/Groundwater.asp)
- Consultation with local communities and community leaders.

INTERPRETING REGIONAL AND LOCAL SIGNIFICANCE

Analyses of community drinking water supplies should include an examination of not only sole drinking water supplies, but of all regionally and locally significant drinking water sources. Determinations of regional and local significance should be made in consultation with communities. This approach is also consistent with the precautionary principal.

INTERPRETING THE PRECAUTIONARY PRINCIPLE

Analyses of drinking water supplies should consider potential impacts to both water quality and water quantity and should consider cumulative impacts of forest management, other land uses and natural disturbances. For example, post fire flooding and related impacts can result in sediment loading into rivers, streams and wetlands. The potential cumulative impact of a stand-replacing wildfire or a 100 year flood and new forest roads should be considered.

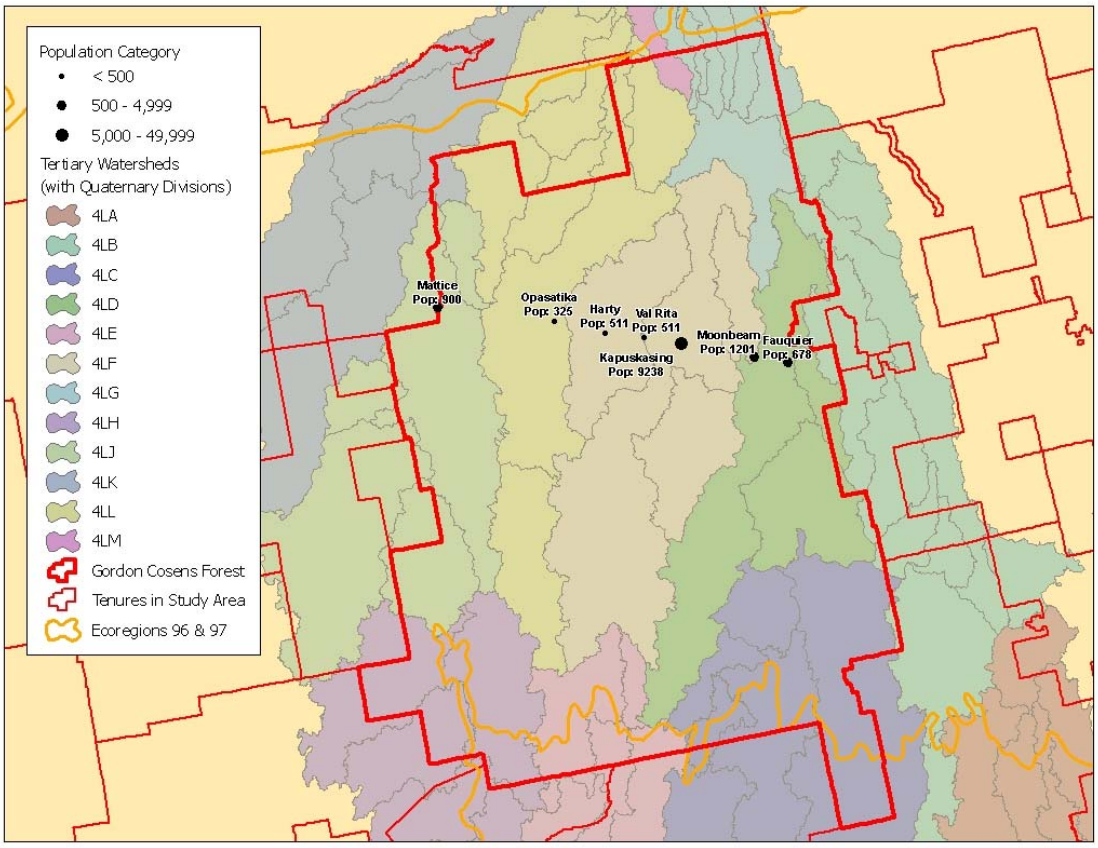
In some areas toxic burdens (*e.g.*, mercury loads) in water are an issue, with toxics re-entering the water column if disturbed. We recommend water testing if historical land use provides reason to suspect toxins may be present. If toxins are present in FMA streams higher precaution per amount of load would be required. In all situations, baselines for water quality and quantity should be established and recorded.

In the absence of completed watershed and/or hydrological flow assessments, it will be difficult to isolate those forest areas or catchments that are of critical importance to maintaining drinking water quality and supplies. Perhaps the most celebrated example is the Catskill/Delaware Watershed (http://www.nyc.gov/html/dep/watershed/home.html), which supplies 90% of the daily needs of the New York City Water Supply for 9 million residents.

ADDITIONAL GUIDANCE

Identifying water recharge areas in the absence of specific data

Figure 12.2 Centres of population within Gordon Cosens Forest and tertiary and quaternary watershed boundaries.



If reservoir or well locations are not available, one approach is to look at relationships between population centres within the tenure, and local and regional drainages.

Figure 12.1 provides an example of this regional perspective, illustrating all secondary and tertiary watersheds intersecting the study area, and the locations of the tenures and population centres. Figure 12.2 scales this down to the level of a single tenure, Gordon Cosens Forest, and shows the tertiary and quaternary watersheds overlaid with centres of population. Table 12.1 provides a summary of the watersheds with communities and the total populations per watershed.

We recommend that direct measurements of hydrology (water level, trends, timing and in-stream flow) be used as indicators of water quantity. We further suggest that a set of water quality indicators be chosen and monitored for HCVFs identified under this category. These indicators may include turbidity, concentration of dissolved organic carbon or nutrients. Suter *et al* (1995) proposed a threshold of 20% reduction in measured physical or chemical parameters as a significance standard for ecological risk assessment. We propose this 20% threshold be applied to HCVFs under Question 12.

We recommend the following question as additional guidance

- If groundwater wells are the source of drinking water for a community, does the groundwater come from one aquifer?

Related HCVF Questions and areas of possible overlap

- Question 13 – Flood control/drought alleviation
- Question 14 – Erosion control
- Question 16 – Impacts to fisheries

SUMMARY OF RECOMMENDATIONS

- Understand regional and local hydrology
- Analyses of drinking water supplies should be conducted at multiple scales (*e.g.*, primary, secondary, tertiary, quaternary watersheds).
- Spatial analysis and maps are important
- Identify all regionally and locally significant drinking water sources as part of HCVF analysis
- Consider cumulative impacts of forest management, other land uses and natural disturbances

LITERATURE CITED

CCFM (Canadian Council of Forest Ministers). 1997. Criteria and indicators of sustainable forest management in Canada. Technical Report. Online: http://www.ccfm.org/ci/pdf/tech/ci_e.pdf

Millenium Ecosystem Assessment. 2005. Ecosystems and human well-being: synthesis. Island Press, Washington, D.C. Online: http://www.millenniumassessment.org/en/Products.Synthesis.aspx

NRTEE (National Round Table on the Environment and Economy). 2003. Environment and sustainable development indicators for Canada. Ottawa, ON. Renouf Publising Co. Ltd. 92 p

Suter, G., B. Sample, D. Jones, T. Ashwood and J. Loar. 1995. Approach and strategy for performing ecological risk assessments for the US Department of Energy's Oak Ridge Reservation: 1995 Revision. Prepared by the Environmental Restoration Risk Assessment Program for the US Department of Energy Office of Environmental Management. ES/ER/TM-33/R2.

METHODOLOGY

Figures 12.1, 12.2, Table 12.1

Sources

- Populated Places. Natural Resources Canada, Atlas of Canada. 1:1,000,000. 2003
- 2001 Census of Canada. Statistics Canada
- Secondary,Tertiary and Quaternary Watersheds. OMNR. 1:20,000. 2002.
- Global Forest Watch Canada. Forest Tenures in Canada.
- Environment Canada & Agriculture Canada. Terrestrial Ecoregions of Canada.

Methodology

- The regional view (Figure 12.1) displayed all data as found, without modification
- The tenure-based view (Figure 12.2; Table 12.1) utilized the 2001 Census figures to set precise population values for communities located within Gordon Cosens Forest, as the Populated Places dataset contains only coded population ranges for communities, and included several "No Data" values for this area