Our Watersheds, Our Future, By Kathryn Lindsay No. words = 1,175

Over the past 60 years the Earth has been warming. The temperature in the Ottawa Valley has risen about half a degree Celsius overall, and wildlife is already responding with changes in species' ranges and breeding patterns. In Algonquin Park, for example, 80 species of birds (68% of those which can be analyzed using information in *Birds of Algonquin Park*, which was published in 2012 by Ron Tozer) are now arriving earlier in the spring, and 31 species (26%) are leaving later in the fall than 40 years ago.

Current climate models project that by 2050 the Ottawa Valley will be on an annual basis about 3^{o} C warmer and 6% wetter than today.

In turn, these changes in climate have been projected to cause a 20% change in the suitability of the Ottawa Valley for birds, mammals and amphibians compared to the present (based on 271 species that could be modelled using climate). Of that 20% change, half is from species being gained as the region gets warmer and wetter and half from species being lost through northward shifts in their climatic envelopes.

So more change is coming. What should we do to get ready?

First off - to manage, we need to measure. It's easy to lose track of incremental change, and end up "dying the death of a thousand cuts". So it's critical that we establish our baseline now and monitor for change. A place to start is with wildlife, water levels and flows, and changes in water quality.

In the Bonnechere River watershed, a few of us initiated community-based RiverWatch program five-years ago to understand local concerns and to begin to assess and track stream condition because no one else was. It's worrisome to us, although not to everyone, that only about half of the stream catchments we have surveyed so far are in good condition. Why that is so, we don't yet know for sure. That work is ongoing.

As is a collaboration with other local volunteer stewardship organizations to map and track flora and fauna in Renfrew County through an on-line biota-base, my long time interest is in understanding and tracking the effects of agriculture and urbanization on birds – first from forest loss and fragmentation and now in relation to farming practices.

We have also been raising awareness through a collaborative, community-based *Nature in Your Neighbourhood* initiative involving field excursions, public presentations, visual and performing arts events, newspaper articles, a blog, a video series of local stewards for broadcast on community cable vision and a *Nature in Your Neighbourhood* guide for the Bonnechere watershed to be launched shortly. Our next step is to engage more actively around climate change impacts and adaptation. A daunting task in a region renowned for its "back-off" attitude, but it's important. Our well-being and the

well-being of generations to come depend on the choices we make today. But the potential consequences of so many independent and unrelated choices are difficult to imagine. To help with that, we have been working with residents in the Bonnechere to envision a series of possible futures. Two factors emerged as the most likely to influence the path forward – the level of local engagement in decision-making and whether decisions are based on a short-term or long-term perspective. For each future, we crafted a narrative that told the story of how the watershed would develop over the next 40 years.

But we all know that a picture is worth a thousand words. So we worked with a local artist to visualize what the Bonnechere River watershed could look like by the middle of this century. It has given us the means to begin to engage with residents of all ages, local governments, and other decision makers in a conversation about choice in a way that is deeply grounded in place, local identity and local distinctiveness.

For example, in the *What's Ours is Yours* future, the watershed is managed 'from the outside' as one big natural resource in a way that is sustainable, particularly for green energy but alienates locals. In *The Great Divide* future, with less local involvement and decision-making based on the short term, the watershed develops with affluent families in the north and industrial agriculture and a mega-dump in the south. In the *Entrepreneurial Boom* future*, t*he local economy is robust with green energy developments, construction and recreational tourism but it is at the expense of environmental quality. And finally, in *The New Rural* future, local engagement in decision making and a long-term perspective combine to retain the best parts of rural living with more equitable attitudes about prosperity and wise investments in sustaining our natural and cultural heritage.

Having a sense of our possible futures, we are then in a position to evaluate them in relation to the present. In the Bonnechere, we asked residents what they value most about their home place. We then assessed the potential effect of each alternative future on those values as a basis for a deeper discussion not only about the choices we make but also about the way that we make them. That required understanding how we govern ourselves today and the policies and plans that inform and guide those decisions.

In the Bonnechere, we have been working to understand who is talking to whom about what concerning the environment. Provincial and county actors appear to have large spheres of influence through the many interactions that their mandates generate, with at least some other actors such as some of the townships. But other actors, including other townships, appear to have a relatively small sphere of interaction and are isolated on the periphery of the governance network. Our challenge then, given an uncertain

future, is to improve on our level of engagement among all actors to enhance our resilience to change including to a changing climate.

In terms of policies, plans and actions, research has shown that existing conservation areas like Algonquin Park not only serve as “refugia” for wildlife but also as “stepping stones” for species on the move. But nature cannot be conserved as an island in a sea of development. For parks to be effective in the face of a changing climate, they need to be resilient as well. That means we need to be attentive to the nature and extent of development around our parks, and to allow only a judicious presence of roads within parks, as roads create movement corridors for invasive species and fragment and disrupt natural habitat – both terrestrial and freshwater.

To recap:

- We need to know our past
- To better understand our present and monitor for change.
- By envisioning our potential futures and considering the consequences to those things we care about.
- We will be better able to adapt as needed as individuals and as a society to not only sustain places such as parks but the home place of each and every one of us, particularly now in the face of our changing climate.

These are our watersheds. Which future will you choose?

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For the climate pattern discussion, 56-year mean values of precipitation (including rainfall and snowfall) and temperature at a centrally located climate station, Drummond centre (Drummond centre and Chatsfalls stations' data combined provide 56-years of data) data was used and summarized in table 4.6. Snowfall and rainfall account for 20% and 79% of the annual

Table 4.5 Annual average precipitation and mean temperature at active climate stations at Mississippi watershed (1994-2005)

Station name	An. Av. Ppn. (mm)	An. Mean Temp. (^{0}C)
Ompah	944.8	5.3
Ompah-seiz	924.7	6.1
Drummond Centre	870.0	6.4
Appleton	869.1	6.3

Table 4.6 Summary of climate data for Drummond centre [1950-2005]

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	An. Total/av.
Prec (mm)	69	57	59	62	75	72	81	88	85	71	82	80	881
Rain (mm)	27	16	33	54	75	72	81	88	85	69	66	32	698
Snow (mm)	42	41	26	8	0	0	0	0	0	2	16	47	183
Max Temp	6	7	15	23	29	31	33	32	29	24	16	9	21
Min Temp	-29	-28	-20	-10	-3	2	6	4	-2	-6	-13	-24	-10
Mean Temp	-11	-10	-2	7	13	17	19	18	14	9	2	-8	5
Potential ET	0	1	6	33	82	116	135	112	71	34	10	1	602

of Canada and studies done by MNR, Moin & Shaw, and Canadian Forestry Service. The temperature in the region ranges from a minimum of -29^{0}C (January) to maximum of 33^{0}C. Although the precipitation is evenly distributed throughout the year, there is a deficit in the precipitation amounts in the summer months (May through August), when potential evapotranspiration rates are high.

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The projected changes in climate and associated runoff patterns in the Mississippi River watershed are expected to create conflicts among competing interests for the basin's water resources. More severe and prolonged low flow conditions when coupled with higher surface water temperatures and the potential for higher nutrient loading will also result in substantial stress on the aquatic ecosystem. Resource management policies and related infrastructure which have been developed based on our past experience and expectations of climate norms will require modification to address a range of social and environmental impacts. At the local level, addressing these will be more difficult given our current administrative structures which are not conducive to integrated planning and decision making.

Results of the reservoir simulations indicate that average annual stream flow will decrease by 10% between the base period (1972 – 2003) and the future period (2070 – 2099). In general, stream flows will increase substantially in the fall (Oct – Dec) and winter (Jan – Feb) periods by 74% and 70% respectively while they will decrease in the spring (Mar – May) and summer (Jun – Sept) by 43% and 66% respectively. On average, spring freshets will occur 6 to 7 weeks earlier in the 2070 – 2099 period than in the 1972 – 2003 period and will be approximately 33 % lower in peak stream flow. Minimum summer flows will decrease by approximately 44% and will persist 28% longer.