

**Reasonable and Urgently Needed Steps to Protect Water in Canada**  
**Dr. John Bacher PhD. June, 2003-Updated August, 2007**

## **1. Stop Proposals for Hydro-Electric Developments that Involve Massive Flooding**

It is not necessary to build hydro electric generating facilities through designs that involve flooding of lands on a significant scale (ie. greater than one kilometer). Such flooding releases mercury toxins trapped in the soil, causing fish in lakes that have been flooded to become inedible. This has had a major negative impact on the diets of native peoples, contributing to their consumption of less healthy foods as substitutes, encouraging a plague of diabetes in many communities. Flooding from power dams, also is a significant contributor to global warming. Flood waters release large amounts of methane into the atmosphere from the rotting of vegetation that is suddenly drowned.

Much of the last large wilderness area on the north-eastern corner of our continent is currently being threatened by flooding from large scale hydro-electric projects. One scheme being reviewed is the proposed diversion of the Rupert River into La Grande. If built, this project would involve the flooding of 1,000 square kilometers of old growth boreal forest. This would destroy the habitat of one of the largest remaining habitats for native brook trout, which is the key indicator species of the health of ecosystems in the eastern half of North America, and has vanished from much of its former habitat.

The Rupert River diversion unfortunately, is not the only massive project being considered in north eastern Canada. A similar scale project, Churchill Falls Two, is being considered by the government of Newfoundland. This would destroy one million acres of boreal forests, and drown nesting sites of the endangered Harlequin Duck and Peregrine Falcon. In addition Hydro-Quebec is proposing massive hydro projects throughout the Ungava Peninsula, even on huge areas which still are, vast roadless areas of pristine tundra, providing habitat for the largest caribou herd on earth.

## **2. Protect Integrity of Remaining Roadless Wilderness Areas In Canada.**

Canada is blessed by the reality that most of its land mass is still, in effect, in large areas of ecologically intact wilderness, without mining, large scale commercial logging, or roads. Many native communities remain "fly-in" settlements, which are inaccessible by roads. One of the effects of these large wilderness areas are that they allow for clean water that can still support healthy and diverse aquatic communities.

Wilderness conditions, where large ecosystems continue to be dominated by natural processes, such as the interaction between caribou and their predators, are important not only for clean water but from a great variety of environmental functions. Canada has the largest remaining free ranging caribou herd in the world. This is the George River herd, which supports around one million migrating animals that roam from the Arctic tundra to the more southern boreal forest. Caribou has been completely extirpated from much of its former range.

Canada's abundant, although shrinking wilderness is far less appreciated than in the United States, where vigorous political battles are engaged to protect the much smaller tracts. Very little work in Canada has been done to identify the remaining wilderness areas. In the time that it takes you to read this paper, industrial incursions have despoiled significant stretches of previously intact ecosystems.

Incursions into wilderness threaten water in many ways. Formerly pristine areas become subject to the dumping of mine waste, which is a major controversy, regarding Northern Ontario's threatened Groundhog River. In Alberta, the industrial assault on the boreal forest is so extensive, with exploration for oil taking place at a rapid rate and the forest being cut up by incursions for seismic testing, that in a few years the only remaining wilderness may be lands which are already designated protected areas such as Wood Buffalo National Park.

It is important to stop the northward extension of the frontier of industrial logging in the boreal forest. This is an area of low grade wood suitable only for pulp and paper products, which can be only commercially logged through clear cut methods. The building of logging roads and clear cutting, will greatly degrade water quality in areas of the boreal forest which are opened up to industrial scale logging.

Following the precedent of the American wilderness legislation, the remaining areas of wilderness in Canada need to be clearly identified. When this mapping is completed, mining and petroleum exploration, road construction, the opening of new mines, the extension of commercial forestry, and new hydro-electric projects in the remaining wilderness areas, should all be prohibited.

It should be recognized that in exchange for permanent wilderness designation, the predominately native communities who live in these areas should receive compensation. This should come in many forms. One would be through the technological transfers to encourage the use of best environmental state of the art community practices in these communities, to provide for such basic needs as energy and clean water, instead of the current harsh conditions caused by the reliance on privy pits and diesel generators. Another should be funds for employment in green industries such as eco-tourism, and for employment and training in various areas related to conservation and ecological restoration.

### **3. Prevent Expansions of Designated Urban Areas**

Next to the massive dams being planned by the governments of Newfoundland and Quebec, the most serious threat to water in Canada comes from urban sprawl. The most practical way to remedy this problem is to prevent future expansions of designated urban areas. Taking this action is also important for encouraging reforestation efforts around cities which are critical components of water protection strategies.

Urban sprawl is a threat to water in complex ways. The most significant is the drying up of recharge areas through paving them over. This reduces the amount of water that is able to percolate through the soil and be released as base flow to feed streams in arid periods such as summer months. Such trends also encourage a short-lived massive and fast release of water following precipitation events, which degrades streams by exacerbating problems of erosion and sedimentation. Potential profits from sprawl also discourage landowners from reforesting parts of their properties that would improve watersheds.

Containing sprawl is an essentially simple, although politically controversial, task. Since municipalities in Canada already have land supplies of at least 30 years, the key is to stop any expansions of this supply for at least the next decade, by opposing all applications for rezoning to permit urban development in rural areas.

#### **4. Stop Rural Severances Outside of Designated Hamlets**

In addition to sprawl harming water through the expansion of designated urban areas with piped municipal services, rural severances have a harmful impact on water quantities and quality. Such severances, which fragment both farms and wooded areas, should be prohibited. Additional residential development in rural areas should be confined to designated hamlets.

#### **5. Encourage Alternative Sewage Technologies in Rural Areas and Have Better Inspections of Existing Systems**

With their lower population densities, in theory, it should be easier to deal with pollution problems from human waste in thinly populated, rural areas. As the Walkerton tragedy however, vividly illustrates, this is not often the actual case, because of a variety of neglected opportunities to use the best available technologies.

If severances are actually curtailed in rural areas, there will be greater development pressures in hamlets that lack piped municipal services. Unless the best available technologies are used in a well regulated manner, health problems may arise and pressure increased for the extension of piped municipal services- increasing the problem of urban sprawl.

One necessary step to cleaner water is to have better inspections of septic systems in rural areas, at least every three years. This can work- the main reason why the Binbrook Reservoir near Hamilton was able to regain its swimming beach was because every septic in the surrounding drainage basin was inspected. Automatic fines, perhaps imposed of the drivers' licenses on anyone who refuses to comply with the inspection requirements of public health officers, is one way to get around this problem.

Currently many smaller municipalities which have piped services have sewage lagoons. Often these have environmental benefits, apart from their immediate water cleaning

functions, most notably as being good habitats for waterfowl- making them under-appreciated tourist attractions. Sewage lagoons can be greatly improved in their ability to clean water, especially regarding discharges of phosphorous, if the effluent which comes out of them is polished by a constructed wetland. This technique of combining a lagoon with a polishing constructed wetland, can be used in a variety of circumstances to treat pollution in rural areas, such as effluent from greenhouses, restaurants, small industries, and leachate collected from landfills.

Constructed wetlands can also be used to treat sewage problems from individual rural homes. An even better method however, one which can also be used in urban environments, is the composting toilet. It is similar in its design principle to the privy pit, with the important difference that these technologies, through their collection tanks and fans, do not have the same amount of odors and can be used consequently, in more densely populated environments. These design modifications also means it is possible to have composting toilets located within a normal home environment, and not as a separate and unheated building.

Grey water restoration systems are commonly used to clean sink and laundry wastes in homes that have composting toilets. These have been designed in ways that can greatly improve the interior of homes, through irrigating flower beds.

## **6. Encourage More Use of Composting Toilet Technologies**

It is astonishing the great variety of environmental benefits that would flow from the greater use of water-less, composting toilets. There would be for instance, no need to spread huge amounts of sewage sludge, laced with untested contaminants, over farmlands, if this technology was the norm. Unfortunately, there are only a few thousand composting toilets in use in North America. Their use is largely confined to such highly protected lands such as national parks and conservation areas.

Getting even a single composting toilet in place and telling people about it, can be a significant achievement. One such victory was achieved by the Friends of Malcomson Park in St. Catharines, Ontario. (this park was named after the founder of the St. Catharines and District Council of Women, Mary Malcomson). When St. Catharines City Council proposed to eliminate its one composting toilet from a city park, the Friends of Malcomson (chaired by Mary Potter a long time member of the Council of Women), persuaded the St. Catharines City Council to relocate it to Malcolmson Park.

## **7. Promote Reforestation in Strategic Rural Land Areas**

Canada has actually made major strides in reducing pollution from major industries. One of the biggest remaining barriers is to eliminate what are termed diverse "non-point", pollution The most effective way of reducing this problem is to encourage reforestation in a strategic sense,

where it will have the greatest impact in terms of promoting water quality. The most economical way to do this is by reforesting a buffer around streams and highly erodible lands in rural areas.

The extent of forest cover in the predominately agricultural areas of Canada outside of the originally non-forested prairie regions, varies greatly. It is illustrative however, of the potential benefits of more forest cover in such regions to consider the good examples of where deforestation was reversed- the largely rural consolidated municipality of Norfolk, Ontario.

Today Norfolk, Ontario is considered in many ways to be a model of good environmental planning in a rural area, which was predominately forested 200 years ago, at the start of European settlement. About a third of the municipality is forested. These forests are protected by some of the best and most well regulated tree cutting by-laws in Ontario. Its streams are well protected. This protection is even extended to streams that are designated as municipal drains under the Drainage Act. Treed buffer strips are included in actual drainage reports under this legislation in Norfolk. Its streams still have healthy populations of native Brook Trout.

It is important however, to realize that Norfolk, was not always the environmental model it later became. One hundred years ago it was widely cited as a negative model of neglect of the environment because of extensive deforestation. Its highly erodible sandy soils in many areas became a desolate wasteland, producing dust bowl conditions. These were so severe that often blowing sand made travel through this region difficult. This problem was solved by an aggressive and successful effort at reforestation.

As part of its ecological restoration plan for the region, Environment Canada has as a goal that 30 percent of rural watershed in the Great Lakes-St. Lawrence basin should be in forest cover. In some areas, notably Kent Essex County and Niagara-on-the-Lake, where the forest cover is only six per cent, meeting this goal would be a big challenge. Such challenges can be met however, by expanding existing forests, and extending forest cover in critical areas such as along water courses. A 100- hundred foot buffer has been found to reduce 40 percent of the nutrients and 75 per cent of the sediments from entering sensitive stream habitats. One practical way to meet these targets is to pay private landowners, who are predominately farmers, to undertake such efforts.

## **8. Eliminate Barriers to Fish Migration**

An important but greatly under appreciated impediment to improving the situation regarding the biological impoverishment of our streams are barriers to fish movement. These barriers are legion- undersized or poorly designed culverts, mill ruins, fences intruding into waters, unauthorized dams, causeways to permit tractor movement across streams and simply the dumping of debris.

As the Niagara Restoration Council has shown, one of the easiest ways to get rid of fish barriers is to get funding to hire someone who can go out and identify these barriers and persuade landowners to remove them. This simple step can eliminate most barriers, although some, such as those created by roads, require more complex steps, such as the redesign of culverts, or replacing them with bridges.

Over the long term, keeping our streams free of fish barriers, should be seen as part of the normal operations of government, instead as is currently the case, a rescue mission by non-governmental environmental organizations. Having a municipal position of Stream Warden would help achieve this. It could ensure that removing fish barriers and preventing them from being created would be a constant priority.

### **9. Promote Effluent Trading- A Needed Tool to Reduce Inertia in Rural Water Issues**

One of the tragic paradoxes, understood by those working on water issues, is that the more expensive issues of industrial pollution are showing substantial signs of progress, where in rural areas comparatively little has been achieved in reducing pollution. This is despite the reality that the rural remedies, such as planting trees in flood plain areas on highly erodible banks not suitable for cropping, are quite cost effective.

The cause of inertia, that stops cost effective remedies in rural areas from being actually carried out in many areas, quickly on a significant scale, was vividly illustrated by author, Ann Strong, from her experience with the Brandywine Watershed Plan, a watershed preservation effort in a rural but urbanizing area, near Philadelphia, Pennsylvania. She found that the biggest barrier to action was the belief of landowners that protecting streams meant that they would forego, “the chance to speculate in the land market” and “the chance of seeking to rezone the land for more lucrative uses.”

Although Strong was writing from an American experience, the reality of landowner hostility and resistance, rooted ultimately in the appeal of land speculation, remains a powerful, if underappreciated barrier to action to improve water quality in Ontario. The strength of such sentiments in rural Canada is vividly illustrated in an experience of the Preservation of Agricultural Lands Society (PALS). This is an organization which became disinclined to widely advertise its annual general meeting, after a chilling experience in 1990 when landowners, backed by municipal politicians, attempted to orchestrate a hostile takeover.

After the disastrous failure of watershed planning on the Brandywine from 1965 to 1971 because of a hostile backlash from rural landowners, Strong found that more positive results were obtained when farmers were clearly told that they would be paid for developing conservation plans on their lands. Through such payments some 20,000 acres of ecologically sensitive lands near streams were placed under conservation easements by the early 1990s, causing the Brandywine to become an appreciated

model of a successful rural ecological restoration effort.

One of the most obvious sources of funds to pay for rural restoration efforts is effluent trading, which addresses the fact that it is more economical to pay farmers to undertake ecological restoration efforts on their own lands than by any other means. Effluent trading is widely and increasingly used in the United States, under the guidance of its Environmental Protection Agency. Plans were underway for similar methods to be used in Ontario, until the Environment Ministry, which would have supervised similar procedures, was devastated by a 30 per cent cut back in its budget in 1995, after a change in government. This is a situation which has still not been reversed.

One of the areas where civil servants in Ontario were especially keen to develop effluent trading in 1995, was the Welland River watershed. They saw the situation here as particularly beneficial for effluent trading since the City of Welland, would have to spend close to \$50 million dollars, to separate its storm from its sanitary sewers, primarily to reduce phosphorous loadings. A far bigger reduction to phosphorous loading would be achieved if this money was paid to farmers on such simple tasks as building lagoons to treat milk-house waste, and reforesting sensitive lands along streams.

The web site of the EPA, provides many examples of how farmers and the environment have benefitted from effluent trading. One interesting arrangement was developed between the Southern Minnesota Beet Sugar Co-operative and its farmers who own it. This requires that for each additional pound of phosphorous to be discharged by the co-operatively owned refinery, that 2.6 pounds of reductions must be obtained. It has very high penalties for non-compliance.

The Southern Minnesota Sugar Beet Co-operative program is part of a wider effort to restore the Minnesota River, with effluent trading playing a major role. Under it farmers closest to streams, or with the most highly-erodible soils, would be the first to receive effluent trading payments. The plan projects that the cost on controlling phosphorus could be reduced from \$18 a pound for point sources alone to \$4-5/ per pound for its targeting to the most cost-effective locations.

The Lower Boise River Effluent Demonstration Project in Idaho found that by focusing on farmers the cost savings would be in the range of \$10-\$158/lb of phosphorus reduced. The state of Connecticut found that trading would result in a \$200 million savings in efforts to reduce nitrogen loadings in Long Island Sound.

In a situation very similar to that of the Welland River, the City of Boulder, Colorado is implementing a program in which it pays for various nonpoint source improvements instead of capital upgrades. It is paying farmers to undertake streambank stabilization and riparian corridor improvements.

Funds to get rural water restoration efforts can come from the general tax base as well

as through trading efforts. What is most important however, is that trading mechanisms can ensure that public funds are spent in the most cost effective manner, which would reduce the considerable political obstacles from landowners who are firmly convinced that they unfairly face a private burden for the greater public good of environmental protection benefits.

### **10. Take Cost-Effective Measures to Reduce Sewage Treatment Plant Over-loads**

One of the biggest sources of water pollution is the over-loading of sewage treatment plants after precipitation events. The key reason for this overloading is the problem of combined storm and sanitary sewers in areas built before 1968, before the separations of these systems were required.

The key to curbing the over flowing sewage treatment plants and to reducing storm water pollution from separated sewers, is to get less water flowing through all systems- storm, sanitary and combined. This means fundamentally, to have more respect for water as a valued resource and not a waste.

Water conservation reduces the amount of water flowing into sewers. A comprehensive approach needs to be taken to ensure effective results. This includes, metering, public education, the distribution of water saving devices such as low flow showerheads and aerators. An obvious massive water saver is low flush toilets and of course, even more composting toilets.

There are a number of measures that can have a quite massive impact on the amount of water going into storm and combined sewers. One is the simple disconnection of eaves troughs from sewers, by directing the water outwards onto lawns and rain barrels. Cisterns have the greatest capacity to hold water, which can be re-used for such purposes as lawn watering without treatment. A water saving method used by the Region of Waterloo was to require cisterns in new subdivisions. Storm water can also be directed into water heating tanks, which can be heated through solar means.

The use of roof top gardens on flat roofs is another massive water conservation device. Roof gardens put rain water that would otherwise rush into sewers to productive use. They can cause roofs to last longer and provide significant energy conservation benefits by modifying temperature extremes- effectively insulating buildings.

Ultimately, like cisterns, roof gardens should be required by municipal by-laws. Before such universal acceptance, they should be encouraged through demonstration in high profile public facilities and financial incentives to landowners and developers to install them.

Better landscaping can be a big method of conserving water, reducing the marginal demands that encourage expansion of water treatment facilities. . One is through the planting of more city trees. Another is through the acceptance of low water landscaping,

through the use of native plants that require less water.

A variety of methods should be employed to slow down and encourage more storm water to percolate through the ground. One necessary measure is to encourage grassed swales instead of the conventional curb and gutters along streets. These should be the norm in new subdivisions, and existing facilities of this kind should be maintained. Well designed and maintained grassed swales, allow water to percolate through the ground before entering storm sewers. Water from parking lots should be directed to flow through such swales, instead of simply being collected directly into sewers. Water passing through swales should have oil grit separators before entering sewers.

Storm water needs to be recognized as needing treatment through constructed wetland facilities. These work most effectively when the effluent entering them is as clean as possible- which is enhanced by a variety of measures such as grassed swales, oil/grit separators, and a two phase screen, which filters sediment before entering the pond or wetland.

### **11. Undertake Stream Restoration in Urban Areas**

The scope for stream restoration in urban areas is quite large. This can involve the “daylighting” of long buried streams. It can also mean preventative action to prevent any more streams from being buried in Canada, through recognizing streams as areas where building is prohibited. In many circumstances, stream restoration in urban areas means replacing concrete linings of streams with living vegetation.

Stream restoration can be achieved in urban areas through the same principles that bring water courses back to life in the less difficult situations in the rural countryside. One clear method is requiring adequate vegetative buffer strips along side of the stream. In St. John’s Newfoundland, creating adequate buffer strips was the key reason the city was able to restore a healthy population of Brook Trout in the stream running through the city. The buffer strips were so effective that they even eliminated toxic leachate discharges from dumps that were killing fish .

### **12. Use Innovative Technologies to Combat Industrial Pollution, Especially in Older Facilities**

While major gains have been made in reducing pollution from industrial sources in Canada, innovative technologies can provide solutions that are especially needed in older facilities which were built before the latest advances in pollution control. This provides new opportunities for new end-of- the- pipe technologies, such as constructed wetlands and solar aquatics, which are wetlands that operate in an enclosed greenhouse environment.

Closed loop systems, in which water is continually reused, have become the norm for new industrial plants. It is difficult however, to install such systems in older industrial plants. It has been estimated for instance, that it would take Niagara area paper mills fifty years to develop such technologies.

Considering the difficulties in modifying older plants, innovative end of the pipe solutions should be encouraged in such situations. This can involve the use of constructed wetlands and solar aquatics, technologies which can create at the same time aesthetic amenities.

### **13 Curb Excesses of Commercial Navigation: Stop Diversions, Channel Widening, Excessive Motorized Pleasure Boats, Invasions of Exotic Species**

Too often commercial navigation in Canada, both its recreational and freight aspects, are uncritically viewed as green industries. In reality, this tends to be less green than rail alternatives. Commercial navigation, needs to be more closely scrutinized.

The key reason for the emergence of the Lake Erie dead zone appears to be the invasion of exotic species. This could be prevented if ocean going ships were required to dock in Montreal, and have their cargos unloaded into lake vessels, as they were required to do so before the building of the Seaway in 1958.

Motorized recreation in boats should be understood as a harmful form of polluting recreation. Such activity should be kept out of all water bodies where it is not already established. It should be much more further restricted, where possible, after appropriate public consultation and research, on waters that it currently exists on, especially where it is not needed for travel to isolated homes.

### **Summary: Opportunities to Clean Water Should Generate Political Empowerment in Canada.**

The vast array of opportunities to clean our water and make it a better support to diverse forms of life, should generate great positive empowerment of the Canadian people. Varied efforts such as stopping an urban expansion, daylighting a buried stream, having a composting toilet established in a park, maintaining grassed swales are all empowering examples of how people can act to restore and protect our nations waters.

