Mending Nova Scotia's broken rivers

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Bob MacDonald watches over the St. Francis River in Guysborough County in this photo from our files. MacDonald and a small, dedicated group of anglers in Mulgrave have helped reverse damage to the river. (AARON BESWICK / Staff)

Once upon a river there were emerald-faceted pools. Their depths flashed gold and silver with the flitting movements of Atlantic salmon and sea trout. Streambanks were sheltered with towering trees. Massive root systems armoured the fertile soils against the ravages of ice and high waters like great fingers holding the earth. Huge trunks and limbs offered cool shade while casting off a shower of leaves needles and insects.

They became important nutrients to the groundwater and direct food for life in the river. As older trees on the banks died and eventually toppled into the stream, their hulks became imbedded in gravel. Sparkling high water plunged over them, reshaping the bottom, maintaining pools and providing shelter for insects, fish and other animals.

Wide and shallow, hot, polluted and with low water levels, many Atlantic rivers today have been transformed into sewers to the sea. Victims of our ignorance and greed, they've gradually been degraded to mere drainage ditches. Efforts to deal with this major ecological disaster have proven grossly inadequate. Acclimatised to only the last chapter of a 300-year horror story, the average person today has never read the book and considers such rivers normal.

There are solutions. Hope lies in restoring and rehabilitating our waterways.

Several hundred years of land "development" commenced with the arrival of white settlers along easter North American shores. Most land clearing was done with meagre thought to how rivers function. Land clearers ignored the role played by large living tree roots in holding riverbanks intact. They also neglected to note the subtle importance of the river's winding or meandering habit, which serves to slov and absorb the energy of the water's downstream flow.

Consider the earth's gravitational pull as felt by downhill skiers. Descending a hill in a straight path generates maximum speed. On the other hand, winding back and forth across and down the slope, a skier's trip becomes longer, and speed is reduced. Rivers and streams, for reasons of geology, hydrology and other natural forces, usually adopt this meandering, slower way, with a "pool — shallow riffle — and turn" sequence repeated until an interruption, such as a rock outcrop, rearranges the pattern. Turns actually function as energy absorbers.

Pre-settlement rivers and streams in eastern North America tended to be more deep and narrow, and longer due to this meander pattern. They were also gradual in slope. Their channels carried less water because historically, when snow melt poured off hillsides into valleys, rivers topped their banks and spread over the surrounding grassy or wooded flood plain. This vegetation on the valley bottom slowed that water, causing water-born sediments to settle out. In early times valley bottoms acted as giant sponges during floods, soaking up water into underlying gravel seams and organic layers. When droughts occurred, these reservoirs of cool, pure water could seep back into rivers to augment flows and maintain fish habitats.

The accumulating soil richness from this process rendered flood plains attractive for agriculture. Farms gradually replaced forests. In the days before electricity, barns were built beside brooks for watering livestock. They are still there, leaching manure. In the woods, logs and pulpwood were cut, hauled and piled along shores over winter periods — to be driven downstream on the high water every spring. Rivers were channelized (straightened) into log "highways" interspersed with dams. By the late 1800s, mill wastes clogged many river channels. Land clearing, drainage projects, channelization and other human endeavours have continued to the present day to erode, flush and straighten rivers, increasing their slope and speed and decreasing their ecological health.

Without trees, riverbanks are more vulnerable to high water and ice. Doubling the speed of a river's flov allows it to erode four times as much bank material and to carry 64 times the amount of material downstream. Widened river channels contain more flood water, capturing the water that once jumped more narrow banks and was then slowed by vegetation and forest cover. Mounds of rapidly eroding bank material now pile up in the channels, diverting flows to the sides, exerting more pressure upon denuded riverbanks during heavy rains or spring run-off. When high water in a fast-flowing, channelized river finally arrives at a turn and slows down, the rubble carried by the current settles to the bottom, eventually plugging the existing channel. This causes increasing pressure on adjacent banks until a nev channel bursts through and carves its way across the valley floor, tearing out trees, topsoil and boulders.

Humans have been clearing land to the water's edge for years, for farming, forest harvesting, homes, cottages, and businesses like golf courses. Heavy rains that used to soaked slowly into flood plain forests now develop hit-and-run patterns over cleared lands. Flooding becomes more common. River beds were raided in the past for gravels to build such things as the Trans Canada Highway. Rivers without riparian zone (shoreline) protection can suffer yet another consequence. Weak-banked and widened, some become ice factories.

When winter descends during low water conditions, wide, shallow rivers sometimes freeze to the bottom. Imagine what that does for the insect life, young salmon and trout hiding in spaces between rocks. When thawing occurs, water begins to flow over existing ice. As temperatures drop below freezing, new ice layers form on top of the ice. Successive layers accumulate with fluctuating weather until thicknesses of more than two metres sometimes develop! That thick ice is finally wrenched off the bottom after a spell of warm weather.

An enhanced form of riverbank bashing then begins. Often these mega-blocks fetch up on bridge abutments, creating ice dams, and flooding neighbourhoods. Newspapers proclaim that nature and the river have run amuck. Humans, albeit unintentionally, have derailed nature's forces to create the more raging, ice-clogged flood situation.

Farmers found that having flood plain water close to the ground surface meant poor root growth for planted crops. They ditch or install drainpipes — often with taxpayers subsidies — to flush water out of the valley floor. This exacerbates the effects of both high and low water. Forest clearcutting in watersheds also produces faster, higher runoff after rains. Humans magnify flood effects even more by emptying storm drains directly into streams and rivers, instead of discharging the water onto flood plains, where it could seep in and enter the watercourse gradually.

There are a host of other problems. Draining and infilling swamps, marshes, and other wetlands destroys their ability to absorb and moderate flood water, to produce clean water and to release flows during low water conditions. Crop irrigation extracts water during critical summer periods. Runoff from fields frequently contributes a witches' brew of fertilizers, silt, pesticides and manure. Years of stream bank trampling by cows and other heavy domestic animals renders streams wide, shallow and polluted. Towns extract drinking water and return sewage.

Not surprisingly, aquatic life has fared poorly. Even headwater streams serve as nurseries for speckled trout. Most older dams were not equipped with functional fish ladders, preventing migratory populations of Atlantic salmon, trout, sturgeon, gaspereau and smelt from reaching spawning grounds. Culverts and bridges are also common impediments. Pools that are so important for adult salmon and trout tend fill in and disappear. Too much distance between pools means that trout and salmon will no longer move up and through the waterway. Acid rain alone has rendered many rivers devoid of salmon in Nova Scotia. Other airborne, heavy-metal pollutants like mercury are seriously affecting fish-eaters like loons. Wide and shallow channels absorb more summertime heat. Cool water contains the extra oxygen which salmon and trout require. As water temperatures exceed 20° Celsius these fish weaken. At 25° C trout and salmon begin to die. Many rivers in New Brunswick and Nova Scotia now reach 30° C.

Degraded rivers are repairable. Nature is slow to heal them without large dead trees. So human help can make a vital difference. The standard cure for river banks made unstable by humans is to place large rock "rip-rap" along them. This requires the use of heavy machinery, and puts sections of the river in a straight jacket. It's a high priced antidote for mismanagement. There are softer restoration technologies proven, more cost effective, and used by fish and game groups and river associations across the Maritimes. These include digger logs (logs placed across a channel in a way that encourages the flow of water to dig a pool), deflectors (placed to trap sediments in the water, while deepening and narrowing the channel), rock sills (to help stop the movement of streambed materials downstream), and tree planting on riverbanks! Restored waterways exist in Atlantic Canada, but funds are scarce and the agents of habitat destruction are still active.

The jurisdictional framework for managing lands along waterways tends to be an overlapping quagmire of municipal, provincial/state, and federal government departments. The federal government's "no net loss" of aquatic habitat policy languishes largely unheeded. Government departments, with agriculture, forestry and other specific mandates, frequently exist to serve clients like farmers, forestry folks, miners, and so on. Each department is run by bureaucrats with scant ecological understanding or background. With economic and accounting blinders on, they tend to serve industrial/business rather than public/environmental interests. The idea of sound, sustainable, ecological underpinnings for their policies is a buzz-word farce. Individual department policies facilitate new development and frequently conflict. As a biologist, I was hired by a provincial government to help volunteer groups restore freshwater habitats. Concurrently, the same government was subsidizing farmers and others to inadvertently destroy fish habitat. One step forward, three steps back. Universally accepted, sensible environmental guidelines for development are a long way off with this chorus line of myopic perspectives and four year mandates.

It is possible to farm, selectively harvest forests, build dwellings and roads, live and have recreational pursuits in harmony with rivers, lakes and wildlife. Instead, we took a river like the Cornwallis in Nova Scotia and added the pig-manure-equivalent of sewage from a city of 250,000. That only stopped when hog farming collapsed. We extract water for irrigation and other purposes until, at one point, 120% of th available water was spoken for in permits. What about fish, beaver, otter and others? Water taken for one town returns as treated sewage in volumes that are sometimes equal to the flow in the river. When sampling determined that the river was too contaminated to irrigate strawberries, the solution was to cu the funding for the monitoring!

Implicated farmers point to towns. Towns, in their turn, blame farmers. When will we wake up? A blessed few look in the mirror, see themselves as part of the problem, and begin to do something positive.

Our rivers, streams and lakes could use more of these people.

Nova Scotia Naturally is a monthly column by Wildland Writers, a roster of Nova Scotia wilderness experts. This group includes Donna Crossland, David Patriquin, Bob Bancroft, Alain Belliveau, Mark Elderkin, Matt Miller, William Martin and Jamie Simpson.

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