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Real economic growth

20 Jul 2010 Ole Hendrickson

That being said, there is ample room for growth on this planet. In fact this planet is all about growth. This is easy to appreciate when the leaves have just unfolded from their buds, the geese are parading their goslings, the grass is growing like stink, and generally all creatures are busy making more of their kind.

Many economists now accept that all this activity contributes to economic growth. Life does important things that are worth lots of money, such running the global water pumps, making food and timber, providing us with oxygen, outdoor recreation opportunities, and so forth.

But some economists, including those who run our national accounts, disagree. They believe that GDP is just perfect as a way of measuring Canada's economic performance, thank you. Accounting for benefits provided by nature (or any losses of these benefits) would be a frivolous exercise.

Never mind that economics is supposed to help people (and governments) make the right choices when they spend money. Or that the oil gushing from the exploded Deepwater Horizon drilling rig actually increases global GDP.

Did you know that GDP, as an accepted measure of the progress of society, is only a few decades old? Economists decided fairly recently that the market value of all final goods and services made each year within the borders of a country is the best way to measure "standard of living". How ironic - measuring the quality of life while ignoring life!

To be more precise, the current practice of national income accounting was developed during the Second World War by Richard Stone and James Meade while they were working as civil servants in the British Cabinet Office. Stone received the Nobel Prize in economics in 1984 for this work, and also for developing the concept of double entry accounting. Basically, the income items on one side of the balance

sheet must be balanced by the expenditure items on the opposite side of the accounting sheet.

Sound accounting principles are important and have their place, but unfortunately, Nature doesn't count in this system. Rainfall, oxygen, even beauty - all these things, and many more "public goods" - are free. No one pays, no one gets paid. There are no markets. Life doesn't measure up in a GDP world.

We need growth - natural growth. Let's say you decide to convert part of your lawn to a garden, including some wilder areas with native shrubs and flowers to maintain a healthy bee population to pollinate the fruits and vegetables. If you eat your own produce or give it away instead of selling it - this is bad for the economy. It doesn't grow GDP. The conventional economists want you to keep mowing that lawn, buying a new mower every few years, and burning that gasoline.

Or say you're a farmer selling your crops. The conventional economists want you to grow as much as possible. Plow right down to the stream. Who cares if the soil washes away and the fish get choked out by siltation? No one will pay you to look after nature. Maximize that GDP.

There are other economists who recognize the need to change how we value and measure nature's benefits and reward people who look after them. Maybe it's time for the public to have a say in this.

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The Turtle Awakens

17 Jan 2007

At the start of a trip into town the next day we saw a female snapping turtle laying eggs in a sandy area alongside the cottage road, maybe 50 meters from the water. On Monday I was working alone at the cottage and I saw her again. She was stuck on our deck at the top of the steps leading down to the beach, unable to move forward or retreat.

Messing around with snapping turtles is generally not recommended. According to the web site of the Kawartha Lakes Turtle Watch, they can rise up on their legs, rock back and forth, hiss with their mouths wide open, and lunge forward and snap with their powerful jaws.

However, this particular female seemed pretty harmless after her egg-laying expedition. I picked her up, carried her to the base of the steps, and watched her slow progress back to the river. Later that year I found a young turtle following in its mother's footsteps.

Winter survival is even more remarkable than turtle reproduction. Imagine spending months submerged in a frozen lake, half buried in the mud. Like frogs, turtles can get oxygen directly from the water. Unlike frogs, most of the turtle's body is covered by its hard, impermeable shell. Turtles breathe underwater through special patches, with lots of blood vessels, on their throats and near the base of their tails. They also slow their heart rate down to around one beat every ten minutes. A turtle's sleep is far

deeper than any mammal's.

On rare occasions turtles wake up and swim under the ice in winter. Painted turtles sometimes emerge from hibernation before all the ice is gone in spring.

For a male turtle, hibernation isn't just about coping with long, cold winters. If it is prevented from hibernating - for example, kept indoors as a pet - it loses its ability to father offspring. Removing a turtle from the wild is a cruel act.

Although snapping and painted turtles are common here, the Ottawa River watershed is noteworthy for its large number of nationally-listed turtle species at risk. The spotted turtle is nationally endangered. Blanding's, spiny softshell, stinkpot, northern map, and wood turtles are also all at risk of extinction and have significant populations in the watershed.

The main threat to turtles is habitat loss. If you have waterfront property, maintaining or restoring natural shoreline vegetation is an excellent way to provide habitat for feeding and basking, and access to egg-laying areas. Other harmful habitat changes include development of upland nesting sites (sandy areas near water), use of herbicides, wetland drainage, river channelization, and water impoundment.

All turtles lay eggs on the land, and some species (e.g., wood turtles and spotted turtles) spend considerable amounts of time in moist forests. This, unfortunately, makes them vulnerable to illegal collecting for the pet trade, contributing to their decline.

Road kill is a significant cause of death for many turtle species. Adult females, which are particularly important for turtle survival, often choose roadsides for nesting. Here they can fall victim to vehicle traffic. Canada's leading turtle expert, Dr. Ron Brooks of the University of Guelph, warns that even 1-2% additional adult mortality from road kill can hasten extinction. Where local naturalists' clubs have put up turtle crossing signs, please drive with caution, especially in spring.

Aboriginal peoples recognize turtles as one of our most remarkable cousins. For many, turtles symbolize the world itself and are worthy of great respect and care.

Ole Hendrickson is a member of the Ottawa River Institute, a non-profit, charitable organization based in the Ottawa Valley supported by volunteers, local donors and a grant from the Ontario Trillium Foundation.

Leaves at your service

09 Jan 2006

Here, more than halfway between the Equator and North Pole, the sun provides too little energy in winter for most green plants to remain active. With tree leaves and needles inactive, cycles of water and carbon slow down. Average humidity decreases, and carbon dioxide levels rise.

When growth resumes in spring, leaves remove carbon from the atmosphere (for photosynthesis) and release water (through transpiration). Huge amounts of solar energy are expended to pump water from land to atmosphere, both directly (evaporation) and through plant leaves (transpiration). Evapotranspiration vastly exceeds photosynthesis in terms of total solar energy use.

Forests act as a giant air conditioner. Compared to bare ground, forests have far more surface area of

leaves which release water to the air. The surface area of leaves can be three to five times the surface area of the ground (even higher in dense forests).

This ratio, known as leaf area index, is a key variable in global models of hydrology and climate.

Water pumped through leaf pores, or evaporated from leaf surfaces, not only cools the earth directly (like sweat evaporating from your body), but also forms clouds that provide welcome shade in summer.

Green plants play a central role in maintaining the hydrologic cycle. This is one of the most important global ecosystem services. Over any large continent, much of the precipitation consists of water that has been recycled back to the atmosphere through the action of green plants.

Scientists now use the terms "green water" and "blue water" to distinguish between water that is cycled through plants, and water that evaporates directly from lakes and oceans.

In our northerly latitudes, transpiration largely shuts down in winter and moisture is retained in the soil. River flows increase during late fall, winter and early spring when transpiration rates are low.

Over tropical landscapes, transpiration by green plants dominates the hydrologic cycle year-round. Tropical forests are the planet's primary humidifiers.

Leaf area index can be used as a measure of how much a given part of the landscape contributes to global hydrologic cycles.

Leaf area index is highly related to nutrient cycling, in itself a key ecosystem service. Decomposing leaves return nutrients and organic matter to the soil. Decomposer organisms are most active in parts of the landscape where the leaf area index approaches the maximum for a given climate zone. They build soil organic matter and increase soil's capacity to absorb and hold water. This recharges groundwater reservoirs and reduces flooding in downstream areas when high precipitation events occur. Groundwater recharge and flood control are vital for human well-being.

Plant leaves provide many ecosystem services: regulation of climate, floods, and water quality; and supporting services such as soil formation, photosynthesis, and nutrient cycling.

The greenness of an area as seen in satellite photographs can tell how high the leaf area index is for that particular landscape.

Places with high leaf area indexes - well-managed forests, agricultural landscapes with hedgerows and woodlots, native prairies - improve the quality of life for everyone on the planet.

Rural communities such as those here in the Ottawa Valley deserve recognition and reward for the valuable ecosystem services they provide. Reforming economic systems to account for this value would bring benefits to all.

Ole Hendrickson is a member of the Ottawa River Institute, a non-profit, charitable organization based in the Ottawa Valley supported by volunteers, local donors and a grant from the Ontario Trillium Foundation.

Wars over Wetlands

28 Aug 2005

Healy says the City of Ottawa is stealing his land by giving it a wetlands designation that will reduce its value by 80%. Since it contained vegetation protected as wetlands, he decided to remove the vegetation.

Not far away, near the Corel Centre, the City of Ottawa is allowing developers to fill wetlands in the Carp River floodplain. Environmental groups such as the Sierra Club and Ottawa Riverkeeper warn that this will lead to flooding, degraded water quality, and sewer backups. They point out that these problems are already occurring in other parts of the west end.

The developers have hired consultants and engineers. They say their studies prove that flooding won't be a problem in the Carp River watershed. Some critics counter that you can always find a consultant who will give the developers the results they want.

Will the government make sure that your new house isn't in a flood-prone area, and that activities occurring upstream won't damage it? Don't count on it.

A cynic might conclude that the City of Ottawa makes wetlands decisions based on the landowner's ability to come up with the cash to hire a consultant.

These shenanigans in Ottawa are rather unusual. Most jurisdictions prohibit development on floodplains. Otherwise, the developers may get rich, but taxpayers pay - bailouts when property damage occurs, increased water treatment costs, repairs to sewer systems, and so on.

Wildlife suffers as well - fish and waterfowl disappear.

Ducks Unlimited has a nice display on wetlands at the Ottawa airport, right in the area where you wait in line to clear security. City of Ottawa officials should check it out.

Saddam Hussein destroyed wetlands to get rid of people he didn't like. He drained the Mesopotamian marshes, home of the Marsh Arabs. Some say they were the Garden of Eden. Now there are heroic - and partly successful - efforts to restore these globally unique wetlands and their associated human cultures.

Another reason to preserve wetlands is that they soak up greenhouse gases that come from burning fossil fuels. Studies of the Mer Bleue bog on the east side of Ottawa show that it has been a "carbon sink" six years running. Some years are close to break even, but in years with warm and wet autumns the bog stores a lot of new carbon in its peaty soils.

Now to be fair, there are many hectares of prime agricultural land in southern Canada that started out as wetlands. No one is proposing to pull out the tile drains and let that land go wild again.

But neither do we want our oceans to end up like the Gulf of Mexico. The Mississippi River is so full of nitrogen and phosphorus that a vast "dead zone" extends from its delta hundreds of kilometres out into the Gulf. There are no fish, no shrimp - only primitive bacteria that can live without oxygen.

A big part of the nutrient pollution in the Mississippi comes from Iowa farmlands. U.S. Department of Agriculture officials are paying farmers to restore floodplain and wetland vegetation. They are trying to make scarce tax dollars go as far as possible by targeting nutrient hotspots such as tile drain outlets.

Getting back to Doug Healy and other wetland owners, do they deserve compensation when governments identify wetlands on their property? Look at it this way. Wetlands provide valuable services - flood

control, water purification, fish habitat, carbon sinks, and so forth.

Why shouldn't governments put a value on this, and start making "payments for ecosystem services"?

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What Smokey forgot

10 Jul 2005

Smokey got the message out effectively: carelessness destroys forests. He taught us to look after our campfires, which is a good thing.

Too bad he didn't give us the whole picture.

Fires happen no matter how careful people are. Lightning strikes burn far more acres of forest than human carelessness. We simply can't prevent all fires.

Nor would we want to.

Fire is one of the great ecological forces shaping life on the planet. Fire rejuvenates prairies, forests, and even wetlands.

In the absence of periodic fires, trees and shrubs encroach on mountain meadows. Habitat for elk and antelope disappears. Lack of fire in the B.C. interior has created a monotonous landscape of mature lodgepole pine stands, with high risks of catastrophic fires, insect outbreaks, or both. The current devastating mountain pine beetle outbreak has been worsened by global warming, but past fire control practices created prime habitat for the beetle.

When housing developments spread into fire-prone forests, fire suppression becomes an issue of protecting life and property. But this is just like building homes on a hurricane-prone coast: the odds are that the big one will come, sooner or later.

Fire needn't be a disaster. Over-zealous efforts to suppress fire have created stands with too many trees, prone to drought and disease, many with dying branches and stems. This is a prescription for catastrophic fires.

Maybe Smokey spent too much time among humans. Maybe he'd stopped eating blueberries and other foods that flourish in post-fire environments. He should have gone back to his roots, and explained fire from Nature's perspective.

Fire created the great white and red pine forests of the Great Lakes and Ottawa Valley regions. These were not great conflagrations, but gentler surface fires that burned off surface organic soil horizons, cleared away fir seedlings, and created space for the next generation of pine seedlings. Mature pines, with thick bark and no lower branches that allow "laddering" of fire up the stem, easily survived these surface fires. Over time, pines became more and more dominant in the landscape.

Our efforts to control fire have reversed this process. Denser forests of maple, birch, fir, and poplar occupy lands where great pines once stood.

Further north in the boreal region, crown fires transform immense tracts of spruces and pines into smoking, charred skeletons. Surface soil is reduced to ash. But here too, fire brings new life. Cones are opened by the heat, seeds are shed, and phoenix-like, spruce and pine seedlings rise from the ashes.

We can change the way change happens, but we cannot stop change itself.

Earlier peoples understood this much better than we do. For them, fire was a tool for deliberately shaping landscapes.

Scientists were ridiculed when they first raised the possibility that native Americans made extensive use of fire. Today, scientists are learning aboriginal burning techniques and applying them as part of the management toolkit.

Australia is one of the last places where native people have continued their traditional burning practices in uninterrupted fashion. They set fires almost casually, at times of the year when no one would dare burn an area that had not been burned regularly.

Left to itself, Nature often creates ecosystems where fires burn too fiercely for human safety. Use of regular, prescribed fire can restrain Nature's propensity to allow dangerous wild fires.

It's a sign of just how disconnected Smokey had gotten from his roots that he never explained this to us.

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Return of the beaver

01 Sep 2004

Hauling gravel in, hauling trees out forestry these days is as much about road construction as it is about cutting timber. Rivers are obstacles to be met with bridges and or culverts, rather than means of driving logs.

According to the Algonquin Park canoe map, "Basin Depot was a supply and stopping site for loggers of the Barnet and McLachlin Companies from about 1850 to 1913, with ten buildings and a post office in 1890." On the logging road providing access to the upper Bonnechere River watershed, two buildings still stand where the road crosses the Basin Lake outlet stream.

The Park map shows Basin Lake as a zone for future development, but it's hard to see what might draw tourists. The only real attraction of the lake, its solitude, would be quickly compromised by development. One excellent campsite can be found on an island at the north end where glaciers left a pile of coarse gravel that now stands covered with pines.

On a quiet evening you can sit in the middle of the lake in your canoe and watch the stars come out, while bats fly about picking off mosquitoes. The only sounds are the loon's cry, the kingfisher's rattle, the slap of a beaver's tail, and the low rumble of thunder associated with flashes of lightning on the northern horizon.

Now that the river is no longer used for log drives, the beavers have picked up the slack. Around every bend on the upper Bonnechere there seems to be another beaver dam. A silver maple fallen across the channel makes a convenient starting point from a beaver's perspective, but if none is available piling branches works just as well.

Paddling down the Bonnechere can get tedious stop at the log blocking the river, climb out of the canoe onto the log, cling there while you drag the canoe over, push off and jump back in with a hand on either side for balance. Beaver dams made strictly of branches are more fun. Pick a low spot, paddle like crazy, and see if you can slide all the way over without getting hung up.

Throughout its length the Bonnechere passes through relatively flat terrain, unlike other tributaries of the Ottawa River in our area the Madawaska, Petawawa, Coulonge, or Dumoine. There are no cliffs or steep hills along the shoreline, and the rapids are shallow and rocky. Just before the river leaves Algonquin Park it passes through some "rock gardens". Signs for the portages are missing, which likely means they haven't been recently cleared of deadfall. This doesn't matter if you float your canoe down the rapids, slipping and sliding on the rocks behind it. There is always the temptation to jump in, followed by the disappointment of grinding to a halt on a rock.

Canoe racing on a river choked with beaver dams and deadfall, with an occasional set of shallow rapids, would make an excellent Olympic sport. It would be much more entertaining than watching canoeists on the artificial rapids built for the recent games in Athens.

Trapping and river modification by logging decimated beaver populations a hundred years ago. Today their numbers have rebounded. They probably exceed historic levels where logging has converted river banks from mature conifers into younger alder, aspen, and maple.

The beaver's resilience and tenacity make it a fitting symbol for Canada.

Ole Hendrickson is a founding member of the Ottawa River Institute, a non-profit, charitable organization based in the Ottawa Valley.

Cultural landscapes

28 Aug 2004

Sacred mountains are found in the Himalayas, the Andes, in Japan, and indeed in most parts of the world. Here people go for contemplation and meditation, for refuge and respite from the pressures of the busy world below, or on a pilgrimage to challenge body and mind.

The world is also still dotted with sacred forest groves, tended with care by local residents. One of Japan's national parks on the southern island of Kyushu contains the spot where tradition says that the first man and woman were placed on Earth. The surrounding forest contains majestic Japanese cedars comparable in size to the redwoods of the Pacific coast of North America. Many of these trees were planted and nurtured by monks who lived on this site for countless years.

In 1992 the World Heritage Convention became the first international legal instrument to recognize and protect cultural landscapes. In Canada this convention is generally associated with national parks and other areas of high scenic value. Elsewhere, the World Heritage Convention is being used to help maintain traditional cultures within culturally modified landscapes.

Many European countries have included agricultural landscapes with rural communities and farms on the World Heritage List. Such a landscape in Spain or Portugal might include open oak woodlands managed for production of cork and charcoal, mixed with grazing lands, and interspersed with dry stone walls, olive groves, vineyards, and networks of paths linking neighboring villages.

Indigenous peoples of North America used controlled fires, planted trees and crops, built sacred sites (including burial grounds), and generally modified landscapes in significant but less dramatic ways than the European settlers who followed them. Identifying and respecting the sacred sites of indigenous peoples has become a significant factor in the environmental assessment of new development proposals. Many World Heritage sites include places sacred to indigenous peoples.

There is increasing awareness and concern about the loss of indigenous cultures and languages and the traditional, landscape-based knowledge they embody. Although perhaps 6000 languages are still spoken around the world, many are fast disappearing. Traditional knowledge is largely oral. Whenever a speaker of a rare language passes away, his or her knowledge of medicinal plants, crop varieties and their uses, or special hunting and fishing areas may also be lost.

European countries often have special policies benefiting the inhabitants of culturally significant landscapes. Farmers using traditional agricultural practices receive support payments or are protected by tariff barriers from competing food imports. Planning laws are in place to prevent urban and industrial development in these areas.

Free trade purists are vehemently opposed to these policies, but the political support for them is strong. It comes not only from rural residents who benefit directly, but from urban dwellers seeking restful summer vacations.

The Ottawa Valley has rural landscapes of stunning beauty, created by a mixture of traditional farming and forestry practices. Stone fences, log houses and barns, unpaved rural roads winding through hills and lakes, and cattle grazing in rolling pastures attract people seeking release from the stress of city life. We also have more ancient traditions represented by the Algonquin people whose knowledge of this area goes back many generations.

In North America we have grown accustomed to rapid change, and we are rapidly losing an appreciation of the spiritual and cultural dimensions of the places we inhabit. Yet, our rural landscapes still have beauty and cultural significance, and represent the logical starting points to reverse this trend.

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Nature's waste treatment specialists

24 Jul 2004

Shorelines are special from an ecological perspective as well. They harbor unique communities of plants and animals. From Atlantic salt marshes teeming with fiddler crabs, through the spruce and alder thickets lining boreal lakes, to flower-strewn meadows along mountain streams, these are places where the world seems more alive.

Liquid water, like life, is always in motion. Just over ten thousand years ago Canada lay trapped under glaciers, miles thick. Glacial meltwaters formed lakes as big as entire provinces, which overflowed and carved canyons through solid rock in their rush to the sea. Elsewhere, remnant pockets of ice stubbornly and slowly melted in place, leaving a bog-strewn landscape.

Our diverse wetlands range from the vast peatlands surrounding Hudson Bay to a fringe of cat-tails along a country road. Everywhere water is moving, seeping downward to fill crevices in bedrock, or persistently and forcefully drawn upwards through the stem and needles of a bog-side tamarack. Escaping as vapor into the air on a hot day, water rushes upwards into towering cumulus clouds, only to crash back to earth in a thunderous downpour.

Even we humans are mostly water, made of billions of water-filled cells mobile wetlands.

Maybe the water you drink comes in a plastic bottle, filled at a giant bottling plant after being drawn from the lake and purified through reverse osmosis, or pumped from an underground aquifer. Still, you should care - we should all care - about that lake or aquifer, and its watershed, and the plants and animals that live there. One day a water molecule is in one of them, a few days later it is in you.

And so it continues.

A previous column mentioned the "dead zone" in Lake Erie. Invasive zebra mussels are growing and dying with unprecedented speed, providing an over-abundant feast for bacteria and other decay organisms. Excessive amounts of nitrogen and phosphorus are released, depleting oxygen, and triggering fish kills and botulism epidemics in waterfowl. Perversely, the mussels can survive in this oxygen-depleted soup far better than most organisms.

Please don't get the impression that bacteria are bad, or that oxygen-depleted (or anaerobic) zones are inherently unnatural. Nothing could be further from the truth. In fact, nearly all healthy wetlands have anaerobic zones. Healthy cows do too. And so do humans. After we eat a sizable meal anaerobic bacteria in our own bodies generate small amounts of methane. With heavy physical exercise, our muscle cells shift into anaerobic mode.

Wetlands, and wetland bacteria, are particularly good at shifting into anaerobic mode when oxygen is in short supply. They have to be, for several reasons. Heavy rains flush fertilizers from the uplands, or cause floods that deposit fertilizers and fresh organic matter as they recede. Coastal wetlands get a daily dose of organic matter through tidal action. Furthermore, all living organisms excrete wastes and a lot of these wastes end up where water meets land. All of this is food for decomposition, which uses up oxygen. When the oxygen is depleted, the wetlands switch to anaerobic decomposition to complete their jobs. They do this any time the oxygen gets low, which would be daily in a salt marsh, or after heavy rains in other wetlands.

Whether in sewage plants or wetlands, much waste treatment is done by anaerobic bacteria. They process wastes into gases such as carbon dioxide, nitrogen and methane that are released to the atmosphere. Remaining solids become organic soil enhancers. In poorly-drained wetlands such as bogs, organic solids accumulate as peat, which may, over many centuries, turn into coal.

Wetlands are specialists in water purification and waste treatment, two of the "free" ecosystem services that nature provides.

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Invasion of the aliens

26 Jun 2004

Their target: firewood.

Many people load up their vehicles with wood before heading out of the city for the weekend. Perhaps you just cut up a dying tree on your suburban lot. Why not take it to the cottage to fuel the wood stove on a cool morning? If you happen to live around Detroit, this is a criminal offense.

Before concluding that this exemplifies government stupidity, consider what is at stake. Ash trees are risk of virtual extinction from a voracious, shiny green beetle accidentally imported from China. Besides being one of our most common street trees, ashes are used in snowshoes, canoes, axe handles, hockey sticks, and native basketry.

When ash trees around Detroit and Windsor began dying, officials were puzzled. Some thought a new fungal disease was at work, like the ones killing chestnuts, elms, butternuts, and pines. When evidence began pointing to the beetle, no one in North America was capable of identifying it, or knew where it came from, or what it did there.

The emerald ash borer, as it is now called, is not a particularly well-known or serious pest in China. Like most invasive alien species, this insect left its predators and parasites behind when it arrived in North America. It found new elm species much to its taste: closely related to its native hosts, but without resistance developed through prior exposure and natural selection.

Almost certainly the beetle arrived in a trade shipment, hiding under the bark of a cheap wooden pallet or packing crate. Global trade means increasing global spread of pests.

Plant health agencies are under extreme pressure to maintain the flow of trade goods. Proposed sanitary measures often meet resistance. Monitoring of shipments is expensive, staff budgets are limited. New crises are met with delay and indecision, sometimes followed by heroic measures of uncertain outcome.

The goal of the emerald ash borer campaign is containment and eradication in the quarantine zone, but a secondary outbreak has already appeared in Indiana. Some motorists stopped during the Memorial Day blitz planned to transport their wood hundreds of miles.

Both forests and lakes are casualties of this biological free-for-all.

Shipping is another pathway for transport of alien species. Ballast water is transported and dumped halfway around the world. Hitch-hikers like zebra mussel larvae get a free ride.

The dead zone in Lake Erie all but disappeared when phosphate detergents were banned. A recent Canadian Geographic article describes its return in graphic terms: "a vast mound of zebra mussels, quagga mussels and other organisms, much of it new to the region, much of it laced with harmful bacteria, that recurs every summer and sucks so much oxygen from the bottom waters that nothing else can live there."

Perversely, while most organisms cannot survive low oxygen conditions, the invading mussels can, along with the bacteria that produce botulism. Each year, thousands of loons and other waterbirds wash up dead on the lake shore, along with slimy fish and rotting algae.

Unfortunately, there are hundreds of other examples of invasive alien species threatening natural resources and natural ecosystems all over the world. It's time we realized that cheap imported goods come with a cost. We must now add biological pollution to the air pollution and greenhouse gases associated with global transport.

Buying less and buying local are two important choices individuals can make that may help stem the tide of invasive alien species in addition to their numerous other benefits.

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The bio-based economy

29 May 2004

Simply put, the notion goes like this: we're running out of fossil fuels, so we'll grow biofuels, bioplastics, and biopolymers. We'll reinvigorate and diversify the rural economy. With our abundant land area Canadians will become the world's vegetable oil barons.

This could signal a welcome shift to a renewables-based economy. Or it could result in serious conservation challenges.

Biotechnology has been touted as the economic engine of the 21st century. But public enthusiasm for biotech has been dampened by the rush to bring genetically modified foods to market. Biotech and GMOs have become synonymous for many people. Some feel that governments, as biotech promoters, have not established adequate safeguards to protect health and the environment.

Industrial visions of a bio-based economy haven't yet translated into visions of working landscapes. What would our fields, forests, and wetlands look like under a brave new bio-based world? The backlash against endless tracts of genetically modified canola for biodiesel production, forests of genetically modified poplars for biofuel, and natural wetlands converted to production of single strains of algae, could be swift and severe.

Is the phrase "bio-based economy" just clever repackaging, a means of shedding some of the negative perceptions associated with biotechnology?

The potential for a clash between biodiversity conservation and the bio-based economy is real. But shedding our fossil fuel addiction would bring huge benefits. The long-term prospects for biodiversity and public health will be immensely improved if the worst of the projected impacts of climate change can be avoided.

Another point to consider is that biodiversity itself is already at the basis of much of our economy. Supplies of food, fiber, and many medicinal products are derived from the Earth's billion-year heritage of species and genetic diversity.

This biological treasure trove is already at risk from habitat destruction, loss of traditional crop varieties, pollution, and other stresses. It would be sadly ironic if the rush to create a bio-based economy were to further endanger the biological wealth upon which that economy were based.

Canada is party to an international treaty - the Convention on Biological Diversity - which attempts to deal with this dilemma. Biotechnology is a double-edged sword. Promises of a better tomorrow must be balanced against obligations to conserve the genetic heritage of billions of years of evolution. The Convention has three objectives: conserving biodiversity, promoting its use in sustainable ways, and sharing equitably the benefits of this use, including the development of appropriate technologies.

Policy makers are attracted to the potential economic gains of biotechnology like moths to a flame. The conservation message often seems to get lost.

Another way of thinking about a future bio-based economy is to consider it as a means to an end, rather than an end in itself. The goal isn't making and selling endless gobs of bioplastic, but creating sustainable livelihoods while meeting our basic needs.

This message remains a tough sell in a consumption-driven, product-driven society. Markets rule, and planning for environmental sustainability is viewed with skepticism.

Achieving independence from fossil fuels won't be easy. A sustainable bio-based economy would need not only to find sustainable ways to grow crops for bio-based industrial processes, but also sustainable ways to package and transport the resulting products. Future economies could be much more localized in terms of production and marketing, while still drawing on global intellectual capital.

Creative thinking today about the bio-based economy could bring major future rewards.

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The eighth wonder of the world

07 May 2004

As Chief Naturalist for 30 years, Dan wrote guides to Algonquin's trees, fish, birds, mammals, reptiles and amphibians, and wildflowers. He guided the creation of two of the Park's main public attractions - the visitor centre and the logging museum.

A long day's paddle from Algonquin brings you to Bonnechere Provincial Park on the shores of beautiful Round Lake. On May 1, park staff - with support from the Ministry of Natural Resources, the Renfrew County Stewardship Council, and the local naturalists' clubs from Arnprior and Pembroke - hosted the Renfrew County Natural History Day.

Dan Strickland was a featured speaker at Natural History Day. Besides his efforts to bring nature to the public, he is the world's leading scientific authority on gray jays, a species that he refers to as the eighth wonder of the world.

Gray jay pairs stay in the same neck of the woods, all four seasons, year after year. Their territories, found among boreal conifers such as spruces, are well guarded from other couples. They are very long lived. Their secret of longevity - and surviving long cold winters - is stored food.

All summer and fall, jays store insects, spiders, berries, and so forth under bark and lichen on trees. They have hundreds of these hiding places scattered through their territory.

Stored food is key to winter survival. One fall, Dan offered pieces of bread dyed blue to the jays. That winter he found blue bird droppings. He inserted mealworms into holes drilled in a spruce one summer and found some still intact next spring, with a significant percentage of their original food value.

Food storage means gray jays don't take dangerous annual migrations, unlike most of our songbirds. Adult jays almost never die in winter. Other seasons are more dangerous. Spring migration brings back winged predators such as sharp-shinned hawks.

Gray jay courtship takes place as early as late January, and eggs are in the nest by March. Why nest in late winter, when snowstorms still rage? Dan explains that the jays are coasting along on stored food. They also need to get nesting duties out of the way early, and begin stocking up for the next winter.

While adults are safe in winter, eggs and nestlings are eaten by red squirrels. To avoid drawing attention to the nest, adults minimize trips back and forth. This means carrying the largest load of stored food possible.

Things get tough when young jays leave the nest. Brothers and sisters fight. Only one gets to remain on the territory where it was born. The others move on. They might get adopted by foster parents who have lost their young to squirrels, but most don't make it through the summer.

Life is getting tough for adults as well. Gray jay territories in Algonquin Park, mapped by Dan through years of work, are now vacant.

The problem is climate change. Warmer winters and freeze-thaw events cause stored food to rot.

Jays prefer spruces for storing food. Their bark and lichens may retard decay. Spruces in Algonquin are at the southern edge of their range, confined to margins of bogs and lakes. They are in decline. As they vanish, so will gray jays.

Gray jays will survive further north in the boreal forest. Species on mountain tops, islands, and other limited habitats won't be so lucky. A recent study in the world's top science journal, Nature, estimates that climate change will cause the extinction of as many as 25% of the world's species by 2050.

This planet is full of amazing stories of survival. But the warning signs are mounting - and not just for gray jays.

Ole Hendrickson is a founding member of the Ottawa River Institute, a non-profit, charitable organization based in the Ottawa Valley.

How much is nature worth?

01 Jan 2004

We find it hard to "connect with nature" in a modern industrial society. Most of us no longer farm, fish, hunt, or cut timber for a living. But we remain connected through the gases flowing in and out of our bodies, the food and water we take in and the wastes we produce, and the microbes that use us as a temporary home - sometimes to our detriment.

We are inescapably part of ecosystems. Should we be disgusted, or indifferent, or grateful? Ecosystem scientists suggest we should count our blessings -the results may surprise us.

Ecosystems provide services essential to life. These include air and water purification, waste disposal, pest control, climate regulation, soil formation, and production of key ingredients for agricultural, pharmaceutical, and industrial enterprises. Ecosystem services are complex and occur at many scales. Waste disposal, for example, involves life cycles of bacteria as well as planet-wide cycles of elements such as carbon and nitrogen. Because these services are not traded in economic markets, they carry no price tags to let us know if supplies are getting scarce, or if the ecosystems that generate them are deteriorating.

Ecologists and economists have teamed up to measure the value of these "free" ecosystem services. A 1997 article in the world's top science journal (Nature) calculated the global value of ecosystem services at \$33 trillion US. The authors noted that this "minimum estimate" exceeded the global gross domestic product (GDP) of \$25 trillion US.

The 1997 article sparked a storm of controversy. Many people were horrified at the notion of putting a price tag on nature. One economist argued that ecosystem values based on market economics could not possibly equal global GDP - this would mean that everything produced by man was worthless.

Despite this controversy, the Ecological Society of America (representing 7,800 ecological scientists from around the world) has stated that, based on scientific evidence, we are certain that

- Ecosystem services are essential to civilization.
- Ecosystem services operate on such a grand scale and in such intricate and little-explored ways that most could not be replaced by technology.
- Human activities are already impairing the flow of ecosystem services on a large scale.
- If current trends continue, humanity will dramatically alter virtually all of Earth's remaining natural ecosystems within a few decades.

The ecological scientists add that large numbers of species are required to sustain ecosystem services, but this is possible if appropriate actions are taken in time. As science cannot say precisely what proportion of natural ecosystems is needed to sustain ecosystem services, a prudent course of action is to maintain enough habitat to avoid local extinctions and support those species found in any given part of the Earth.

Robert Constanza, the lead author of the 1997 Nature article, observes that governments get bogged down in short term conflicts between special interests, and fail to create broadly shared visions that can resolve these disputes. Our worries about the world's future - how many people it can support, impacts of climate change, etc. - are best addressed by creating visions of the society (and ecosystems) that we want. The more we agree on where we want to go, the greater our chances of sustaining life.

Ole Hendrickson is a member of the Ottawa River Institute, a non-profit, charitable organization based in Pembroke.

The Forgotten Forest Product

21 Dec 2003 Lynn Jones

There is another forest product that most of us don't often think of. And arguably it's by far the most important - water.

A recent article in the New York Times (Jan 3, 2003) called attention to this forgotten forest product, pointing out that forests generate most of the water in the U.S. According to the U.S. Environmental Protection Agency, more than 60 million people in the U.S. rely on national forests for their drinking water. Millions more depend on state and private forests to facilitate the refilling of aquifers from which they draw their water.

Forests are equally important and equally unsung for providing fresh water in Canada.

According to an informative article on forests in the library at www.thinkquest.org, forests filter and clean water, soften heavy rainfalls which would otherwise erode soils, and hold river banks in place. In turn, water carries dissolved nutrients, which it distributes through the forest soil. Forests are "sponges", capable of collecting and storing large amounts of rainfall. Forest soils absorb four times as much rainfall as soils covered by grass, and eighteen times more rainfall than bare ground.

With their deep root systems, trees are able to pull water up from far below the ground. The water moves through the tree and is used in photosynthesis, cooling, and other growth processes. From the leaves, it is evaporated as water vapor. In this cycle, trees are living "water fountains" that redistribute liquid: moisture that would otherwise remain trapped deep underground. Water is released through their leaves into the air, where it condenses into clouds and falls as rain once again. Without trees to redistribute this water, the climate in many areas would be far drier. Trees tap this constant underground reservoir of water slowly and evenly, helping to prevent seasonal floods and droughts.

Forest canopies intercept much of the precipitation that falls over them. This rain and snow would otherwise fall directly on the soil, washing it away as erosion. The water that lands in the forest canopy

gently drips to the ground with much less force than direct rainfall, and then percolates through the soil into aquifers.

According to Mike Dombeck, former chief of the United States Forest Service and author of the New York Times article referred to above, mature forests do this work best and should be protected for the simple reason that they provide the cleanest water in the country.

Water shortages are increasing worldwide. Aquifers are being depleted and precipitation is declining in many areas, a side-effect of global warming and climate change. Rivers are going dry and lakes are disappearing in some parts of the world. Unfortunately, at the same time, world forest cover is also declining at a time when we need it more than ever. Our economic system does not recognize or value the water provided by mature forests, putting this vital life support service at risk.

We are forest-rich in the Ottawa River watershed. Three-quarters of the 146,000 square kilometer area of the watershed is forested. Our forests give us wood products, paper, wild food, recreation, the opportunity to commune with Nature, climate moderation, flood control, clean air and many other things. Most important of all of these is water.

Lynn Jones is a member of the Ottawa River Institute, a non-profit, charitable organization based in the Ottawa Valley.

The overflowing sea of nitrogen

17 Jul 2003

All organisms need large amounts of nitrogen. It is a key element of proteins, basic building blocks of our bodies. Like most animals and plants, we can't get nitrogen from the air. Animals get it from eating plants or other animals. Plants mainly get it from the soil.

When plants and animals die there is a scramble among decomposer organisms for the nitrogen found in them. Decomposers like fungi release nitrogen into the soil in forms that plants can take up.

And so the cycle begins again.

Nitrogen is scarce in most soils. Competition for nitrogen is intense not just among decomposers, but also between decomposers and plants, and among most plants as well.

The same is true in the oceans. Dissolved nitrogen gas, though abundant, is largely unavailable to the microscopic plants (phytoplankton or algae) at the base of the marine food chain. Plant-available nitrogen is scarce and often limits marine productivity.

Farmers are well aware that nitrogen is a limiting element for plant growth. They add it in the form of manure or fertilizers to increase crop yields. Or they grow legumes (soybeans, alfalfa, clover, etc.). Unlike most plants, legumes have root-dwelling bacteria that directly convert atmospheric nitrogen into plant-available forms.

If soil nitrogen is so scarce, why do ecologists consider excess nitrogen to be one of the main threats to the world's ecosystems, along with climate change, habitat loss, and invasive species?

The answer comes back to life in a sea of nitrogen. Atmospheric nitrogen is changed to plant-available forms by three main pathways: bacterial action, fertilizer manufacture, and fossil fuel burning.

Humans are wholly responsible for the latter two pathways, and have accelerated all three. We have more than doubled natural inputs of nitrogen. The sea of atmospheric nitrogen is overflowing into our lands, lakes, rivers, and oceans.

Too much nitrogen can mean excessive growth of algae in aquatic environments. Nitrogen pollution from agriculture in the Mississippi River Basin has created an enormous "dead zone" spreading from the river's mouth far into the Gulf of Mexico. Decomposer bacteria feast on a soup of rotting fish and algae, sucking all the oxygen out of the water. Many bacteria thrive without oxygen, but higher organisms cannot.

Unfortunately, this is not an exception. Many of the world's major rivers are loaded with nitrogen from agricultural runoff, urban sewage, and airborne deposition, and have dead zones at their mouths.

Oil, gas and coal contain relatively small amounts of nitrogen. However, when they are burned at high temperatures - as in vehicle engines or coal-fired power plants - nitrogen oxides are formed as combustion by-products. These combine with water to form acid rain. Nitrogen oxides can harm plants at high levels, but mostly occur at lower levels that stimulate plant growth.

These "free" nitrogen fertilizers are deposited in indiscriminate fashion. They likely make a small positive contribution to agriculture. But when channeled into and concentrated in aquatic environments, they become serious pollutants.

Burning fossil fuels causes dead zones as well as global warming. This argues for an accelerated transition to renewable energy sources

The other two nitrogen pollution pathways - fertilizer use and planting of legumes - both begin with farming. Dealing with these pathways involves keeping nitrogen where we want it, on crop fields, rather than allowing it to leach into ground and surface waters.

This will be the topic for another column.

Ole Hendrickson is a member of the Ottawa River Institute, a non-profit, charitable organization based in the Ottawa Valley.

White Pines Part 2

01 Jun 2003

In response to his column, we received comments from several readers.

A Renfrew resident called to tell Ole about her late husband's work for the Department of Lands and Forests on White Pine Blister Rust. Other readers also wondered if the blister rust and perhaps other diseases were responsible for some of the damage.

A Pembroke resident called about a very large, old white pine tree on his property in the west end of the city which seemed to be more damaged on the south and east side (not facing the street). He also noted that the pine cones did not drop at their usual time, but rather fell many months later.

Several people noted that the browning was considerably worse along the highways, as we also had noticed. Some busy intersections were particularly bad, prompting the speculation that perhaps a new type of deicer had been used.

Brent Gutzman of Westmeath wondered this as well and after considerable research was able to determine that a new type of deicer is being used in Ontario - liquid calcium chloride. Here are some comments from Brent about his research:

I have been doing research on the use of liquid calcium chloride as a deicer and have found that many provinces and states are turning to this solution. One thing I have discovered is that the use of this is very effective when used in moderation and at proper concentrations. This deicer works by absorbing moisture out of the atmosphere/ice.

One study in Ohio indicated that all their white pines along the roadways had been killed off and it was due to the mist coming off the roads and landing on the trees. The mist (calcium chloride) draws the moisture out of the trees causing them to burn and eventually die.

Brent emphasizes that cedars and spruces are also badly affected. He notes that he has seen many people digging up their dead and damaged cedar hedges this spring.

I spoke to a number of people who work or worked in forestry or related businesses including retired scientist Kris Morganstern of Pembroke, Larry Powel of Madawaska Forestry in Eganville, and Grant Dobson of Connaught Nursery near Cobden. They all seemed to agree that the severe drought of last summer had weakened the trees and then the deep frost had made the problem worse. Kris noted that shallow rooted trees around ponds had been quite badly affected.

Now that the deciduous trees have leafed out it seems that some of them also have been damaged, but whether more than in other years is not clear. It seems that quite a few poplars have died and new growth at the tops of some Maples and Birches seems to be very spindly and unhealthy or dead. In Pembroke we have seen a number of dying deciduous trees being removed from people's properties.

Have you noticed any effects on your trees recently, or did you have to dig up a hedge? If you would like to share any of your experiences or observations, please give us a call at 613-735-6444.

Citizen science

01 Apr 2003

Still, we have considerable information about wild species. A recent Ontario Ministry of Natural Resources technical report lists at least 55 different species of fish in the Ottawa River between Rolphton and LaPasse. Books and web sites tell us about the hundreds of bird species found in our region, the frogs, trees, snakes, butterflies and the like. If you're interested in which species are common in Ontario, which are rare, and which are at risk of extinction, check out the Wild Species 2000 web site (www.wildspecies.ca/en/Home_E.html).

Are there armies of civil servants out in the bush doing surveys? Actually, not. You might be surprised to know how much of the publicly available knowledge about nature comes from volunteers.

Right now, all over Ontario, bird watchers are gearing up for the third field season of a major initiative to find out what species are nesting in each part of the province, and track changes in their distribution. The Ontario Breeding Bird Atlas, as it's called (see www.birdsontario.org/atlas/atlasmain.html) is all based on work done by unpaid volunteers. Chris Michener of Golden Lake is the Atlas Coordinator for Region 26, a huge, reverse L-shaped area stretching from Bancroft and Maynooth east towards Griffith and Mattawatchan, and then north to Pembroke and Deep River. Some of the terrain is rough and relatively inaccessible. Chris is still looking for volunteers to cover some of the southern parts of the region.

Does anyone apart from bird watchers use the results of all this work? The MNR is interested in knowing how activities such as forestry practices or wetland management impact bird populations. The Canadian Wildlife Service has legal responsibility for protecting birds that migrate across national boundaries - the majority of species in our area. Both are co-sponsoring the Breeding Bird Atlas.

You don't have to venture into rugged bush to be a citizen scientist. The Canadian Nature Federation, the University of Guelph, and Environment Canada have teamed up to sponsor NatureWatch, a highly successful program that demonstrates that volunteers can collect valuable data to assess ecosystem health (see www.naturewatch.ca/english). NatureWatch is composed of a suite of monitoring programs such as FrogWatch, IceWatch, PlantWatch and WormWatch. These programs encourage participation by schools, community groups, individuals, naturalists, backyard enthusiasts, Scouts and Guides.

Frogs and toads, for example, are valuable indicators of the health of ecosystems. Because they live "on the edge" between air, water and land, and have semi-permeable skin, they are very sensitive to pollution and other environmental changes. Worldwide, many species are declining or have recently become extinct.

Each species of frog and toad has a very distinctive mating call. FrogWatch volunteers learn these calls, and then "adopt" a pond or wetland. They visit regularly each spring, tracking changes in numbers and the beginning and end of the spring calling season for each species. Observations can be sent via the Internet into a central database. Results are updated regularly, and participants get the reward of seeing their direct contributions to a broader scientific monitoring effort.

The most recent issue of the Federation of Ontario Naturalists' publication, Seasons, has a supplement entitled "Wildlife Watchers - Report on Monitoring." It lists no fewer than 20 different volunteer programs, most of which are being done throughout Ontario. Details are on the web at www.on.ec.gc.ca/wildlife

Citizen science is more than a way for wildlife agencies to stretch their limited budgets. It helps people stay in touch with nature, and provides an opportunity to act as stewards for the other species that share our environment.

What's happening to the white pines?

01 Apr 2003

While you can find dying pines in the bush, there is no doubt that the damage is most severe along the roadsides. Also, the busier the highway, the worse the problem.

Is this salt damage? Does it have anything to do with auto and truck exhaust? Is it drought-related? Could the cold winter have been a factor?

As you might expect, science is not going to provide a simple answer. This appears to be one of those problems with no single cause - one that involves complex interactions.

One thing that science has very clearly demonstrated is that white pine is highly susceptible to smog - in particular, to the main constituent of smog, low-level ozone. Many careful studies show that pine needles turn yellow and brown when exposed to ozone. There is evidence that some white pines are genetically predisposed to ozone damage. In fact, forestry scientists believe that the more susceptible white pines have already been wiped out by air pollution.

But is smog really a problem here in rural Ontario? The answer, unfortunately, is yes. You may recall the smog alerts of last summer, with haze blanketing Ontario up to North Bay, Pembroke, and Ottawa. Smog comes from the big coal plants in southern Ontario and the U.S., but also from pollution along busy highways - wherever they are.

So then, why didn't the damage show up on pines last summer, when ozone levels were high?

This is where things get a bit more complicated. In addition to being smoggy, last summer was dry. During drought, trees conserve water by closing the pores in their leaves or needles (known as stomates). When these pores are closed, they do not take up air pollutants. Ozone damage to pine actually decreases during drought, as has been shown by a number of studies.

However, air pollutants also have longer-term effects. Ozone also damages protective waxes on the outside of pine needles. This type of damage predisposes them to drought, and also to insect and disease attack.

Drought reduces ozone damage in pines, but ozone damages pine needles and makes them susceptible to drought. Confusing, eh? But why all this talk about drought? We're talking about damage that occurred this winter. Was there a drought this winter?

From a pine tree's point of view, the answer is "Yes". You'll recall that it got quite warm last month, and the snow melted away quickly. The warm temperatures stimulated pines and other conifers to begin opening the pores in their needles, and trying to move sap into them. But their roots were all in deeply frozen soil, owing to the cold weather. Trees can't replenish their water supplies from ice.

There's one final piece to this puzzle. After it got warm, and the pine needles started filling with what little water they could find, it then got cold again - quite cold, for March. Warm temperatures followed by a hard frost can be fatal to trees. When water freezes inside pine needles, cells and tissues are ruptured. Many younger pine trees, already weakened by drought and air pollution, have simply died.

Dying white pines are like the canary in the coal mine. Climate change is not just simple warming, but involves unpredictable swings between cold and hot temperatures. Ozone and other air pollutants kill people as well as trees, and are a major contributor to the growing problem of asthma.

Governments have cut back severely on forest health monitoring. We're not going to get official reports on "the white pine dieback of late winter 2003". But seeing is believing. If you have observations you would like to share please contact me by phone at 613-735-6444 or by email at ole@nrtco.net.

Ole Hendrickson is a member of the Ottawa River Institute, a non-profit charitable organization aimed at fostering sustainable communities and ecological integrity in the Ottawa River Watershed.

The Wonder of Snow

22 Dec 2002 Lynn Jones

Whatever we may think about shoveling snow or driving in it, the pure, white, sparkling blanket is a wonderful sight to behold.

The snow blanket is made up of snowflakes of course, billions and billions of them, no two alike. In turn, each snowflake can contain hundreds of individual snow crystals. Snow crystals are remarkably complex and beautiful structures and have been the subject of much study in the last hundred years or so.

A farmer from Vermont named Wilson "Snowflake" Bentley (1865 - 1931), spent much of his life finding and photographing snow crystals. Just before he died, he published a book entitled Snow Crystals which displayed more than 2000 of his photographs and introduced the world to the incredible beauty, complexity and uniqueness of individual snowflakes. Seventy years later, the book is still in print.

Many others have picked up where Bentley left off, and are studying and photographing snow crystals with ever more sophisticated equipment. There are many stunningly beautiful photos on the internet at a number of excellent websites. A good place to start is a website called "Snow Crystals" by Professor Kenneth Libbrecht from the California Institute of Technology, who also has recently published a wonderful book called The Snowflake: Winter's Secret Beauty.

The beauty of snowflakes has also inspired writers and poets through the ages. Here's what Henry David Thoreau wrote about snowflakes in his journal in 1856:

"How full of creative genius is the air in which these are generated!
I should hardly admire them more if real stars fell
and lodged on my coat."

One of my favourite things about snow is the silence that it brings. There is a deep stillness and peace in a snowy forest. Even in town, the silence after a fresh snowfall is wonderful. Gone are the pervasive traffic noises that intrude into life so much these days. What a relief.

Have you ever wondered as I have what it is about fresh snow that makes the world so suddenly quiet? Apparently the answer lies in the structure of the snow crystal itself. Because it is so multi-faceted, it breaks sound waves up into smaller parts thus absorbing rather than reflecting them. Apparently, the huge number of randomly aligned surfaces on a sheet of fresh snow resembles the acoustic baffles used to achieve silence in a recording studio.

The multifaceted nature of snow crystals is also what enables snow to sparkle like a million diamonds in sunlight and moonlight (or streetlight).

Snow is important ecologically as well. We need a good blanket of snow in the winter to protect ground plants and small animals. In spring, melting snow also recharges aquifers and helps to keep the ground moist for the germination of wild plants and crops.

For all these and many more reasons, you've got to love the snow. . .

Lynn Jones is a founding member of the Ottawa River Institute, a non-profit charitable organization based in the Ottawa Valley.

Take the nature challenge

01 Dec 2002 Lynn Jones

The Union of Concerned Scientists (UCS) in the United States recently commissioned a study on the environmental impact of the average American household. The researchers identified four major environmental problems related to everyday consumption: climate change, air pollution, water pollution and habitat alteration. The study then identified the categories of household expenditures that cause the greatest environmental damage, and provided Americans with a list of the most important things they could do to become more environment-friendly consumers.

The David Suzuki Foundation substituted Canadian data in the USC model to come up with a list of the top ten things we Canadians can do to reduce our environmental impact. The Foundation has issued a "Nature Challenge" and is asking that people look the list over, pick at least three and promise to do them over the next year.

Besides David Suzuki himself, Hockey Night in Canada host Ron MacLean, National Ballet of Canada's Karen Kain, comic Mary Walsh, children's author Robert Munsch and musicians Bruce Cockburn and Randy Bachman have all taken up the challenge.

According to Suzuki, "In our busy lives most of us have forgotten that it is nature that supports everything that we do. By leaving nature outside of our day-to-day decision making we are seriously damaging the environment and threatening our quality of life. By taking the Nature Challenge, we can all make a difference and protect the environment for our children and grandchildren."

You can register for the challenge and read a lot more about the science behind it at www.davidsuzuki.org. Or just choose one thing from the list, and do it faithfully in 2003. Mother Earth will thank you!

Note that some of the things on the list are more geared to people in large urban areas. Still there is a lot for us here in the Ottawa Valley to choose from.

Here is the list of ten things:

1. Find ways to reduce you home heating and electricity use by 10% this year. The Ottawa River Institute can help with this one. We are offering a series of workshops around Renfrew County this winter on home energy conservation
2. Choose and energy-efficient home and appliances. Check to see if homes meet R-2000 standards and appliances are Energy Star approved
3. Replace chemical pesticides on your lawn, garden, and houseplants with non-toxic alternatives.
4. Choose at least **one** day a week to eat meat-free meals in your household.
5. Prepare your meals with food from local farmers and producers for **one** month this year.
6. Check the Canadian Government's Auto Smart ratings for the next car you intend to buy to make sure it's fuel-efficient and low polluting.
7. Walk, bike, carpool, or use transit to get to **one** of you regular destinations each week.
8. If you are moving, choose a home within a 30-minute bike, walk, or transit ride from your daily destinations.
9. Support alternatives to the car.
10. Learn more about conserving nature and share what you've learned with family and friends.

The more the merrier (and better for the planet) so get your whole family involved. Maybe your friends too! Let me know how it goes. In our household, we're working on 1, 5 and 7. I'll report back at a later date.

The miraculous Monarch

01 Sep 2002 Lynn Jones

The Monarch's fall migration, a true miracle of nature, is well underway right now. The predicted peak of migration for the latitudes of our watershed was between the last week of August and first week of September.

Millions of Monarchs migrate every year at this time. Although they are only 4 cm long and weigh only half a gram, these amazing insects travel up to 4000 kilometers to a place they have never been before. They fly about 80 kilometers a day, flying during daylight only, aided by millions of scales on their wings that are filled with air to provide buoyancy. Those butterflies that left the Ottawa Valley in the last few weeks will get to their southern destination sometime in November.

The winter whereabouts of the eastern Monarchs was an unsolved mystery for many years. It was discovered by a Canadian scientist named John Urquhart in the mid-1970's after a 50-year search that involved tagging Monarchs all over North America prior to and during the annual migration.

The overwintering grounds are high up in what are called the Neovocanic Mountains of Central Mexico. There are special fir forests there at high elevation (3000 meters) where the conditions are cloudy, cool and damp just right for four months of hibernation for Monarchs. The hundred million or so that migrate each year all cluster in these Oyamel fir forests in a total area no larger than 10 hectares. It is said that one acre of trees can shelter as many as 4 million Monarchs. They blanket the trunks, branches, and needles of the fir trees, quite an amazing site no doubt! How the Monarchs find their way to these forests remains a mystery.

Last January close to 80 per cent of the hibernating Monarch population in Mexico were killed by a bad winter storm and very cold temperatures. So it was with some trepidation that my husband Ole and daughters Grace and Claire and I began our annual search for Monarch caterpillars early this past July. We were surprised and delighted to find three of them in our own yard on Morrison Island, near Pembroke. Two of them were feeding on some Milkweed plants I had transplanted into a neglected garden a few years ago in an attempt to make it into a "butterfly garden". (Monarchs caterpillars feed exclusively on Milkweed leaves.)

We successfully raised all three to the adult butterfly stage, an amazing process to watch and subject perhaps of another article.

We christened all three butterflies and wished them well on their journey to Mexico. We hope they are doing well. Because of last winter's die off and poor weather in some parts of their summer habitat, late summer populations were reported to be below normal. The winter population is predicted to be quite low this year.

According to Chris Michener of the Pembroke and Area Field Naturalists, who has coordinated butterfly counts in Renfrew County since 1988, the counts in our area were low in July but numbers had increased greatly by September. There may have been a particularly good hatch in our area in early summer this year.

If you would like to help the Monarch species survive and thrive, transplant a few Milkweed plants into a corner of your yard or garden. I have not found them to be at all invasive. Unfortunately, they are classed as a "noxious weed" in Ontario which leads to eradication efforts, thereby reducing the availability of food for the Monarch caterpillars.

There are vast amounts of information on Monarchs on the internet. A good place to start is "Monarch Watch". Just type it into the Google search engine and hit the "I'm feeling lucky" button.

Lynn Jones is a founding member of the Ottawa River Institute, a non-profit charitable organization aimed at fostering sustainable communities and ecological integrity in the Ottawa River Watershed.