

FOREST FUNCTIONS/VALUES INCLUDE:

- ▶ PREVENTING SOIL EROSION, CONTROLLING SEDIMENT
- ▶ PROTECTING WATERSHEDS
- ▶ REGULATING CLIMATE, STORING CARBON
- ▶ PROVIDING HABITAT FOR WILDLIFE/ENHANCING BIODIVERSITY
- ▶ PROVIDING JOBS, RECREATION AND AESTHETIC ENJOYMENT
- ▶ SUPPORTING TOURISM
- ▶ PROVIDING TIMBER

THE CHALLENGE IS HOW TO USE OUR NATURAL FOREST WEALTH MORE EFFECTIVELY AND HARVEST IT MORE INTELLIGENTLY TO PROTECT AND ENHANCE ALL ITS VALUES – ECOLOGICAL, SOCIAL, ECONOMIC, AND RECREATIONAL.

BY CONTRAST, IN CANADA WE HAVE:

- ▶ INCREASED TIMBER HARVESTS 60% IN THE LAST 30 YEARS
- ▶ USED CLEARCUTTING IN MORE THAN 80% OF HARVESTS
- ▶ LOST MANY OF OUR VALUABLE OLD FORESTS
- ▶ CREATED COMPARATIVELY FEW JOBS FOR THE AMOUNT OF WOOD CUT
- ▶ ADDED LITTLE VALUE TO THE WOOD WE CUT



THE CANADIAN REVIEW OF WELLBEING

Watch for the next issue of Reality Check:
Valuing Our Health

Valuing our natural wealth

When we ask how Canada is doing, and how well off we are as a society, we generally look at how fast our economy is growing. But we can grow the economy, at least temporarily, by depleting natural resources, by debt financing, and by spending more money dealing with sickness, crime, war, pollution and disasters. These are hardly indications that we are better off as a society.

This issue of Reality Check focuses on one of the fallacies of standard measures of progress: our failure to account for natural capital. Because Canada is a forest nation, with forests covering close to half our land mass, and because we are the largest exporter of forest products in the world, this issue of Reality Check highlights this vital resource. In a comprehensive Canadian index of wellbeing, natural resource accounts tracking the state of our forests would be essential.

The story of our forests shows that the failure to account for the value of natural capital can send misleading and even dangerous signals to policy makers. Conversely, measuring and valuing forests and other natural wealth accurately can encourage better policies that change the way we harvest, market, and conserve our resources. In the following pages, we point to practical models that show a new way forward.

Although our enormous natural wealth makes us much richer as a nation than standard economic measures show, good natural resource accounting is only in its infancy in Canada. The statements,

conclusions, and recommendations in this issue of Reality Check are necessarily tentative and approximate, but they raise questions that are essential to pursue in assessing our natural wealth accurately.

The next issue of Reality Check will take a parallel look at the health of Canadians – as vital an element of our human capital as forests are of our natural capital. Properly valuing our human capital, and accounting accurately for the health of Canadians, will shift policy and budgetary allocations from an almost exclusive concern with disease treatment to a greater emphasis on disease prevention and health promotion. Together, these two issues of Reality Check demonstrate that what we measure shapes policy and even determines what issues make it onto the policy agenda.



What's a natural forest worth?

“Economic estimates ignore the fact that many ecosystem services are literally irreplaceable.”

– Costanza et al, 1997

How do you put a price tag on clean air and water, biodiversity, and healthy forests and societies? We often call these things priceless, because they have almost infinite value. But lacking any consistent way to measure them, policy

makers tend to treat them as if they have no value. That makes it easier to ignore or downplay the degradation of natural ecosystems, despite the very real costs that degradation imposes on society.

Natural capital, in this case forests, performs a wide range of ecological, social and economic functions, providing people and the economy with both direct and indirect services. Forests supply such goods and services as soil formation, habitat conservation, watershed protection, flood control, natural pest control, climate regulation, and carbon storage, all for free. They also provide us with wood, wild foods, pharmaceuticals, and a place to relax and rest our minds. When a forest can no longer provide these goods and services, the loss should show up in our economic accounts as a cost.

The economic value of these goods and services is staggering. In 1997, an international team of scientists headed by Robert Costanza of the Maryland Institute of Ecological Economics estimated the average annual value of global ecosystem services at US\$33 trillion, based on replacement cost and contingent valuation estimates. This is almost twice the total annual GDP for all the countries on Earth (*Nature* 387, 1997, pp. 253-259).

Counting the true value of our forests

THE MORE TREES WE CUT DOWN, AND THE FASTER WE CUT THEM DOWN, THE MORE THE ECONOMY GROWS, AND, THEREFORE, THE MORE PROSPEROUS WE THINK WE ARE.

We have made that mistake before – with catastrophic consequences. Right up to the eve of the Atlantic groundfish collapse, the fishing industry appeared to be booming. Because we mistakenly relied on economic growth measures like the Gross Domestic Product (GDP) to tell us how well off we were, record fish landings fooled policy makers, if not fishermen, into thinking the fishery was healthy.

GDP measures the total value of all goods and services produced in the market economy, and the total money earned and spent. GDP only values natural resources when they are harvested and sold. It makes no difference to the GDP what is growing or how money is spent. As long as people spend money, the economy grows.

A more sensible accounting system would include a national balance sheet that measured assets and liabilities, not just income and expenses.

At present, we regard increased harvesting of

natural resources as economic growth, even if that harvesting takes place in a manner that impairs the ability of that resource to produce future wealth. A proper balance sheet would measure reckless depletion or degradation of natural resources as a reduction in our wealth and wellbeing.

The GDP counts an increase in fish exports and timber sales as growth, but ignores what harvesters leave behind in the sea and the forests. What's left behind is the natural capital on which these industries depend. Counting only the timber sales is akin to a factory owner selling off his machinery, or capital, and counting the sale as profit. We need a better way to value our natural wealth.

New measures of wellbeing in Canada value our resources as natural wealth, giving us a more accurate picture of how we are doing as a society. If we tend natural resources carefully, we can pass them on to future generations in good condition. If we degrade and deplete our forests, fisheries, soils, and other resources, we create a debt our children will inherit.

Timber harvest levels in Canada have risen 60% over the past 30 years, contributing to GDP growth. But vast areas of our forests can no longer perform their vital functions as effectively as they once could. Much of the timber they yield isn't as valuable as it could be if we had conserved older forests composed of more valuable species.

Increased efficiency in mills and harvesting equipment means that expanding timber harvests have not produced commensurate increases in jobs.

Over the past 30 years, the ratio of forest industry jobs to wood harvested has dropped from 2.16 jobs per 1000 cubic metres in 1970 to 1.82 jobs per 1000 cubic metres in 1999.

Canada's job-to-harvest ratio of about 2.0 jobs for every 1000 cubic metres of wood harvested, compares to 2.6 in the United States and 3.0 in Sweden.

Nor is our forest industry creating as much money as it could. We generate about \$163 for every cubic metre of wood harvested here, while Sweden generates about \$178, New Zealand \$247, and the United States \$318. In other words, we don't add much value to the wood we harvest.

If we value our forests properly we'll get a more accurate picture of the state of our natural forest wealth. We can then design incentives to harvest sustainably, conserve resources, and enhance the value of our forests.

The GDP is a quantitative measure that was never intended to assess the quality of our lives. Simon Kuznets, the Nobel prize winner who was principal architect of the GDP, warned against misinterpreting greater production and spending as signals of economic health and wellbeing. To judge how well off we are, Kuznets counselled, “goals for ‘more’ growth should specify of what and for what.”

Current national and provincial measures of forest health are quantitative and tell us nothing about the quality of Canada’s forests. Official measures deem forest practices sustainable as long as forest regeneration through natural re-growth and tree planting matches or exceeds depletion due to harvesting, fire, insects, and disease. By these standards, we can clearcut a diverse, old growth forest and replace it with a young, single species plantation, and the difference will never show up in official statistics as long as the overall quantity of timber remains unchanged.

But capital can depreciate through degeneration as well as through depletion. An accurate portrait of forest health therefore requires qualitative as well as quantitative measures. The stories on this page explain why age class distribution is a vital indicator of forest quality, and why conservation of old forests is a key indicator of forest health.

Recognizing this reality, the Environment and Sustainable Development Indicators Steering Committee of the National Round Table on the Environment and the Economy recently recommended forest age distribution as one of its core indicators of sustainable development for Canada.

Old forests are more than trees

THE VALUE OF CANADA’S FORESTS GOES WELL BEYOND TIMBER. FROM PROTECTING AGAINST DROUGHT AND FLOOD TO REGULATING THE CONSTITUENTS OF THE AIR WE BREATHE AND SECURING WILDLIFE HABITAT, OLD FORESTS PROVIDE VITAL SERVICES TO MOST LIVING BEINGS.

In the long run, these non-market services have direct economic value. For example, healthy wildlife habitat also serves the tourism industry and the recreational needs of Canadians, and produces spending on nature and wildlife-related activities.

The World Resources Institute says Canada’s forests are home to roughly two-thirds of the country’s estimated 140,000 species of plants, animals and micro-organisms, only about half of which are classified. Many of those species depend specifically on large trees and old forests to live. The Committee on the Status of Endangered Wildlife in Canada (COSEWIC) says that one quarter of all species at risk are dependent on the country’s forests.

With the cutting of old-growth forests – which has been happening since European colonization – the habitat of old-growth dependent plants and animals is disappearing.

With the disappearance of habitat – such as large standing or fallen dead trees – comes the disappearance of species.

Most Canadian species at risk live in two areas that have undergone extensive clearing and fragmentation: the Coast Region of British Columbia, and the Carolinian Forest Region of southern Ontario. Roughly 60% of Canada’s endangered forest-dwelling species inhabit the Carolinian Forest Region. The Canadian Forest Service lists 84 forest-dwelling species at risk – 18 mammals, 17 birds, 39 plants, and 10 reptiles.

Protecting biological diversity – from microbes to animals such as pine martens – is an important step in maintaining ecosystem functions and services. Biodiversity means the variety of life and all its processes, and includes the living organisms, their genetic differences, and the communities in which they naturally occur. Old growth forests, rich in biodiversity, house many different plants and animals that have specialized needs. By contrast, young, softwood plantations are simple places, low in biodiversity.

Old forests vary greatly across the country. The original Acadian forests of the east were dominated

Where have all our old forests gone?

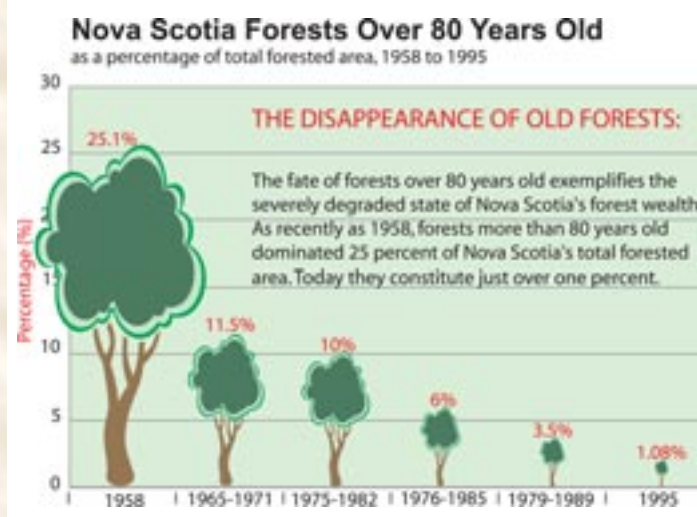
ACROSS THE GLOBE, FRONTIER FORESTS ARE SHRINKING. ACCORDING TO THE WORLD RESOURCES INSTITUTE (WRI), JUST 20% OF THE EARTH’S FRONTIER FORESTS REMAIN.

WRI defines frontier forests as “large, intact and fully functioning natural ecosystems.” Old growth forests are defined more generally as ecosystems characterized by old, often large-diameter live trees, a multi-layered canopy, plenty of deadwood (both standing and on the ground), and many microhabitats.

Canada still has vast areas of frontier forest in the north, and threatened patches of frontier forest in every province except in the Maritimes, where none remain.

Canada still conducts substantial logging within old-growth forests. We are the world’s biggest exporters of timber culled from such forests, and cutting leases on Crown land are now expanding into the far north. About 89% of all wood cut in 1999 – the most recent year for which data are available – was clearcut, while just 8.8%

of wood was cut using the more careful selection method. In 2000, British Columbia reduced its clearcutting from 87% to 60% of total harvests, which should bring the national average down to about 80% when new data appear.



Despite government and industry initiatives to improve logging practices, Canada cuts more trees today than it did 30 years ago. In the early 1970s, we cut about 120 million cubic metres per year. By 1999, harvesting had increased to more than 190 million cubic metres per year. In its 2000 report on Canada’s forests, the World Resources Institute states that “under current management practices, harvesting rates appear unsustainable over the long term.”

Of the nation’s 10 major forest types, two have lost about 60% of forest cover and seven are

severely fragmented, zig-zagged by logging roads over more than half their terrain. This fragmentation threatens ecosystem integrity, and undermines the capacity of forests to perform their functions effectively.

Provincial snapshots show varying degrees of deforestation. For instance, more than half the Carolinian and Aspen

forests bordering the prairies have been converted to farm and residential land. The Pembina Institute estimates that Alberta’s forests are getting burned or harvested faster than they are growing and replenishing themselves. In British Columbia – home of one-fifth of the earth’s remaining temperate rainforest – more than 80% of forests are allocated to logging companies. Nova Scotia has lost almost all its remaining old forests in the last generation.

Indeed, Nova Scotia can act as a warning for other provinces, especially British Columbia, where significant old forests still remain. In 1958, a provincial government inventory showed that Nova Scotia had already lost most of its valuable, original forest, with much of it replaced by young age-classes, and low-value, short-lived species.

But even in 1958, nearly 60% of Nova Scotia’s forests were more than 60 years old. Today, that number is just 12%. Forests 81 to 100 years old declined even more sharply, from about 16% of total area 40 years ago, to less than 1% by the mid-nineties. Forest more than 100 years old fared the worst, dropping from 8% in 1958 to 0.15% today.

Largely due to over-cutting, Nova Scotia’s long-lived tree species have dwindled. Today, low-value, short-lived stands dominate. The premium-priced, large dimension, clear wood that comes from old forests has nearly disappeared.

The loss of old forests has also reduced Nova Scotia’s forest carbon storage capacity by about 38% in the last 40 years alone. Climate change economists estimate that every tonne of carbon stored in our forests prevents \$20 in potential damages due to climate change. By that reckoning, the degradation of Nova Scotia’s forests over the last 40 years produced an economic loss of \$1.3 billion. Such changes in the composition and type of Canada’s forests represent a real loss of natural capital value – one that traditional measures of economic growth and wellbeing have missed.

fires and hurricanes. At current harvesting rates and under the current predominant harvesting methods, most forests outside protected areas will be degraded in this manner.

These losses are invisible in conventional measures of economic wellbeing, but they can be carefully tracked in a good set of natural resource accounts.



Ecosystem services are an important component of an accurate system of accounting for Canada's forests. But such a system must also account for the value of social and economic services provided by that resource. On this page, we ask how changes in forest harvest practices have affected jobs – a vital aspect of wellbeing.

Mechanization: does it really pay?

THE FOREST INDUSTRY HAS COME A LONG WAY FROM THE TWO-MAN CROSS-CUT SAW AND OXEN OF THE 1870S. TODAY, ONE FELLER BUNCHER CAN DO THE JOB OF NEARLY A DOZEN WORKERS, CUTTING MORE WOOD AND BRINGING IN MORE PROFITS IN A SHORTER PERIOD OF TIME.

Across Canada, the volume of timber cut has steadily increased without a commensurate increase in jobs. Over the past 30 years, the proportion of forest sector jobs to wood harvested has dropped by about 15%, while harvest rates increased by 60%.

Increasing mechanization may be desirable for a lumber company whose eye is on greater volumes and short-term profit margins. But from the viewpoint of a resource-dependent community, the wrong kind of mechanization can threaten jobs, deplete the resource those jobs depend on, and undermine the prospects of future generations.

The problem is not technology per se, but the type and purpose for which it is used. Technological innovation can be highly compatible with intelligent resource use, energy efficiency, environmental conservation, and economic savings. Emissions controls on vehicles and combined cycle power generation are two obvious examples.

But mechanization aimed at felling more trees more quickly has actually made it harder for logging contractors to earn a modest living after paying all the bills. Pressure to pay for expensive machines means cutting night and day, working 80 to 100 hours per week, stopping only for breakdowns, and often carrying more than \$1.5 million in debt. To run a harvester and a forwarder for a typical 100-hour week can cost about \$2,700 in fuel expenses alone, based on using 36 litres of diesel fuel per hour at \$0.75 per litre. Maintenance of a tractor-trailer can cost at least \$10,000/year.

The chronic indebtedness and extremely long work hours of many logging contractors directly affects their quality of life, stress levels, and health. Statistics Canada reports that long hours of work may increase the risk of smoking, alcohol abuse, lack of physical activity, sleeplessness, poor eating habits, and other negative health behaviours.

There are other ways to harvest trees, using more



Jobs plus...or minus?

WITH MORE SUSTAINABLE HARVEST PRACTICES, CANADA'S FORESTS COULD PRODUCE MANY MORE JOBS.

According to Natural Resources Canada, in 2001 the forest sector created about 353,000 full-time equivalent jobs – 164,300 in wood product manufacturing, 110,500 in paper manufacturing, 54,600 in logging, and 24,300 in forestry services. More than 1,600 Canadian communities depend on forest industry jobs, 337 of them for more than half of their employment.

But the number of jobs alone tells us little about the long-term livelihood security of forest-dependent communities. To link viable employment with sustainable forestry management, we should be asking, "On an annual basis, how many jobs are created per volume of wood harvested?" Adding value to each unit of wood harvested should create more jobs per volume of wood harvested.

By this criterion, Canada's forest industry doesn't look quite so robust. Despite a 60% increase in wood harvested annually over the last 30 years, the ratio of jobs to wood harvested has remained static at 2 jobs for every 1000 cubic metres. That puts

Canada well behind the U.S. at 2.62 jobs per 1000 cubic metres harvested, and Sweden, at 3 jobs for the same harvest.

In some provinces, the overall ratio of jobs per unit of wood harvested is actually decreasing. In Nova Scotia, for instance, the ratio of jobs per unit of wood harvested has declined by about 24% over the last two decades, while volumes of wood harvested have doubled. And in British Columbia, the volume of wood cut has nearly doubled – from roughly 40 million cubic metres per year in 1960 to 75 million cubic metres in 2000 – while the ratio of jobs to wood harvested has declined.

Overall, Canada does not strive for high quality wood. In fact, the opposite is happening in many parts of the country. Provinces such as Nova Scotia have seen the near-complete loss of older forests, along with a decline in valuable, high quality timber, resulting in fewer opportunities to manufacture a diverse array of wood products. Tending the forest better could produce better-quality timber that would produce more jobs.

Another reason there has been no increase in jobs per volume of wood harvested is that too few companies add significant value to the wood they buy. Additional processing of wood involves more human effort, tools, and machines. Each additional step employs more people, and creates a product of higher value. One U.S. study found that turning logs into lumber creates just 3 jobs for every million board feet harvested, while turning it into furniture parts creates another 20 jobs, and assembling those components into furniture creates another 80.

A small hardwood flooring manufacturer on Cape Breton Island, Nova Scotia, for example, created 10 jobs for every 1000 cubic meters (m³) of wood

purchased in 2000. The pulp and paper industry, by contrast, creates just 1.4 jobs for every 1,000 m³ of wood harvested annually, and a modern sawmill creates less than 1 job per 1,000 m³ annually.

Adding value translates into dollars, too.

Canada generates \$163 per cubic metre of wood harvested, while the U.S. generates \$318. Among the provinces, Ontario adds the most value to its harvested trees at \$273/m³, followed by Quebec at roughly \$204/m³ and Manitoba at \$187/m³. British Columbia, which harvests almost as many logs as Ontario and Quebec put together, creates just \$110/m³, while Alberta creates \$88/m³ and Nova Scotia creates an anemic \$82/m³. These provincial figures are based on 1997 data.

Instead of turning our forests into top wood products, we're chopping them into cheap lumber and grinding them into pulp and paper. The Communications, Energy and Paperworkers Union, which represents thousands of pulp and paper mill workers, says the only way to avoid mill closures is "to influence investments [that] move the Canadian industry up the value chain."

Reliance on pulp and paper exports to the U.S., and a relatively small domestic market for high quality finished wood products, have contributed to Canada's low value-added performance. Recent job growth in wood products manufacturing may signal the beginning of a shift to greater value-added production. A switch from clearcutting to selection harvest practices would also produce more jobs.

This is an example of how economic growth statistics, viewed in isolation, send misleading signals to policy makers. If Canadian governments were to encourage selection harvesting and value-added wood industries, the country could create far more jobs and wealth from its forest-based industries.

How many jobs does 1000 cubic metres of wood create?

A business selling moulding and high-end wood products¹



A small ecoforestry woodlot and sawmill²



Algonquin Park, Ontario



Pulp and paper industry³



A typical ultra-modern sawmill



¹ Based on actual case study at Finewood Flooring and Lumber Ltd., Cape Breton, Nova Scotia

² Based on actual case study at Windhorse Farm, an ecoforestry woodlot and sawmill in Lunenburg County, Nova Scotia

³ Based on Nova Scotia pulp and paper industry, which employs 1.4 people for every 1000 cubic metres harvested

For more details on employment at Finewood Flooring, Windhorse Farm, and Algonquin Park, please see the GPI Forest Accounts, volume 2, at www.gpiatlantic.org.

appropriate technologies. The Menominee Tribe in Wisconsin has logged an 89,000-hectare forest for 147 years. The reservation has more wood of higher quality today than when it was established in 1854. The Menominee motto is to cut what the forest provides, and never modify a cut for the market. Even when wood prices are high, Menominee forest managers resist the temptation to cut more.

Fifty per cent of the harvesting that takes place in the Menominee forest uses the selection method, where only single trees or small patches of trees are cut using chainsaws. Trees greater than 18 inches in diameter are the norm – a size many large harvesting machines cannot handle.

Algonquin Park: an investment that's paying off

In the early 1970s, the managers of Algonquin Park in Ontario began removing low quality, poorly formed trees, and leaving behind the high quality, good growing stock. They did this because for many years, Algonquin Park had been high-graded – with loggers "taking the best and leaving the rest." The managers knew that the sawmills would complain – after all, they were now receiving poorer wood. But they persisted with their long-term plan knowing the first 20 years would be the toughest, with everyone scrambling to find markets for their low quality wood.

The good news is that their investment is already paying off. One sawmill owner, who receives logs from areas first treated 20 years ago, reports that mills are now sawing more high quality wood from the managed hardwood stands. Quality sawlogs are now 50% of total hardwoods cut, up from the traditional 35-40% range from these managed areas. In contrast to the decline in wood quality in Nova Scotia, the Algonquin Park forest is literally "worth more" than it was 25 years ago, and is producing ever higher grades of lumber.

A WAY FORWARD: FROM MEASUREMENT TO ACTION

Measurement is not a theoretical or academic exercise. Its purpose is to tell the truth and provide information so that individuals and society can see reality clearly and take action to improve their lives, strengthen their communities, and create a better world. The purpose of forest accounts is to generate actions and change forest practices in practical ways that will improve the health of Canada's forests for the benefit of future generations.



Pictou Landing: a forest with a future

In 1992, the forests of the Pictou Landing First Nation were similar to most forests in Nova Scotia – subjected to more than 300 years of land clearing, cultivation, burning, clearcutting, and highgrading (taking the best-formed, most vigorous trees and leaving behind the poor quality trees). By the 1990s, the Pictou Landing forests had been badly degraded and were dominated by short-lived, low value tree species, such as alders, white spruce, balsam fir, white and gray birch, red maple and poplar. More than 70% of the trees were between 40-80 years old. The large-sized, long-lived trees of the Acadian forest, such as white pine, red oak and sugar maple, had all but disappeared from Pictou Landing.

Across Nova Scotia, foresters usually log for speed and quantity, typically cutting and replanting short-lived, fast-growing coniferous trees. These trees are cut again in short order. By contrast, Pictou Landing practises “restoration forestry.” This method fosters trees of many ages, creating an opportunity for the development of an old-growth forest. It also provides a stable place for diverse populations of mammals, birds, reptiles, amphibians and micro-organisms. Restoration forestry requires knowledge and patience. The work of returning a forest to its “natural” state could take as long as 300-500 years – depending on the condition of the forest.

One way to allow restoration to occur is simply to leave a forest alone. In time the forest will heal itself. However, restoration can also be sped up a little bit, if done carefully. Benefits can be realized along the way. That's what is happening at Pictou Landing.

In March 2000, Pictou Landing was internationally recognized as a forest with a future. It became the first Forest Stewardship Council (FSC) certified forest operation in Nova Scotia, and one of only ten FSC certified forest operations in Canada. The FSC supports environmentally appropriate, socially beneficial, and economically viable management of the world's forests. With this certification, all wood products from Pictou Landing can now be labelled with a “green” stamp that guarantees they came from a certified well-managed forest.

Doing what's best for the forests

THREE CENTURIES OF CARELESS EXPLOITATION HAVE REDUCED THE AVERAGE AGE OF CANADA'S FORESTS, AND REDUCED THE PROPORTION OF HIGH-VALUE SPECIES THEY CONTAIN. AS A RESULT, OUR FORESTS ARE LESS CAPABLE OF PERFORMING THEIR MANY FUNCTIONS OPTIMALLY.

Measuring the health of our forests accurately and comprehensively to account for the full range of forest values will shift policies towards practices that conserve and enhance our natural wealth, while creating a more viable timber industry. We have the knowledge, the capacity, and the practical models to restore the value of our forests.

This will require far more careful tree-cutting. Currently, clearcutting still dominates wood harvesting in Canada. In 1999, the most recent year for which data are available, clearcutting accounted for more than 89% of Canadian timber harvests. Only 8.8% of Canada's forests were managed carefully, using a cutting system called the selection method, which preserves the value of the forest left behind.

Selection harvesting involves cutting individual trees or groups of trees. Up to 30% of a stand's volume may be removed, compared to 100% in a

clearcut. Slow-growing trees are cut, and the healthiest, tallest, and best-formed trees are left behind. Long-lived valuable tree species are favoured, and old-growth trees, live and dead, are left alone. When the stand is harvested again in 15-20 years, the quality and volume of wood has improved.

Ecological forest practices also protect forest soils from root damage, ruts, and erosion. They also ensure that standing trees are not damaged during logging. They maintain a protective canopy of trees; protect significant wildlife habitat; and plan for the long-term health of the forest, ensuring that harvest volumes do not exceed annual growth rates.

At Windhorse Farm in southwest Nova Scotia, managers have shown what sustainable logging can do. Despite 162 years of continuous harvesting, the value of this hemlock-dominated woodlot has steadily increased. Some trees are 450 years old, and trees over 80 years old dominate more than 90% of the forest, compared to just 1% in the province as a whole.

Policies to restore Canada's forest wealth

HOW WE MEASURE THINGS ISN'T A THEORETICAL EXERCISE. IT AFFECTS REAL POLICIES. ONCE CANADA'S MEASURES OF PROGRESS INCLUDE NATURAL RESOURCE ACCOUNTS, GOVERNMENT, INDUSTRY, WOODLOT OWNERS, AND THE PUBLIC WILL HAVE AN ACCURATE GUIDE FOR ASSESSING THE IMPACT OF FOREST POLICIES. THAT'S A CRITICAL FIRST STEP TOWARD REALIZING THE TRUE POTENTIAL OF CANADA'S FORESTS.

Because forests perform so many vital non-market functions, governments have a vital role in ensuring that the full range of forest values is maintained and enhanced. Here are some likely policies that will emerge from a good set of national forest accounts:

Harvest volumes should not exceed sustainable levels, both nationally and regionally. Shifting from volume-based to value-based production will enable the forestry industry to decrease wood consumption while promoting real increases in wealth and employment. This means managing forests for high quality, premium-priced wood, and promoting value-added manufacturing.

Restrictions on clearcutting, especially in highly-diverse forests, will encourage forests with a variety of ages and tree species, and enhance the capacity of Canada's forests to perform their full range of functions optimally.

Research, development, innovation, and worker training must focus on harvesting methods that preserve the full health and value of the forest. This may require financial incentives to reward uneven-aged management, selection harvest methods, and forest restoration.

Monitoring the health of our forests will also enable citizens to hold government and industry accountable for the preservation and conservation of the country's natural wealth.

Changes may also be needed in the way stumpage fees are calculated. Stumpage is what harvesters pay for standing, unprocessed trees on Crown land. Canadian stumpage rates, set by provincial governments, are low by world standards. In Nova Scotia, for example, taxpayers

paid \$61.7 million to subsidize forestry on Crown lands between 1990 and 1997, but the province collected just \$25.6 million in stumpage fees over that same period. Such practices encourage a high volume, low quality approach to harvest management. Some critics advocate a more transparent system for calculating such fees, based on a competitive, market-based bidding system in which standing timber is sold to the highest bidder.

These and other policy shifts, designed to protect and restore the value of Canada's forests, should flow naturally from resource accounts that track Canada's forest values accurately, and that are part of a more comprehensive Canadian index of wellbeing.



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