Biodiversity Conservation in Canada: From Theory to Practice

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2 The Historical Foundations of Conservation in Canada

The contemporary practice of conservation is rooted in the events, decisions, and learning that have occurred in the past. This applies not only to the landscape changes that now threaten many species, but also to our collective way of thinking about biodiversity and what it means to maintain it. To understand current conservation practice we need to understand its historical foundations. The aim of this chapter is to provide that foundation by tracing the evolution of conservation in Canada from the initial influx of Europeans through to the start of the new millennium. More recent developments will be discussed in subsequent chapters.

A New World

When the Europeans packed their bags for the New World, they brought with them a worldview that emphasized human dominion over the earth. European conservation practices were based on the control of land and resource use by nobility, and they were not part of a culturally shared worldview (Donihee 2000). Furthermore, in the battle for survival that characterized the lives of early settlers, wilderness was something hostile that needed to be subdued and tamed, not preserved. In any case, few could perceive

the need for conservation in a land so bountiful and limitless.

The effects these early Canadians had on the environment grew with their numbers and with the expansion of the fur trade. Canada's population increased slowly at first, remaining under 50,000 until the mid-1700s. It reached 3.5 million by the time of Confederation in 1867 (SC 2014a). Three categories of activity accounted for most environmental impacts during this early period: hunting and trapping, agriculture, and tree harvesting.

The activity with the most widespread ecological impact was trapping associated with the fur trade. Beavers were the primary species of interest, and by the late 1800s, they had been extirpated from many parts of Canada. Given the beaver's role as an ecosystem engineer and keystone species, its removal had widespread ecological repercussions (Hood and Larson 2015). The Hudson's Bay Company eventually instituted trapping limits as a conservation measure; however, the directives were never effectively implemented (Sandlos 2013). What ultimately saved the beaver was not conservation but changing fashion. By the mid-1800s, beaver hats were out, and silk hats were in.

In contrast to the fur trade, which affected species and ecosystems across Canada, hunting, agriculture, and tree harvesting were concentrated near the early settlement areas. Before Confederation, almost all of these settlements were located along the St. Lawrence River, the Great Lakes Lowlands, and around the coasts of the Maritime provinces (Fig. 2.1). Agriculture had the greatest impact because it involved the clearing and transformation of land and because it supported an ever-increasing human population with an ever-growing environmental footprint.

Even though most settlers were not dependent on hunting for survival, supplemental hunting was common and resulted in substantial pressure on local wildlife. Hunted populations went into regional decline, and some species, like elk, were extirpated from some eastern areas (Rosatte 2014). Forests were also pushed back, as the need for agricultural land, lumber, and fuel for heating steadily increased. The eventual loss of 90% of

Fig. 2.1. The distribution of Canada's urban population in 1871. One dot represents 1000 inhabitants. Source: Atlas of Canada, 3rd Edition (http://open.canada.ca).

southern Ontario's Carolinian forest, Canada's most diverse ecosystem, can be traced back to this period (Suffling et al. 2003).

Nation Building

With Confederation in 1867, Canada transitioned from a collection of British colonies to a country in its own right. From the perspective of conservation, the most important aspect of Confederation and the associated *Constitution Act* was the division of power between the provinces and the federal government. The provinces were awarded exclusive control of lands and resources within their boundaries and given primary responsibility for their management. Wildlife was not mentioned in the *Constitution Act* directly but has since been interpreted to be a component of the land, and therefore, is also under provincial control (Kennedy and Donihee 2006).

There are a number of specific provisions in the *Constitution Act* that create exceptions to the general rule of provincial control over wildlife. In particular, the federal government has control over the management of fisheries, most migratory birds, and endangered species. It also shares responsibility for various aspects of environmental management that impinge on conservation indirectly, such as the control of pollution and the environmental assessment of certain types of industrial projects. Finally, the federal government has retained partial control of land and resources in the territories and has full control over certain other areas, such as national parks.

Confederation was followed by a period of vigorous nation building. Settlement of the West was a top priority for the new national government and was supported by the building of a transcontinental railway and a campaign to draw immigrants from all corners of Europe with offers of free land. These efforts were highly successful in terms of their stated goals. By 1911, Canada's population had more than doubled from the time of Confederation, to 7.2 million (SC 2014a). Export markets grew in importance and began to include a wider range of products. Businesses were established, a service sector was developed, and urban centres grew in size and importance.

Economic growth and the great wave of immigration led to increased environmental degradation. The problems were similar to those of earlier periods but the rate of change was now much faster. In the space of only three decades (1881–1911), the area of farmland in the Prairie provinces increased from 1.2 to 24.3 million hectares, comprising over half of all farmland in Canada. Canadian wheat exports rose 16–fold, to 97.6 million bushels (SC 1983a). Not only were there more people in more places than ever before, but growing external markets for resources placed increasing and unsustainable demands on natural systems. Last but not least, the frontier mentality and human-centred worldviews of earlier periods remained largely intact, muting concerns over the ecological changes that were occurring.

An important feature of this period was the existence of markets for wildlife meat and parts, which increased the rate of harvest far above that needed to meet local subsistence needs. Unsurprisingly, targeted species declined precipitously. A prominent example is the plains bison, which once roamed the Great Plains in the millions. By the late 1880s, the Canadian bison population was extirpated and only a few hundred individuals remained in the US.

Market hunting of bison was initially conducted mainly by the Métis from Manitoba's Red River region (Dobak 1996). By the mid-1800s, their hunts had evolved into highly organized biannual events, sometimes involving over a thousand individuals. The bison meat provided winter provisions for Métis families and also supported

a thriving trade with the Hudson's Bay Company and European colonists. The 1870s brought hide hunters, who "killed lavishly for the one or two dollars per mature hide that American tanners were prepared to pay" (MacEwan 1995, p. 59). In fairly short order, all that was left of the vast bison herds was their bones, which were later collected and ground up as fertilizer.

A similar fate befell the passenger pigeon (Fig. 2.2), which went from being the most abundant bird in North America to extinction in the late 1890s. These pigeons had always been hunted because their colonial nesting habits and large numbers made them an irresistible target. The tipping point to unsustainability occurred when hunting became commercialized and then increasingly mechanized in the late 1800s. By the end, railcars were annually shipping pigeons by the millions to markets in large cities (Yeoman 2014). Although market hunting was not the only factor involved in the demise of the passenger pigeon (Bucher 1992), extinction is unlikely to have occurred without it.

Trade in meat was not the sole focus of market hunting in the 1800s. The fur trade was still important at this time, and there was also a thriving whaling industry that was providing whale oil for lamps and baleen for corsets. This would eventually land many whale species on the endangered species list. Last, but not least—not to be outdone by the gentlemen and their beaver hats—ladies started a craze of their own involving the use of feathers to adorn their hats. Innocuous as this may seem, the growing size and affluence of human populations in the late 1880s generated an unsustainable demand, leading to the decline of many North American bird species, including Canada's own now-endangered piping plover (Doughty 1975). Wild bird feathers were also harvested for stuffing pillows, and this was one of the main drivers of the extinction of the Great Auk off the coast of Newfoundland in the mid-1800s.

Fig. 2.2. A male passenger pigeon, displayed at Chicago's Field Museum of Natural History. Credit: J. St. John.

Early Twentieth-Century Conservationists

Toward the end of the 1800s, the demise of the bison and passenger pigeon, and the overexploitation of many other species and other natural resources, began to affect the collective conscience of North Americans. Sporadic conservation efforts and localized restrictions on hunting had been implemented earlier, but these were of limited scope and were never effectively implemented (Loo 2006). What transpired at the turn of the twentieth century was a broad social movement that embodied a new way of thinking about wildlife and nature.

The first conservationists were mainly Americans. The end of the frontier was reached earlier in the US than in Canada, and environmental

losses were more apparent, making the myth of limitless resources untenable (Foster 1978). Almost from the start, two disparate views of conservation emerged, and they remain distinct themes today: a **utilitarian** or "wise use" view and a **preservationist** view (MacDowell 2012). Advocates of the utilitarian approach, such as the first Chief of the US Forest Service, Gifford Pinchot, focused on the sustainability of resource use and elimination of wasteful practices. They also emphasized the importance of scientific management and centralized control over resource use.

The preservationists valued nature for its intrinsic qualities, rather than as a resource for human use. They were led by men such as John Muir, who co-founded the Sierra Club in 1892. The preservationists' main concern was the loss of wilderness, and their preferred tool was protected areas, where resource development was prohibited. Pinchot and Muir were both advisors to President Theodore Roosevelt, who was himself a strong advocate of conservation. Both views of conservation were advanced under his watch, though the utilitarian view was dominant and eventually co-opted the term "conservation."

Conservationist ideas percolating in from the US helped to generate a conservation movement in Canada, distinguished by strong support among political and business leaders (Sandlos 2013). The high-water mark was the establishment of the Commission of Conservation, through an Act of Parliament in 1909. The Commission was heavily influenced by Pinchot and his utilitarian views of conservation as well as ideas from the contemporary Progressive Movement about efficiency, science-based decision making, and professional management (Sandlos 2013). It published about 200 reports during its tenure, greatly expanding knowledge related to resource management and contributing to the development of public policy (MacEachern 2003). In so doing, it raised the profile and credibility of conservation and promoted its widespread adoption.

By the World War I, Canada's approach to resource management had been completely overhauled. The state was now firmly in control, and the fragmented and uncoordinated management efforts of earlier periods had been replaced with top-down bureaucratic management systems involving planners, scientists, foresters, game wardens, and others. The new approach incorporated the concepts of utilitarian conservation and featured a legal foundation, professional staff, research-based problem solving, and effective enforcement. Attention was focused on three main areas: game management, forest management, and parks.

Game Management

The decline in wildlife populations during the 1800s was, fundamentally, a manifestation of the Tragedy of the Commons (Box 2.1). Human populations were now far too high and technology was far too lethal to maintain a sustainable rate of harvest in the absence of effective control mechanisms. This control was achieved by the early conservation movement, but not simply through tougher laws and regulations. The critical change was the emergence of a sport hunting ethic, originating mainly in middle and upper-class society (Loo 2006). In the absence of such a shared vision and ethic, it is unlikely that regulation alone would have been effective, given the challenge of enforcing such rules in Canada's vast wilderness.

By the turn of the twentieth century, Canadian society was changing, as cities grew and became the focus of political power. Subsistence hunting had no relevance for these urbanites, though many retained a strong desire to hunt and reconnect with nature as a recreational pursuit (Fig. 2.3). Sport hunting reached its pinnacle

Box 2.1. The Tragedy of the Commons

The Tragedy of the Commons is a resource management problem in which the users of a shared resource end up depleting it through the narrow pursuit of self-interest (Hardin 1968). In the absence of controls or assigned rights, individuals are motivated to take as much from the commons as they can because failing to do so means someone else may get their share. Perhaps the most grievous example in today's world is the global decimation of fish stocks through overfishing of the high seas.

during this time and was one of the top recreational activities for men (Herman 2003).

The objectives of sport hunting are far removed from those of subsistence hunting. It is not the meat, but the hunting experience that is of highest priority. And this changes everything. Instead of focusing on the most effective and efficient means of killing, sport hunting is based around ideas like challenge and fair chase (Posewitz 1994). As a result, wildlife is most valuable while it is alive, not dead. Finally, from the perspective of sport hunters, subsistence hunters, market hunters, and hunters that did not adhere to the sport hunting creed were all unwanted competitors.

The sport hunters, being largely urban based, were politically well connected. In fact, politicians were as likely as not to be sport hunters themselves. Therefore, the system of game management that developed during this period was designed to serve the needs of sport hunters over other users. The new system of management was based on three core policies, which remain in place today: (1) the absence of a market for the meat and products of game animals; (2) the allocation of hunting rights by law, not birthright, social position, or land ownership; and (3) a prohibition on the frivolous killing of wildlife (Geist 1988). Earlier piecemeal hunting laws and regulations were also coordinated and strengthened, and

Fig. 2.3. Portrait of a sport hunter, circa 1900. Credit: B. Hoare, Provincial Archives of Alberta.

game wardens were hired to ensure compliance. Practices contrary to the sport hunting ethic of fair chase were generally banned, and restrictions were placed on the number and types of animals that could be taken and on the timing of the hunt (Donihee 2000).

These policies and regulations had several effects. First, they removed value from dead animals and increased the value of living animals. They also ensured that the killing of wildlife was not economically rewarding, once the costs of equipment and travel were accounted for. In addition, the take of individual sport hunters was reduced to a sustainable level. Finally, the system made each citizen a shareholder in wildlife, with a stake in maintaining healthy populations. An important caveat was that management interest was squarely focused on game species above all others. Species that were perceived to be a nuisance, such as wolves and raptors, were still killed indiscriminately.

The new system of game management was very successful in terms of its stated objectives. After decades of widespread decline, the populations of most game species stabilized and began to recover (Geist 1988). In turn, hunting opportunities increased, and so did economic benefits and jobs associated with wildlife (e.g., outfitters and equipment suppliers). Many conservation organizations also came into being, providing political and material support for conservation efforts.

This is not to say that the new system was free from detractors. Rural people, in particular, chaffed at the new restrictions imposed upon them by what they perceived as urban elitists (MacDowell 2012). Market hunters were, of course, none too pleased either, though declining wildlife populations had already reduced their prospects for profit. In any case, neither of these groups had the political power needed to stem the tide of change.

The new system of wildlife management, which emphasized public access to the resource and the absence of markets, was applied to most game species. However, furbearers and certain fish species were handled differently. For furbearers, sustainable commercial harvest was achieved, and continues to be achieved, by regulating access through exclusive-use traplines. This privatization of the resource kept interlopers out and encouraged trapline owners to harvest at a sustainable rate. In addition, the high rate of reproduction of furbearers, relatively low economic potential of trapping, and the labour-intensive and arduous nature of trapping, all contributed to keeping supply and demand in balance.

Commercial harvest was also maintained for a variety of fish species, but here the outcome was generally very poor in terms of sustainability. In large part, this was because the resource could not be effectively privatized—neither fish nor boats could be tied to defined locations. Thus, the Tragedy of the Commons manifested, exacerbated by progressive improvements in the efficiency of commercial fishing. We will review an example involving walleye fisheries in Case Study 5 (p. 293).

Forest Management

Forest harvesting underwent a rapid expansion during the 1800s, supported by a thriving export market to the US and England, as well as growing internal demand. The general approach to harvesting was "cut and move on," which propelled cutting crews down ever-smaller tributaries of the waterways needed to transport the timber to market (MacDowell 2012). The advent of railroads in the mid-1800s greatly improved access to backcountry forests, leading to further increases in the rate and spatial extent of cutting.

Forest harvesting was only loosely regulated throughout most of the 1800s. The main concern of governments was the extraction of rents and

the control of competition through regulated access (Ross 1997). In contrast to the US, access to forests was generally provided through temporary leases rather than land sales, and this turned out to be a pivotal decision. Over the years, the retention of public land ownership in Canada has been a critical factor in advancing forest conservation.

The conservationists of the early twentieth century were not concerned about the commodification of forests products, as they were with wildlife. Their major worry was that forest depletion would lead to timber shortages, jeopardizing future economic development (Drushka 2003). This was conservation with a very strong utilitarian and economic orientation. Three main problems were identified that required attention: farmers, fire, and poor harvesting practices.

The primary tool for dealing with agricultural clearing was the establishment of forest reserves, where land clearing and human settlement were prohibited (MacDowell 2012). The basic idea was to allocate landscapes according to the uses for which they were most suitable. In some areas, the forest reserves were intended to also support watershed conservation.

Concerns about fire losses led to regulations on the use of fire and the deployment of fire rangers in many parts of the country. Rangers sought to prevent fires, especially from careless brush burning and sparks from trains. They were also expected to find and fight fires, to the extent this was possible at the time (Drushka 2003).

As for harvesting practices, the conservationists engineered a major overhaul, which included new measures to ensure forest regeneration, sustainable rates of harvest, and the prevention of waste (Ross 1997). In addition, under the influence of Pinchot and the Progressive Movement, management was thoroughly modernized. Formal bureaucracies dedicated to forest management were developed at the provincial and federal level, and professional foresters came into existence. Research into sustainable and efficient forest harvesting also got underway, led by the federal government's new Dominion Forestry Branch (1899), Canada's first Faculty of Forestry, at the University of Toronto (1907), and the Commission of Conservation (1909).

Parks

Another manifestation of the early conservation movement was the establishment of parks. Unlike the US, where wilderness preservation was an important driver of park establishment, Canada's first parks were created mainly for their utilitarian benefits. A good example is Ontario's Algonquin Park, established as the first provincial park in Canada in 1883. This park was created with three specific uses in mind (MacEachern 2003). Sport hunters sought a wildlife sanctuary to provide hunting opportunities. Logging interests sought a forest reserve where a secure supply of pine could be obtained. And municipalities sought the protection of the headwaters of several major rivers. Wilderness preservation and the conservation of biodiversity were notably absent as motivating factors.

The creation of Banff in 1885, Canada's first national park, also illustrates the mindset of the time. In this case, the primary interest was the commercial potential of tourism (MacDowell 2012). The government and the directors of the Canadian Pacific Railway recognized that the region's spectacular mountain scenery and the newly discovered hot springs would draw travellers from around the world. It took just three years for the 250-room Banff Springs Hotel to be built, and other mountain parks and Canadian Pacific Railway hotels soon followed. Although tourism was the main focus, additional revenue was sought from hunting, mining, and logging, all of which were permitted in the mountain parks in their early years.

In 1911, Canada formally established a Parks Branch, responsible for overseeing the expansion of the national parks system (Tanner 1997). The agency was led by James Harkin, who would become one of Canada's leading voices on conservation and the preservation of Canada's special places. Additional provincial parks were established during this period as well. Management efforts were primarily focused on creating the infrastructure needed to support tourism and recreation within the new parks. Additional efforts were directed at increasing wildlife populations and the prevention and control of fire (MacDowell 2012).

In addition to the new recreational parks, several wildlife reserves were established to support the rehabilitation of species that had been decimated through overharvest. The largest of these, at 44,800 km^2, was Wood Buffalo National Park, established in 1922. Some of the other reserves that were established around this time, such as the National Antelope Parks in Alberta and Saskatchewan, were later decommissioned after the target species had recovered (Foster 1978).

Rise of the Machines

The threats facing biodiversity underwent a fundamental shift in the twentieth century. Whereas wildlife declines in the nineteenth century generally involved someone setting a trap or firing a gun, the declines of the twentieth century were mainly the result of widespread habitat degradation from agricultural expansion and industrial development. The rapid growth and intensification of the resource sector was the result of several interacting factors:

- **Mechanization.** The farmers and lumberjacks of earlier periods had only muscle power and hand tools with which to push back the frontier, limiting the rate of change. The story of the twentieth century is one of increasing mechanization—more machines doing more things, with more efficiency, and more power.
- **Energy.** The increase in mechanization and expansion of the development frontier was supported by and dependent on an ever-increasing supply of easily transportable energy, primarily in the form of diesel and gasoline.
- **Access.** A defining feature of the twentieth century was the development of an extensive national transportation network that not only linked together Canada's far-flung settlements, but also provided the access needed to bring resources from remote areas to market (Fig. 2.4).
- **Innovation.** Technological advancement was rapid in the twentieth century, leading to greater effectiveness in finding and exploiting resources as well as increased profitability.
- **Population size.** Canada's population increased steadily over the twentieth century, increasing the demand for resources and providing the labour needed to extract them.
- **Export market.** During the twentieth century, Canada became one of the world's leading exporters of resource staples, especially to the rapidly growing US market. Market demand was, in turn, a strong driver of development and technological innovation.

Resource development also led to the establishment of mining and mill towns in remote areas that owed their prosperity and survival to the extraction of a single resource. In time, these towns would become a politically powerful constituency that supported industrial development.

Agriculture

The amount of land used for agricultural production reached its peak in the 1930s (Figs. 2.5 and 2.6). Most of the agricultural expansion occurred in western Canada, and the three Prairie

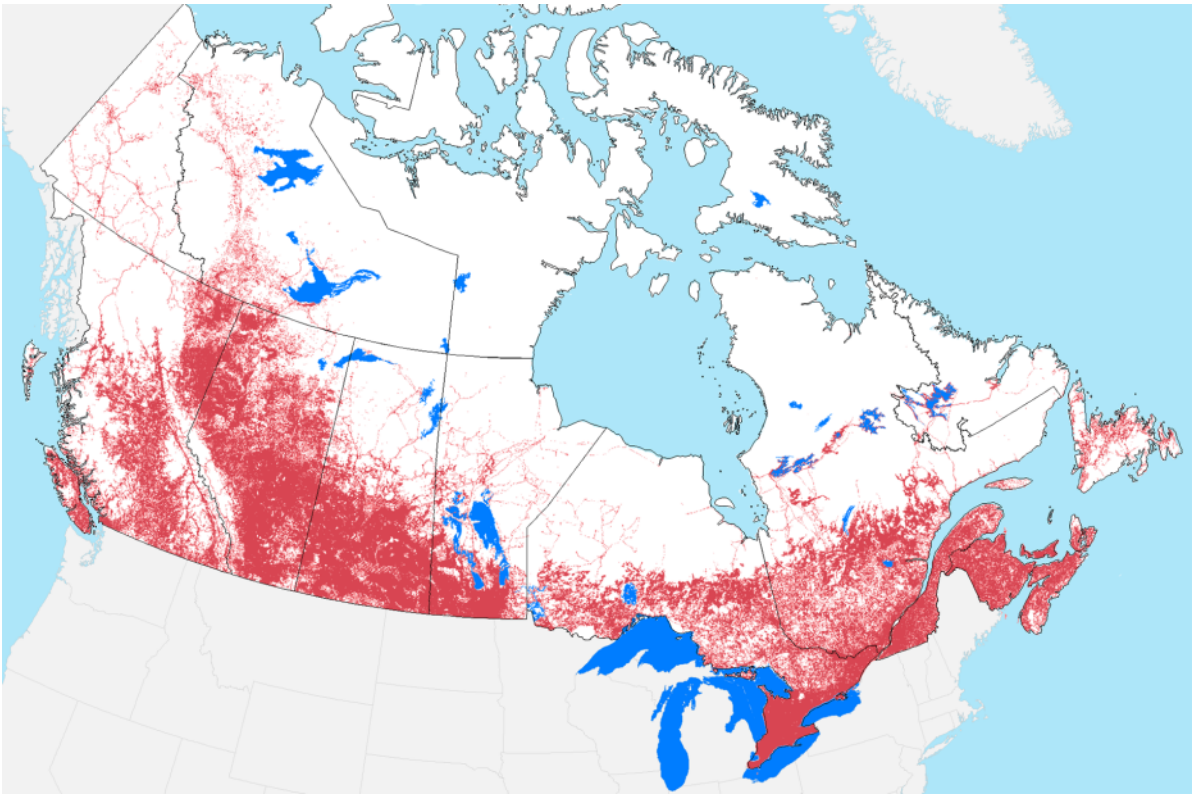

Fig. 2.4. The distribution of human access in 2013, based on Landsat imagery. Source: Global Forest Watch Canada.

provinces today account for over 80% of Canada's agricultural land. In the East, agriculture remained focused in the Great Lakes Lowlands and the lands adjacent to the St. Lawrence River.

Although the amount of land devoted to agriculture plateaued early in the twentieth century, the impacts of agriculture on biodiversity continued to rise in later decades because of intensification. The transition from horses to tractors was pivotal. Steam tractors were already available at the turn of the century but widespread ownership of tractors did not occur until affordable gas-powered models became available in the 1940s (Fig. 2.7). Over the years, farms increased in size, through consolidation, and tractors grew larger to match. Whereas the popular 1937 Allis Chambers Model B produced less than 20 horsepower, John Deere now sells eight-wheel behemoths that produce 620 horsepower and weigh more than 20 tonnes.

As farms mechanized, the cost of farming increased, leading to further intensification. Less and less of the landscape remained in a natural state. In addition, wetlands were drained to provide more cropland and to reduce the nuisance they represented to large farm machinery. It is estimated that more than 40% of prairie wetlands were lost to drainage over the past century and there is little evidence to suggest that the rate

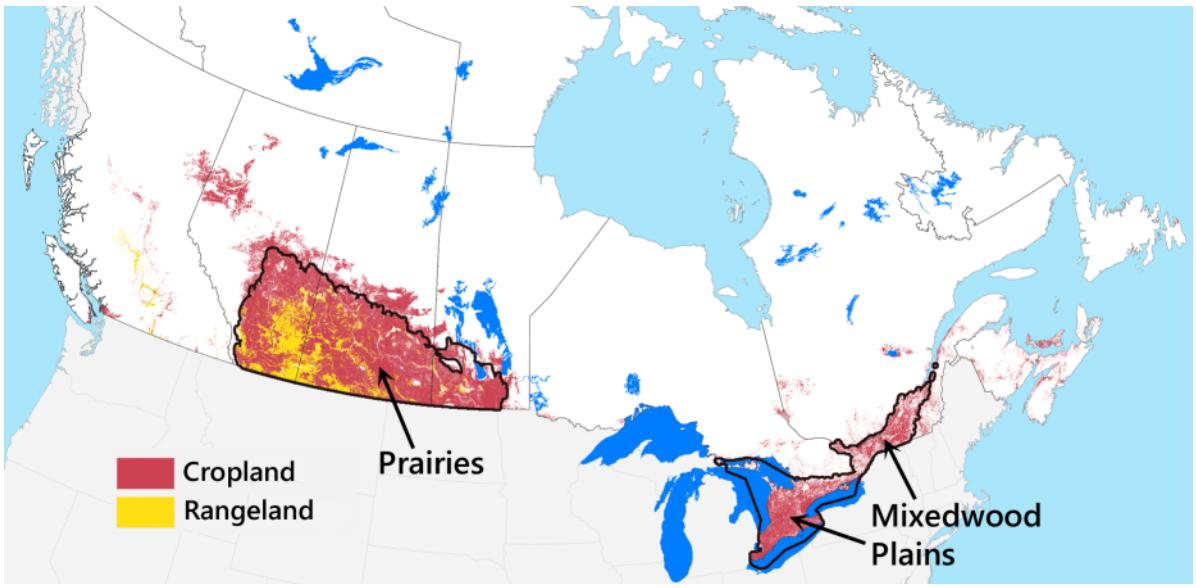

Fig. 2.5. The distribution of agricultural land in Canada in 2010. The Prairies Ecozone and Mixedwood Plains Ecozone are outlined in black. Source: Agriculture and Agri-Food Canada.

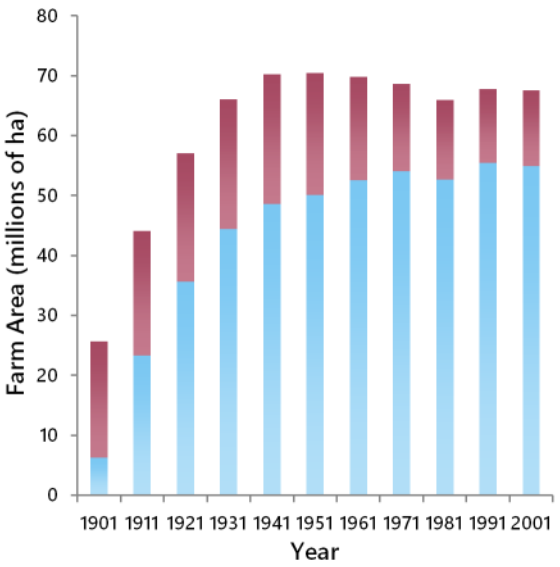

Fig. 2.6. The total area of farms in the Prairie provinces (blue) and the rest of Canada (red), 1901–2001. Source: Statistics Canada.

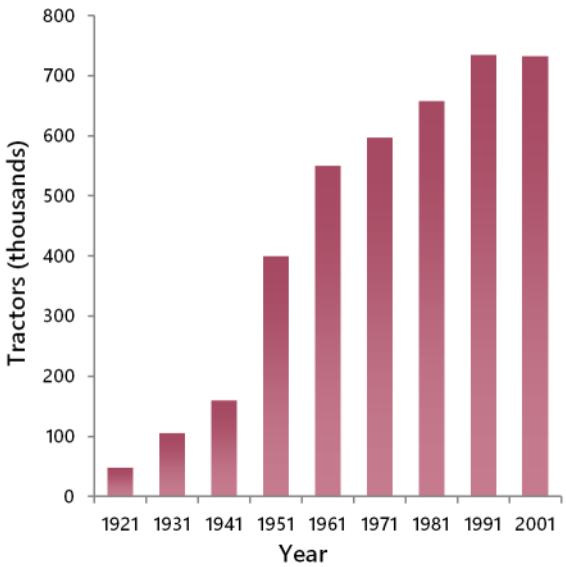

Fig. 2.7. The number of tractors on Canadian farms, 1921–2001. Source: Statistics Canada.

of loss has slowed in recent years (Cortus et al. 2011). Other manifestations of intensification included the removal of hedgerows, especially in Eastern Canada, and a progressive increase in the use of fertilizers, herbicides, and pesticides.

The rangelands of southeast Alberta and southwest Saskatchewan (Fig. 2.5) merit special mention because they followed a different trajectory. Low moisture inputs in these areas made them unsuitable for growing crops or pasture grass, so the native prairie remained largely intact. However, the replacement of bison with cattle, the control of prairie fires, and invasion by agronomic grasses had cascading effects on the integrity of these ecosystems (Fuhlendorf and Engle 2001). This region was also impacted by the development of an extensive road network.

Forestry

Rail networks expanded rapidly in the early decades of the twentieth century, providing access to a progressively larger proportion of Canada's merchantable forest. Another important change in this period was the rise of the pulp and paper industry, particularly in Eastern Canada (Kerr et al. 1990). Advancements in the design of the rotary press allowed the production of large numbers of daily papers, which became popular throughout North America. Demand for newspapers was also stoked by rising population levels.

Harvesting for pulpwood led to changes in forestry practices. Previously, trees were individually selected based on their suitability for producing dimensional lumber, which meant that much of a forest stand remained after harvesting. With pulpwood harvest, smaller trees could be utilized and so could species not suited for lumber production. Therefore, harvesting became more intensive and involved a greater range of stand types (Drushka 2003).

The next major change in forestry was mechanization, which became widespread after World War II. Most important was the internal combustion engine, which powered everything from chainsaws to large logging trucks. Trucks offered much greater mobility and flexibility than trains, and consequently, the development frontier was pushed even deeper into Canada's hinterland.

Mechanization also led to a further intensification of forest harvesting, culminating in the clearcut approach, which became the dominant method of harvesting in the last half of the twentieth century. Clearcutting offered several advantages for timber companies (Nyland 1996). First, it was efficient to implement, especially once harvesting was done with large machinery instead of chainsaws. Clearcutting also provided companies greater control over regeneration trajectories. Monocultures of desired species could be generated, boosting timber yields relative to natural regeneration, especially in mixedwood systems. The regenerating clearcuts were also even-aged, which facilitated the achievement of an even flow of timber each year at a standardized age at harvest (i.e., the rotation age).

The combination of mechanization and improved access led to steadily rising production of both lumber and pulp over the twentieth century (Fig. 2.8). The majority of Canada's merchantable forest is now subject to harvesting, and the remaining unallocated forest is mostly in the far north where productivity is low (Fig. 2.9). Harvesting has resulted in a progressive simplification of forest structures and patterns over time, and these changes continue to accumulate (see Chapter 5). Furthermore, forestry access roads have fragmented forested landscapes and served as wicks, drawing in other industrial and recreational users and their associated ecological impacts (Trombulak and Frissell 2000).

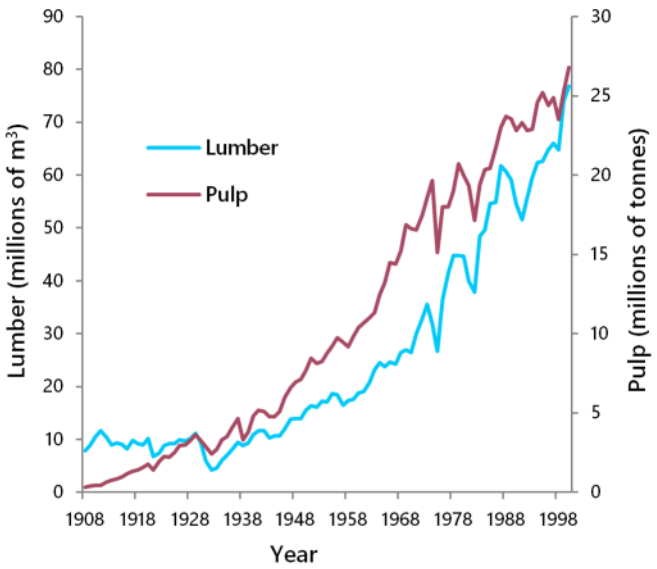

Fig. 2.8. The production of sawn lumber and pulpwood in Canada from 1908–2000. Source: Statistics Canada.

Oil and Gas

Oil and natural gas (Fig. 2.10) were discovered in Canada in the nineteenth century. However, significant levels of production did not occur until the middle of the twentieth century, when several factors came into alignment. The first factor was demand, which increased exponentially once the internal combustion engine came into widespread use. The second was exploration success, which improved as a result of systematic seismic surveys and better understanding of subsurface geology. The third was the ability to extract and ship the oil and gas to market, which improved with better technology and expanding infrastructure.

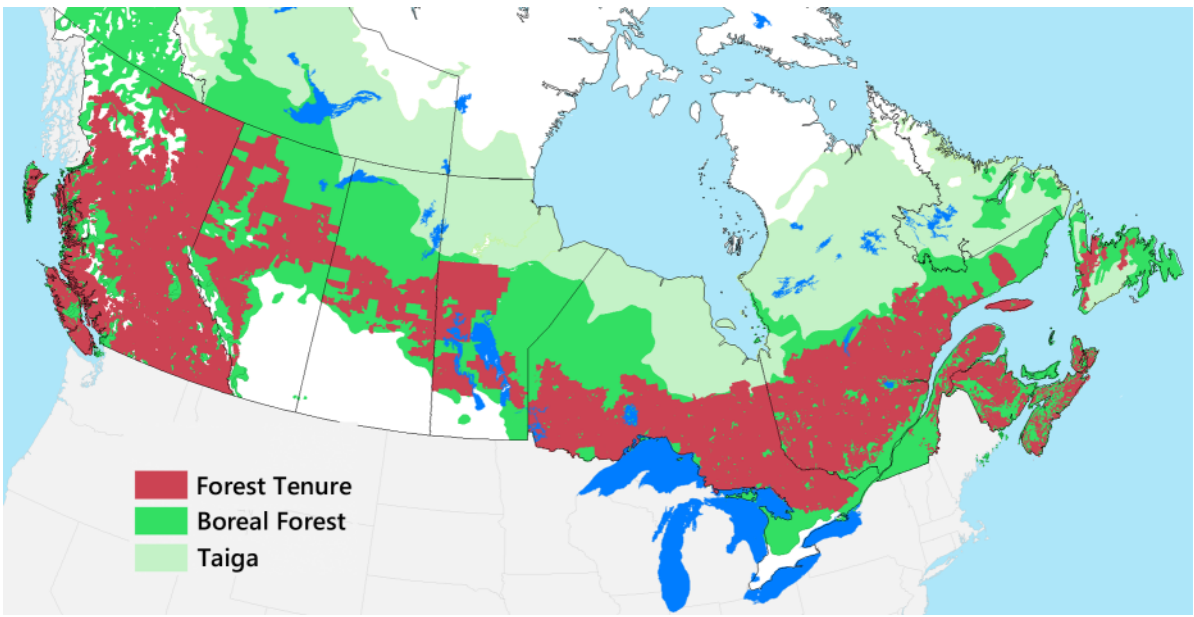

Fig. 2.9. The distribution of forest tenure (red) in 2013. The extent of forested land is shown in Green. Source: Global Forest Watch Canada and Canada's Forest Zone classification.

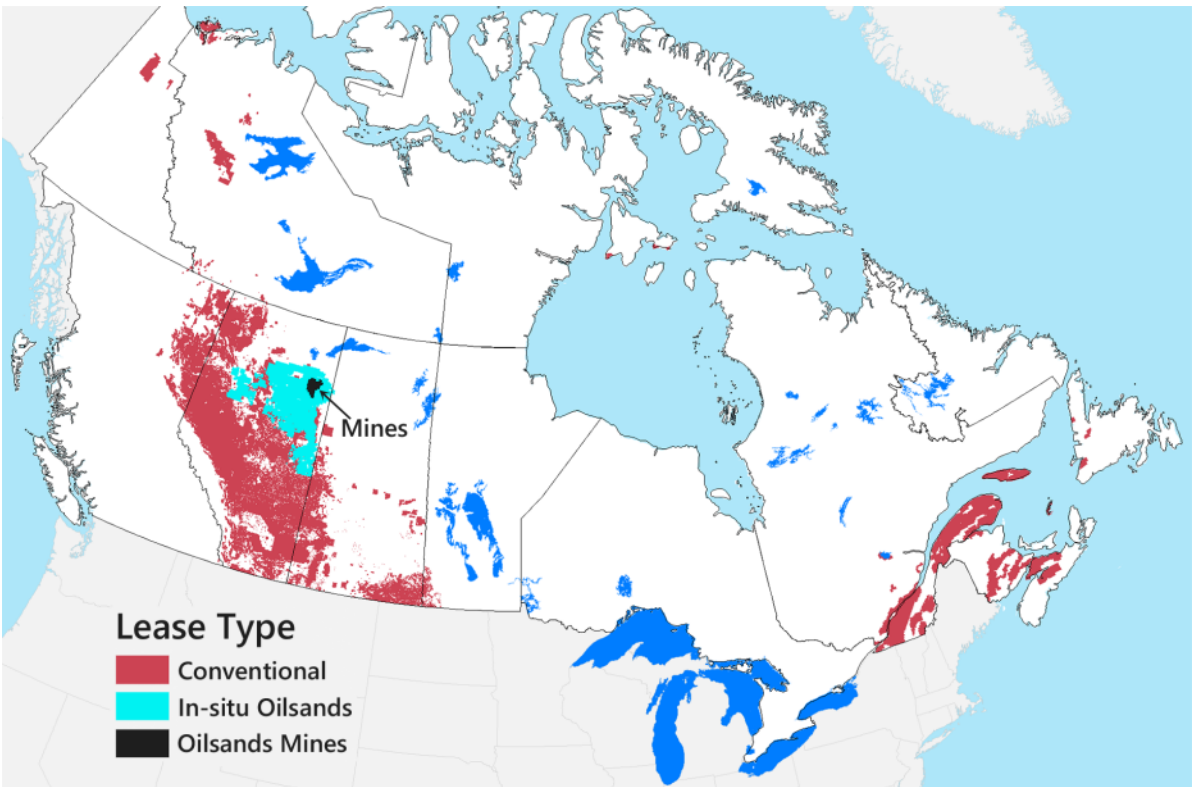

Fig. 2.10. The distribution of oil and gas tenure, by type, in 2013. Source: Global Forest Watch Canada.

Oil and gas deposits were eventually found throughout the Western Canadian Sedimentary Basin, stretching from northeast BC, across most of Alberta, and into southern Saskatchewan. Additional deposits were found in the Maritimes, Northwest Territories, and offshore. Drilling and infrastructure development were initially centred in the Prairie region, where most of the early discoveries were made and where access was plentiful. However, by the 1960s, road and pipeline networks were being developed deep into the boreal forest and the foothills of the Rocky Mountains. In areas of active oil and gas development, the annual rate of forest clearing for roads, well sites, pipelines, and seismic exploration approached the rate of cutting by the forestry sector (ECA 1979).

In 1973, the production of conventional oil reached its peak and then began to slowly decline (Figs. 2.11–2.12). Thereafter, growth in oil production was achieved through the development of unconventional deposits. Most important were the oil sands in northern Alberta, which contained thick bitumen mixed with sand. Some of the oil sands deposits were close enough to the surface to be recovered through surface mining, and this is where initial production began, in 1967. In the 1990s, technology was developed that allowed the recovery of deeper oil sands deposits using steam heating and in situ extraction. As a

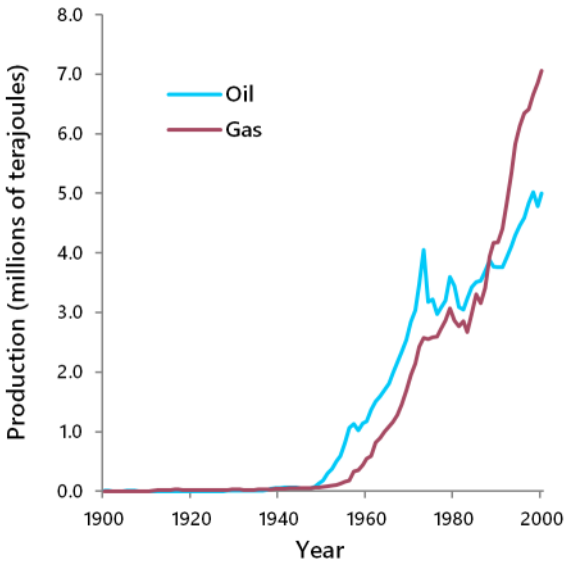

Fig. 2.11. The production of oil and natural gas in Canada from 1900–2000. Source: Statistics Canada.

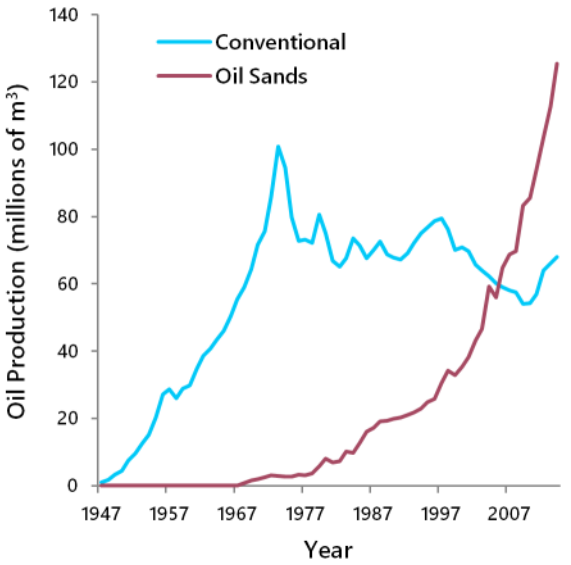

Fig. 2.12. The production of oil in western Canada, by type, from 1947–2014. Source: CAPP 2017.

result, the land area affected by oil sands development expanded from 4,800 km^2 (surface mining only) to 142,000 km^2 (Fig. 2.10). Today, the oil sands produce more oil than all other sources in Canada combined (Fig. 2.12).

Not all of Canada's oil and gas deposits have been brought into production. Many deposits remain stranded because of a lack of infrastructure and challenging working conditions, especially in the Northwest Territories. In areas with established infrastructure, there has been a tendency for successive waves of development to occur, as evolving technologies allowed different types of deposits to be profitably extracted.

The development of oil and gas over the last century has left a significant cumulative footprint, especially in the western boreal forest. Over 400,000 wells were completed in Canada between 1955 and 2017 (CAPP 2017), disturbing approximately 1 ha of habitat in each case. Virtually all of these wells required the construction of an access road, and most were connected to a pipeline. In addition, hundreds of thousands of kilometres of seismic cut-lines remain in forested areas as a legacy of exploration activities. Oil and gas development and refinement also resulted in air, soil, and water pollution (see Chapter 5).

Mining

Before 1900, mining in Canada was limited to small-scale operations focusing mainly on coal, iron, and gold (Cranstone 2002). Mining slowly expanded in the early twentieth century, closely tied to the expansion of transportation infrastructure. Many mining towns in the Canadian Shield and BC interior got their start during this early period, including Kimberley, Flin Flon, Sudbury, and Val-d'Or.

The demand for metals and other minerals rose rapidly after World War II as a result of increased mechanization. Demand was further stimulated by advances in metallurgy, which led

to new applications for metals. Rising demand provided mining companies with the incentive and security needed to undertake large, capital-intensive mining projects. Moreover, with the advent of heavy machinery, it became possible to remove large quantities of surface material to access extensive low-grade deposits through open-pit mining. Finally, advancements in science and technology enabled systematic exploration for mineral deposits and provided better methods of ore refinement. Consequently, mining production increased rapidly in the second half of the twentieth century (Fig. 2.13).

Today, there are 220 principal mines in Canada producing more than 60 minerals and metals (NRCAN 2013). These mines are distributed across the entire country, including the territories (Fig. 2.14).

From an ecological perspective, the most important legacy of mining in the twentieth century is the waste produced. Hundreds of millions of tonnes of rock had to be crushed, ground, and then chemically processed to extract the target minerals, which were generally a minor component of the ore (less than 1% for many metals). The residual tailings were stored on-site or discharged into the water, posing a variety of environmental hazards (Allan 1997).

Ontario's Sudbury region provides one of the more egregious examples of environmental harm caused by mining in the twentieth century. Over 7,000 lakes within a 17,000 km^2 area were acidified to the point of significant biological damage (Keller et al. 2007). In addition, the lakes and soils in the Sudbury region accumulated dangerously high levels of copper, nickel, zinc, and lead from windblown dust from tailings piles (Nriagu et al. 1998). The result was "an unusual anthropogenic ecosystem of denuded barren land with lifeless lakes" (Nriagu et al., 1998, p. 99).

Not all mining operations were as bad as Sudbury's, but it was not alone in leaving a long-lasting environmental legacy. Over 10,000 abandoned mines exist in Canada (MacKasey 2000), many of which are leaching arsenic, mercury, lead, sulfuric acid and other chemicals into the environment (Parsons 2007). Consequently, twentieth-century mining continues to have an environmental impact today that extends well beyond the footprint of the mines themselves.

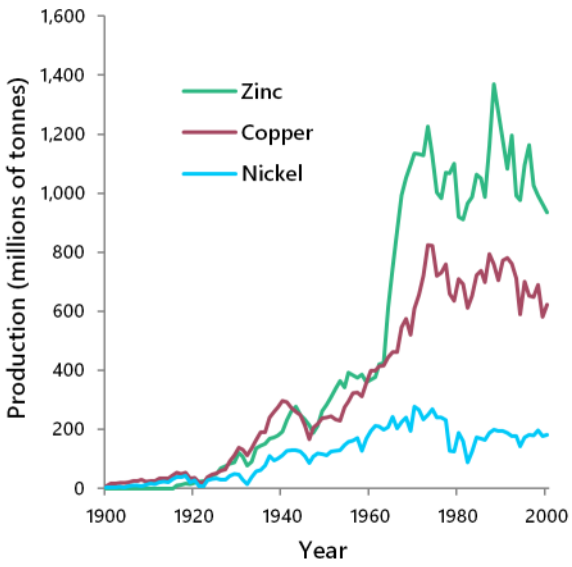

Fig. 2.13. The production of zinc, copper, and nickel in Canada from 1900–2000. Source: Statistics Canada.

The Advent of Modern Conservation

The ecological deterioration and decline in wildlife populations that occurred as a result of industrialization in the twentieth century presents a question: what happened to the early conservationists? Some authors have suggested that the initial flourish of interest in conservation at the turn of the twentieth century waned once societal

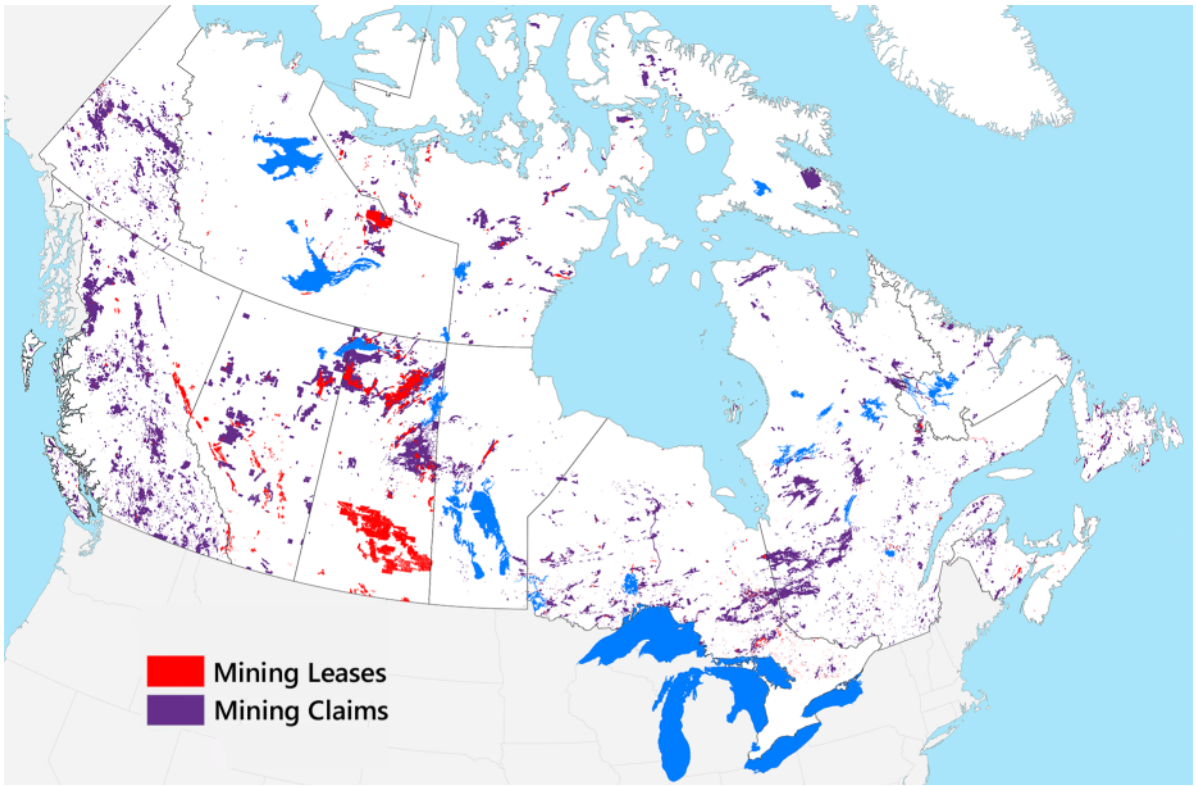

Fig. 2.14. The distribution of mining tenures, by type, in 2016. Source: Global Forest Watch Canada.

attention shifted to economic growth in the 1920s (MacEachern 2003; MacDowell 2012). In reality, conservation efforts during this period did not diminish at all, they expanded and became institutionalized (Burnett 2003). However, they remained narrowly focused on species that were hunted or harvested; broader conservation concerns had yet to be meaningfully recognized.

Over the ensuing decades, we got more of everything—bureaucrats, game wardens, foresters, scientists, schools, and associations—greatly expanding management capacity. Our knowledge base also improved. By the 1930s, game management emerged as a distinct discipline and research was well underway into species distributions, population sizes, food and habitat requirements, predator-prey dynamics, disease, and many other topics. Silviculture likewise underwent substantial development and maturation.

As capacity increased and ecological knowledge accumulated, management efforts became increasingly sophisticated. The basic objective of sustainable use morphed into the concept of maximum sustained yield, which guided research and management efforts in wildlife and forestry for much of the century (Larkin 1977). Regulations to avoid overexploitation were fine-tuned, and steps were taken to increase the productivity and long-term sustainability of desired resources. Species with no direct utility were largely ignored, and those identified as having negative effects were often targeted for elimination.

The management of Wood Buffalo National Park during the first half of the twentieth century provides a window into the mindset of the time. The park was established in 1922 to support the recovery of bison. Initial management efforts simply involved a prohibition on hunting by local Indigenous communities and others. Once the herd began to recover, the park administration began a program of small-scale, seasonal bison hunts, in response to a request for bison meat from the local residential school (McCormack 1992).

From the early 1940s until well into the 1950s, wolves in the park were poisoned with strychnine and cyanide, and a wolf bounty was used to encourage trapping, all to increase the production of bison (Fuller and Novakowski 1955). In the early 1950s, infrastructure within the park was expanded, and the commercial slaughter of bison began in earnest, lasting until 1967. In total, several thousand buffalo were killed, along with an unknown number of wolves (McCormack 1992). Wood Buffalo National Park forests fared no better. Approximately 70% of the park's riparian old-growth spruce was clearcut between 1951–1991, without concern for the species that depended on it (Timoney 1996).

The upshot is that modern concepts of biodiversity conservation did not arise through the progressive refinement of early twentieth-century conservation principles. Management capacity and knowledge certainly increased over the years, but the objectives of management remained wedded to a narrow, utilitarian view of conservation. For the most part, wildlife and forests were treated as commodities, even in parks, and progress was measured in terms of rising production.

To be fair, there were some individuals at the fringe who argued for a less utilitarian approach to resource management. They were unable to effect much change during their time, but they did help prepare the ground for the future. One of these individuals was Grey Owl, whose articles and books were popular in the 1930s (Loo 2006). Writing from a cabin in northern Saskatchewan, Grey Owl railed against the commodification of wildlife. He suggested that conservation was hampered by the view that nature was a basket of goods that could return an income if properly managed.

Another important figure was Aldo Leopold, considered to be the father of wildlife management. Leopold's early career involved killing cougars, wolves, and bears in New Mexico. However, in his later years, he came to believe that these types of management activities were misguided. In his most influential work, the *Sand County Almanac* (1949), he outlined a biocentric approach for interacting with nature that he termed the "land ethic." The non-consumptive values and holistic ecosystem-based management concepts he articulated presaged the future direction of conservation:

> The land is one organism. ... If the biota, in the course of aeons, has built something we like but do not understand, then who but a fool would discard seemingly useless parts? To keep every cog and wheel is the first precaution of intelligent tinkering. ... The land ethic simply enlarges the boundaries of the community to include soils, waters, plants, and animals, or collectively: the land. A land ethic of course cannot prevent the alteration, management and use of these resources, but it does affirm their right to continued existence. (pp. 190, 239–240)

A notable Canadian figure of this period was Ian McTaggart-Cowan. He advanced a holistic approach to conservation through television, radio, writing, and lectures. Other individuals and groups promoted direct interaction with wildlife. Birdwatchers and field naturalist groups were in

the forefront (e.g., establishing the Audubon Society of Canada in 1948). Low-level efforts to support species at risk of extinction also continued. These efforts expanded from their initial focus on overhunted game species to new species such as the whooping crane and trumpeter swan. At the international level, the International Union for the Conservation of Nature (IUCN) was established in 1948, with a primary focus on endangered species.

Origins of the Environmental Movement

Although Leopold and his compatriots influenced many people, they were too far ahead of their time to affect mainstream thinking. The real crucible of modern conservation was the environmental movement of the 1960s, which carried conservation along like a surfer on the crest of a wave.

The environmental movement arose as a collective response to the negative impacts that industrialization was having on the environment. But there is more to the story than simple cause and effect. Consider, for example, the Cuyahoga River which runs through Cleveland, Ohio. This river was so polluted with industrial waste that in 1969 it started on fire (Stradling and Stradling 2008). The fire attracted widespread media attention, including an article in *Time* magazine which reached millions of readers. It graphically illustrated just how bad the nation's environmental problems had become and fuelled outrage and demands for action. It was followed, in 1972, by the US *Clean Water Act*.

The problem with this narrative, which suggests a direct relationship between environmental damage, public concern, and policy response, is that the Cuyahoga River had burned at least nine times before (Stradling and Stradling 2008). The 1969 fire was not even the worst. The picture used in the *Time* article was actually from a much more serious fire in 1952. If environmental degradation was the trigger for action, why then did it take until 1969 for the public to engage? The same disconnect exists for most of the other environmental issues that rose to prominence in the 1960s. Clearly, other factors were at play. And in the messy details lie the foundations of modern conservation.

The world did not suddenly fall apart in the 1960s. Instead, a tipping point was reached that led to a new way of looking at things. In short, we developed an environmental consciousness. The key players in the development of this new environmental awareness included researchers, the media, environmental groups, policymakers, the public ... and the hippies.

Hippies are symbolic of the counter-culture revolution that took place in the 1960s. Their contribution was to question authority (Fig. 2.15). Such youthful rebellion was, of course, not new. But in this case, many of the issues being raised resonated with the broader public, including the deaths of young men in an unpopular war in Vietnam, the prospects of a nuclear Armageddon, and slow poisoning from environmental pollutants. Consequently, many began to reconsider the merits of the paternalistic system that controlled decision making.

The range of issues attracting attention quickly expanded and people from all walks of life became activists or supporters of change. It was a social awakening, and North American society was never the same afterward. In particular, elitist, closed-door decision making would no longer be accepted. Henceforth, the public would demand a say.

The development of environmental consciousness also involved a conceptual frame shift. **Frames** are mental constructs that shape the way we see the world (Lakoff 2004). They help us make sense of events and information by providing background context and default interpretations of cause and effect. They are also

Fig. 2.15. A "flower-power" protest against the Vietnam war, in 1967. Credit: A. Simpson.

value-laden, which means that certain aspects of reality may be highlighted while others are marginalized or ignored (Reese 2001). Because they are mental constructs, frames can change over time, even if the underlying reality does not.

Prior to the 1960s, people did not think of the environment in the same way we do now. Most environmental deterioration occurred out of view, and relatively few individuals had any direct knowledge of what was happening. There were no government monitoring programs, no environmental reporters, no activist groups, and little scientific research on environmental problems. Incidents like the early Cuyahoga River fires were reported as isolated local events rather than symptoms of a broader problem. The existing frame, to the extent that one existed at all, was that environmental damage was the cost of progress (Sachsman 1996).

The initial change in perspective was led by individual scientists with a personal interest in the environment and by environmental activist groups, most of which were spawned by the broader counter-culture revolution. These individuals and groups gave voice to the environment, bringing firsthand accounts and analysis of what was happening to a public that was unable to witness the changes directly. The publication of *Silent Spring* in 1962, by Rachel Carson, was a seminal event. It drew attention to the effects that pesticides were having on birds and, more generally, to the powerful and often negative effects of humans on the natural world.

As the 1960s progressed, the media began to play a central role in facilitating the environmental dialog, linking information providers with the general public. Stories about the environment proliferated and journalists began to connect the dots, interpreting individual local events in the context of broader national-scale concerns. By the time the Cuyahoga River burned in 1969, it was a national story about industrial pollution out of control, not a minor article in the local paper about how much it would cost to repair the railway bridge.

The interactions between scientists, activist groups, the media, and the public were mutually reinforcing. Mass media sparked public interest, which produced more activists and stimulated more scientific research, resulting in more information for the media in a virtuous cycle. In addition, political figures began to understand that taking a stand against pollution and other forms of environmental degradation made for good public relations. Their pronouncements and actions helped to legitimize the issues. Environmental awareness rose quickly, and by the first Earth Day, in 1970, the transition to the modern framing of the environment was essentially complete.

Indigenous Influences

Indigenous perspectives on conservation first attracted public attention with the writings of Grey Owl, who gained a wide audience in the 1930s (Fig. 2.16). Grey Owl suggested that much could be learned from the way that Indigenous people interacted with nature (Loo 2006). Other writers, such as Henry Thoreau and John Muir, had presented conservationist ideas ahead of him, but Grey Owl was the first high-profile author to make a strong connection between conservation and Indigenous ways of life.

Although Grey Owl planted a seed, the time was not yet ripe for widespread uptake of Indigenous perspectives. This had to wait until the arrival of the environmental movement in the 1960s. In the search for alternative approaches, Indigenous worldviews re-emerged and found fertile ground.

Fig. 2.16. Grey Owl feeding a beaver. Credit: Canadian National Railways; Library and Archives Canada.

The incorporation of Indigenous perspectives in this period centred on broad philosophical themes about stewardship and respect for nature that resonated with an increasingly environmentally aware public. These ideas were widely circulated, sometimes ending up on posters alongside Indigenous people and art (Fig. 2.17). Common themes included respect and reverence for wildlife and nature, the idea that resources are being held in trust for future generations, and the intrinsic interconnectedness and sacredness of animals, humans, and the land. Popularized quotes from a speech given by Chief Seattle in 1854 provide an example of how these ideas were presented:

> We know that the white man does not understand our ways. One portion of the land is the same to him as the next, for he is a stranger who comes in the night and takes from the land whatever he needs. The earth is not his brother, but his enemy—and when he has conquered it, he moves on.
>
> Humankind has not woven the web of life. We are but one thread within it. Whatever we do to the web, we do to ourselves. All things are bound together. All things connect.
>
> Humans merely share the earth. We can only protect the land, not own it.

A defining feature of this period was that Indigenous worldviews were being interpreted and presented mainly by non-Indigenous commentators. Ironically, Indigenous people were themselves still marginalized at the time (e.g., the right to vote was not awarded until 1960). It was the harmony-with-nature ideal that Indigenous people represented, and the powerful symbolism they provided, that was most important to non-Indigenous conservationists. To some extent, this

Fig. 2.17. An example of the types of posters that became popular in the 1970s, depicting Indigenous images alongside quotes attributed to Chief Seattle. Photo credit: H. Pollard, Provincial Archives of Alberta.

involved filtering, simplifying, and romanticizing Indigenous culture and worldviews.

There was also liberal use of artistic licence concerning attribution. For example, although Chief Seattle did give a speech in 1854, his popularized quotes were later attributed to a television scriptwriter named Ted Perry (Stekel 1995). And while Grey Owl did live with and learn from Indigenous people, he was later exposed as an Englishman. Despite the dubious morality of some of these tactics, their historical impact is clear. Indigenous perspectives on nature went from relative obscurity into the mainstream, affecting the thinking of Canadians at large and helping influence the changes in resource management that occurred during this period.

Later in the twentieth century, Indigenous communities found their own voice and began to engage directly in public discourse about resource use, especially at the local level (see Chapter 3). Moreover, conservation was often subsumed into a broader discussions about treaty rights, self-determination, and control over resources.

An important feature of this later period was the development of place-based conservation campaigns involving formal alliances between Indigenous communities and conservation groups. Notable examples include campaigns against logging in Clayoquot Sound in British Columbia (Nuu-chah-nulth, 1993), Alberta's boreal forest (Lubicon Cree, 1990), and the Temagami forest in Ontario (Teme-Augama Anishnabai, 1989). The objectives of conservationists and Indigenous communities aligned in the context of these campaigns and this provided the foundation for widespread gains in wilderness protection.

From Game to Biodiversity

Although the primary concern of the early environmental movement was pollution, the plight of wildlife also received increased attention at this time (Fig. 2.18; Gregg and Posner 1990). The scope of concern expanded beyond overexploitation to include habitat degradation and the harm to wildlife arising from pesticides and pollutants. Public attitudes toward wildlife also changed, with increasing emphasis placed on non-consumptive values, the moral right of all species to exist, and general respect for nature.

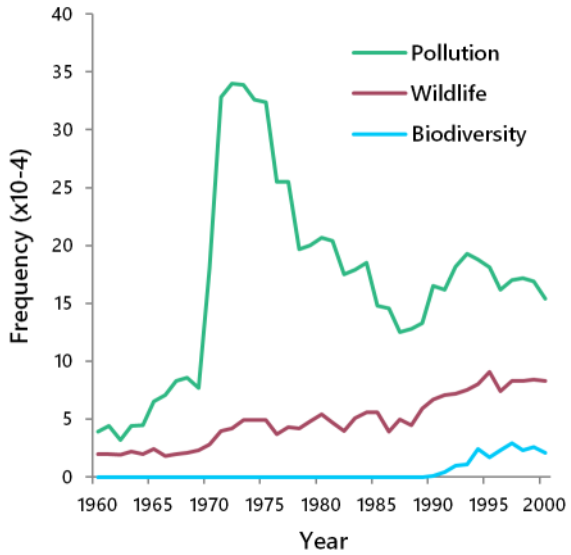

Fig. 2.18. The use of the words "pollution," "wildlife," and "biodiversity" in North American books, 1960–2000. Source: Google ngram viewer.

Narrow utilitarian perspectives were faulted for failing to prevent the environmental declines that had occurred in preceding decades. From this point forward, resource management would be increasingly scrutinized and contentious, involving competing and conflicting values held by different segments of society. Utilitarian values continued to play an important role in decision making but they were no longer the default.

The changing status of the wolf is illustrative of the public's evolving attitudes toward wildlife. Prior to the 1960s, wolves were considered dangerous and undesirable, a menace to human safety and livelihood. Extermination campaigns, such as those in Wood Buffalo National Park, were routinely conducted, and public opposition was basically nonexistent. In the 1960s, through writers such as Farley Mowat and filmmakers like Bill Mason, the public—especially the urban public—began to see wolves in a new light. In Mowat's *Never Cry Wolf*, released in 1963, wolves were noble creatures whose commendable conduct highlighted the virtues of nature (Loo 2006). Mowat may have made liberal use of literary licence, but his story resonated with millions of readers. Mason was later hired by the Canadian Wildlife Service to provide some balance to Mowat's writing, but his 1972 documentary film, *Cry of the Wild*, further advanced the preservationist perspective.

Never Cry Wolf and *Cry of the Wild* were not just arguments against predator control; they embodied a new conception of wildlife and conservation (Loo 2006). Rather than efficient use, they advocated an ethic of existence, similar to what had been proposed earlier by Leopold. However, rather than emphasizing ecological integrity, their arguments were based on the intrinsic value and rights of animals. These views may have found little support among farmers and hunters, but had great appeal to city dwellers, who sided with the wolves. For these people, utilitarian and scientific arguments were not critical factors. They were swayed by the ethical dimensions of the issues, viewed in the broader context of social change and progressive loss of wilderness. For many, saving the wolf was a proxy for saving the wild.

The shift in public attitudes toward wildlife led to a series of policy changes. The US was again first to respond. However, this time Canada did not simply follow the US lead. Our response was substantially slower and differed in several important aspects that set us on a distinctly different policy trajectory (VanNijnatten 1999).

In the US, the landmark change was the passage of the US *Endangered Species Act*, in 1973. This Act was heavily influenced by input from scientists in the Bureau of Sport Fish and Wildlife and members of the conservation community (Illical and Harrison 2007). Through

their efforts, the Act included a broad definition of species, a scientifically based determination of endangerment, and mandatory prohibitions on harm to listed species.

Notably lacking in the Act were economic considerations, reflecting the virtual absence of input or opposition from the private sector (Illical and Harrison 2007). In hindsight, many of the Act's provisions should have been red flags for the business and agricultural communities. However, lacking experience with such legislation, the private sector did not grasp the full import of the new Act as it related to their interests. In the absence of arguments to the contrary, the bill received near unanimous consent in the House and Senate.

A key feature of the US *Endangered Species Act* is the use of non-discretionary language, which reflects the separation of powers within the US system of government. Congress tends to be distrustful of the Executive Branch, which it must rely on to execute its instructions. Therefore, US environmental statutes have invariably employed non-discretionary language and firm deadlines to control the actions of administrative agencies, backed for good measure by "citizen suit" provisions that invite any individual to sue the executive should it fail to fulfill Congressional mandates (VanNijnatten 1999). The US system also contains many veto points which make it difficult to unwind laws once they are passed.

Once the practical implications of the *Endangered Species Act* began to be understood, developers sought to avoid them. This led to legal action, culminating in a Supreme Court challenge over the construction of a dam that posed a threat to a small endangered fish—the snail darter. The Supreme Court ruled that, despite the obscurity of the snail darter, the intent of the law was quite clear and non-discretionary: all species were to be protected, regardless of the cost. Amendments to the law were made in subsequent years, providing exceptions; however, there has never been enough support for the fundamental features of the Act to be repealed (Illical and Harrison 2007).

The trajectory of wildlife policy in Canada has been quite different from that of the US, for a variety of reasons (VanNijnatten 1999; Illical and Harrison 2007). In Canada, the legislative and executive branches of government are combined, so there is no incentive for creating non-discretionary laws. Our environmental statutes typically authorize, but do not compel, government actions. Second, because of decisions made at the time of Confederation, provinces have primary jurisdiction over natural resources, including wildlife. This has led to the uneven development of wildlife policy across the country and has hindered the coordination of conservation efforts. Finally, because Canada did not react as quickly as the US to the initial wave of environmentalism, there was an opportunity to learn from the US experience. The most important lessons were gleaned by the business community who, in contrast to their American counterparts, mounted a strong lobby to limit the scope and economic impact of Canadian wildlife legislation as it was being developed.

Initial efforts to update Canadian wildlife policies began in the mid-1960s, with efforts by the Canadian Wildlife Service, in cooperation with the provinces, to develop a national policy on wildlife. These efforts culminated in the passage of the *Canada Wildlife Act* in 1973—the same year as the US *Endangered Species Act*. The new Act expanded the definition of wildlife to include any non-domestic animal and also stated that any provisions respecting wildlife extended to wildlife habitat. The Act also included a provision for the protection of species at risk of extinction, expanding the scope of federal interest in wildlife beyond its traditional bounds. In contrast to the US law, there was no explanation of what the species at risk measures might entail,

who would do them, or when they would be implemented. Instead, our Act simply stated, "The Minister may ... take such measures as the Minister deems necessary for the protection of any species of wildlife in danger of extinction" (GOC 2015, Sec. 8).

Although a number of conservation groups and some members of Parliament were pressing for federal endangered species legislation, it was evident to Canadian Wildlife Service officials that such an approach would be anathema to the provinces (Burnett 2003). Therefore, national efforts were instead focused on a program to determine species status, without infringing on the legal prerogative of each province to manage wildlife within its boundaries. This led to the establishment of the Committee on the Status of Endangered Wildlife in Canada (**COSEWIC**) in 1977.

During the 1980s, wildlife policy continued to evolve through regular conferences of federal and provincial wildlife ministers. One notable change was a further broadening of the definition of wildlife to include all wild organisms, including plants and invertebrates. In 1988, Canada's wildlife ministers established the Recovery of Nationally Endangered Wildlife committee to coordinate the development and implementation of recovery plans for the growing list of species that were being listed by COSEWIC. The committee was also intended to prevent species from becoming threatened or endangered and to raise public awareness of species conservation.

In the late 1980s, Canadians went "green," amid a renewed surge in global environmentalism. Polling in 1990 found that 82% of Canadians agreed with the statement "We must protect the environment even if it means increased government spending and higher taxes" (Lance et al. 2005). Also, Canadian Wildlife Service surveys demonstrated that wildlife-related activities, especially non-consumptive ones such as photography and birdwatching, were growing rapidly (Burnett 2003). Federal interest in conservation reached its high-water mark at this time. In 1990, the federal Progressive Conservatives unveiled their *Green Plan*, which provided funding for a range of environmental initiatives, including wildlife conservation. Canada was also an active participant in the development of the 1992 UN *Convention on Biological Diversity*, and we became the first industrialized country to ratify it. This was followed, in 1995, by the *Canadian Biodiversity Strategy* (EC 1995).

The *Canadian Biodiversity Strategy* marked the final stage in the conceptual evolution of conservation in Canada. In contrast to previous conservation policies, wildlife was now mentioned only in passing. The primary focus had shifted to biodiversity, a term that had only come into widespread use a few years earlier (Fig. 2.19). The Strategy defined biodiversity as "the variety of species and ecosystems on earth and the ecological processes of which they are a part" (EC 1995, p. 5). This was an important conceptual shift. Conservation was now about maintaining biodiversity, not the wise use of a few preferred species.

In the mid-1990s, efforts also finally got underway to develop federal species at risk legislation. In contrast to the 1973 US *Endangered Species Act*, which passed swiftly with minimal opposition, the development of Canada's *Species at Risk Act* (SARA) was highly contentious. Conservation groups were guided by the US experience and sought comparable mandatory provisions for endangered species in Canada. However, business interests, also guided by the US experience, mounted a vigorous opposition. Further complicating the negotiations was the reluctance of the provinces to accede any further control over wildlife management to the federal government.

Given the widely divergent positions of conservation groups and scientists on one side of the

debate, and the provinces and business interests on the other, it took until 2002 for SARA to finally be passed. The federal government sought a middle ground, and this meant that many compromises were made. SARA ended up substantially weaker than its US counterpart. We will examine the specific strengths and weaknesses of SARA in Chapter 6.

While SARA was being developed at the federal level, many of the provinces adopted endangered species legislation of their own. By the time SARA was passed in 2002, eight provinces and territories had species at risk legislation in place, and five did not (Boyd 2003). The provincial legislation was generally weaker than SARA and featured the same compromises (see Chapter 3).

The War in the Woods

The advancement of conservation in the late twentieth century was not limited to the recovery of species at risk; it also included the management of landscapes. Landscape-based efforts began when rising environmental awareness in the 1970s led to demands for better management of industrial activity on public lands, most of which were forested.

Federal and provincial governments initially responded through commitments to manage forests for multiple values (such as wildlife), and not just timber supply. However, in practice, managers generally interpreted this directive to mean that other values were to be accommodated only to the extent that they did not significantly impinge on resource extraction (Wilson 1998). This did allow for some conservation gains, such as the protection of sites with low resource value. But fundamental changes in forest management were not forthcoming. Consequently, individuals and groups concerned about forests became progressively disillusioned with the government and their trust was eroded.

South of the border, forest management was also evolving, but along a different trajectory (MacCleery 2008). By the mid-1970s, studies had revealed that late-successional forests in the Pacific Northwest provided essential habitats for a suite of animal and plant species, including the northern spotted owl (Fig. 2.19). In response, conservation-minded scientists began to develop and promote new ecologically based approaches to forestry. These developments, together with a growing wilderness preservation movement, fuelled intense debate about the management of

Fig. 2.19. A northern spotted owl. Credit: J. Hollingsworth.

US public forests, most of which were under federal jurisdiction.

The turning point came in March 1989, when federal district court judge William Dwyer issued an injunction on the harvest of virtually all national forest timber within the range of the northern spotted owl (i.e., most of the Pacific Northwest). He ordered the Forest Service to revise its standards and guidelines to ensure that the northern spotted owl remained viable, as required under the US *Endangered Species Act*.

When the dust finally settled, in the early 1990s, a new system of forest management, referred to as ecosystem management (see Chapter 7), had been adopted for all US national forests. Harvest volumes, which had been relatively consistent between 1960 and 1989, fell by over 80%, reflecting what the US Forest Service deemed necessary for maintaining the ecological integrity of national forests and the viability of species dependent on old-growth habitat (MacCleery 2008). These changes were backstopped by the US *Endangered Species Act*, which had no counterpart in Canada at the time. Nevertheless, Canadian conservationists were emboldened by the developments to the south and determined to see ecosystem management concepts applied here.

Another important development affecting the course of Canadian conservation was the release of *Our Common Future* (also known as the *Brundtland Report*) by the World Commission on Environment and Development in 1987 (WCED 1987). This high-profile report drew international attention to the importance of balancing economic and environmental objectives through **sustainable development**, which was defined as "development that meets the needs of the present without compromising the ability of future generations to meet their own needs" (WCED 1987, p. 43). The report also called for a tripling of the world's protected areas to achieve adequate representation of all ecosystems. This recommendation formed the basis of the 12% protection target that was popularized in many countries, including Canada (see Chapter 8).

Our Common Future and the old-growth forest controversy in the US were elements of the broad resurgence of global environmentalism in the late 1980s that we encountered earlier in our discussion of species at risk legislation. In this milieu of heightened environmental salience, simmering discontent with forest management across Canada reached a flashpoint, resulting in the so-called "War in the Woods." During this period, the media once again displayed heightened sensitivity to environmental issues, and local stories that had previously lurked in obscurity were now cast onto the national and sometimes international stage.

Although the War in the Woods affected forests from coast to coast, BC was ground zero (Fig. 2.20). Most of the initial battles involved opposition to proposed harvesting in southern BC's last pristine watersheds, including South Moresby Island, the Stein Valley, and Clayoquot Sound. These early campaigns were primarily based on a wilderness preservation agenda, rather than a forest management agenda.

Conservation groups advanced their forest protection objectives through broad networks of supporters and public outreach. The groups were adept at using symbolism and emotional appeal to win support for their cause, feeding into shifts in societal values. They were also highly effective in discrediting the forest industry's old-growth liquidation program and out-of-date harvesting practices. In later stages, the groups also used international public opinion and boycotts as leverage. The forest industry, for its part, spent millions of dollars on advertising campaigns, but public perceptions of the industry continued to decline despite these efforts (Wilson 1998).

In terms of public profile, the high-point of the BC campaigns occurred in the summer of

Fig. 2.20. One of the hundreds of individuals willing to be arrested in protests against old-growth logging in BC. Credit: R. Muirhead, Elphinstone Logging Focus.

1993 when over 800 people were arrested for blocking logging trucks in Clayoquot Sound—the largest act of civil disobedience in Canadian history to that point in time. Television sets across the country beamed images of hundreds of people, from students to raging grannies, being dragged off to jail in defiance of an industry that had been the lifeblood of the BC's economy for almost a century. The protests did not result in immediate capitulation by the government, but most of the areas contested in the early campaigns were eventually protected.

The events in BC had ripple effects across the country, raising awareness and leading to forestry-related protests in many areas. The objectives and nature of the protests were different in each case. In Alberta, the trigger was the allocation, in 1987, of vast northern timberlands without public hearings, scientific study, or regional planning (Pratt and Urquhart 1994). In Ontario, the focal point was the proposed logging, in 1989, of the old-growth pine forest in the Temagami region, one the last of its kind in eastern North America. One of the protesters arrested in this case was Bob Rae, who would later serve as premier of Ontario. In Quebec, the film *L'Erreur Boréale*, directed by a popular folk singer, Richard Desjardins, generated public outrage over forestry practices in the province and demands for change. Forest protests even reached the east coast, as New Brunswickers battled to save the Christmas Mountains from harvest.

As the 1990s progressed, the place-based wilderness preservation agenda began to merge with the ecosystem management agenda imported from the US. A broad consensus emerged to protect 12% of Canada's lands and waters in sites that provided representation of all of Canada's natural regions. World Wildlife Fund Canada provided initial leadership through its ten-year Endangered Spaces campaign, launched in 1989 (Hummel 1989).

Several provinces initiated formal planning programs in the 1990s to complete or augment their parks systems, and efforts are still ongoing in some regions (Fig. 2.21). As of 2017, 10.6% of Canada's terrestrial area (land and freshwater) was protected, along with 2.9% of Canada's marine territory (GOC 2018a). Legislation governing parks was also strengthened during the late 1980s and 1990s. Of particular note was an amendment of the Canada *National Parks Act*, in 1988, which established that the first priority of national parks was to maintain or restore of ecological integrity (GOC 2000).

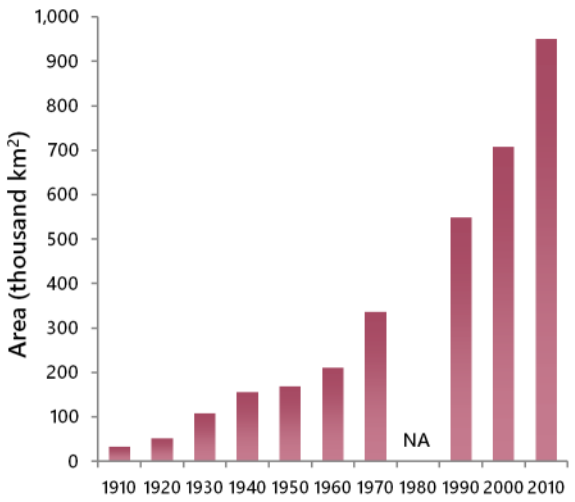

Fig. 2.21. The area of national and provincial parks in Canada, from 1911–2010. Source: SC 1983b and GOC 2018a.

The War in the Woods also led to changes in forest management which emphasized the maintenance of ecological integrity over the production of wood fibre. This shift was heralded by the *Canada Forest Accord*, signed by the Canadian Council of Forest Ministers in 1992 (CCFM 1992). As stated in the Accord, the goal of forest managers was to "maintain and enhance the long-term health of our forest ecosystems, for the benefit of all things both nationally and globally, while providing environmental, economic, social and cultural opportunities for the benefit of present and future generations" (CCFM 1992, p. 1).

Although federal, provincial, and territorial forestry ministers all signed the Accord, implementation was inconsistent across the country. The federal government could not enforce minimum standards or even ensure a coordinated response because authority over forest management rested with the provinces. The provinces blazed their own trails; some were progressive, and others were not.

BC and Ontario both passed legislation in 1994 that enshrined the goal of forest sustainability in law and set forth new requirements for forestry practices (GOBC 1994; GOO 1994). Both provinces also initiated land-use planning initiatives in the 1990s aimed at resolving broader conflicts related to land use. Forest legislation was also modernized during the 1990s in Saskatchewan, Quebec, Nova Scotia, and Newfoundland. The approaches varied but all included a commitment to forest sustainability and provisions for public participation (Boyd 2003). In contrast, Alberta, Manitoba, and New Brunswick made no effort to update their forestry legislation during this period.

The War in the Woods also disrupted the monopoly on decision making long held by government and industry. A large majority of the public now favoured forest protection over development and these values could no longer be marginalized (Lance et al. 2005). Furthermore, forest management was no longer a quiet, private affair. Conservationist groups had expanded tremendously in terms of the number of members, financial resources, technical knowledge, and experience in communications. They, together with other engaged stakeholders (including Indigenous groups), were now a permanent fixture of the policy landscape and could not be sidelined. Though it was still a David and Goliath scenario with respect to financial resources and technical capacity, it was understood by all that conservationists were representing the conservation-minded public—like the part of an iceberg you see above the water line.

A related development was that some conservation groups, dissatisfied with years of half-hearted government responses, began to engage directly with forestry companies under the rubric of social licence (see Chapter 3). These efforts included direct negotiations over practices, the development of product certification schemes,

and boycotts of selected high-profile companies. In some cases, these efforts proved to be quite effective.

For example, in Alberta, Alberta-Pacific Forest Industries became a lightning rod for popular discontent over forestry expansion in the late 1980s, making it the target of protests. This newly-formed company emerged from its trial by fire with heightened environmental sensitivity. It became an early adopter of ecosystem management concepts coming from the US and quickly evolved into a vocal champion of progressive forestry, serving in the role the provincial government had abdicated (see Case Study 1, p. 259).

Because of these changing political dynamics, land-use decision making by the late 1990s was far more complex than it ever had been in the past (Luckert et al. 2011). The simple government-industry axis of information flow and decision making had evolved into a tangled web of interactions (Fig. 2.22). Although the large protests eventually subsided, governments, companies, and conservation groups continued to compete for the hearts and minds of the voting and consuming public in a "cold war" of claims and counter-claims about management successes and failures.

Unfortunately, the on-the-ground changes arising from the War in the Woods were much less impressive than might be expected given the grand commitments to forest sustainability made by governments and industry. In the US Pacific Northwest, maintaining the integrity of national forests meant reducing harvest levels by 80% (MacCleery 2008). In Canada, harvesting rates in the 1980s and 1990s did not fall at all; they actually increased (Fig. 2.8). Furthermore, late-successional forests generally remained primary targets for harvesting.

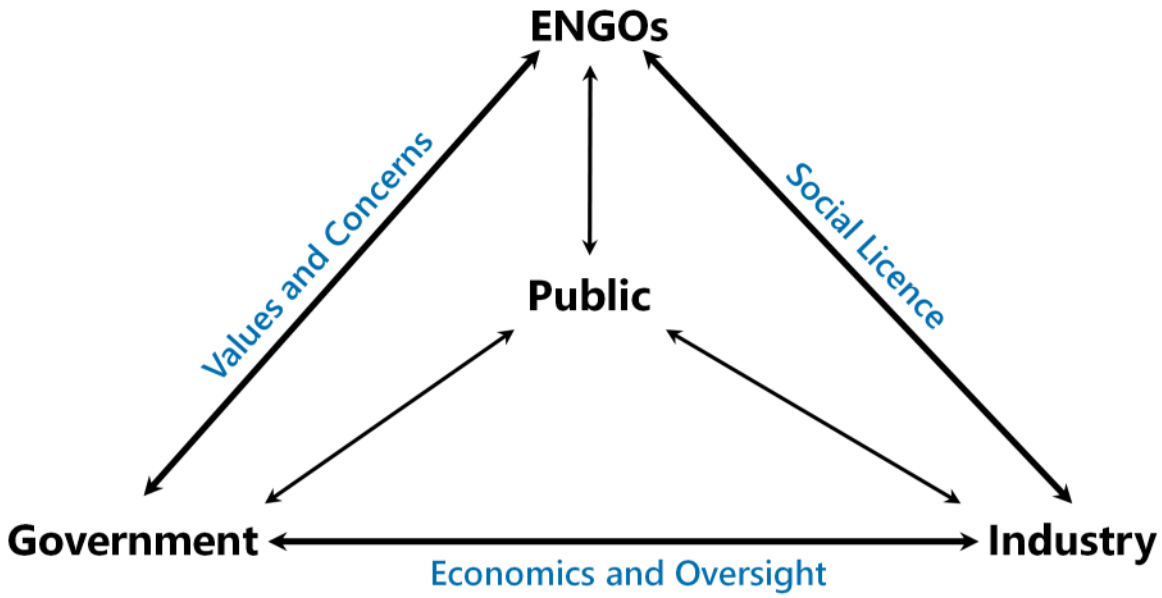

Fig. 2.22. A diagrammatic representation of the information flows characteristic of forest management decision making after 1990.

These differences reflect the simple fact that, in Canada, mill requirements continued to serve as the primary determinant of how much wood was cut. Even in BC, a leader of forestry reform, the Minister of Forests decreed that the average reduction in annual allowable cut resulting from the province's new forestry regulations would be no more than 6% (Wilson 1998). This defined, in no uncertain terms, the extent to which forestry reforms would be allowed to proceed. Harvest levels of forestry companies in other provinces were also maintained near their historical rates (Boyd 2003). As for lands taken out of production as protected areas, these were more than offset by new forestry allocations in other regions.

To be sure, several important changes did occur. Many ecologically important areas were protected during this period, including irreplaceable old-growth forests in southern BC. On the managed land base, though harvest rates did not decline, substantive improvements were made to harvesting practices. For example, progressive companies began varying the size and shape of cutblocks and leaving patches of live trees after harvest in an attempt to emulate natural disturbance processes (see Chapter 7). These efforts were guided by research undertaken by forestry companies, governments, and the academic community that sought to describe natural forest patterns and processes and to quantify the effects of human disturbances on forested ecosystems.

In summary, the War in the Woods was perhaps more evolutionary than revolutionary. But it did usher in a distinctly new era, featuring the actors, decision processes, and legacies that characterize forest management today.