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Aller au sommaire du numéro

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Résumé de l'article

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Reflections on the Nature of an Urban Bog

Sally Hermansen and Graeme Wynn

Abstract

Camosun Bog has existed for approximately two thousand years. Little is known about its use by indigenous people, but it was left essentially undisturbed by European newcomers until the twentieth century. Then, as the population of Vancouver and its neighbouring suburb of Point Grey (amalgamated with Vancouver in 1929) grew almost exponentially, the bog was subject to massively accelerated change. By 1980 it was a tiny, endangered remnant landscape, little understood, and valued even less, until a small group of volunteers constituting the Camosun Bog Restoration Society began to reverse the ravages of the previous seventy-five years. This paper combines careful Geographical Information Systems–based mapping of the bog, using evidence from aerial photographs, the scientific findings of botanists, and interviews with members of the Bog Restoration Society, with research in the City of Vancouver archives and newspaper files to detail the effects of human action upon the bog and to reflect upon what the history of this unique place reveals about changing attitudes toward nature in the city.

Résumé

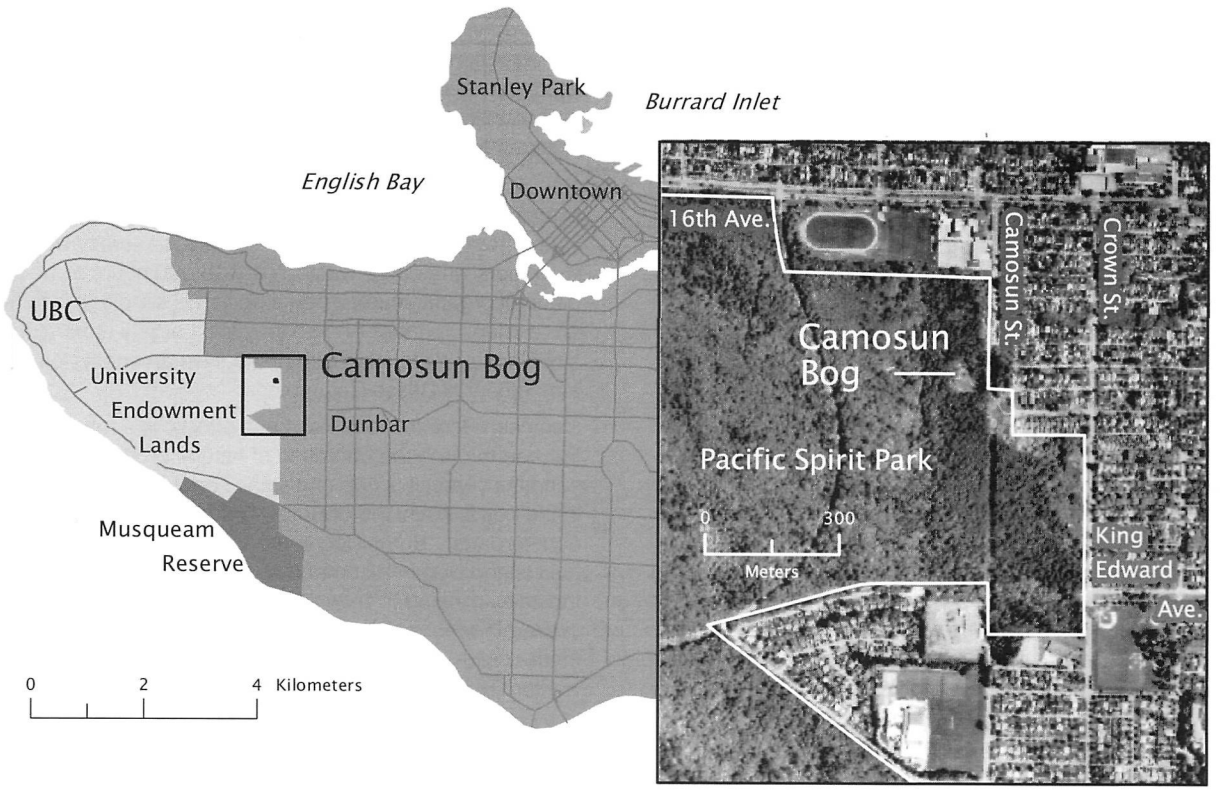
La tourbière Camosun existe depuis environ deux millénaires. Nos connaissances sur l'utilisation qu'en faisaient les indigènes est limitée, mais on sait que, jusqu'au seuil du XX^e^ siècle, les colons européens l'ont pratiquement laissée telle quelle. Puis, avec la croissance presque exponentielle de la population de Vancouver et de sa banlieue de Point Grey (fusionnée à Vancouver en 1929), la tourbière a subi une suite accélérée de changements majeurs. En 1980, la tourbière n'était plus qu'un vestige près de disparaître, peu comprise et encore moins valorisée, jusqu'à ce qu'un petit groupe de bénévoles, la Camosun Bog Restoration Society, commence à réparer les ravages des 75 dernières années. Cet article présente une cartographie soignée, basée sur les systèmes d'information géographique de la tourbière et s'appuyant sur des photographies aériennes, des travaux scientifiques de botanistes et des interviews avec des membres de la Bog Restoration Society, à quoi s'ajoutent des recherches menées dans les archives de la Ville de Vancouver et de la presse écrite. L'article s'attarde à décrire les effets des activités humaines sur la tourbière et offre une réflexion sur ce que l'histoire de cet endroit particulier révèle au sujet de l'évolution des mentalités à l'égard de la nature dans la ville.

On the edge of a park, on the edge of a city, on the edge of the continent a "hidden treasure" is being brought into the light. On a small patch of land, surrounded by trees, away from the traffic of everyday movement, and hidden from the knowledge of most of the two million people who live in the Greater Vancouver Regional District (GVRD), small work parties of six to fifteen persons can be seen on almost any given Saturday, wielding shovels, moving barrow-loads of dirt across narrow boards, stooping on bended knees, cradling specimens in their hands, examining, excavating, and contemplating the earth. Ranging in age from six to eighty-one, these are the "crazy boggers," volunteers who have invested over 15,000 hours of labour in this piece of organic muck. Their ambition is simple. It is to recover an "ancient wonder." And so they toil. Largely unheralded, they strive not for material wealth but to save an ecosystem for the enrichment of British Columbians.[1]

Camosun Bog, the focus of these efforts, is a relict landscape. Formed through the operation of natural processes over thousands of years, it is one of a small handful of significant bogs in the Lower Mainland of British Columbia. Like its much larger counterparts—Burns Bog in the Vancouver suburb of Delta, the Lulu Island Bog in Richmond and Pitt Polder Bog to the east of the city—it includes several plant species not normally found in this biogeoclimatic zone.[2] Its deep accumulation of organic matter yields one of the longest fossil pollen records in southwestern British Columbia.[3] But situated, as it is, on the Point Grey peninsula, where loggers wielded saws and axes to serve the beginnings of the provincial lumber industry, where a rapidly expanding city engrossed space, and where the provincial government and the University of British Columbia promoted a range of plans for development of land designated for the purposes of "university endowment," Camosun Bog is also "ecologically compromised."[4] Urban development has impinged upon its limits. Urban drainage schemes have affected its delicate hydrological balance. Fires have burned across it. Vast quantities of fill have been dumped on its shrinking perimeter. Twenty years ago the bog was close to oblivion. Then it was incorporated into one of the largest urban parks in North America. Restoration efforts were initiated, although the bog accounted for less than 2 per cent of the park area and no one knew whether such a degraded bog could be re-established. In 2005, Camosun Bog remains a much-altered shadow of its former self. But it is a shadow with a future, and a shadow worth attention, because the penumbra of its past reveals a great deal about the interplay of human and natural forces and of changing attitudes toward nature in the city (figure 1).

Deep Time

The beginnings of this story lie deep in the past, when the Cordilleran ice sheet that once extended to the southern end of Puget Sound spread a kilometre-thick layer of ice across the area now known as Vancouver. As the climate warmed and the ice retreated some 12,500 years ago, it left behind a thick layer of glacial till, the surface of which was pock-marked by depressions. Lakes formed in these hollows, and gradually the newly exposed surface of the land was colonized by vegetation. Tundra dominated by lichens and a few vascular species gave way to mosses, saxifrage, and dwarf shrubs



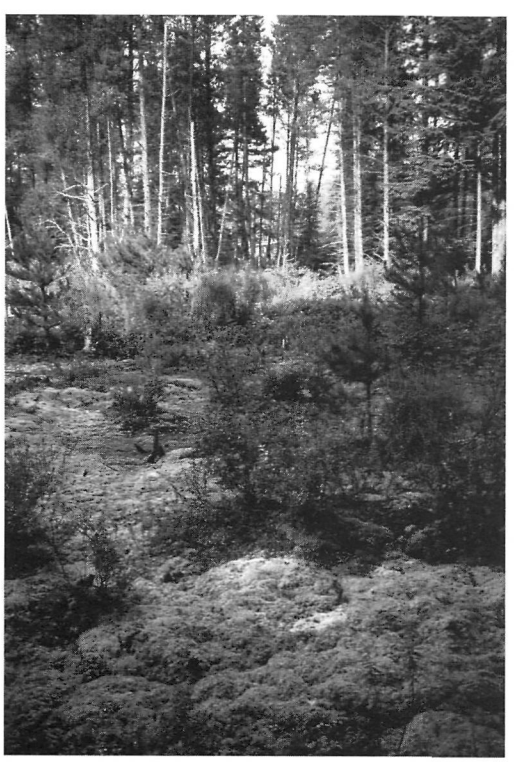


Figure 1: Camosun Bog, Vancouver, present day

Photographs by Linda Prochaska

such as Arctic willow (*Salix arctica*) and Arctic white heather (*Cassiope tetragona*). Over time, the number and density of vascular plants increased, the vegetation became noticeably more woody, and lodgepole (or shore) pine (*Pinus contorta)*, Labrador tea (*Ledum groenlandicum*), black spruce (*Picea mariana*), Arctic willow (*Salix arctica*), and scrub birch (*Betula glandulosa*) flourished amid various mosses, herbs, and sedges (*Carex spp*). Gradually spruce (*Spicea spp*), pine (*Pinus spp*), Douglas fir (*Pseudotsuga menziesii*)—about 10,500 years BP—and alder (*Alnus spp*) colonized favourable sites, and later hemlock (*Tsuga heterophylla*) and cedar (*Thuja plicata*) became established. In this dynamic environment, location and contingency shaped emerging vegetational patterns. Many of the lakes and ponds left behind by the melting ice drained, dried, filled with sediment, and disappeared relatively quickly beneath the march of forest trees.[5]

High in the centre of what the English navigator George Vancouver would much later name the Point Grey peninsula, however, the site and situation, the extent and depth of one post-glacial lake led to a different outcome. At its maximum, this lake probably extended some 1,500 metres in a NNW-SSE direction and some 300 metres at right angles to this at its widest points. It was likely about six to eight metres deep, and its catchment encompassed approximately 250 hectares; it drained south through what later became known as Lake Head Creek.[6] Here, as in many other locations, cattail, rushes, sedges, and other plants adapted to wet littoral conditions began to grow around the edges of the lake. Pond lilies floated on the surface. Gradually, organic and other materials accumulated on the bed and at the edges of the lake. Marsh conditions, with vegetation growing in standing water, prevailed around the shallow edges of the lake and became more extensive as the processes of sedimentation and plant invasion that ecologists and biogeographers know as hydric or hydrosere succession continued. Dead, un-decomposed material accumulated around the roots and stems of the rushes (*Juncus spp*) and sedges to form lenses of sedge peat. Inland, marsh gave way to swamp—where shrubs and trees dominated. Here the surface was drier, although the accumulated sediment was saturated for much of the year. As these processes of vegetation succession continued, the lake contracted. In the rich, moist environments of the lake fringe, plants such as swamp laurel (*Kalmia spp*) and Labrador tea grew profusely. Decomposition of this plentiful organic matter depleted oxygen supplies and created anaerobic soil conditions sustained by the high water table. A bog composed largely of sphagnum (*Sphagnum spp*) began to form. Eventually, the buildup of organic matter restricted the inflow of surface water into the former depression. Some areas were entirely cut off from the supply of nutrients carried by inflowing drainage.[7]

Such environments are markedly unfavourable to the growth of most plants. Soils become acidic, and nitrogen fixation and nitrification are suppressed. When pH levels are low, many nutrients are unavailable to plants. Little vegetation thrives. A few vascular plants and shrubs occur on the better-drained hummocks that typically occur on the undulating bog surface, but unless they are shallow-rooted and acidophilous, they struggle and their growth is stunted. Because sphagnum peat is a poor conductor of heat, temperatures in the root zones of most vascular plants are low, and their growing season is relatively short. By contrast, the shallow surface layer beneath sphagnum tends to be warm, prolonging the growing season of that species. Moreover, sphagnum is an effective interceptor of such nutrients as are available in bog environments, and the slow decomposition and mineralization of vegetative matter in these settings further reduces the supply of nutrients to vascular plants. Without significant competition, therefore, sphagnum is able to thrive and to spread laterally. In sum,

> the morphological, anatomical, physiological and organo-chemical properties of Sphagnum give it attributes . . . that help form acidic, nutrient-poor, heat-insulating and slowly permeable peat. Depressed growth of vascular plants increases (1) light availability and (2) wetness, via decreased evapotranspiration, both of which positively feed back to the growth of Sphagnum, and thus to peat growth. Accumulation of peat is further promoted by feedbacks involving physico-chemical processes and depression of decomposers.[8]

Where lakes are relatively deep, the accumulation of dead sphagnum (peat) may form a floating mat that grows outward into the lake. In these circumstances, as sphagnum growth continues at the surface, the vertical accretion of plant material also extends the peat lens down toward the lake bottom. Typically, peat deposits are two-layered, or "diplotelmic," with a highly permeable, thick upper layer (the acrotelm) of freshly decomposed peat in which aerobic bacteria and other microorganisms occur, and an underlying, slowly permeable, water-saturated anaerobic layer, the "catotelm." The roots of most plants are confined to the acrotelm, the depth of which is defined by the low point of the water table.[9]

Sphagnum not only tolerates a lack of nutrients, a high water table, and acidic conditions, it helps to sustain these conditions by exchanging H+ ions from its tissues for cations in solution, which acidifies the water in which sphagnum grows. Years ago, it was believed that sphagnum had hollow stems that served as capillaries drawing water to the surface from lower levels, and that it thus also elevated groundwater levels.[10] However, more recent work has revealed that sphagnum stems consist of a central parenchyma of pale, isodiametric cells, a sclerenchyma of long, thick-walled cells, and a cortex of large, empty, thin-walled cells. Such capillary movement as there is takes place between tightly overlapping pendant branches and leaves that hang down against the stem, and is greater when sphagnum is elevated above the water table. Today the capillary model has been discarded and replaced by the groundwater mound model, which attributes the domed profile of the water table beneath raised bogs to the low hydraulic conductivity of the mass of compressed and decayed peat comprising the catotelm.[11] Still it is important to recognize that "about 98 percent of a living sphagnum carpet is pore space" and that the porous

hyaline cells (which constitute about 80 per cent of the volume of sphagnum plants) absorb and hold considerable quantities of water. When emptied by drought, these cells "impart a whitish appearance" to the sphagnum, raising the albedo of the surface, increasing the reflection of incoming radiation, and reducing dessication.[12]

An analysis of a 570 centimetre core taken from the depression drained by Lake Head Creek (Camosun Bog) reveals a preponderance of cattail pollen and diatom shells at the deepest levels. At about 130 centimetres, pond lily gives way to heathers and sedges, and at 30 centimetres the amount of sphagnum in the profile increases considerably.[13] From this it may be inferred that, in the area of the pollen core at least, the eutrophic lake established some 12,000 years ago gradually decreased in size as sedimentation occurred and vegetation encroached on its edges. After 5,000 years or so, a substantial part of the former lake had turned into marsh. Sedge peat began to accumulate. Then, in the first millennium BCE, sphagnum, which had long been present as a minor constituent of the vegetation of the area, began to dominate the site, forming an extensive bog. The pattern of these changes is not known precisely. The successional sequence would have depended on water depth and the steepness or otherwise of the near-shore lake bottom as well as the pH levels and nutrient status of the organic soils. In broad terms, however, a bog mat of the sort described above likely formed and extended directly into deeper parts of the lake, while marsh and sedge peat developed in shallower more gently shelving areas.

In many areas of exposed wetlands in the forest-tundra zones southeast of Hudson Bay, proto-bogs and bogs have formed relatively rapidly, within the 1,500 to 3,000 years since the land emerged from the bay. Because decomposition proceeds more slowly in the more acidic environment of the bog-centre than at its margins, the accumulation of decay-resistant sphagnum eventually raises the surface to produce a domed or raised bog with a convex profile in a process known as paludification. According to some older theories of plant succession, this produced drier conditions and opened the way to eventual colonization by shrubs and small trees. Evapotranspiration and the production of litter by these larger plants was assumed to continue the course of change until the former lake/marsh/swamp/bog was replaced by forest. There is logic in this view, but both the inevitability and the speed of this transition remain the subject of debate, and the simplicity of this progression has been discounted.[14] Basically bogs are now regarded as stable ecosystems, and certainly stratigraphic pollen analyses indicate that they can persist with little change for thousands of years. So long as the water table is maintained near the surface through much of the year, and because peat is acidic, it is difficult for any but bog-adapted species to become established in the bog environments. Yet the processes that produce bogs are reversible. Researchers recognize that de-paludification can occur as a result of changes in local hydrological, climatic, and dominant vegetational patterns. Indeed, some have suggested that a form of senescence may terminate bog development and lead the bog surface "to break up into regressive lake-bog complexes leading back to forest phases again."[15]

Early in the nineteenth century, Camosun Bog was a unique element in the landscape of the Point Grey peninsula. It formed a relatively extensive opening, perhaps some twenty hectares in extent, in the tall forests of cedar, hemlock, and Douglas fir that covered most of the rest of the upland. Here and there on the peninsula there were "cranberry swamps" and areas of cedar swamp and light bush, but none so open or as extensive as the bog. On this tract of organic soils grew shore pine, Labrador tea, bog laurel (*Kalmia angustifolia, K. occidentalis*), cloudberry (*Rubus chamaemorus*), bunchberry (*Cornus unalaschensis*), sundew (*Drosera rotundifolia*), Arctic (northern or American) starflower (*Trientalis borealis*), blueberry (*Vaccinium ovalifolium, V. uluginosum*), Alaska huckleberry (*Vaccinium alaskaense*), bog cranberry (*Vaccinium Oxycoccus*), and sphagnum. All of these plants were adapted to and depended upon the high-light-intensity and acidic, nutrient-poor soils of the open bog; many of them were remnants, species generally found, at this time, at higher elevations and more northern latitudes. The bog was a botanical refuge. Around the pond there were rushes and sedges, and yellow pond lilies flowered on the water. Many of the plants in the bog were utilized by Native peoples of the Pacific coast: bog laurel to treat skin ailments, Labrador tea for sore throats, berries for food, and sphagnum for bedding, feminine hygiene, and diapers.[16] The Southern Red-Backed Vole, moles and shrews, herons, and probably Sandhill cranes, a wide range of other birds, and bears also used the area.

Development, Disturbance, and Desiccation

People of European origin first encountered the bog in the mid-nineteenth century. Sawmills established on Burrard Inlet in the 1860s soon turned to the Point Grey area as a source of timber. In 1865, the Vancouver Island Spar, Lumber, and Sawmill Company, Limited (VISLSC), acquired cutting rights on some 3,250 hectares of the peninsula, and four years later surveyor F. W. Green ran the boundaries of these timber limits for the provincial Department of Land and Works. His eyes were firmly on his compass and the forest. Traversing the lowland now known as Camosun Bog, he simply noted the growth of Labrador tea and berries before recording that he climbed into a forest of "pines."

Like Green, the lumbermen who worked the VISLSC limits into the 1880s had little interest in the bog. They took thousands of large Douglas Fir and cedar trees from the peninsula. Stumps indicate that forests in the vicinity of the bog were exploited, but these lumbermen generally cut selectively, with an eye to the value of the tree and its location. The forest persisted, although logging did a good deal of local damage to the vegetation, and loggers left much slash and debris on the ground. Disturbance was compounded by the construction of skid roads along which ox teams hauled out timber, but none of these passed

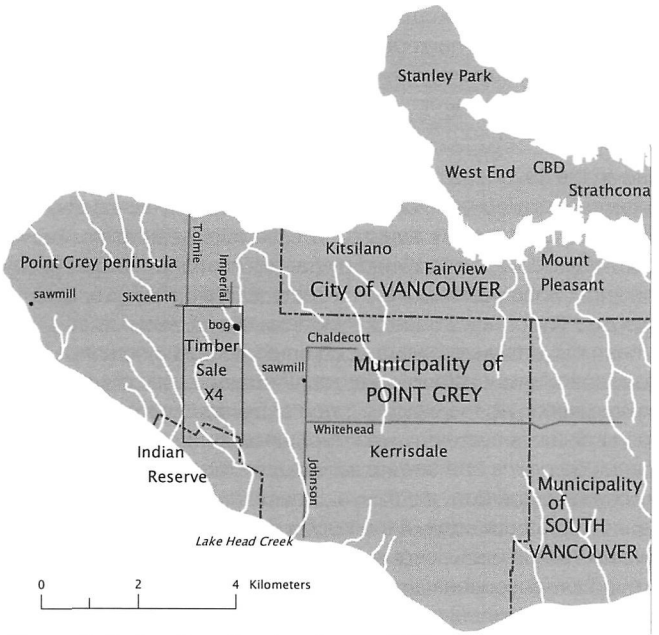


Figure 2: Point Grey Peninsula ca. 1900

through the bog. Still these activities began the series of human-induced changes that would bring the bog to the verge of disappearance within a century. They set the kindling for fires that would sweep through the area. And because large trees absorb considerable quantities of water and nutrients from the soil, removing a large number of them from the bog catchment might have injected a nutrient-rich (and thus potentially destabilizing) pulse of water into the bog ecosystem.[17] Certainly, this last process gained potency with the destruction of the forest and the encroachment of the city early in the twentieth century.

In 1886, as the original twenty-one-year timber leases awarded the VISLSC expired, the City of Vancouver was incorporated. The population of the newly formed town skyrocketed. From a total of some three hundred people clustered around the VISLSC's Hastings Sawmill in the early 1880s, Vancouver grew to include 15,000 residents in 1891, 27,000 in 1901, and (with the neighbouring municipalities of Point Grey and South Vancouver) 120,000 by 1911 (figure 2). Aided by the expansion of a streetcar system that had over 160 kilometres of track before the First World War, the city engrossed space. By 1914, the city and its suburbs spread over 8,000 hectares of land. By 1929, most of the peninsula between Burrard Inlet and the North Arm of the Fraser River (some 23,000 hectares of land) had been urbanized. In this booming western metropolis, observed a visitor in 1912, signs of "the battle . . . being waged against forests and stumps by the makers of homes" were everywhere, and the common mantra of the populace seemed to be "more room, more homes . . . more people." Residents flocked to live "among the cedars," although these trees typically fell almost immediately to new suburban subdivisions. Vancouver, observed a prominent urban planner of the late 1920s, reminded him of Topsy for the way in which it had "just growed."[18]

Into the first decade of the twentieth century, the Camosun Bog area remained beyond the fringe of urban expansion. But it did not remain untouched. Squatters and others logged and cut shingle bolts in the Point Grey forest, largely unregulated until 1907, when the provincial government began to consider the area for development. A hundred or so shingle-cutters were served eviction notices. But little was done until 1912. By that date, streetcars ran within a kilometre of the bog, the urban grid had been extended, at least in broad form, into its northern and eastern fringes, and, with the urban real estate bubble inflating, the newly created British Columbia Forest Branch sought profit from the sale of timber on a substantial tract destined for subdivision into the housing lots "for which it [was] excellently suited." This block encompassed a huge area between 16th Avenue and the Musqueam Indian Reserve on the Fraser River, extending several hundred metres west from Camosun Street.[19] A surveyor's report suggested the ravages to which it had been subject. The western area had been heavily logged and repeatedly burned. On the eastern perimeter, just over twenty hectares of "fairly good timber," with trees about seventy-five centimetres in diameter, had escaped axes and fires. Immediately north of this area was Camosun Bog, 22.5 hectares of "muskeg." Both were bordered to the west by 100 hectares of land that was partly timbered, having been "culled over by previous logging" and subject to "exceedingly severe" windfalls and fires (figure 3: X4 Timber Sale). In all, the tract contained 2.5 million feet of Douglas fir, and 400,000 feet of cedar, as well 2.2 million feet of "dead & down" wood.

In March 1913, a local logging outfit obtained a two-year lease to the eastern part of the area shown in figure 3, set up a lumber and shingle mill, and began logging the best timber in the tract. Before long they were in economic difficulties. Exploitation of the area continued temporarily, but when the outfit fell into bankruptcy, the Forest Branch sought to capitalize on what remained in the area by offering new leases, one of which encompassed Camosun Bog. A surveyor's report noted that there was only scattered timber on the lease, and that windfalls and logging debris were common. Reports from neighbouring tracts suggest the despoliation of the landscape: in one area burned in 1910 there was "no reproduction of value"; the shingle bolts and downed timber that the Forest Branch wished to sell were "windfalls, badly burned and small," that would have to be retrieved from "a large percentage" of "worm eaten" and "rotten material."[20] In the end, some 600 cords of firewood and shingle bolts were salvaged from the Camosun lease. By this time, 1917, dense second-growth stands of hemlock were regenerating on previously burnt land to the west, and alder grew in parts of the bog, suggesting that here and there at least the ecological disturbances produced by logging, fires, and surveys had created drier conditions suitable for the growth of this light-loving invader.

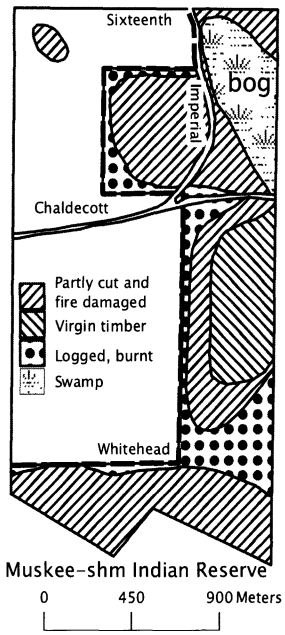


Figure 3. Timber Sale X4 (1913)

Fire engulfed the bog again in midsummer 1919. Reports in the local press suggest the size and dramatic character of the conflagration. Two hundred hectares were "devastated." "Homes and Property Were Menaced" by the blaze. Two hundred men made "valiant" and "heroic efforts" to check the flames, but high winds made the task difficult. The fire crossed the "marshy ravine" of Camosun Bog, and residents on the western fringe of settlement in Dunbar Heights some two or three hundred metres east of the bog evacuated their dwellings, fearful that they would be destroyed.[21] Palynological (pollen) and dendrochronological (tree-ring) studies reveal the impact of this fire on the bog. Most of the taller species—the shore pines, mature Labrador tea, mature swamp laurel, and the invading alder—were burned. Some surface growth, including sphagnum, was likely damaged as well, if not directly by flames then by heat and ash, but resilient bog species including young Labrador tea and swamp laurel in moist hollows survived.[22]

In the aftermath of the fire, shore pine, a fire-adapted species with cones that open only with temperatures above 45 Celsius, recolonized the bog. So, too, did other bog-adapted plants. In the years that followed, hemlock seeds blew into the area from the surrounding forest, as they had (only to fail in competition with bog species in the wet, acidic, nutrient-poor environment) in preceding decades. Early in the 1920s, however, some hemlock seeds were able to find shade, perhaps beneath young shore pines, and—importantly—less acidic soil conditions, perhaps on slightly elevated areas of the bog surface covered with mineral-rich ash. There they took root, but hardly prospered.

Annual growth rings from hemlock trees of this generation in Camosun Bog are markedly close together, suggesting that they struggled to survive. Normally they would have perished after a few years, unable to draw sufficient nourishment to sustain their growth from the deep wet peat of the bog.[23]

Late in the 1920s, as housing development proceeded at a hitherto unrivalled pace on the grid of surveyed lots east of Camosun Bog, the city began to wrestle with the problems of stormwater disposal spawned by the replacement of forest by the impervious surfaces (roofs, streets, and sidewalks) and exposed soil of new suburbs.[24] Gutters, drains, and subterranean culverts were built to accommodate the heightened, quickened flows of storm water runoff characteristic of urban environments. As the western fringe of Dunbar was occupied, so the district's hydrology was re-engineered. Late in the 1920s, combined drains and sewers served the areas north and southwest of the bog. In 1929, a special drain was constructed near the southern edge of the bog to draw water away from "the swamp," which many local residents abhorred as a breeding ground for mosquitoes and a dangerous, unattractive place. But where settlement was still evolving, where disturbances to soil and vegetation were common and continuing (as housing lots were developed, basements were excavated, and surfaces were reworked), and where drainage networks were incomplete, mess and muddle were inevitable.

The consequences began to transform Camosun Bog. Summer—dry season—water levels fell. Increased winter-time runoff carried soil, organic matter, and nutrients from newly exposed neighbouring slopes into the bog. Both of these occurrences stressed sphagnum, the bog's essential species, and other bog plants as they improved opportunities for invading species to take hold. Drier conditions during the growing season allowed the hemlocks that had seeded after the fire to thrive. Annual growth increments increased, and as they did so, the rising hemlocks quickened change in the bog by increasing evapotranspiration, depositing litter, and creating shade, all of which were detrimental in some degree to bog plants. In time, even the shore pines, which do not tolerate shade well, began to lose ground to the more vigorous hemlocks. With remarkable speed, measured against the thousand years and more through which the bog had remained more or less stable and exhibited the capacity to rebound from the effects of such natural disturbances as fires, this unusual and distinctive space began to disappear. As aerial photographs of the site taken at intervals since 1930 reveal, invading tree species colonized the surface of the bog and reduced its perimeter. In detail, the patterns of change and the processes of transformation entailed in these developments were infinitely complex, but they are revealingly summarized in figure 4.[25]

Maps 4a, 4b, and 4c tell an arresting tale of vegetation succession and landscape modification through a quarter century of human neglect of—and incidental interference with—the ecosystem of the bog and its surrounding catchment. An open landscape dominated by sphagnum and other bog plants gave

way, remarkably quickly and extensively, to a low scrub of more profuse Labrador tea, skunk cabbage (*Lysichiton americanum*), false lily of the valley, bracken (*Pteridium aquilinum*), and berries, which was in turn overtaken in many areas by hemlock and salal (*Gaultheria shallon*). No one planned this outcome. No one expected it. Like so many of the changes made by humans in pursuit of progress, like so many of the environmental consequences of urbanization, these alterations to the landscape just happened—or so it seemed. So far as we can tell, no one worried about them. In the dynamic, rapidly changing human environments of a fast-developing urban centre, differences that took decades to become evident were hardly noteworthy. If a quarter century amounted to mere seconds in the ecological history of a bog, it was half a lifetime in the human history of Vancouver. Insofar as contemporaries noticed what was happening to this tiny tract on the western edge of the city, they likely regarded its transformation as natural and unavoidable. If it was not entirely inconsequential in the larger scheme of things, it was most probably considered benign or beneficial. Here, after all, a dishevelled and despoiled landscape of wind-throws, snags, and burned-over vegetation was growing into green (and ultimately useful?) forest, a "marshy" mosquito-breeding wasteland was turning into land that might eventually be used for housing.

Development was certainly expected. Legal authority over the Camosun Bog area shifted from the Ministry of Forests to the Department of Lands in 1923, when revisions to the *University Land Act* designated approximately 1200 hectares on the western end of Point Grey as the University Endowment Lands (UEL).[26] Established by provincial statute in 1907, and granted an endowment of almost 810,000 hectares of land scattered throughout the province, the University of British Columbia began haltingly. Although a site for the new university was selected on the tip of Point Grey before World War I, early classes were held closer to the city, and the new campus was not occupied until early in the 1920s.[27] At much the same time, the far-flung original endowment was given up in favour of the smaller, closer parcel of land between the university and the city, from which it was hoped to generate revenue through sales, leases, and taxes. Early plans called for residential and commercial development across all but 60 hectares of the tract.

Nothing came of these particular designs, and university officials expressed occasional concern that their endowment holdings were being devalued, even as "demonstration and practice areas" for forestry and biology courses, by logging operations. Still, some land near the university was converted to housing (and more was cleared) before the stock market crash of 1929 brought the local economy to its knees.[28] In the difficult years that ensued, the Department of Lands granted local residents hundreds of permits to cut firewood from the Endowment Lands, and the area began to attract a growing number of recreational users, from Boy Scout troops who camped there, to equestrians who rode old logging trails. Little of this impinged directly on Camosun Bog, but as grand new development plans were floated, as conflicting claims to use rights over the larger area of the endowment lands quickened, and as brush fires threatened in the 1940s, the manager of the UEL recommended that woodcutting be restricted to the vicinity of the bog, as this held "little attraction for riders and posed the least amount of fire hazard."[29]

The bog was a backwater. It was also something of a nuisance. Too wet and unstable for housing development, it blocked the westward advance of the city and subverted the potential for profit from this part of the Endowment Lands. This was no wilderness, but it was, in many minds, a wasteland—an area of little value, except as a source of firewood, as a site in which to dump garbage, and as a place for children to build tree forts. Then, in 1952, the wasteland became a health menace. In May of that year, a nine-year-old boy and a thirteen-year-old girl, both of whom lived near the bog and were known to have played there, contracted polio. A month later a three-year-old girl—"who lives adjacent" to the "swamp land"—did likewise. Polio was one of the most feared diseases in the developed world at the time. In the United States alone it afflicted over 20,000 children every summer until the introduction of Jonas Salk's vaccine in 1955.[30] When the boy died, parents and local residents rose in alarm and outrage.

The disease, caused by an enterovirus that enters the body through the mouth, was known to spread through fecal contamination. The "swamp," said a spokesman for the protestors, showed "a high degree of human pollution"; it was a "sewer menace" created by the drainage of "city side" pollution into the area over many years. Almost five hundred children "up to grade six," reported the *Vancouver Province*, attend Queen Elizabeth School, "which stands adjacent to the bog"; moreover, the report continued, "pre-school children play near it, too." Residents and city officials agreed that a septic tank serving a hundred homes in the area was the likely source of the contamination. But where did responsibility for correcting this lie? City engineers knew that the "ground formation" near the bog made "proper drainage . . . difficult," but they had expected that the trouble would be solved by sewers serving housing developments that "never materialized" on immediately adjacent provincial lands.[31] In the circumstances, said City Engineer John Oliver, the most direct and effective solution was to link houses east of the bog to an existing trunk sewer south of 29th Avenue. But the bog, the sump if not the source of the pollution, was beyond the city. Fiscally conservative aldermen preferred to hand the burden of remediation to the province. The city, said Alderman George Miller, had asked the government to fix the problem before, but could "get no co-operation."[32] Provincial officials simply tossed responsibility back to the city, arguing that Vancouver residents had fouled the waters of the bog.

The city had a problem. Over a third of Vancouver dwellings were not properly linked to sewers. At prevailing rates of expenditure, it would take at least two decades to deal with this backlog. Much of the year's million-dollar budget for sewer works had already been spent. Until the polio outbreak,

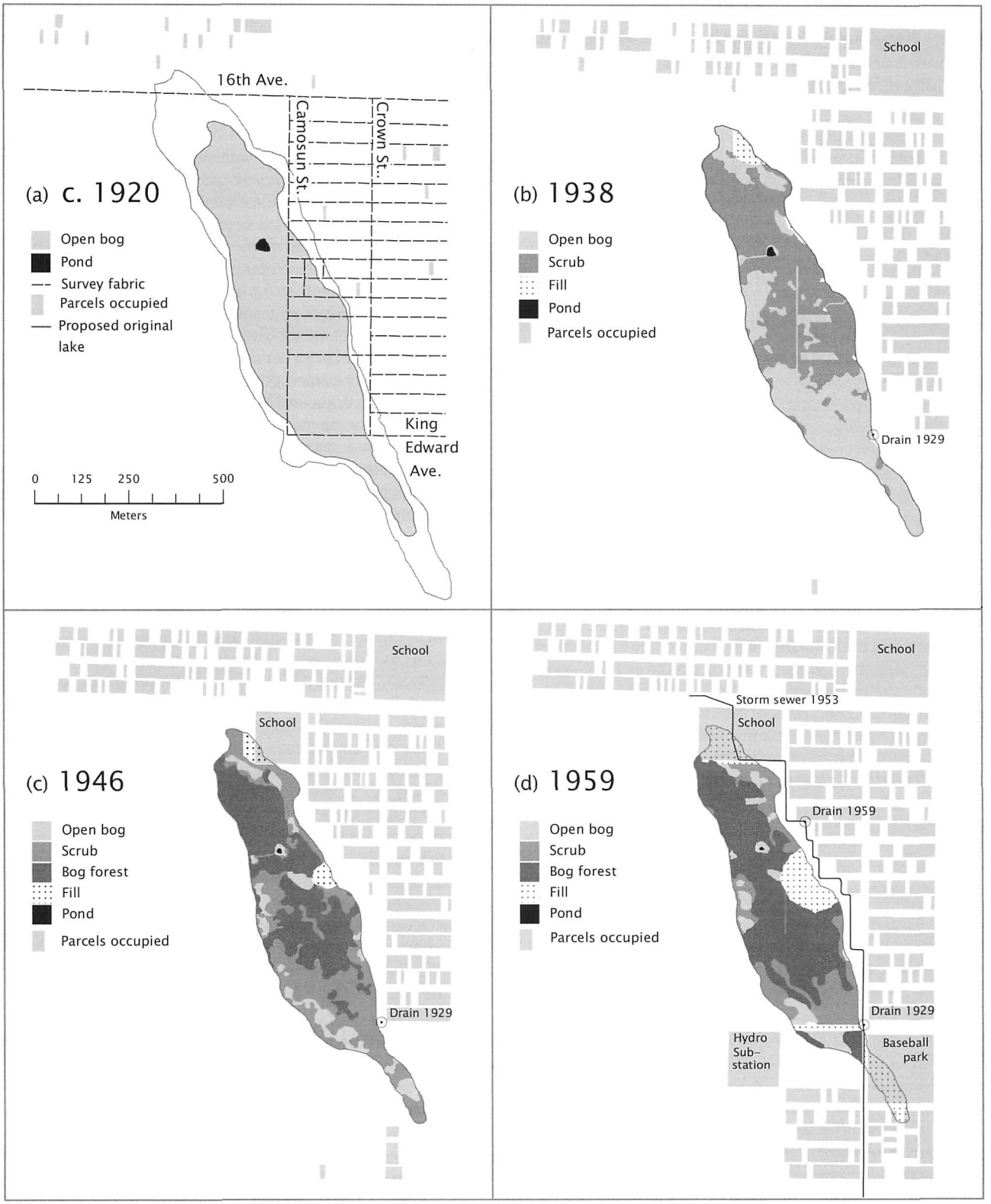


Figure 4: Transformation of the bog

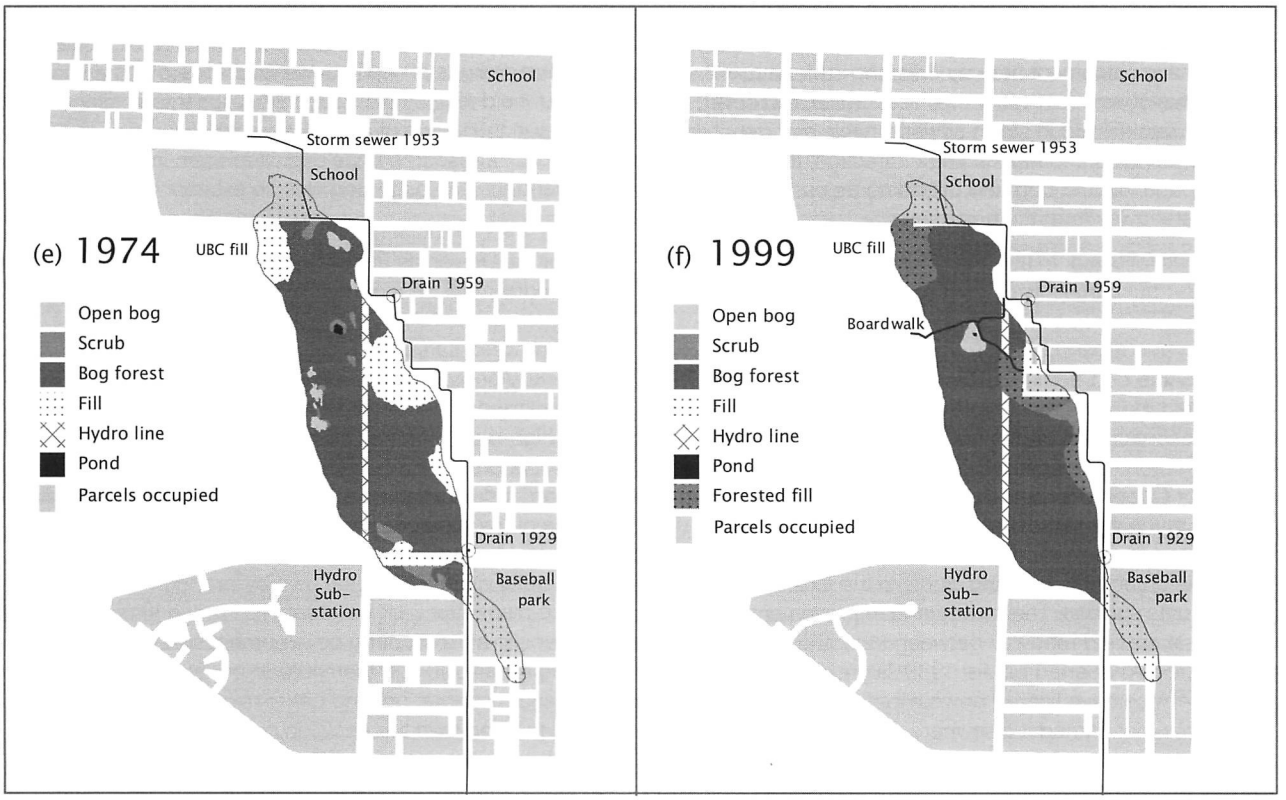


Figure 4: Transformation of the bog (continued)

Point Grey ranked well down the engineers' priority list, below districts plagued for years by faulty septic tanks and others in which sewage had backed up into washtubs the previous winter. Fixing the "swamp" would cost between $400,000 and $500,000, money that the city did not have.[33] But the thunder of protest could not be ignored. The Queen Elizabeth School Parent-Teacher Association and a local Action Committee rallied support from local community leagues, service clubs, and the Teacher's Federation.[34] Aldermen jumped into the fray. "It's an unbelievably dirty, filthy area," bellowed one. "We've got to take the bull by the horns and do something about it." Another urged local residents to appear before the city council's board of works, accompanied by as many children as they could muster. "To the devil with waiting for the Provincial Government," said a third. "If we waited for the government we'd never get anything done." This colourful rhetoric was seconded, more soberly, by the city medical health officer: "Sewers are much more important than a civic auditorium," he declared. "We should devote all our available money to clearing up the health dangers before we start providing frills."[35]

By mid-July decisions had been taken. The "polio swamp" would be drained, even if it meant exhausting the 1952 sewer fund budget, borrowing $200,000 from the following year's allocation, and taking money from the civic auditorium fund. Anxious to make headway, city engineers set to work almost immediately. Surveys revealed that solid ground lay 7.5 metres below "the worst of the muskeg bog area," and that the city stood to lose significant potential revenue, because "no residential development" was possible on the land it owned on the edge of the bog. Councillors also suffered criticism, for cancelling three sewer projects on the less-affluent east side of the city, and for failing to finance work in at least two other "critical areas" in which septic tank seepage posed a serious health hazard. "Harried officials confessed" that their hands had been forced and that there was nothing they could do for the other areas "except wait."[36]

A year later the *Vancouver Sun* reported, "City 'sandhogs' [technically workers who labour "beneath unforgiving waters to forge subterranean arteries"] are burrowing into a bush-covered Point Grey swamp to drain it of stagnant water—and any polio germs that might be lurking there."[37] Using prefabricated cribbing frames, they cut through "mucky black earth" twelve metres below the surface, with "pumps working around the clock to keep seepage out," in order to run a "snaking sewer line" beneath the bog to link two hundred homes to the nearest trunk sewer. Prudently, the engineers reported that their "big headache" was "being turned into cash . . . as all the muskeg dug out is being sold to the park board as peat for use

in fertilising city park land."[38] When complete, this sewer also served as a storm drain, and significantly reduced the size of the bog's effective catchment area by diverting surface runoff from its eastern slopes directly into the Fraser River. Moreover, the permeable backfill laid in storm-sewer tunnels and trenches likely carried groundwater off in the same direction, thus reducing water seepage into the bog and providing a conduit for the drainage of water away from the bog itself.[39]

More disruptions followed. In the quarter century after 1946, a series of smaller but cumulatively consequential developments supplemented the sandhogs' massive re-engineering of drainage patterns in and around the bog. An expanding population in the vicinity of the bog demanded recreational facilities, and clearly accorded the construction of sports fields a higher priority than the preservation of open and "natural" spaces. During the 1950s, part of the bog's northern edge was converted into a playing field for Queen Elizabeth School, built on higher ground to the east. At much the same time the southeastern corner of the bog was filled to make a baseball diamond. Step by step, encroachments on and engineering works in the vicinity of the bog threatened its survival. The paving and improvement of Imperial Drive, a curving roadway between 29th and 16th avenues west of the bog opened before 1930, likely diverted water that would otherwise have filtered downslope into the bog into drainage ditches that carried it elsewhere. In 1956, the casing of a 38-metre deep borehole drilled into the bog was perforated in its upper and lower sections to allow water to drain from the peat into a layer of sand 27 metres below the surface.[40] In 1959, a second drain was constructed near the northeastern edge of the bog to carry water away from that area. Large quantities of fill were dumped into the eastern edge of the bog. An access road was driven westward through its southern quadrant, and as the 1950s gave way to the 1960s, the BC Hydro Corporation built a substation to the southwest of the bog and cleared a power-line right-of-way north–south almost through its centre. Drainage from the hard substation surface was carried into the older special catchment basin drain by a ditch cut alongside the access road that also drew water from the bog. Every one of these developments affected the bog, but they did so in different ways. Fill obliterated it. The removal of vegetation along the power line helped it, inadvertently, by opening the area to the light and favouring the growth of bog plants. Roadways, ditches, catchment drains, and boreholes disturbed drainage patterns and generally conspired to lower water levels, especially during the summer.

None of these events should be surprising. The 1950s and 1960s were decades in which an enthusiasm for high modernism—an ideology shaped by extraordinary faith in the capacity of humans to alter the world, and embodying an almost unshakeable conviction that such alterations were good—seized the minds of many British Columbians.[41] Under the Social Credit government of W. A. C. Bennett, the province embarked on a series of ambitious schemes to invigorate the provincial economy. Huge construction projects, most specifically highways and hydro dams, were the centrepieces of this campaign, which generally entailed remaking the world according to the designs of newly powerful planners and engineers.[42] "Nature" held no intrinsic value in this scheme of things. It was as putty in the hands of a child, something to be shaped by human will, a resource to be exploited or an impediment to be transcended. Camosun Bog was no exception.

In 1956, the provincial Department of Lands developed a plan for the University Endowment Lands to "realize optimum cash endowment on a perpetual basis," for the university. This proposal was entirely congruent with the high modernist ethos and expressed something of its hubris. By this design, approximately 800 hectares between the university and the city were to be developed into a neighbourhood, housing 23,000 people in 3,400 high-quality homes and 34 apartment blocks. Churches, schools, and recreation areas, as well as 45 hectares devoted to "clean" industry were also envisaged. As for the bog, it was an area of "high potential value" that should be drained and "reclaimed," a task made the more palatable by "the possible commercial value of the peat as a by-product."[43] Nothing came of these plans, but their basic tenets echoed through the 1960s, as other still-born property development schemes anticipated housing for 34,000 and then 40,000 people in the UEL area.[44] In the end, however, nothing better revealed prevailing attitudes toward the bog than the decision by the University of British Columbia to use it as a landfill site. Engaged in the construction of a subterranean undergraduate library early in the 1970s, the university needed to dispose of considerable quantities of excavated material. Much of it was dumped into the northwest corner of the bog. Well over two metres thick, this mix of coarse gravel and sand as well as glacial till likely depressed the underlying peat, altered the hydrology of this corner of the bog, and provided space, in time, for the development of a dense stand of red alder. It may also have injected significant quantities of nutrients into the bog environment.

Late in the 1970s, Camosun Bog was on the verge of disappearance. Even in the moister parts of the bog, summer water-table levels were almost half a metre below those that had prevailed less than five decades before; toward the drier edges of the bog, groundwater levels were a metre and more below the surface. Even in winter, the water table remained ten or fifteen centimetres below the surface, over large parts of the bog. Soil-water pH levels on the perimeter of the bog were not only significantly higher than those near its centre (as is normally the case in bogs), but reached levels of 7.0 and 8.0 (far above the 3.0 to 4.5 more typical of ombrotrophic environments and recorded at the ever-shrinking core of Camosun Bog). Whether attributable to the summertime drop in water levels, and better soil aeration and mineralization of nutrients as a result, or to nutrient-rich seepage from nearby fill, these pH levels favoured the establishment of non-bog species. Studies of hemlock growing in the bog show a repeated pattern of "release," of more vigorous growth, beginning in the 1950s, with the precise timing dependent upon microscale characteristics of particular

sites. As hemlocks prospered, bog plants were overtaken by their advance across the site. Many shore pines were weakened by western gall rust (Endocronartium harknessii), leaving them more vulnerable to attack by insects and fungi. According to one study, completed in 1979, "regeneration of shore pine is non-existent . . . and the younger pine are suffering high mortality because of the shading effects of the closing canopy." The consequences of half a century of human interference with the environment of the bog and its surroundings are made evident in figures 4d and 4e. Continuation of these trends was only to be expected, said one investigator. They would lead to steady contraction of the "waterbody," and increasing desiccation of the bog environment, with hemlock attaining "at least subclimax status and the understory also evolving to reflect this change."

Re-conceptualization and Restoration

Yet nothing is inevitable in human affairs, and the future of the hybrid landscape that Camosun Bog had become remained to be determined. Across North America, a rising environmental consciousness laid siege to high modernist ambitions during the 1970s, and in Vancouver, where Greenpeace was founded in 1969 and concern about the consequences of environmental pollution and human hubris was strong, new voices began to assign new importance to nature.[50] The UEL, in the view of a raising chorus of conviction, was not just a "vacant piece of real estate." In the face of yet more proposals for development of the land, proponents of a different future for the area stressed its potential value as a park, argued that its conversion would be a short-sighted and irreversible decision that would make "an inconsequential dint in the housing problem" and insisted (belatedly and thus somewhat ironically) that "encroachment" on the watershed of Camosun Bog—where "rare tundra plants and wild flowers grow"—would "deprive it of natural run-off . . . change water level[s]" and diminish "the value of what is left."[51]

The issues were far from simple. Members of the university community, including Dr. Bert Brink on the Faculty of Agriculture, challenged the university administration's decision to turn the bog into a landfill, and eventually managed to have the dumping stopped through the intervention of Dr. Bill Gibson of the President's Committee on the UBC Endowment Lands.[52] Politicians pointed out that the demand for housing was intense, and that saving the UEL from development would require higher densities in neighbouring areas. Seeking a middle ground, some advocated balanced development that would save ecologically sensitive areas and "spruce up" others.[53] In 1975 slightly more than four hundred hectares of the UEL south of 16th Avenue were designated as potential parkland, and slightly more than a fifth of it was declared an ecological reserve.[54] Although the park was never officially dedicated, its contemplation deflected development from the area and reflected a sea change in attitudes toward the bog and its surroundings.

As landscape architect Michael Hough noted from the other side of the continent, the environmental concerns and values that emerged in the 1960s produced "an acute awareness of the earth's fragility as a natural system." More and more people began to appreciate that natural processes and human affairs "are inseparable issues."[55] Within weeks of the establishment of the ecological reserve there were calls for control of the endowment lands to pass to the provincial parks branch, and within months the minister of the environment established a committee to advise him on the future of the area. By 1978, the idea that the UEL might become a regional park under the jurisdiction of the Greater Vancouver Regional District was gaining favour.[56] Yet it took a decade to settle the issue. Planners, city officials, and developers made the case for housing development on some of the land. The university wanted to develop other parts for its own purposes. The Musqueam people claimed aboriginal title to most of the area. Meanwhile, the university established a liaison group to conduct research, provide technical advice, and represent its interests in the UEL to the GVRD. In 1981, a subcommittee of this body was formed to investigate the deterioration of Camosun Bog.[57] A few years later, the GVRD began basic management of the bog and sponsored further work and publication on the area.[58]

By 1985 it was clear that something needed to be done, quickly, if the bog were not to disappear, and that public opinion favoured action. Across the country, environmental angst gathered momentum and turned it into action. "Dedicated citizens," noted Michael Hough, "are planting trees, building wetlands, bringing back native wildflowers to prairie landscapes and restoring their rivers and watersheds."[59] In December 1988, the provincial government opened the way to concerted effort on behalf of the bog by announcing the establishment of Pacific Spirit Park, 850 hectares under the authority of the GVRD, described as "the gateway to the Pacific and a spiritual ground to becoming one with nature." By some accounts, this decision was precipitated by the desire to place the former Endowment Lands beyond the reach of the Musqueam land claim by transferring its title from the provincial government to a third party. Egregiously, the Musqueam learned of the decision from the public announcement. Briefly, they won a restraining order, claiming traditional use of the land for sacred and secular purposes. But this view was soon set aside, on the understanding that the government's transfer of the land to the GVRD was without prejudice to the Musqueam land claim. In April 1989, the new park was established by provincial legislation approved despite the jeering of Native peoples in the public gallery.[60]

Within weeks, the Camosun Bog subcommittee produced a *Proposal for the Restoration of Camosun Bog*.[61] Fully in accord with the restorationist enthusiasms noted by Michael Hough, it recommended weeding competing non-bog species from remaining patches of sphagnum bog, raising the summer water table close to surface levels, and removing large hemlock trees. Each of these steps was seen as crucial, but the authors of the report were also acutely aware of the limits of their knowledge and that their recommendations were unprecedented. The "manipulation of natural systems," they advised, "requires caution and small gradual changes."[62] Manual weeding began

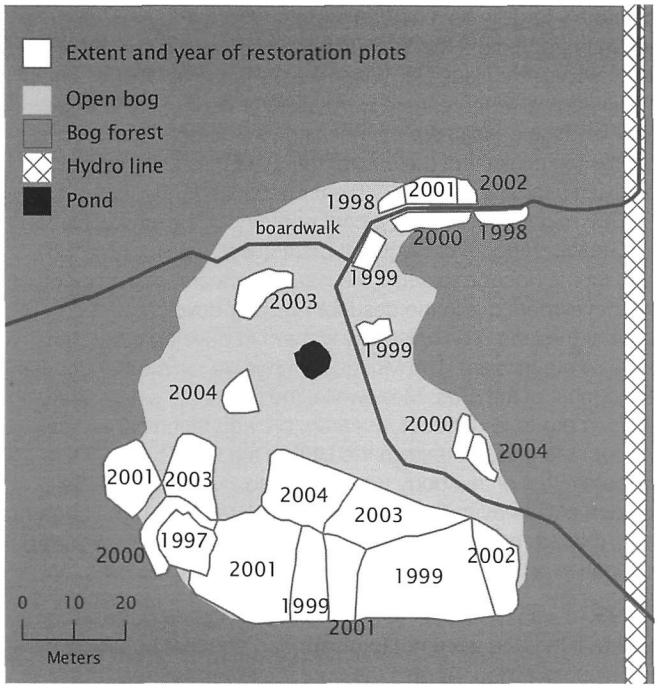


Figure 5(a): Bog restoration 1997–2004

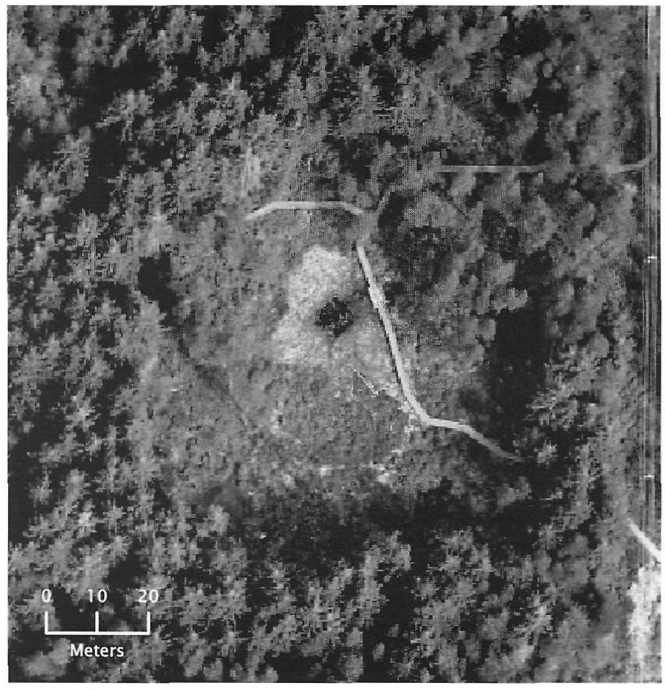


Figure 5(b): Orthophoto 2002

almost immediately. In the winter of 1990–1991, the Vancouver Natural History Society and the GVRD collaborated on the removal of 150 hemlock trees, with diameters of fifteen to forty-five centimetres, from the core area of the bog. Helicopter logging techniques allowed this to be done with minimal surface disturbance, but the results were not entirely expected. Eliminating the hemlocks had little favourable effect on water levels in the bog, and opened the ground to invasion by other species such as birch (*Betula papyrifera*), salmonberry (*Rubus spectabilis*), blackberry (*Rubus ursinus and R. discolor*), swordfern (*Polystichum munitum*), and salal, all of which had to be removed. Moreover, because birch coppices if cut at the base, its root systems had to be grubbed out by hand. Several strategies were considered to elevate water levels. These ranged from drilling a well to diverting a creek into the bog, from irrigating it with city water (possibly in conjunction with the construction of a berm around major parts of the bog) to placing a collar on the southern catchment drain. All seemed flawed or prohibitively expensive.

Ultimately, a solution to the water-level problem emerged almost serendipitously, if not by chance.[63] Surveys of the bog in 1990–1991 revealed how little vigorous sphagnum remained. To maintain this essential species until ways of raising the water level in the bog were found, GVRD workers transplanted moss into small holes, less than a metre in diameter, dug down to the level of the water table beneath the bog. There it flourished. Within a few years the sphagnum in some pits had grown twenty-five or thirty centimetres up the side of the hole to the surface. The holes had become "boglets." As this was happening, a small group of individuals interested in and attached to the bog came together as the Camosun Bog Restoration Group—otherwise known as the "crazy boggers." Established in 1995, the CBRG included a number of dedicated volunteers, including scientists, (former) employees of the University of British Columbia, and long-time residents of the affluent neighbourhood. Together they seized upon the evidence provided by the boglets to frame a larger-scale experiment in bog restoration.[64]

In 1997, CBRG members began clearing an eight metre by ten metre area in the core of the former bog. The hemlocks growing there had been removed in 1990–1991, but the area was dry and covered with young growth and forest litter; it contained no bog habitat. Now the tree stumps were grubbed out, other vegetation was dug up, and the litter was removed to expose the peat surface. All of this work was done by hand. Then peat was excavated (also by hand) to different depths, to yield an uneven (and carefully surveyed) surface some thirteen to fifty centimetres below the level at which work had commenced. The lowest parts of this new surface were at or close to the prevailing summer water table. In September, 250 plugs of sphagnum were planted on a grid across all but the very lowest and wettest parts of the "test bog," providing approximately 10 per cent coverage of the area. The experiment was intensely monitored and observed, and careful weeding—for the most part of the common rush and grey sedge that appeared less aggressively

as sphagnum occupied more of the area—took place each summer (figure 4f). Within a year, sphagnum covered almost 30 per cent of the test bog surface. Other bog species—sundews, bog cranberry, shore pines, and Labrador tea—colonized the area spontaneously.

Remarkable though its results were, this initial experiment was not an unqualified success. Over time it became clear that widely fluctuating water levels and prolonged winter inundation meant that sphagnum did not thrive in the lowest parts of the test bog.[65] Similar observations were made in a second area worked on with machinery in 1999: removing stumps and roots lowered ground levels too much. Learning from these results, the CBRG has continued its work, excavating and replanting new areas of the former bog according to its members' developing understanding of bog ecology. The progress of their endeavours to 2004 is charted in figure 5a, and restoration efforts continue. Hard and careful work, close and detailed observation, scientific understanding, and a certain amount of old-fashioned trial and error have remade substantial areas of the bog lost to the effects of human interference and plant succession in the twentieth century (figure 5b).

Changing "deeply rooted values and traditions" that framed Camosun Bog as wasteland, threat, and nuisance has been a central part of the restoration project centred on this area. From the first, the CBRG acknowledged that its small-scale, low-cost volunteer efforts had more to do with changing attitudes toward than producing economic benefits from the bog. It identified "public education to increase awareness and appreciation of the natural beauty and value of the bog" as an important part of its mandate. In conjunction with the GVRD and young people involved with the Environmental Youth Corps, a boardwalk was built across the bog, both to encourage visitors and to limit damage to the habitat. Informational signs were erected at the entrances to the bog. Small sites adjacent to the boardwalk were excavated, weeded of invaders such as salmonberry (*Rubus spectablis*), hardhack (*Spirea douglasii*), and salal, and labelled to allow visitors to identify sphagnum, bunchberry, Arctic starflower, and other bog plants. Recent park literature stresses the efforts of volunteers who have worked "tirelessly" to save this "priceless" but endangered "jewel." Local high school students and neighbouring residents have also been encouraged to participate in the larger project of restoring Camosun Bog, and re-establishing "a healthy, functional and sustainable bog ecosystem, one which will be appreciated and protected by all."[66]

By changing its ecology and appearance, by publicizing its distinctiveness, by making it more accessible, and by enlisting public support for its restoration, Camosun Bog has been reconstructed both physically and intellectually. But only to a degree. Much physical labour lies ahead of the crazy boggers, and many of those who live, work, and play in the vicinity of the bog remain largely ignorant of both its history and its present qualities. The link between actions and ideas remains weak, even at the local scale. What hope, then, that efforts invested in Camosun Bog in recent times will change attitudes towards the environment on a larger canvas? Will they encourage an ecological view of cities? Can local deeds change public opinions and actions toward the bog, the park, the environment, and even global sustainability? These questions haunt those who believe that ecological restoration is environmental enhancement, that environmental education begins at home, and that the fate of the planet rests upon new ways of living with the earth. And it is to them that we turn, in conclusion.

Learning from Experience and the Crazy Boggers

This paper has been written and these maps have been prepared (almost) within the proverbial stone's throw of Camosun Bog. We have visited this place often. Its many moods have enchanted us and drawn us back. Conversations with crazy boggers and earlier defenders of the bog have informed and inspired us. We have taken students and colleagues into the heart of this area, hoping that they experience some of the fascination we find in this small and unusual part of our city. We have been intrigued, challenged, provoked—and dismayed—by what we have learned about this place. Vancouver, we feel, would be the poorer without this bog and the work that has gone into it. Yet we know that much of that work would have been unnecessary had Vancouver not grown as it did, and had those who preceded us here behaved differently in this environment. Further, we appreciate that had they acted differently we likely would neither live and work near the bog, nor find it as remarkable as we do.

Camosun Bog is an enigma. It maps a past and holds a vision of the future up to the present. Time runs deep here, but in this tiny tract of territory history is, in some sense, for naught. These few hectares encompass an enormous amount of natural and human history, but the bog cannot rightly be regarded as a natural or a human space. It is, in its way, a hybrid, a product and unique manifestation of the increasingly complicated imbrication of natural and social processes that has marked the human occupation and transformation of North America. Its restoration, say many of those who live nearby, is much to be desired, but their conceptions of what was (and thus of what "restoration" might mean) are hazy, and their very presence in the area makes it impossible to return, in any meaningful way, to the pasts of which they dream.

From one vantage point, the story of Camosun Bog is essentially tragic. Ignorance and avarice, the hubris exhibited by members of a modernist, capitalist society, the triumph of engineers, planners, and brute force technologies conspired, in short order, to all but destroy an area now regarded, with other bogs and wetlands, as fulfilling important ecological services. Among these might be numbered the bog's role as a carbon sink, sequestering atmospheric carbon dioxide; its function as a hydrological reservoir, suppressing floods, maintaining surface and groundwater quality, and filtering sediments; and its place as a locus of biodiversity, marked especially by the growth within its bounds of cloudberry and Arctic starflower plants. To

these losses might be added others, such as the destruction of a recreational area offering special opportunities for nature observation, the elimination of a unique habitat for nature appreciation, and the foreclosure of educational opportunities.[67] This is a saga of nature abused and subdued for human purposes.

From another perspective, there is a much happier tale to tell. In this version, nature is rescued from the brink. The creation of a park, the work of GVRD staff, and especially the efforts of the crazy boggers came just in time to set the world to rights. Clear-headed vision and personal commitment, a rising sensitivity to environmental values, and a growing appreciation of people's ethical (or moral) responsibility to "respect the intrinsic value of nature" and serve as stewards of the earth combined to stay the Damoclean sword of human-induced ecological disaster. Now the bog is being "successfully restored" by the judicious actions of enlightened citizens committed to repairing its health and fixing the damage done to its ecology.[68] These efforts suggest that the human wrongs of yesteryear can be corrected by human action today and they hold open, to those who embrace this account, the comforting possibility of once again finding a home in nature.

A third story might draw a parallel between efforts to restore Camosun Bog and notorious instances of forgery in which skilfully crafted and painstakingly accurate replications of famous—and highly valued—paintings are passed off as the real thing. For all that it looks like a Monet, pretends to be a Monet, fools some people into believing it is a Monet, and for all that I wish to believe otherwise, my beautiful picture of water lilies produced in a Parisian garret in the 1990s is a fake, a fraudulent imitation of no significant value. Alternatively, a restored Camosun Bog might be likened to a fine and beautiful carving, treasured until it is understood that it was fashioned from the scapula of someone sacrificed for the purpose of making this particular objet d'art. Now this exquisite piece is tainted by knowledge of its origins. Someone had to die—just as nature had to be despoiled—to bring this human creation into being.[69] On these accounts, Camosun Bog can never be recreated. No amount of restoration effort can reproduce the real thing, the original, and no amount of exquisite landscaping should expunge the memory of what was lost to enable this creation. To pretend and do otherwise, to speak of restoration, or to value what we might have without regard to its origins, is at best to dissimulate, certainly to beguile, and at worst to swindle.

Each of these stories has its defensible elements. But each is an obvious simplification. Human interference undoubtedly hastened change in the bog, but it did not initiate it. Nor was it the sole driver of the quickening transformation that depended on natural processes of vegetation competition and succession as well as upon human action. To indict those who helped remake this landscape (in the century or so before 1970) for their failure to recognize and attend to present-day concerns (of which they were substantially unaware) may be comforting to those who revel in the conviction that they hold unassailable knowledge and possess perfect understanding, but it is as hubristic a stance as the one they would disparage. Circumstances were different then. The past of seventy-five years ago may not have been a foreign country, but those who inhabited it had needs, priorities, and understandings that were substantially different from those that prevail today. The historian's task is to comprehend and convey the quintessential character of these circumstances rather than to preach the virtues of current views.

By the same token, one should not (necessarily and always) read the phrase "restoration ecology" literally, as a commitment to the re-establishment of (original) ecosystems. Although countless commentators proclaim and imply that "habitat restoration" is essentially "the practice of attempting to restore damaged or destroyed habitats back to their previous natural state," the reality, as many practitioners of restoration ecology recognize, is a good deal more complicated.[70] Suffice it here to note that even Aldo Leopold, one of the inspirational founders of the restoration ecology movement, recognized that its focus was on the future rather than the past. Although he argued the importance of reconstructing "a sample" of the "original" landscape, he knew that this effort was but a "starting point . . . in the long and laborious job of building a permanent and mutually beneficial relationship between civilized man and a civilized landscape."[71] This is a hugely important task, and insofar as it contributes to its realization, restoration ecology is much to be commended. But it is not a general panacea for environmental ills; the scope, appeal, and impact of individual restoration projects are typically limited. Indeed, even as they ranked the restoration of Camosun Bog a high priority, local residents worried that it would increase mosquito populations in the area. These fears were heightened a few years later, by the expectation that the West Nile virus would reach coastal British Columbia. Authorities established monitoring systems in the bog and prepared to spray the site—despite knowledge that this action would probably have disastrous consequences for some rare insect species in the bog.[72]

Nor can one escape the fact, as one reflects upon the history recounted in these pages, that the Camosun Bog Restoration Group is as deeply engaged in the manipulation of nature as those whose earlier deeds contributed to the bog's virtual disappearance and that it is impossible to turn back the clock in hope of obliterating actions taken and changes made between past and present. In circumstances such as those considered here, one can only agree with William James, that "the trail of the human serpent is . . . over everything."[73] Early and late, human actions have combined with natural processes to remake landscapes in ways both planned and unintended. Loggers, engineers, and developers in the early years, and crazy boggers in later times, have counted their interventions as progressive. All have regarded their activities as contributions to their communities. And all are open to question and censure. Cultural values change. They are also, typically, subject to debate and contestation along the way. Just as calls to save the sorely abused bog stood as indictments of earlier uses of this space, so restoration ecology has been criticized as "ultimately

lamentable meddling," reflecting a commodified relationship with nature that conforms "to the same destructive patterns that produced the problems to which . . . [restorationists] are now responding."[74] By this account, such commitments of time and labour as the crazy boggers have donated to the Camosun Bog become nothing more than "an expensive self-indulgence for the upper classes," mistakenly drawing energy and resources away from engagement with more pressing and systemic environmental concerns.[75] On this view, indeed, preoccupation with the fate of Camosun Bog, past and future (as reflected in this paper), is an idle extravagance by comparison with the many and varied environmental challenges facing global society at the beginning of the third millennium.

Except . . . except that there are important things to learn from close engagement with this place on the edge of a park, on the edge of a city, on the edge of the continent. "By contemplating the legacy of change," Eric Higgs has written in a recent book subtitled *People, Natural Process, and Ecological Restoration*, "we can all imagine a different kind of place in the future."[76] A historical perspective on nature and society, such as that offered here, reminds us that change is contingent and that particular events are but points on a continuum. It encourages greater reflexivity about the process of living on, and with, the earth, and by enhancing understanding of where we (collectively, as generations of inhabitants of this place) have been, what we have done, and how we have responded to change, it provides a foundation for more conscious and deliberate choices of action in the future.

Camosun Bog is old and small, but it is hardly insignificant. Its *early* history is a mirror reflecting and reminding those who look into it of the dynamic and precarious qualities of the natural world and of the powerful forces unleashed on twentieth-century environments, knowingly or otherwise, by fast-developing societies armed with powerful technologies and moved by expansionist ideologies. Its *more recent* past provides a touchstone both of changing attitudes toward nature and of the extent to which nature and society are inextricably tied together in modern urban settings (or indeed, more generally in the modern world). And its *present* offers a stimulus to thinking anew about human–environment relationships and about the challenges of living with nature in the future. In sum, this small piece of territory encapsulates an enormous amount of human and environmental history and raises important questions about modern-day society's evolving relations with its surroundings—questions that are best understood by considering the bog against the broader backdrop of recent environmental debate in North America.

In 1989, within weeks of Camosun Bog's inclusion in the newly created Pacific Spirit Park, the American Bill McKibben published an influential, albeit controversial, book. Adopting the widespread and long-established view that humans exist apart from nature, and insisting that *natural* meant "untouched" by human influence, he argued that human exploitation, transformation, and contamination of the earth had destroyed all vestiges of the natural; the world had come to *The End of Nature*.[77] Advocates of wilderness preservation, and many others who clung to the idea of nature as retreat and respite, apart from the artificiality of modern existence, were outraged at the implication that treasured, protected areas were less than pristine, not least because it seemed that their special status might be jeopardized by such claims. But the ground was shifting beneath both McKibben and his critics. In the final decades of the twentieth century a swelling army of scholars—ecologists, social theorists, geographers, historians, sociologists, philosophers, and others—began to undermine the bedrock upon which arguments over "the end of nature" were based. Social theorists blurred and erased the clear line between humans and nature.[78] Ecologists questioned their previous conceptions of nature that turned upon ideas of balance, equilibrium, climax communities, and ideal states. "The old idea of a static landscape, like a single musical chord sounded forever, must be abandoned, for such a landscape never existed except in our imagination," wrote Daniel Botkin, one of the leaders of the new "non-equilibrium ecology," in 1990.[79] The idea of wilderness was deconstructed, and even national parks have been shown to be "contingent, historical landscapes." As environmental historian Richard White had it, "Wilderness is not so much preserved as created."[80]

All of this has provoked serious reconsideration of the meaning of nature, as it has called into question the effectiveness and worth of such narratives as the tragic, triumphal, and duplicitous stories about Camosun Bog. Ultimately, none of these three accounts is sensitive or subtle enough to capture the complexities of historical and ecological change associated with human life on earth, of people within nature. Rather than rendering the early- and mid-twentieth century history of Camosun Bog as tragedy, might it better be regarded as one thread in the intricate web of a developing urban ecosystem in which environments and politics, technology and geography, ideas and aspirations knit together, interacted, fused, and blurred in complex ways to produce ever-shifting human-ecological conditions through time?[81] Rather than counting efforts to save the bog as triumph, perhaps they should be considered simply as another array of interactions in the kaleidoscopic urban ecosystem. Rather than disparaging ecological restoration as deceit, perhaps it is more appropriately regarded as opportunity—or at least as occasion for "thinking into the future and then connecting the future with the past."[82]

The environmentalist Eric Higgs has argued this last position eloquently. Contemplating a future in which technology threatens to run rampant, and the value of things, activities, and experiences is ever more determined by the marketplace, Higgs worries about the implications of the commodification and "technological constitution of contemporary life." As a practitioner and theorist of ecological restoration, he also worries about the ways in which these developments threaten to denature the world—he points to the Wilderness Lodge in Disney World, Florida, as a "complete fabrication not only of

experience but also of place"—and to turn ecological restoration into a commodity- and technology-driven exercise, shaped by considerations of efficiency and profit. None of these prospects pleases. But things need not be this way. Although such places as the Wilderness Lodge offer more material comforts and artificial distractions than a tent under the stars, people do not have to prefer technological representations of nature and wilderness to the wide open spaces of the outdoors. Nor does the work of ecological restoration have to conform to the imperatives of planning, process, and efficiency. Indeed, Higgs argues, ecological restoration can—and should—be conceived differently, to serve as an antidote to the prevailing and constraining techno-economic paradigm that governs so much of contemporary life.[83]

On this view, ecological restoration is about much more than—indeed, perhaps only incidentally about—reclaiming damaged environments or restoring the viability of ecosystems. It is a social as well as an environmental movement, an activity that nurtures both nature and culture. Place and time are central to the enterprise. Places acquire meaning through experience, they are forged by remembrances of the past and become "significant through narrative continuity." They are revealed by the stories told about them. Restoration also "invokes memory" and depends upon narrative for its meaning. "Restorationists create stories through their actions, which accumulate and prepare the way for a richer interpretation of the place. The place grows in value precisely because of the restoration." More than this, restoration conducted at the scale and in the manner exemplified by the crazy boggers "builds value through participation and in doing so strengthens human communities."[84] This restoration project, like others of similar scale and impetus elsewhere, creates social capital by connecting individuals and communities to place.[85] It is characterized by what the philosopher of technology David Strong has called correlational coexistence—the mutual relationship constituted when "a thing is enlarged by care, and a person is rewarded with a more profound understanding of existence and responsibility."[86]

The history of Camosun Bog may not, to paraphrase William Blake, allow anyone to hold infinity in the palm of her hand or bring her eternity in an hour, but it does force those who consider it awhile to confront the implications of change—of change in nature, of change in society, of changing societal attitudes to nature, and of their own (changing) position in relation to these things. Doing this is no more likely to carry anyone into the Garden of Eden than the efforts of the crazy boggers are to return the bog to its "primeval state." But this is not really the point. The endeavours of the crazy boggers (as we hope, in some small way, the words of this paper) ultimately find their utility in reminding us that the value of a specific location "is often a consequence of the way that the life of the community is embodied within it." So too, we trust, these pages demonstrate that contemplating the past of a place "tempers our ambitions and on occasion reveals clues about ways of engaging with the landscape that make good sense in the present."[87] Such contemplation should also open minds to the complications that lie at the core of human–nature interactions and encourage people to "find refuge in change" (as the writer-naturalist Terry Tempest Williams has it), even if part of the price of this "ecological education" is, as Leopold recognized, to live "alone in a world of wounds."[88]

Acknowledgement

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Data Sources for Camosun Bog Maps

The maps and analysis of Camosun Bog and its surrounding area from 1920 onward draw upon the following digital spatial data sources: From the City of Vancouver, Engineering Department, May 2004 data related to: Block boundaries; Lot lines; Address text points; Street centerlines; Sewer lines and manholes; Water lines and manholes; Colour orthophoto, 2002, 10cm pixels. From the BC Assessment Authority, 2001, parcel data indicating year occupied (built). From DMTI Canmap Data, 2004 landuse; from Greater Vancouver Regional District (GVRD) municipal boundaries; streets; from GVRD Parks, May 2004 data relating to Park boundaries; Trails. We also derived valuable information from the following non-digital spatial data sources: Laurence Brown, October 2004, Restoration plots; extent and year restored; Gerry Harris and Sharon J. Proctor, *Vancouver's Old Streams*, rev. ed. (Vancouver: Vancouver Public Aquarium Association, 1989); Bruce MacDonald, *Vancouver: A Visual History* (Vancouver: Talonbooks, 1992). The analysis of vegetation also rests upon the following aerial photographs derived from a number of sources (A = National Air Photo Library Natural Resources Canada, Ottawa; BC = Ministry of Sustainable Resources Management, Victoria, BC; SRS = Selkirk Remote Sensing, Richmond, BC; BR = Burnett Resource Survey Ltd., Burnaby, BC): A2234:86(1930); A5872:18(1938); A10339:54–55(1946); BC1674:70(1954); A1680:165(1959); BC5062:42(1963); BC5323:6(1969); BC7227:183,205–6(1970; BC5574:67(1974); BR80008:15(1980); A26511:110(1984); SRS6064:130(1999); SRS6929:19(2004).

Notes

1. The phrases "hidden treasure" and "ancient wonder" are from information boards posted at the site.
2. V. J. Krajina, "Biogeoclimatic Zones and the Classification of British Columbia," *Ecology of Western North America* 2, no. 1 (1969): 148–168.
3. G. K. Kiss, "Pollen Analysis of Postglacial Peat Deposit in Vancouver" (master's thesis, University of British Columbia, 1961); Audrey F. Pearson, "Peat Stratigraphy, Palynology and Plant Succession in Camosun Bog" (undergraduate thesis, University of British Columbia, 1983); but see also Richard J. Hebda, "Paleoecology of a Raised Bog, Burns Bog, British Columbia" (doctoral thesis, University of British Columbia, 1977), and R. W. Mathewes, "Paleoecology of Postglacial Sediment in the Fraser Lowland Region of British Columbia" (doctoral thesis, University of British Columbia, 1973), for other deep cores.
4. Sarah Howie, "A Look at Burns Bog," *Davidsonia* 13, no. 4 (October 2002): 82. See also Hebda, "Paleoecology of a Raised Bog."
5. For a general account see E. C. Pielou, *After the Ice: The Return of Life to Glaciated North America* (Chicago: University of Chicago Press, 1991).

More detailed studies are H. P. Hansen, "Postglacial Forest Succession, Climate and Chronology in the Pacific Northwest," *Transactions, American Philosophical Society, Part 1* (1947): 1–130, and R. W. Matthewes, "A Palynological Study of Postglacial Vegetation Changes in the University Research Forest, Southwestern British Columbia," *Canadian Journal of Botany* 51 (1973): 2085–2103, and R. W. Mathewes, "Paleobotanical Evidence for Climate Change in Southern British Columbia during the Late-Glacial and Holocene Time," in Climate Change in Canada 5: Critical Periods in the Quaternary Climatic History of Northern North America, ed., C. R. Harrington, *Syllogeus* 55 (1985): 397–422. Broad patterns of vegetation change are mapped in Cole Harris, ed., *Historical Atlas of Canada*, vol. 1, *From the Beginning to 1800* (Toronto: University of Toronto Press, 1987).

6. There are neither surveys nor good descriptions of the lake/swamp/bog before the late-eighteenth century. Our estimates here are based on field survey, the interpretation of later aerial photographs and topographic maps, and botanical studies of the bog. Indigenous people knew the low, wet ground of this area as *mukwaam* ("swampy place"), the lake at its centre as *khahtsulek* ("lake at the head"), and the stream that drained south from this area as *nough khahtsulek stalo* ("lake head creek"). See Bruce Macdonald, *Vancouver: A Visual History* (Vancouver: Talonbooks, 1992).
7. Such areas are known technically as oligotrophic (nutrient-poor) and ombrotrophic (precipitation-dependent) environments.
8. Nico van Breeman, "How *Sphagnum* Bogs Down Other Plants," *Trends in Ecology and Evolution* 10, no. 7 (July 1995): 273.
9. H. A. P. Ingram, "Soil Layers in Mires: Function and Terminology," *Journal of Soil Science* 29 (1978): 224–227; K. E. Ivanov, *Water Movement in Mirelands* (London: Academic Press, 1981).
10. J. G. Gosselink and R. E. Turner, "The Role of Hydrology in Freshwater Wetland Systems," in *Freshwater Wetlands*, eds. R. I. Good, D. F. Whigham, and R. I. Simpson (New York: Academic, 1978), 63–78.
11. The classic and highly mathematical work is by Ivanov, *Water Movement in Mirelands*. See also Dan Charman, *Peatlands and Environmental Change* (Chichester: John Wiley and Sons, 2002): 35–38, and H. A. P. Ingram, "Size and Shape in Raised Mire Ecosystems: A Geophysical Model," *Nature* 297 (1982): 300–303, for a more accessible account. For a brief summary see chap. 2, sec. 2.3.2, in Richard J. Hebda, Kent Gustavson, Karen Golinski, and Alan M. Calder, *Burns Bog Ecosystem Review*, http://www.eao.gov.bc.ca/epic/output/documents/p60/1036434231789_16af42884ae64e0f8553d621be48be92.pdf.
12. van Breeman, "How *Sphagnum* Bogs," 271.
13. Kiss, "Pollen Analysis," and Audrey F. Pearson, *Ecology of Camosun Bog and Recommendations for Restoration* (Technical Paper #3, University Endowment Lands / Forest Park Research, Burnaby, BC, UBC Technical Committee on the Endowment Lands and GVRD Parks Department, 1985): 109–113.
14. van Breeman, "How *Sphagnum* Bogs."
15. Geoffrey A. J. Scott, *Canada's Vegetation: A World Perspective* (Montreal and Kingston: McGill-Queen's University Press, 1995), 218–224.
16. Howie, "Burns Bog," Jim Pojar and Andy MacKinnon, *Plants of Coastal British Columbia* (Edmonton: Lone Pine, 1994).
17. Pearson, *Ecology*, 138.
18. For a detailed account of these developments, and the sources of quotes, see Graeme Wynn, "The Rise of Vancouver," in *Vancouver and Its Region*, eds. Graeme Wynn and Timothy Oke (Vancouver: University of British Columbia Press, 1992), 69–101.
19. Details in this and the immediately following paragraphs about timber leases and surveys of the area are from records held by the Department of Timber Harvesting, BC Ministry of Forests, Victoria. Photocopies of records pertaining to timber sales, for the decade or so after the establishment of the Forest Branch in 1912, in the area that became the University Endowment Lands in 1923, were made by the GVRD and are reported in part in Gabrielle Kahrer, *A Mosaic of Destinies, A Mosaic of Landscapes: The History of Pacific Spirit Park, 1860s to 1950s* (Burnaby, BC: GVRD, 1991), 30–37, but neither photocopies nor originals could be located in 2004–2005.
20. Timber Sale X788, November 1916, cited in Kahrer, *Mosaic*, p. 36.
21. Accounts of the fire can be found in the *Vancouver Daily World*, 16 July, 17 July 1919; *Vancouver Daily Sun*, 16 July, 17 July 1919; *Daily Province*, 17 July 1919; *Weekly Gazette and Home News*, 19 July 1919.
22. Pearson, *Ecology*, 109–138.
23. M. J. Jull, "A Hydrological and Biogeochemical Investigation of Accelerated Forest Succession in Camosun Bog" (undergraduate thesis, University of British Columbia, 1983).
24. In 1911, Vancouver, Point Grey, South Vancouver, and Burnaby hired Montreal sanitary engineer R. S. Lea to plan a sewage and drainage system for the peninsula. His 1913 report advocated construction of separate sewage and stormwater drainage systems. It led to the establishment of the Vancouver and Districts Joint Sewerage and Drainage Board in 1914. But financial constraints steered this body toward the development of combined collector sewers that routed sewage and stormwater into neighbouring waters such as the Fraser River and English Bay. See A. Keeling, "Sink or Swim: Water Pollution and Environmental Politics in Vancouver, 1889–1975," in "On the Environment," special issue, *BC Studies* 142/143 (Summer/Fall 2004): 69–101, and A. Keeling, "The Effluent Society: Water Pollution and Environmental Politics in British Columbia, 1889–1980" (PhD diss., University of British Columbia, 2004), for more details.
25. In the preparation of maps 4a to 4f, thirteen vertical aerial photographs of the Camosun Bog area made between 1930 and 2004 were scanned and geographically referenced to the City of Vancouver 2004 digital street centrelines data (UTM, NAD83). Six were selected to chart the transformation of the bog between 1920 and 1999. The outline of the bog mapped in figure 4a is clearly visible on the 1930 air photo; this outline was digitized, classified as open bog, and used as the basis for mapping the changes in the bog revealed in figures 4b to 4f. For 1938, 1946, 1959, 1974, and 1999 the vegetation on the original bog was classified as open bog, scrub (low scattered trees, brush), or bog forest. Vegetation classification was verified by an inventory forester using stereo pairs of photos, where available. Fill (including later streets), the BC Hydro line, and other details were added from evidence in air photos and other maps and documents of the period. The GIS procedure entailed laying a 10 by 10–metre grid on the digital air photo image, classifying each cell (as open bog, scrub, etc.), dissolving cell boundaries between identical classifications, and manually smoothing the boundaries. The spread of housing on land adjoining the bog, represented as "occupied parcels," was mapped using BC Assessment Authority Data, verified by cross-checking against information in city directories. The outline of the lake in Figure 4a is an approximation based on careful evaluation of small-scale topographic maps and detailed field reconnaissance in the vicinity of the bog.
26. Most details of this story and more information on much of what follows are to be found in General files, UEL Collection, UBC Archives. Summary treatments can also be found in Kahrer, *Mosaic*, and in A. Klassen and Jan Teversham, *Exploring the UBC Endowment Lands* (North Vancouver: J. J. Douglas, 1977).
27. Cole Harris, "Locating the University of British Columbia," *BC Studies* 32 (Winter 1976–1977): 106–125.
28. H. L. McPherson, "The Planning of the University Endowment Lands, Vancouver, British Columbia," *Town Planning* 6 (1926): 5–18; Alfred Buckley, "Planning the British Columbia University Endowment Lands: A Great Town Planning Scheme for Western Canada," *Town Planning* 6 (Dec. 1926): 2–4, available in General files 1–7, UEL Collection, UBC Archives; Kahrer, *Mosaic*, 40–41.
29. Kahrer, *Mosaic*, 46–48.
30. "Polio: The Final Assault," *Science* 303 (26 Mar. 2004): 1961.
31. *Vancouver Province*, 6 June, 17 June, 21 June 1952.

32. Ibid., 11 June 1952.
33. Ibid.
34. *Vancouver Province*, 4 June 1952.
35. *Vancouver Sun*, 24 July 1952, *Vancouver Province*, 18 June 1952.
36. *Vancouver Sun*, 18 July, 19 July, 24 July 1952.
37. Ibid., 25 July 1953; definition of *sandhogs* from http://www.albany.edu /history/collison.html.
38. *Vancouver Sun*, 6 Oct. 1953.
39. Piteau Associates, *Hydrogeological Assessment of the Camosun Bog, Pacific Spirit Regional Park, Vancouver, British Columbia, Phase II* (Report to Parks Department, Greater Vancouver Regional District, Burnaby British Columbia, 1991).
40. Piteau Associates, *Hydrogeological Assessment*, 6–7. Later, efforts were made to seal the holes in the upper part of this borehole.
41. For succinct accounts of the high modernist ethos and its implications, see Paul R. Josephson, *Industrialized Nature: Brute Force Technology and the Transformation of the Natural World* (Washington: Island, 2002), and James C. Scott, *Seeing Like a State: How Certain Schemes To Improve the Human Condition Have Failed* (New Haven: Yale University Press, 1998).
42. Tina Loo, "People in the Way: Modernity, Environment, and Society on the Arrow Lakes," in "On the Environment," special issue, *BC Studies* 142/143 (Summer/Fall 2004): 161–196, offers a useful account.
43. D. B. Turner, University Endowment Lands—Master Plan Survey, Dec. 1956, box 1, 1–10, General files, UEL Collection, UBC Archives; and Description of the Collection, UEL Collection, UBC Archives.
44. UEL Collection, UBC Archives; Kahrer, Mosaic, 52–53; *Vancouver Sun*, 12 Dec. 1988.
45. Jull, "Hydrological and Biogeochemical Investigation," 30–39. There are no measurements of water-table heights ca. 1920, but the implication here is that the situation in Camosun Bog was similar to that in other undisturbed bog environments.
46. Jull, "Hydrological and Biogeochemical Investigation," 40–44.
47. W. D. Husby, *Camosun Bog Restoration Monitoring Report, 1990/91* (Report to GVRD Parks Department, West Area, 1991), 23–26.
48. Reginald Brick, "A Study of the Growth and Succession of the Camosun Bog Forest" (undergraduate thesis, University of British Columbia, 1979), 49, which also notes the gall rust.
49. Ibid., 50.
50. For the Greenpeace story, see Frank Zelko, "Making Greenpeace: The Development of Direct Action Environmentalism in British Columbia," in "On the Environment," special issue, *BC Studies* 142/143 (Summer/Fall 2004): 197–239, and for the rise of other environmental groups in Vancouver see Keeling, "Effluent Society," 273–346.
51. Endowment Lands Regional Park Committee, "Submission to the Government of British Columbia, December 1974," box 1, General files 1–23, UEL Collection, UBC Archives; Heather Persons, "University Endowment Lands: We would rather see higher density housing around the park than medium density all over it," *Vancouver Leisure Magazine* 7, no. 5 (May 1974): 15–16; Point Grey Action Group of Canadian Scientific Pollution and Environmental Control Society, "Proposal for Preserving the University Endowment Lands as Park," box 1, General files 1–20, UEL Collection, UBC Archives; Adrian Belshaw, "A Proposal for the Future of the University Endowment Lands, prepared for UBC Student Council" (September 1971), box 1, General files 1–17, UEL Collection, UBC Archives; Dunbar-West Point Grey Endowment Lands Committee, "Brief Requesting the Preservation of the University Endowment Lands as Parkland and Green Belt" (Nov. 1973), box 1, General files 1–21, UEL Collection; Carmen R. Rida, "The Preservation of Urban Woodlands: A Case Study of the University Endowment Lands" (master's thesis, University of British Columbia, 1988).
52. Personal communication, conversation of GW with Dr. V. Brink, Jan. 2005; and N. Baker, P. Lilley. T. Sasaki, and H. Williamson, "Investigation of Options for the Restoration of Camosun Bog, Pacific Spirit Regional Park" (UBC Environmental Studies 400 thesis, Apr. 2000), 53.
53. Persons, "University Endowment Lands"; Anonymous, "The University Endowment Lands . . . Somewhere between a Park and a Parking Lot," *Westworld* 1, no. 2 (Mar.–Apr. 1975): 49.
54. This area, known temporarily as Frank Buck Memorial Park, encompassed most of the southeastern section of what later became Pacific Spirit Park. The ecological reserve encompassed a blue-heron breeding ground but did not include Camosun Bog. The eastern boundary of the proposed park appears to have followed the line of Camosun Street, also the original boundary between the City of Vancouver and the UEL. For a map, see Macdonald, *Vancouver*, 58–59.
55. Michael Hough, *Cities and Natural Process* (London and New York: Routledge, 1995), xvi, 5.
56. GVRD, *A Regional Park for the Endowment Lands* (1980) was based on extensive public consultation and co-operation with the Endowment Lands Regional Park Committee.
57. Important studies undertaken under the guidance of this subcommittee include G. G. Catt, "Foliar Analysis of Western Hemlock and Lodgepole Pine in Camosun Bog: Nutritional Status Interpretation and Correlation with Groundwater Chemistry" (undergraduate thesis, University of British Columbia, 1983); Jull, "Hydrological and Biogeochemical Investigation"; J. Marowitch, "A Study of Soil Water Levels and Water Chemistry in Camosun Bog" (undergraduate thesis, University of British Columbia 1982); Pearson, "Peat Stratigraphy, Palynology"; and W. W. Smith, "Ecological Considerations Concerning the Rehabilitation of Camosun Bog with Reference to Recreation" (master's thesis, University of British Columbia, 1983).
58. M. A. Comeau, *Vegetation Classification and Ordination of Camosun Bog in the University Endowment Lands* (GVRD Parks Department, 1983); A. F. Pearson, *Camosun Bog Endowment Lands, Vancouver* (GVRD Parks Department, 1984); Pearson, *Ecology*; Grant A. Thompson, *Vegetation Classification of the Endowment Lands* (Technical paper #4, UBC Technical Committee on the Endowment Lands / GVRD Parks Department, 1985).
59. Hough, *Cities*, xvi. Indeed, the enthusiasm for environmental restoration gained enormous momentum across North America at about this time. Although the first systematic attempt to restore a piece of North American land is generally said to have made in 1934, at Curtis Prairie under the auspices of the Arboretum of the University of Wisconsin, and to have been inspired by Aldo Leopold, the movement was slow to gain popular support. See Dave Egan, "Historic Initiatives in Ecological Restoration," *Restoration & Management Notes* 8, no. 2 (1990): 83–90; Matthias Gross, *Inventing Nature: Ecological Restoration by Public Experiments* (Lanham, MD: Lexington, 2003); R. J. Hobbs and D. A. Norton, "Towards a Conceptual Framework for Restoration Ecology," *Restoration Ecology* 4, no. 2 (1996): 93–110; William R. Jordan 3rd, *The Sunflower Forest: Ecological Restoration and the New Communion with Nature* (Berkeley: University of California Press, 2003); and Z. Naveh, "Ecological and Cultural Landscape Restoration and the Cultural Evolution towards a Post-Industrial Symbiosis between Human Society and Nature," *Restoration Ecology* 6, no. 2 (1998): 135–43.
60. The Musqueam Indian Band, *The UEL Park and the Musqueam Band: The Real Story* (Apr. 1989), box 2, General files 2-11, UEL Collection, UBC Special Collections, also available as Spam 7308; Delbert Guerin, *Musqueam Aboriginal Rights to the University Endowment Lands* (Vancouver: Musqueam Band, 1977), Spam 239, UBC Special Collections; *Vancouver Sun*, 24 June, 3 July 1987, 3 Jan., 6 Apr., 21 Apr. 1989.

    The eastern boundary of the park was extended in 1989 to Crown Street. The city conceded a small parcel of land (said to be worth $7 million) that the sewer excavations of 1953 had shown to be unfit for development. A

small additional area in the vicinity of King Edward Avenue appears to have been attached to or assumed by the park at this time.

61. Prepared by A. F. Pearson, J. P. Kimmins, and G. E. Rouse, this is included as Appendix 2 of D. Watmough and A. Pearson, *Camosun Bog, Summary Report* (Greater Vancouver Regional District, Parks Department, 1990). The appendix is dated June 1989, although the *Summary Report* attributes it to April.

62. Pearson, Kimmins, and Rouse, *Proposal*, 26.

63. At least by some accounts. A more prosaic story offered by Husby, *Camosun Bog*, 4, is that Richmond Nature Park staff had already attempted sphagnum transplantation, and that Vancouver Natural History Society and UBC personnel were advocating that "sphagnum milkshakes" (shredded sphagnum in water) be poured on suitable areas to promote regrowth, in addition to advocating transplantation.

64. These developments are reported in Laurence Brown, Terry Taylor, and Brian Woodcock, "The Restoration of Camosun Bog," *Discovery* 28 (1999): 27–32, and Laurence Brown, "The Camosun Test Bog, 1997–2000" (unpublished paper provided by the author). As Brown notes, the test bog project was suggested by Sue-Ellen Fast of GVRD and Hamish Kimmins of the Faculty of Forestry at UBC. See also Laura C. Chessor, "Restoration of Camosun Bog" (undergraduate thesis, Faculty of Forestry, University of British Columbia, 1999).

65. This was an outcome congruent with observations of naturally occurring bogs that show sphagnum succeeding best at levels five to fifteen centimetres above the mean water table. This implies that prolonged submersion (for more than some 165 days per annum) is detrimental to most species of sphagnum. L. D. Gignac, "Distribution of Sphagnum Species, Communities and Habitats in Relation to Climate," *Advances in Bryology* 5 (1993): 187.

66. Brown, Taylor, and Woodcock, "The Restoration," 32.

67. These "ecological" and other services are discussed at slightly greater length in Baker, Lilley, Sasaki, and Williamson, "Investigation of Options," which comes close to framing the history of the bog as tragedy.

68. Echoes of this story appear in Brown, Taylor, and Woodcock, "The Restoration."

69. These examples derive from Robert Elliot, "Faking Nature," *Inquiry* 25 (1982): 81–93. The argument is elaborated in his *Faking Nature: The Ethics of Environmental Restoration* (London: Routledge, 1997).

70. The pages of the journal *Restoration Ecology*, published by the Society for Ecological Restoration, are one measure of the complexity. The quotation exemplifying the more straightforward view is from C. J. Stevens, review of *The Sunflower Forest*, by William R. Jordan 3rd, *Environment and History* 11, no. 1 (2005): 101.

71. Aldo Leopold quoted by Curt Meine in "Foreword," *The Historical Ecology Handbook: A Restorationist's Guide to Reference Ecosystems*, eds. Dave Egan and Evelyn A. Howell (Washington: Island, 2001), xv–xix.

72. Surveys of public opinion were conducted by Pearson, *Ecology*, in 1985 and by Baker, Lilley, Sasaki, and Williamson, "Investigation," in 2000. Both reported high levels of support for restoration of the bog. The concern about mosquitoes is noted in Baker, Lilley, Sasaki, and Williamson, "Investigation," 43.

73. The James quote is taken from Eric Katz, "The Big Lie: Human Restoration of Nature," *Research in Philosophy and Technology* 12 (1992): 231–242.

74. The quotations are drawn from summaries of these positions in Eric Higgs, "Designing, Not Faking, Nature," in *Helping the Land Heal: Ecological Restoration in British Columbia*, ed. Brian Egan (Vancouver: BC Environmental Network Educational Foundation, 1999), 34. See also Elliot, "Faking Nature"; Katz, "The Big Lie"; and Eric Katz, "The Call of the Wild," *Environmental Ethics* 14, no. 3 (1992): 265–273. A useful collection of relevant essays is William Throop, ed., *Environmental Restoration: Ethics, Theory and Practice* (Amherst, NY: Humanity, 2000).

75. Jack Temple Kirby, "Gardening with J. Crew: The Political Ecology of Restoration Ecology," in *Beyond Preservation: Restoring and Inventing Landscapes*, eds. A. Dwight Baldwin Jr., Judith DeLuce, and Carl Pietsch (Minneapolis: University of Minnesota Press, 1994), 234–240, quote from 240.

76. Eric Higgs, *Nature by Design: People, Natural Process and Ecological Restoration* (Cambridge: MIT Press, 2003), 269.

77. W. McKibben, *The End of Nature* (New York: Random House, 1989).

78. Donna Haraway, *Simians, Cyborgs and Women: The Reinvention of Nature* (New York: Routledge, 1991); Bruno Latour, *We Have Never Been Modern* (Cambridge: Harvard University Press, 1993).

79. Daniel Botkin, *Discordant Harmonies: A New Ecology for the Twenty-First Century* (New York: Oxford University Press, 1990), 62.

80. Quotes are from Richard White, "The New Western History and the National Parks," *George Wright Forum* 13, no. 3 (1996): 31. But for the most controversial articulation of this position, see William Cronon, "The Trouble with Wilderness, or Getting Back to the Wrong Nature," in *Uncommon Ground: Rethinking the Human Place in Nature*, ed. William Cronon (New York: W. W. Norton, 1996), 69–90. Yet not everyone embraced these developments. See the series of articles by Gary Snyder, Dave Foreman, Don Walker, and others grouped under the title "Opposing Wilderness Deconstruction," in *Wild Earth* (Winter 1996/97): 8–82. For further debate on this issue see essays in M. Soulé and G. Lease, eds., *Reinventing Nature: Responses to Postmodern Deconstructionism* (Washington DC: Island, 1995).

81. In echo, for example, of Anne Whiston Spirn, *The Granite Garden: Urban Nature and Human Design* (New York: Basic Books, 1984).

82. Higgs, *Nature by Design*, 288.

83. Ibid., 184, 49.

84. Ibid., 157, 226, and passim.

85. See Stephanie Mills, *In Service of the Wild: Restoring and Reinhabiting Damaged Land* (Boston: Beacon, 1995). For an outline of the Social Capital argument, see Robert D. Putnam, *Bowling Alone: The Collapse and Revival of American Community* (New York: Simon and Schuster, 2000), and Robert D. Putnam and Lewis Feldstein, with Don Cohen, *Better Together: Restoring the American Community* (New York: Simon and Schuster, 2003).

86. David Strong cited by Higgs, *Nature by Design*, 246.

87. Higgs, *Nature by Design*, 153, 22.

88. We are indebted to Curt Meine, "Foreword," for the core of this paragraph, including the quotations from Williams and Leopold. The Blake reference is to his "Auguries of Innocence," in *Poems from the Pickering Manuscript*, ca. 1805.