



READING THE ENTRAILS: AN ALBERTA ECOHISTORY

by Norman C. Conrad

ISBN 978-1-55238-671-2

THIS BOOK IS AN OPEN ACCESS E-BOOK. It is an electronic version of a book that can be purchased in physical form through any bookseller or on-line retailer, or from our distributors. Please support this open access publication by requesting that your university purchase a print copy of this book, or by purchasing a copy yourself. If you have any questions, please contact us at ucpress@ucalgary.ca

Cover Art: The artwork on the cover of this book is not open access and falls under traditional copyright provisions; it cannot be reproduced in any way without written permission of the artists and their agents. The cover can be displayed as a complete cover image for the purposes of publicizing this work, but the artwork cannot be extracted from the context of the cover of this specific work without breaching the artist's copyright.

COPYRIGHT NOTICE: This open-access work is published under a Creative Commons licence.

This means that you are free to copy, distribute, display or perform the work as long as you clearly attribute the work to its authors and publisher, that you do not use this work for any commercial gain in any form, and that you in no way alter, transform, or build on the work outside of its use in normal academic scholarship without our express permission. If you want to reuse or distribute the work, you must inform its new audience of the licence terms of this work. For more information, see details of the Creative Commons licence at: <http://creativecommons.org/licenses/by-nc-nd/3.0/>

UNDER THE CREATIVE COMMONS LICENCE YOU **MAY**:

- read and store this document free of charge;
- distribute it for personal use free of charge;
- print sections of the work for personal use;
- read or perform parts of the work in a context where no financial transactions take place.

UNDER THE CREATIVE COMMONS LICENCE YOU **MAY NOT**:

- gain financially from the work in any way;
- sell the work or seek monies in relation to the distribution of the work;
- use the work in any commercial activity of any kind;
- profit a third party indirectly via use or distribution of the work;
- distribute in or through a commercial body (with the exception of academic usage within educational institutions such as schools and universities);
- reproduce, distribute, or store the cover image outside of its function as a cover of this work;
- alter or build on the work outside of normal academic scholarship.

STRIPS, LAMINATES AND BIOMES

No natural biomes remain unintruded on in Alberta and once intruded on, few survive intact. Pieces persist but disconnected remnants do not make well-functioning ecosystems. Plans are in place to eliminate even these. Our purpose now is to examine shifts in dominion from Biosphere to Noosphere; first by examining that stripped or taken away; then that anthropogenically infused or laminated on; and finally in speculating on resulting dynamics in these merged human/nature biomes. Alberta presents this family of techno-morphized biomes in stark and recent light, and, but for our entrenched ways of looking at nature and ourselves, one might be able to determine the directions of these dynamics.

DELUDED DUALISM

Alberta's popular history tells of a civilized and beneficent people (Whites) gently moving in, providently taking over management and control, and improving Alberta by civilizing its first inhabitants and developing the land. Nature still survives in this narrative and Native people, having seen the true White light of civilization, switch sides. In this progression, those Whites who most quickly seized the best became history's heroes. The theme is that in taking the most they civilized, developed and improved the most. So it goes.

Natural history maintains a similar exclusivity, avoiding human history by rarely addressing human effects on nature, leaving scarcely challenged the myth that pristine nature still exists. This history tells us that untainted wilderness lies just beyond our sight, over the horizon. Television and video offers a panorama of places where leopards lurk, wolves howl and whales blow. Academics research and publish papers discussing in detail the cycles, systems and processes of this, that or another creature in its natural con-

text. National park wardens, ecotourist entrepreneurs and politicians avow the intact wilderness. Industry shouts, “We haven’t hurt a thing.” Environmentalists hoist placards fighting for this or that wild place. Coffee table books display their gorget of brilliant natural beauty, reassuringly, unquestioningly, as if it still existed. Pristine wilderness exists in books, on the screens, on promotional brochures and in the speeches of politicians and business leaders. On the land, it exists no more.

If the myth was true, and nature survives intact and unchanging, it ceases to be of historical interest. It is nearly irrelevant except as a permanent theatrical backdrop for the truly intriguing drama, that of powerful, ambitious humans in quest of progress and empire. Reducing man and nature to two solitudes creates formidable problems because it ignores this fundamental reality—humans and nature interact as part of a dynamic totality. But if we consider humans as part of nature and that human progress is, in that sense, truly natural, then, as a thinking and prudent species, and perhaps as a species with ambition and a desire to be ethical, it becomes important to see where human dominion and progress takes the human species and non-human nature. If that direction is risky or wrong, it may be that courses could be changed. It would be helpful to find ways that treat man and nature together more appropriately. One place to begin such a synthesis is by observing the effects of human progress on relatively unperturbed biomes—the effect of the Noosphere on the Biosphere—and Alberta provides a relatively clear view of those effects.

NOOSPHERE DIALECTICS

The idea that technology is transformative is fundamental to anthropology. Major technological changes demarcate the ages of humankind—Stone Age, Bronze Age, Industrial Age, to Information Age—each change synthesizing something-not- before in both the Biosphere and the Noosphere. Exploitation of Alberta followed successive technology—the horse, the gun, the train, the mould-board plough, fast-growing varieties of grain, hardwood pulping technology and heavy oil-recovery systems. This technology transformed the land and people. They changed the background conditions—negating or taking some things away, adding new things to this background, and if powerful enough in each one’s aggregate effect, ultimately synthesizing something new.

In its negating or taking away from the pre-existing or background condition, technology seizes things from nature, bending, breaking or eliminating them. Sometimes this occurred by intent and design—trapping of the beaver, butchering of the bison, capturing of oil or sequestering of



Native people on reserves. At times the effects were unintended, as when technology delivered smallpox. Ploughing shortgrass prairie and draining sloughs eliminated the old. This negating or eliminating is the “strip.”

Things are added. Exotic species of plant and animals invade the land or are introduced. Crops, weeds or pests come seeking niches in nature or nurture compatible with their Eurasian genesis. Noosphere adjuncts—occupation, buildings, transportation systems, production and consumption complexes, chemicals and pollution—layer on and spread out over the land. Things added on are “laminates.” Laminates may replace or displace elements of what was there and, in doing so, strip something; or they may just contribute new complexities to a labyrinthine background.

In taking away from what was—the strip, in adding the new—the laminate, elements and dynamics change. Additions interact with remainders and exploit voids. The background biome changes in form and function. Changes may be to essence, enough so that the biome metamorphoses into a new biome (perhaps a techno-morph), a result of the technology applied to it and that technology’s usual companions. Southern Alberta’s irrigated farming regions are no longer native shortgrass prairie. They are something new, something to be considered for what it is and what it is becoming. Its successions will depend on its origins, what was stripped away (i.e., native grass) and laminated on (crops and water systems), and how they all dynamically interact. The “mature,” or “climax” conditions expected in natural successions often have high diversity and low entropy, existing in a state of complex, dynamic equilibrium or homeostasis. These new anthropogenically perturbed biomes are usually characterized by high entropy and low diversity, accompanied by dynamic, degenerative disequilibrium.

BUILDING BLOCKS

Ecologists talk about an event, activity, or project having a “physical footprint” and its broader ecological effects as its “ecological footprint,” “shadow,” “penumbra” or its “shadow effects.”¹ The metaphor indicates that intervention may result in far wider consequences merely than that within the physical footprint. When boreal forest logging destroys the springtime nesting site of a pair of magnolia warblers, it eliminates a family of overwintering warblers in Central America. Shooting one grizzly bear eliminates the dominant omnivore from up to 2,000 km² of wildlands. Introduction of a domestic sheep disease may decimate populations of bighorn sheep hundreds of kilometres distant, leaving predators to starve. Smallpox acted the same way among the Native population. Ecological footprints stomp across lands remote both in time and space.



Alberta's usual form of "development" is a large-scale resource project dedicated to international trade, a focus that demands transportation. Canoes for furs gave way to carts for robes, trains for grains and on to internal combustion engines, pipelines and telephone lines. All but canoes depend on linear incisions on the land. These are called "line" intrusions. As wide as a six-lane divided highway or as narrow as five-metre seismic lines, these lines open lands to invasion, constructing avenues for subsequent, more varied exploits. But it goes further than just the line and the physical footprint.

Line shadows cast out far beyond the right-of-way, roadway, ditch and borrow pit. In this shade, lands may be ecologically disrupted in cumulating, progressively degenerative ways. Along the fresh-cut survey line, into the wilds, comes the poacher, hunter, geologist, woodsman, 4X4er, farmer, rancher, miner, ecotourist operator, entrepreneur, tax collector and cottage developer. Perhaps the most formative event for the west was the linear incursion of the CPR, not by its physical footprint but because the Iron Horse carried the Noosphere, it provided the world transport to and from the west, for immigration of people and technology, access for market forces and means of export.

Rail, road and other linear disturbances create new habitat where some native species may be eliminated, others disadvantaged, some favoured and exotics introduced. For good reason, some mega-faunal species—grizzly bears and caribou for instance—avoid linear disturbances.² Less wary residents suffer whatever and whomever comes down the road—vehicles, hunters, developers, recreationists and exotics. Margin-loving native animals (e.g., robins and cowbirds) thrive in the disturbance, displacing species that rely on intact habitat—cowbirds do so by nest parasitism.³ Omnivorous species change eating habits as readily as flipping a menu page, shifting from recycling nature to consuming human detritus. With roadside garbage increasing and nature decreasing, scavengers feast while hunters starve. Europe's shrill starlings and its English sparrows displace sweet songbirds; weasel and ferret, hawk and eagle are succeeded by dog, cat and crow, all admirably suited to scavenging garbage can entrées and the kills from marauding auto tires.

If "the medium is the message" as McLuhan claimed, and roads are a medium, they give off clear messages. A new road announces, like Charles II's 1670 Charter, that this land is claimed for the empire. The road leads to something to be taken. Then, with the road in place, everything along the way becomes available to the global appetite. The road says, "I am the way, the means of moving things about, the way to reshuffle Mother Nature by rearranging physicality." Roads are inevitably part of a larger strategy to take from one place and deposit in another—a means of strip and laminate.



Hives of activity occur at various points along lines—railway sidings, elevators, feedlots and oilfield batteries—as humble as the farmer’s yard, as haughty as the city. Home to humans, synanthropic life forms and a range of uses, these centres are named “nodes.” Some, like Calgary, grew; some, like Little Chicago and Little Philadelphia near Turner Valley, blossomed and then withered with their resource. Cities are nodes having such overwhelming power that they turn into Noosphere islands, sometimes defying even climate and geography.⁴ And their shadows cast deep into the countryside.⁵

Agriculture, forestry and oil technology impose their own characteristic geometries on the land. The forestry industry clearcuts in blocks, resulting in an increasingly dense patchwork of cutblocks. The agricultural industry ploughs sodmat into large cultivated fields. These discrete areas of intense stripping are “blocks.” As forestry or agricultural exploitation matures, blocks become so expansive as to blot out nature. Where lands are best, blocks extend over the horizon to the margins of the forest or arability.

Lines, nodes and blocks link together in increasingly dense matrices or webs. A few locations that are good for neither man nor beast—mountaintops, alkali lakebeds and badlands—remain outside the matrix but not outside its ecological footprint or shadow. They avoid physical exploitation only until a use may be found for them. There is no mountain so remote that it will not satisfy some appetite with a proper application of technology and a sufficient appetite. Then the matrix embraces them.

TECHNO-BIOMIC PROGRESSIONS/REGRESSIONS

Our baseline goes back 12,000 years ago, to glaciation’s end, when a continent of ice turned to flood of water and life returned, at a time before significant human impacts. That was the time of Alberta’s first big strip, the Quaternary Extinctions and its epochal human laminate. America’s longest surviving native mega-faunal species—from mammoth and horse to sabretooth tiger and giant short-faced bear—went extinct within several thousand years. Those stripped from the land did not co-evolve with humans. The survivors—including grizzly bears, grey wolves and bison—were generally human acculturated newcomers, having emigrated with man over Beringia. Perhaps more than humans, they contributed to the extinctions as new predators or competitors. Perhaps not.

Eurasian humans emigrated to become the America’s keystone species, laminating their kind, culture and influences on the land. Human roles in this mega-faunal decline are unknown and perhaps unknowable, but anthropogenic contributions are certain. Even if wielding only palaeolithic

technology, a new opportunistic adaptable top-level predator contributed to the new dynamics. Native American life retreated in the face of surging Eurasian life. Nature modified over the next ten millennia to harmonize with humans and their dominant technology (paleolithic) in what might be called paleolithic biomes. The coming of another wave of Eurasian peoples and their technology destroyed that homeostasis and biomic combinations.

Before contact, European effects spilled out over Alberta—horses, guns, disease and global appetites. A shock wave of higher hunting-gathering technology fractured the background paleolithic harmony. The fur trade, the bison debacle and then the exodus of Native people to reserves stripped the land of its last large life, marking the end of the paleolithic biome.

Appetites then turned to agriculture. Agriculture attacks the land in two general ways. One is direct, the sodbusting, soil-turning action of the plough in cultivation. This leads to the “plough biome.” More indirect is the other, the mouth and gut of grazers or browsers, often the cow, to harvest the land. This leads to the “cow biome.”

Ploughs capture the richest, most productive lands for agriculture, cutting this lowest trophic level from the Biosphere while eliminating vegetative, mega-faunal and much microfaunal life. Mechanical, chemical and other technology defend the species selected for culture from counterattack by nature’s diversity, leaving the one cultured species, the monoculture. Biological successions on croplands are not determined by natural selection but by the farmer’s estimation of what the market will demand next year. Little natural refuge remains near the ploughed field. Neighbouring sloughs, ditches or margins occasionally host fleeting small creatures. Farmers, markets, assessors and tax collectors assay these areas, calculating how to turn this “waste” to profit. In time most are purged of nature—by design, appetite, exotic displacement, shadow effect and sometimes, just because.⁶ Diversity is driven from the land.

Lands too poor to cultivate, can be bent to profit by turning plants to meat to money through the cow. Cattlemen use various mechanical means, chemical regimens or exotic grass enhancements to increase meat production. Wildlife is killed, driven off or displaced by cows. Farmers tolerate little competition from bear, cougar, elk, ground squirrel or mouse. Stripped and laminated thus, the land changes, becoming the “cow biome.” This biome occupies grasslands from the foothills cow-calf operation out to mixed farming and feedlot operations on the cultivated plain.

The future of the cow biome involves more range enhancement, more productive exotic grasses, more clearing of scrub, more intense management and elimination of competitors and predators. Land use intensifies as more lands are cleared, scarified or ploughed, cross-fenced, seeded, ferti-



lized, sprayed with chemicals and cropped. While the farmer appears in charge, marketplace appetites manage the lands, continuously demanding more of them, tending toward total exploitation. Perfect exploitation will never be achieved but it is the path taken and the goal in mind. Even now, the plough and cow biomes occupy one-third of Alberta and over 80% of the White Area and their ecological shadows stretch far beyond that, to the wildest corners of the province.⁷

Oil and gas exploration pokes holes over nearly all Alberta. Lease sites, production facilities, pump stations, plants and other developments dot the map. These interconnect by lines, converging in larger and larger patterns of roads and pipelines and seismic cutlines, lacing out over the land in the “petro-biome.” Nodes, patches and latticework are this industry’s geometry. As the conventional resource dwindles, exploitation costs increase as do the intensity of interventions to land, air, water and life. “Drilling spacing units” will reduce in cases from 640 acres (256 ha), to 160 acres, then to 40 (16 ha), to 20 (8 ha) and to five acres (2 ha). Secondary and tertiary recovery practices will use increasingly intrusive and disruptive technology to take the last economic hydrocarbons. With oil and gas, the formerly wild biomes—plains, parklands or forest—metamorphose into petro-biomes with few intact remnants and much margin habitat that serves little ecologic function.

Petro-biome successions share some features of the plough and cow biomes. Nature’s dominion is ousted as exotic species stream in, down its lines. The margins host synanthropic species—starlings, crows, robins, cowbirds and white-tailed deer—but most original residents shrink away or die off. With 95% of Alberta in the fossil-fuel prone Western Sedimentary Basin, the oil patch has probed most lands, some of it with startling intensity. Desperate to continue the flow of oil wealth, industry drills more and more, finding less and less. As oil declines, Alberta’s flush population will hungrily turn on whatever remains to sustain itself. That is where forests came in.

Regions retaining good-quality forests are changing. Nearly 100% and perhaps more than 100% of Alberta’s available AAC are committed to the saw. In the “forestry biome,” the wilds are stripped by clear cutting and laminated with new varieties through reforestation. Its lines are the expanding complex of logging and access roads, occupying about 5% of cut areas. Its geometry expands through intensifying patchworks of clearcuts and reforestation progressions.

The market demands specific fibres and woods. New technology delivers these through intensive cultural regimes. Reforestation involves culturing the soil for a crop of selected plants. With that, the forestry biome



emerges as a nearly exclusive human use zone, dedicated, like agriculture's several biomes, to holding nature at bay and otherwise producing specialized products, usually in a local monoculture. Over time the powerful diversity of native fauna and flora degenerates in the face of the usual exotics, opportunists and the intended crops. Those that dwell lower on the techno-hierarchy—Native people, trappers and small or local forestry businesses—have no place in corporate-owned industrial-age forests.

NEOTERIC BIOMES

The cow, plough, petro- and forestry biomes arise from primary production. They represent the productive efforts of some 400,000 Albertans and their associated capital. Alberta's gross employment is more than 1.7 million, therefore over 1.3 million people work daily in secondary and tertiary economic activities, producing effects not mentioned above. Many of those activities are very intrusive but, even when considered, the largest category of effects is still omitted. All of Alberta's three million people are consumers. Aggregate consumption's consequences are colossal.

About 65% of Alberta's population lives in larger cities, 15% in its towns and villages, while 20% live in rural contexts. Alberta's urban population ballooned enormously from 1939 to the present, a factor of six, and per capita income by a factor of eight. In these simple but misleading terms, aggregate urban consumption increased by a factor of approximately 50. This prodigious appetite reflects on Alberta's hinterlands in powerful and deforming ways. Acting as centrepoint or vortex, the city draws into its maw things desired from the countryside (strip). Acting as a centrifuge, the city blows out and laminates many manner of things on the hinterlands—constructing, advancing, excreting new structures, demands, pollution and residues.

Urban areas may be the home to most appetites, but satisfaction's source usually resides elsewhere. Consuming is now a long-distance affair. English appetites for fur initiated the White taking of Rupert's Land. Albertan's breakfast habit of orange juice and coffee contributes respectively to the felling of subtropical lowland forests and tropical highland forests. The physical building and maintenance of a city requires mountains of minerals and forests of fibre. City food and energy, business and resources depend on distant places. City recreation and tourism demands scenic golf courses, ski hills, hotels and roads, often in the most biologically productive of nature's retreats. Cities are not discrete or impermeable units, isolated from the surrounding lands, but depend more than ever on the lands beyond.⁸ Without supporting lands, the city dies. It is on those lands that the city's shadow falls and its ecological footprint tread.



Cities most often have ambitions to grow forever, to grow numbers of people and wealth. It is good for business. It is the demographic strategy. It is the custom. It is the Noosphere's will. Talk of limits or contraction is heresy. But where does this lead?

BIOSPHERE TO NOOSPHERE

Once, an instant ago in geologic time, Alberta was pristine. The dazzling diversity of 11,000 years ago diminished to a merely magnificent abundance after the Quaternary extinctions. One hundred and fifty years ago, before Palliser spied on the land, it had 470,000 km² of boreal forest, 52,000 km² of parkland, 90,000 km² of plain and prairies, and 46,000 km² of montane, alpine and subalpine lands. On the plains, foothills, montane, mountain and parklands ranged four million bison, 400,000 mule deer, 300,000 antelope, 200,000 elk and almost 50,000 bighorn sheep. Alongside were less populous species such as mountain goats, and of course, all their predators—thousands of plains grizzly bears, cougars and 100,000 wolves. In the northern forests were 100,000 wood bison, as many woodland caribou, moose and more mule deer again. There too, were thousands of grizzly bears and tens of thousands of wolves and black bears.

Today the plains, forests and parklands are in retreat; each endangered, planned or committed to ecological obsolescence. In replacement the new biomes are 130,000 km² of plough biome, 80,000 km² of cow biome, 370,000 km² of forestry (woodlot) biome, all overlain by the blanket and matrix of petro-biome, nodal ecotones, shadows and ecological footsteps that shade, choke and crush what remains.⁹ Now the wilds hold 6,000 bison, 15,000 elk, 5,000 antelope, 50,000 muleys and 500 grizzlies, no plains wolf, no black-footed ferret, no plains grizzly bears and 10 dozen reintroduced swift fox.¹⁰ That is approximately 1% of the mega-faunal wildlife of 250 years ago.

What was, no longer is. Except for a few dogs, in 1730 there were no exotic plants or animals. Now virtually no intact natural biomes remain. Instead of wildlife, nearly five million cows, 1.8 million pigs, nine million chickens, 800,000 turkeys, 300,000 sheep and over 100,000 horses range the province. The displacement of mega-faunal wildlife by domesticated animals is proportional, pound for pound, and nearly complete. Domestic animals are well over 99% of Alberta's non-human mega-faunal biomass, while less than 1% is wild.¹¹ That 1% is debasing. The strip is complete, the laminate done.



SUCCESSIONS TO TORPOR

Natural systems are composed of extremely complex pieces engaged in wildly complicated dynamics, few of which are discrete. Pieces number near infinity and the full shape, features and significance of any particular piece no one yet fully understands. Parts taken away affect the entirety. Parts added also change it. The strip and laminate interact with the background natural biome to produce new dynamics and difficult new pieces. At some point in the degrading of any system it changes its essence and becomes something new; systems in relative homeostasis may be so altered that they lose resilience and dynamically transform. The immediate product of these changes may be difficult to anticipate. Longer-term products may be more apparent. That is likely in the case we are examining.

Technology and appetites determine progressions in exploiting nature. To maximize returns, best economic technology is used. Technological change enables more intense exploitation of resources, moving, as it has, from hunter-gatherer through to soil, forest and geological exploitations. Each level of exploitation has consequences. The direction—indeed the imperative with increasing population, increasing demands and an ideology of “more”—is to intensify exploitation. Technology’s potential power increases as science and economics urge the technology-formation machine on to deliver more and more ways to deliver more and more. But to what end?

“Total energy content in the universe is constant and the total entropy is continually increasing” thermodynamics tells us. Entropy is “a measure of the amount of energy no longer capable of conversion into work.” Increasing entropy or diminishing capability for work is accepted physics; it is absolute. The rate at which the degradation occurs, the increase in entropy, on the other hand, is variable.

Natural ecosystems use energy available for nature’s work. Natural life’s complexity and efficiency slows entropy; conservation occurs in retarding entropic decay. As ecosystems lose complexity and efficiency, entropy accelerates. Modern technology takes energy capable of work, redirecting it in ways to satisfy human appetites. Usually that is sooner rather than later, so it speeds entropy. Nicholas Georgescu-Roegen described the economic process “not as a mechanical analogue, but an entropic, unidirectional transformation” or as the “entropic transformation of valuable natural resources (low entropy) into valueless waste (high entropy).”¹² Viewed this way, modern materialistic, consumer society is a swelling entropy machine.

Take a barrel of Devonian oil. Ancient life forms living on the reef captured solar energy 360 million years ago. On dying, the rocks embedded



this energy. Now, through application of other energy—all the energy required to find, produce, transport, process and market oil—this oil reaches an ultimate consumer, who burns the oil. Outputs are heat and polluting chemicals, all now in entropic form, unusable and threatening in other ways. Alberta's blessed conventional oil and gas heritage from Devonian and Cretaceous times would be exploited and turned to greenhouse gases in an average human's lifetime. One genius of technology is to turn the eternal to the instantaneous.

Successions in the various anthropogenically influenced biomes lead to entropy. Although starting from different beginnings, as intensity of exploitation increases and biological systems disassemble, successions become increasingly alike. The ultimate or climax succession, entropy, holds no good for anyone or anything. The physicist's entropy is a remote, distant universal condition; local entropy is not. It slinks along, almost imperceptible in its incremental ways, just behind civilization's march.

Locally these successions involve increasing displacement of nature, a kind of biological entropy. First the large, easy and profitable pieces to the puzzle—the big animals and plants—are taken. Next successions involve the smaller, more remote and less apparent resources—the soil. The cow and plough biomes lead in one direction, the same way as forestry. Fossil fuels, because they are non-renewable, contribute prodigiously to entropy. Together these sources aggregate with those entropies resultant from secondary and tertiary activities. Each succession involves higher technology exploiting a diminishing natural base. Entropy increases, torpid amorphousness settles into a dangerous bio-entropy, perhaps abiotism.

When considering the future some look for limits. What thing is it that we will most likely run out of? Malthus talked about limits. In 1972 the authors of *The Limits to Growth* did as well.¹³ In popular practice, the limits debate seems shallow, mechanistic and reductionist. The sleight of hand is to select the right problem. If the problem is running out of a resource, then technology and substitution, perhaps even economics may solve that. If the problem is running out of life or fundamental systemic decay in the Biosphere, then solutions differ.

The Laurentide Ice Sheet's takeover of Canada was nearly absolute, reigning for many thousands of years. Virtually erasing all habitat, it seemed not to devastate life. Populations survived in refugia, nunataks, Beringia or just beyond continental ice. At the end of the Pleistocene, Quaternary extinctions had great consequences for life but smaller effect on the land. But neither the ice ages nor the Quaternary extinctions altered Alberta like the most recent cataclysm, the deluge of White people, their technology and global appetites. This new flood of occupation is progressive and



cumulative. Nature's subjugation threatens in its effect to be as deep, thick and cold as the glaciations. One wonders how and when its retreat will occur and the dynamics when this ice turns to meltwater.

Today there are few places for wildlife to hide. Inaccessible wilderness is now accessible. Every day it shrinks. Transient, furtive species still shadow the land like fugitives, but every year they are fewer. Zoos and parks are the refugia and nunataks, the terrestrial Arks of the 21st century. These places maintain select shallow genetics, but wild culture and dynamics are dead. Aldo Leopold's rule of intelligent tinkering, "to keep all the pieces" is difficult in practice. Zoos focus on large showy pieces. Pandas, tigers and peregrine falcons are better than frogs and fish. They are sexy and people swoon over them. Critical pieces may be small, ugly or revolting to sensitive and civilized persons. Magic lies not in the individuals but in the functioning totality. All the pieces and all the wisdom of man can never reconstruct that cosmic marvel. The public bias is away from fundamental dynamics to the shallow but acceptable emotive concerns for dewey-eyed deer and cuddly bears. This is reflected in the pattern of conservation history in Alberta. 

