'Gee, This Is Magnificent'

HOOVER DAM
An American Adventure.
By Joseph E. Stevens.
Illustrated. 326 pp. Norman:
University of Oklahoma Press. $24.95.

By Samuel C. Florman

ON the morning of Sept. 30, 1935, President Franklin D. Roosevelt motored from the Las Vegas, Nev., railroad station to a nearby canyon along the Colorado River. He had traveled across the country to dedicate the great structure then known as Boulder Dam. Settling into his seat on the bunting-draped speaker's platform, the President was heard to say, "Gee, this is magnificent." Joseph E. Stevens, the author of "Hoover Dam," feels much the same. He has written a paean to American energy, ingenuity and constructive genius.

As Mr. Stevens perceives the Boulder Canyon Project (more about the name in a moment), it not only demonstrated the nation's can-do competence but, more important, revealed how free enterprise and Government initiative could be joined in fruitful endeavor. Built during the cruelest years of the Great Depression, the magnificent dam helped restore the nation's faith in itself.

For the many Americans who today are losing confidence in the technical and economic superiority they have so long taken for granted, this historical narrative can serve as a pleasant tonic.

The book is fun to read. Its protagonist, the dam, is awe-inspiring: a graceful concrete monolith 726 feet high and 660 feet thick at its base. The technical details of its construction are fascinating and described in terms readily apprehended by the nonspecialist. Most of the characters involved in the enterprise are talented and robust, overcoming daunting obstacles of terrain, climate and disease. The workers' feats of daring are the stuff of high adventure. The politics is absorbing, as is the social and cultural background of the times. It is particularly intriguing to observe the marginal improvements in working conditions, the rights of unions and the treatment of blacks that occurred during the transition from the Hoover Administration to F.D.R.'s New Deal. This is a history lesson that slips right down like ice cream.

The grand master of this literary genre is David McCullough, whose epics "The Great Bridge" (1972), about the building of the Brooklyn Bridge, and "The Path Between the Seas" (1977), the tale of the Panama Canal, are among the very best nonfiction books of our time. Mr. Stevens is not in the same league as Mr. McCullough, whether in grace of prose, delineation of character or scope of historical understanding; he is a young man and this is his first book (and now the recipient of the John H. Dunning prize from the American Historical Association). But he is an engaging author who tempers enthusiasm with solid facts and good sense, and he has wisely kept his story taut and fairly brief. This could be the beginning of a fine career.

Every great engineering work provides a potential theme for an entertaining and informative book. (In 1987 John van der Zee did a nice job with "The Gate," the saga of the construction of the Golden Gate Bridge.) I wonder, however, whether books of this type can, like biography, proliferate without limit, or whether they might come to seem repetitive and predictable. I suspect the latter. One thing is clear, though: the history of technology, now well established as an academic discipline, will increasingly be intended for the general reader. Popular interest has been demonstrated, as how could it not be in this technological age?

As for "Hoover Dam," aside from offering us general pleasure and instruction, it invites us to ponder several topics of particular contemporary interest. First, the project's name. In 1930, several months before the start of construction, President Herbert Hoover's Secretary of the Interior, Ray Lyman Wilbur, by fiat as it were, announced that the project would henceforth be known as Hoover Dam. When in 1933 Harold L. Ickes was named by Roosevelt to succeed Wilbur, one of his first executive acts was to change the name back to Boulder Dam, as it had originally been known. On April 30, 1947, the name Hoover Dam was permanently restored by a joint resolution of Congress. This subplot engages our attention not only because of its demonstration of political pettiness, but also because of the continuing debate about whether Herbert Hoover, the only engineer to become the nation's President, has received fair treatment from history.

THIS book also raises questions about the future of macroengineering. Clearly we will never again look to dams, bridges and canals as symbols of Utopia. The faith our forebears had in technology today appears naïve. But, given the new realities of environmental groups, community organizations, construction unions, budget deficits and so many other factors, the obstacles confronting planners of large engineering projects are verging on the insurmountable.

Finally, there is the question of esthetics. Twenty-five years ago, Ada Louise Huxtable wrote in The New York Times in praise of dams and bridges and other great engineering works: "These structures stand in positive, creative contrast to the willful negativism and transient novelty that have made so much painting and literature, for example, a kind of diminishing, naughty game. The evidence is incontrovertible: building is the great art of our time." Mr. Stevens' book, in passing, reminds us of this often-overlooked truth. □

Samuel C. Florman, a civil engineer and builder, is the author of "The Existential Pleasures of Engineering" and, most recently, "The Civilized Engineer."

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Children's Books

Abe, Honestly And Otherwise

By Henry Mayer

ALTHOUGH many publishers seem to think that young readers are most interested in the childhood of historical figures, contemporary children, surrounded by complicated social issues and aware of unpleasant problems, are more apt to ask, "What was so great about him?" and "Did he get shot?" For Abraham Lincoln, neither question receives much of an answer in the most durable of the juvenile biographies — "Abe Lincoln Grows Up" by Carl Sandburg, with illustrations by James Daugherty, and "Abraham Lincoln," written and illustrated by Ingri and Edgar Parin d'Aulaire.

The Sandburg is an abridged version (published in 1928 and currently available in paperback) of the first 27 chapters of the poet's epic biography, and its fervent re-creation of a frontier boyhood is enhanced by Daugherty's muscular black-and-white sketches of pioneer life. The book stops abruptly when Lincoln takes off on his own for New Salem, however, and although it is filled with coy premonitory references — young Abe ponders the meaning of "E Pluribus Unum" on pieces of money, he is impressed by one of Aesop's fables "about a bundle of sticks and a farmer whose sons were quarreling and fighting" — these will pass over the heads of the uninitiated.

Even if contemporary readers can get past Sandburg's overblown prose ("Nancy Hanks welcomed into a world of battle and blood, of whispering dreams and wistful dust, a new child, a boy") to incarnation of virtue unsullied by politics. North admires Lincoln for "his kindliness and his hatred of cruelty, injustice, and war," and mourns Lincoln's death with the old line that it deprived the defeated South of his presumably magnanimous plans for Reconstruction.

Like the d'Aulaires' book, North's, which was reissued in paperback in 1987, concentrates its narrative and dramatic energies on the Civil War and underplays the issue of emancipation. Lincoln's opposition to slavery is stated, but the problem is addressed primarily as a sectional issue and never examined as a social institution.

Although these books, and countless imitations of them, have endured, their working assumptions have become outmoded. The new social history has broadened the scope of the curriculum and, aided by fresh perspectives generated by the civil rights and feminist movements, has given us good books on previously neglected figures such as Harriet Tubman and Frederick Douglass — although it has led some traditionalists to worry about the fate of a nation that knows more about Jane Addams than John Adams.

Last year the American Library Association awarded its Newbery Medal for contribution to children's literature to Russell Freedman's "Lincoln: A Photobiography," an eloquent work. Its authority comes both from its esthetic — photographs speak more powerfully today than paintings — and from the sophistication with which Mr. Freedman's text combines personal and public lives into a human portrait of a politician honorably confronting the most vexing issues of his era.

From the opening page, which depicts Lincoln in beak-nosed profile above his handwritten sentence, "As I would not be a *slave*, so I would not be a *master* — This expresses my idea of democracy," to the homely inventory of the assassinated President's pockets (spectacles, handkerchief, a wallet

Talk to the Animals

By Bernd Heinrich



Scott Menchin

BURLINGTON, Vt.

THERE they came trudging along, straight upright on stubby legs, shoulders swinging back and forth with each step. Fuzzy at first, their dark silhouettes started to come into focus on the screen just as I was eating my first bite of popcorn. Hobbits, maybe? No. We already knew from the movie's title that they would be birds. Then Morgan Freeman's otherworldly voice informs us that these beings are on a long and difficult journey in one of the most inhospitable places on earth, and that they are driven by their "quest for love."

Since the documentary "March of the Penguins" has become one of the sleeper hits of the summer, I guess I'm not the only one to have been mesmerized. I've long known the story of the emperor penguins, having told it to generations of biology students as a textbook example of adaptation, but to see the sheer beauty and wonder of it all come into focus on the screen still took my breath away, because film technology has finally allowed us to (virtually) enter an exotic world, and yet one that is real.

As the movie continues, everything about these animals seems on the surface utterly different from human existence; and yet at the same time the closer one looks the more everything also seems familiar. Stepping back and viewing from the context of the vast diversity of millions of other organisms that evolved on the tree of life — grass, trees, tapeworms, hornets, jellyfish, tuna, green anoles and elephants — these animals marching across the screen are practically kissing cousins to us. Like many others who loved the movie, I admired the heroics of both the birds themselves and the intrepid camera crew that braved the inhumanly hostile environments of the Antarctic. But as a research biologist who has spent half a century studying the behavior and cognition of animals other than ourselves, I also admired the boldness of the filmmaker, Luc Jacquet, to face down the demon, if not the taboo, of anthropomorphizing his subjects.

Which brings me back to Mr. Freeman's use of the word "love" in the context of the penguin's behavior. The unspoken rule is that this four-letter word is to be applied only to one creature on earth, homo sapiens. But why? A look at the larger picture shows this presumption of exclusivity is utterly unproved. In a broad physiological sense, we are practically identical not only with other mammals but also with birds — muscle for muscle, eye for eye, nerve for nerve, lung for lung, brain for brain, hormone for hormone — except for differences in detail of particular design specifications.

Functionally, I suspect love is an often temporary chemical imbalance of the brain induced by sensory stimuli that causes us to maintain focus on something that carries an adaptive agenda. Love is an adaptive feeling or emotion — like hate, jealousy, hunger, thirst — necessary where rationality alone would not suffice to carry the day. Could rationality alone induce a penguin to trek 70 miles over the ice in order to mate and then balance an egg on his toes while fasting for four months in total darkness and enduring temperatures of minus-80 degrees Fahrenheit and gusts of up to 100 miles an hour? And bear in mind that this 5-year-old penguin has just returned to the place of its birth from the sea, and thus has never seen an egg in its life and could not possibly have any idea what it is or why it must be kept warm. Any rational penguin would eventually say, "To hell with this thing, I'm going back for a swim and to eat my fill of fish."

> Nature films shed the curse of 'Bambi.'

And that, of course, would be the immediate end to the evolution of rationality in emperor penguins (and perhaps to the evolution of the penguins as a species). Adaptation and adherence to an unconscious genetic program driven by passions and appetites are as vital as they are often incredible. Even humans, the most rational of all species, require an overpowering love to do the remarkable things that parents do for their children.

The penguin's drives to persist in proximally bizarre behavior in the face of what must otherwise be overpowering temptations to do otherwise also suggests that they love to an inordinate degree. Where they differ from us is that they can "love" an egg as much or more than a peeping fuzz-ball of a hatchling.

In the last half-century, the hidden reality of nature has been revealed as never before. Our general perceptions, though generally lagging behind, are now catching up. We are becoming weaned from the make-believe world of Walt Disney's "Bambi." Is that why high-tech documentaries like "Microcosmos," "Winged Migration," "March of the Penguins" and, in a slightly different vein, Werner Herzog's new "Grizzly Man" are catching on? I suspect that the new breed of nature film will become increasingly mainstream because, as we learn more about ourselves from other animals and find out that we are more like them than supposed, we are now allowed to "relate" to them, and therefore to empathize.

Paradoxically, the cartoonish anthropomorphism of "Bambi," although it entertained the youngsters, blocked rather than promoted an understanding of animals. In "Bambi" we do not see other creatures. Instead, we are presented humans with antlers, and with our thought and speech. This is what the traditional idea of anthropomorphizing is — expecting animals to feel and behave like humans, which they never will. One look at that penguin with the egg on its toes shows the inadequacy, the outright folly, of wishing they "were more like us."

Nature is the greatest show on earth, and reverence for life requires acknowledging the differences between ourselves and the animals as well as seeing our relatedness. Sometimes that involves walking a tightrope, and missteps can result in tragedy. Take grizzly bears. Most of us rightly fear them (no less an instinct than love). Those who don't feel fear and consort with them — like Timothy Treadwell, the subject of "Grizzly Man" — stand a good chance of being eliminated from the gene pool.

There are so many stories to tell. Furthermore, the "actors" in these dramas do not perform for any money. They are at home in the most inhospitable (for us) places on the planet, and not only do they behave as if they are oblivious to the camera, they probably *are* oblivious. If we gain more exposure to the real — and if the producers and studios invest half as much care and expense into portraying animals as they do into showing ourselves — I suspect the results will be as profitable, in economic as well as emotional and intellectual terms — as the "March of the Penguins." □

Bernd Heinrich, emeritus professor at the University of Vermont, is the author of "The Geese of Beaver Bog."

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THE MOUNTAINEERS BOOKS

Yellowstone to Yukon: Freedom to Roam

A photographic journey by Florian Schulz

Published by The Mountaineers Books
Fall 2005

For Ivan Doig:

Attached are some page samples from the preliminary book layout. We are still designing the finished page layout, so these are here to provide you with a feel for the artistry and scope of Florian's imagery, and the design of the book. The book will include a number of maps, and the captions are either "placeholders" without the final text, or are missing from these examples.

This is reduced in order to fit on our color printer. The actual book will be 12 inches wide by 11 inches deep—this is abut 75% of actual scale. It will be a hardcover book, and the cover art will be similar to what is on the enclosed promotional piece. There will be about 200 pages in total.

Helen Cherullo



THE MOUNTAINEERS BOOKS

Yellowstone to Yukon: Freedom to Roam

A photographic journey by Florian Schulz

Published by The Mountaineers Books
Fall 2005

For ease of reading, here is the manuscript for the book. We are still waiting for the epilogue from Robert Kennedy Jr.

Helen Cherullo

THE MOUNTAINEERS BOOKS

Yellowstone to Yukon: Freedom to Roam

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Outdoor books by the experts

Publisher's Note: Helen Cherullo

The broad expanse of land that begins in Yellowstone Park and extends along the spine of the Rocky Mountains up and through the Yukon region comprises the last intact mountain ecosystem on our planet. Yellowstone to Yukon, or Y2Y, is alive with native mammals, birds, and plants in a life-sustaining landscape. The Y2Y Conservation Initiative is the plan that began as a dream of a small group of biologists and conservationists—to link the existing parks in the United States and Canada with connected corridors into one intact ecosystem. This could preserve the habitats of many threatened or endangered wide-ranging and migratory mammals that may otherwise become extinct within decades— including grizzly bears and wolves. Fortunately in the case of the Yellowstone to Yukon region, there is still time to piece together the complex solutions to keep this ecosystem intact, but we must act immediately before this slender opportunity slips away forever.

The artistic photographic work of Florian Schulz is a singular and astonishing accomplishment. He has captured the vastness of the region and through artistic sensitivity reveals the living heartbeat of the web of life that defines it. Florian is a native of Germany, and at a young age was awestruck with images of the vast and beautiful wildness and animals of Yellowstone Park. The seed that became this project were firmly planted, and at 20 years of age he embarked on a journey to capture images of this region that would consume him body and soul for the next nine years. He raised and borrowed funds in order to immerse himself in capturing the remarkable images within this book. The result is a unique and comprehensive body of work that includes wildlife that inhabit this mountain ecosystem including his beloved grizzlies, wolves, caribou, bison, bighorn sheep and more, and represents a web of life that survives in the refuge of the mountains. This book is his testimony, and provides a concrete foundation that portrays the life of this region, creating a framework for some very complex issues.

Florian Schulz envisions the creation of National and Provincial Corridors—much in the same way as our ancestors over 100 years ago had the foresight to establish National and Provincial Parks in North America. Although not born or raised in this country—and in many ways perhaps because of this—Florian has seen the degradation of nature in other parts of this world, and knows what a significant treasure we have in our trust. With this book, Florian also promotes the logical extension of the Y2Y initiative to include the Yukon through Alaska to the biological heart of the Arctic National Wildlife Refuge—the coastal plain area that is the calving grounds of the Porcupine Caribou herd, and where over 160 species of birds from five continents migrate to hatch and raise their young.

A variety of eloquent First Nation, Canadian, and North American essayists contributed to this book to bring a sense of the vastness not only of the landscape, but also of the people who live within it. This community of voices affirm in the pages that follow that establishing connections between wild areas need not be one of partisan politics, or disregard for community dialogue or the exclusion of human needs. In order for this effort to be successful, we know that the solution cannot exclude people, or rational development within this territory. If it were otherwise, the plan would be doomed to fail before it began. The solutions are also clearly rooted in the premise that an intact ecosystem is by far more valuable than all the natural resources that could be exploited

This is a visionary plan on all fronts—and perhaps the most ambitious and significant conservation in North America today. Through his images of landscapes and wildlife, Florian provides an overview of the life within the Y2Y region that both moves the viewer's heart, as well as supports the science of the vision. If we embrace connectivity and corridors in the Y2Y region, wildlife will continue to have the freedom to roam, and people will become a richly rewarded partner in sustaining this balance.

Foreword by David Suzuki

The first astronauts on the way to the moon gave us our most stunning icon{em}a photo of our home seen from outer space. That stunning image captured it all: planet Earth seen as a shining jewel of blue and white set in a backdrop of black, empty space. As space scientist James Lovelock has said, a scientist from another galaxy arriving in our solar system would know instantly that Earth is alive. The high oxygen content of the atmosphere, the stable temperature of the air, and the salinity of the oceans disclose this globe's difference from any other known planet. That picture from space revealed no evidence of the human borders that our species takes so seriously{em}air, water, and land are all seamlessly held together within the biosphere, providing the underpinning for all life on Earth.

The movements of vast ocean currents, high-altitude atmospheric winds, and dust and topsoil are not constricted by human needs or jurisdictions. Migratory birds and whales moving from South America to the Arctic cannot be claimed by any one country, any more than the elk and wolves that rove across the slopes of the Rocky Mountains can be claimed by the United States or Canada. Nor can the edges of a forest and all its inhabitants be confined within human-made parks or boundaries. Take grizzly bears. In the "Lower 48" states of the United States, the bears are protected as an endangered species, yet if a grizzly wanders 30 meters across the border into Canada, it can be shot for sport. And grizzlies are known to range over as many as 2,000 miles of territory.

As astronauts move closer to Earth's surface, the signs of one species{em}human beings{em}would leap out. The land is crisscrossed with straight lines of roads, rectangular enclosed farmland, immense lakes backed up behind dams, the checkerboard pattern of clearcuts within forests, and the characteristic brown domes looming above our cities and towns. Human beings have catapulted suddenly into a major force on this planet, capable of altering the biophysical properties of Earth on a geological scale. In the 3.8 billion years of life's existence, no other species has ever had the capacity to do so.

But until the last century, we've always been a tribal animal, living in small family groups of nomadic hunter-gatherers, or more recently in rural, village communities. Under such conditions, our concerns were local, perhaps extending to neighboring tribes or valleys but never encompassing our entire species. Until very recently, we've never had to worry about the collective effect of all of humanity on our surroundings. So now we continue to operate at a local level, much more responsive to anecdotal, personal experience than to the compilation of global statistics. It's difficult to wrap our minds around the immensity of our impact, to think beyond our next paycheck, annual report, or coming election. Yet without paying attention to biogeographical realities, we have no hope of "managing" any organism or ecosystem sustainably.

The challenge is to keep referring back to that picture from space, to remember the oneness of the planet, the need to protect the integrity of that thin web of life that covers Earth, and to recollect our understanding that we are embedded deep within it. Unlike any other organism, we have been endowed with the incredible gift of foresight. By looking ahead, we can anticipate hazard or opportunity and deliberately choose a path into the future. No other species has that gift.

The Y2Y vision of an immense continuous corridor extending from Yellowstone to Yukon and connected to an even wider series of wilderness areas offers a chance to begin that process, to provide a model of what can and must be done all over the planet. Human activity and demand are extending into the furthest reaches of the globe through logging, mining, dams, clearing for agriculture, and urban sprawl. Can human activity take place while protecting the space and complexity that wild organisms must have in order to flourish? That's the promise of the Y2Y vision.

Biodiversity as the Sustainer of Life on Earth

A truly wondrous aspect of life on Earth is the fact that the fabric of countless interdependent and interacting species{em}referred to collectively as "biodiversity"{em}is responsible for creating the oxygen-rich atmosphere, cleansing the water, producing the soil, capturing photons of sunlight, and providing our nourishment. Biodiversity is one of Nature's most successful strategies for resilience and long-term survival. After all, throughout the vast sweep of life's existence on this planet, no "perfect" organism, destined to survive and flourish forever, has ever emerged, because conditions have never been constant or fixed. Change is the hallmark of Earth's history. The Sun is 30 percent hotter than when life began; the atmosphere has become rich in oxygen; magnetic poles have switched; continental plates have moved and collided; and ice ages have been punctuated by warm episodes as countless species have evolved and disappeared. All the while, life has persisted and flourished around the planet. The secret to this remarkable resilience was diversity at the gene, species, and ecosystem levels.

Without this diversity, this web of life, the planet would be a hostile place for animals like us. We are absolutely dependent on life's variety to deliver the most fundamental needs we have as biological

beings{em}clean oxygenated air, filtered water, food and the soil for it to grow in, and the Sun's energy for the fuel we burn within and outside our bodies.

We hardly understand how biodiversity carries out these priceless services. However, we've learned from painful and costly lessons in agriculture, forestry, and fisheries that monoculture{em}the spreading of a single strain or species over a wide area{em}increases risk through dependence on a limited base that is extremely vulnerable and inflexible when conditions such as new diseases, parasites, or climate shifts arise. So long as there is a pool of diversity, when conditions change there is opportunity for some genes, organisms, or ecosystems to flourish in the new environment. We've also learned that biodiversity is best protected and maintained in large blocks of ocean or land. Reduced to small marine protected areas or terrestrial parks, species continue to decline.

A project like Y2Y provides the dimensions within which diverse life can flourish. It recognizes the need to protect large intact areas in which Nature still functions in all her complexity, not only to cleanse and replenish our basic needs but also to provide us the opportunity to learn her secrets.

Human Nature and Human Perception

For most of our 100,000-year existence, our species, *Homo sapiens sapiens*, lived in an intimate relationship with the natural world. For millennia, we depended on our surroundings for all of our needs, while in that same world we encountered the many hazards of predators, disease, and accidents. Our evolutionary advantage was the most complex structure in the known universe: the human brain. That two-kilogram organ locked inside our skulls endowed us with a relentless curiosity, dazzling inventiveness, and a massive memory. As our distant ancestors gazed out at the world, they recognized cycles and repetitious patterns of day and night, seasons, stages of the moon, movement of stars, tides, animal migration, and plant succession. Those predictable regularities were collected into a worldview, the sum of all observations, insights, and speculations, in which everything, including the past, present, and future, was part of a seamless whole. In such a world of elaborate interconnection, people understood that everything they did had consequences and therefore every deliberate act was laden with responsibility.

Until the most recent century, that is how it always was. Even today, traditional and indigenous people continue to reaffirm that perspective. Their stories, songs, and prayers constantly validate who they are, where they belong on this planet, and why they are here. Aboriginal people often refer to Earth as their mother and say we are created by the four sacred elements: Air, Water, Earth, and Fire. From this perspective, there is no environment "out there," separated from us.

The most advanced insights from science corroborate these ancient truths. Earth *is* our mother, generating all life from air, water, earth, and fire. Air is the physical substance in which we are all embedded and which we share with all other life forms. It circulates throughout every cell of our bodies, and with each expiration, mixes into the atmosphere and is absorbed by other life forms. Water is what constitutes more than 60 percent of our body weight; it inflates us and constantly flows through us as it escapes through our skin, breath, tears, and excretions. Like trees and soil microorganisms, we are temporary custodians of the water we imbibe and then release. Every part of our material form, the body, is constructed of molecules and elements scavenged from the carcasses of other life forms, most of which grew in the soil. And within our bodies, all of the energy that allows us to move, grow, and reproduce is fire from the Sun, miraculously captured by plants and transformed through photosynthesis into stored chemical energy.

Although all human beings are part of a single species, we have found myriad ways of being human. Our cultures reflect the places where people live and the ways we have found to exist within those places. Even though we share the capacity to respond to light, sound, smells, tastes, and textures through a common set of sensory organs and neurological functions, the way we perceive the external world and respond to it is expressed in enormous variety.

Each of us acquires values and beliefs molded by our individual biology, experiences, and environment, and those perceptual lenses filter the input from our sensory organs and thereby shape our reactions and responses. Ethnobotanist Wade Davis explained to me that in a valley in Peru, children grow up believing the mountain looming over their village is an *apu*, or god{em}not a symbol of god but an actual god{em}and that so long as they live in the shadow of that *apu*, their destiny is determined. We can be sure that as adults, those children will treat that mountain very differently from people who grow up in the Rocky Mountains believing the surrounding hillsides are laden with valuable minerals just waiting to be exploited. And so it goes. Consider how differently we would behave if to us a forest was a sacred grove, not only timber and pulp; if a river was the veins of the land, not simply water for irrigation or power; if fish were our relatives, not merely resources; if soil was a community of organisms, not just dirt. The way we perceive the world shapes the way we behave towards it.

A Shattered World

In the past century, that world of interconnection, filled with sacred elements and other species that are our biological relatives, has been shattered into fragments that have become, in our eyes, potential resources, wealth, and opportunity. Yet large, intact landmasses provide a reference base against which to measure and recognize the impact of human activity. We cannot deal with the terrible consequences of the fragmentation of our images of the world unless we understand the underlying root causes. Our surroundings have suddenly become a mosaic of disconnected bits and pieces through the conjunction of a number of factors, including population explosion, growth of science and technology, the move from villages and towns to big cities, globalization of the economy, hyperconsumption, and massive expansion in information.

The first and foremost factor underlying the fragmentation of our perceptions is the population explosion. It took almost all of human existence for the world population to finally reach a billion people early in the nineteenth century; in my lifetime, global population has tripled. One consequence of such explosive exponential growth is that most people alive today have never known anything different, and erroneously believe that such abnormal and completely unsustainable growth can be maintained.

Another phenomenon of our recent century is the explosion of science in our lives and its effect on how we perceive the world. Virtually all the modern technology we take for granted in our lives was invented in the past century, each innovation transforming our lives, altering patterns of thought and behavior, and extinguishing the way we lived before. But most scientists today acquire insights by focusing on parts of Nature, instead of on the whole. And we have learned painfully{em}with nuclear weapons, DDT, CFCs, and biotechnology{em}that when parts are combined, they interact to yield new properties that cannot be predicted on the basis of the properties of the parts. As well, by focusing only on parts, we lose sight of the context within which they exist, the rhythms and patterns of which they are a part, and the synergy of their interaction.

As human beings, we have also undergone a remarkable transition in the way we live. Most people on Earth now live in large cities, where our link with Nature is much more tenuous than it was in rural, village communities. In such human-created habitats, it is easy to think we don't need Nature, that our intelligence enables us to escape its constraints and create our surroundings.

A fourth factor endangering our connection to and understanding of Nature is the globalization of the world economy. This "global economy," being sold as the key to progress, is fundamentally flawed, its growth inevitably destructive of local communities and local ecosystems. Economists now consider human creativity and inventiveness the very foundation upon which economies are built, and view Nature{em}from the ozone layer and aquifers of fossil water to topsoil and biodiversity{em}as vast and endlessly self-renewing "externalities" that needn't be factored into economic equations. In such a grotesquely distorted view of the world, the entire planet is viewed as an endless source of raw materials, while all six billion of us represent a possible market for the products created from those resources, fueling the economy.

Newer, bigger, and more seem to be the driving imperatives of our time. After World War II, the President's Council of Economic Advisors was challenged to come up with a way to transform a war economy to a peacetime economy. Its answer? Consumption. By incorporating disposability and obsolescence into products, industry has created an endless market, while buying, using up, discarding, and buying more have became a way of life and the main part of the economy.

Finally, today's glut of information makes it more, not less, difficult to understand our world. The average person is overwhelmed with information that comes from the print media, the Internet, television, and movies. The challenge is not to acquire yet more information but to navigate these crowded waters, to know what is credible and what is propaganda, self-interest, or advertising. When "I read it" or "I saw it on TV" is all it takes to validate the repetition of some tidbit as fact, we are in deep trouble.

Taken all together, these factors{em}population explosion, growth of science and technology, the move from villages and towns to big cities, globalization of the economy, hyperconsumption, and the information explosion{em}prevent us from seeing the exquisite interconnections that underlie the real world of which we remain a part. In a shattered world of no connections, there are no causal relationships and it becomes difficult to see how our actions ramify through the rest of the world. And when we are blind to cause and effect, we can no longer see where there is a need for responsibility.

Human beings and our activities are undercutting the life-support systems of the planet. We are altering the atmosphere, poisoning air, water, and soil, depleting topsoil and the oceans, clearing forests, and extinguishing species, all at catastrophic rates. It is undeniable that we are careening along an unsustainable path.

An Ancient Vision for a New World

The challenge of our time is to rediscover hard-earned ancient truths and recognize that as biological beings, we remain utterly dependent on the natural world for our most elementary needs{em}clean air, clean water, clean

soil, clean energy, and a rich diversity of life forms to keep the planet habitable. Aboriginal people are right{em}Earth does give us birth, and creates us from the four sacred elements of Air, Water, Earth, and Fire. And we are immersed within a community of our relatives who nourish each other by creating, cleansing, and replenishing those sacred elements. How can we learn these truths without the opportunity to experience the vast expanse of intact Nature?

If we as a species hope to be more than a flash in the pan, making a spectacular splash for a brief moment, then we must resurrect those old understandings, find our place in a world already radically diminished by our own activities and demands. It won't be easy. The past century has witnessed spectacular technological achievements and growth in human numbers and consumptive demand, but modern science is also revealing the illusory nature of this "progress," which has been achieved at the expense of our relatives and a future for our offspring.

Humility would be a good beginning, an acknowledgment of the vastness of our ignorance that in no way detracts from the spectacular insights made in science but merely puts them into perspective with the enormity of our ignorance. Respect for Nature is necessary before we will learn anything or before Nature will open her secrets to us. Love of our children is intimately connected to our love of Nature. And we need Spirit{em}a sense that we arose out of the natural world and will return to it upon our deaths, that there are forces impinging on us that are beyond understanding or control, that there are sacred places where we must go with veneration to recharge ourselves spiritually. Enlightened self-interest ought to be a prime motivator. Where miners once took canaries into mines as early signals of degenerating air quality, our own children have become canaries, warning us with epidemic levels of asthma, allergies, and childhood cancers.

Four billion years have honed interconnections and interdependencies that we barely comprehend but on which our survival depends. Rather than celebrating the apparent submission of nature to the brute power of our technology, we would be far less destructive, and perhaps find genuine secrets of sustainability, by honoring Nature and hoping she will reveal secrets that we might try to understand and emulate{em}an approach author Janine Benyus has called "biomimicry."

But we can't learn from Nature unless she is intact. We cannot learn how a system works by simply examining small, isolated patches, any more than we could find out how our bodies function simply by studying its parts separately. Nature needs space and time. But most parks in the world are too small to maintain a stable mix of species or to avoid a continued depletion of diversity. As the climate warms, the species mix within the boundaries of parks will undergo radical shifts: Temperature-tolerant species will persist, while those that are temperature-sensitive will have to move if they are to stay within their range of viability.

The wisest move on our part would be to recognize the enormity of the changes we have already brought about and to begin a massive enterprise, every bit as urgent and vast as entry into a world war, only this time to protect the biodiversity that is the source of our real basic needs. That means we have to aim at bringing our industrial power and productivity, consumption and numbers into balance with Earth's regenerative capacity. We have to protect every bit of wilderness and intact ecosystems that are left. And we have to begin to connect the disparate patches we call parks or preserves into large communicating areas.

This is the context within which I see the Y2Y project, the beginning of a re-envisioning of our home and our relationship with the rest of life on Earth.

David Suzuki

Dr. David Suzuki, a highly acclaimed geneticist and environmental thinker, is the author of forty books, including *The Sacred Balance, Rediscovering Our Place in Nature.* He has won numerous academic awards and holds sixteen honorary degrees in Canada, the United States, and Australia. Since 1979, he has been host of the Canadian television series *The Nature of Things with David Suzuki,* for which he has won four Gemini Awards. Recognized as a world leader in sustainable ecology, he is the recipient of UNESCO's Kalinga Prize for Science, the United Nations Environment Program Medal, and the Global 500, and is a member of the Royal Society of Canada and the Order of Canada. He is founder and chair of the David Suzuki Foundation and is Professor Emeritus of The University of British Columbia, Sustainable Development Research Institute. He lives in Vancouver, British Columbia.

Preface

By David Quammen

Almost forty years ago, in 1967, two young biologists published a dry little book filled with mathematical equations, schematic diagrams, swooping curves on coordinate graphs, and careful deductions, all grounded in field data from places like Trinidad, Bali, and Krakatau. It wasn't natural history in any old-fashioned sense. It was a technical monograph aimed at other biologists, especially those with a bent toward theoretical modeling and an appetite for calculus. But it triggered a major shift in perspective within the science of ecology, during the 1970s and later, that led not just toward new ideas but also toward urgent actions, including the founding of what we now call conservation biology. From that little book, and from work by other ecologists (such as Michael Soulé, Jared Diamond, Daniel Simberloff, Michael Gilpin, Thomas Lovejoy, Mark Shaffer, and many others) that it inspired, came important implications--some general, some specific--for the design and management of nature reserves, national parks, and other wild lands. One of those implications is that the Y2Y Conservation Initiative is utterly crucial to the fate of species and ecosystems in western North American.

That book was *The Theory of Island Biogeography*, by Robert H. MacArthur and Edward O. Wilson. MacArthur was a mathematical wizard who had done his early ecological fieldwork on warblers. Wilson was a myrmecologist{en}an ant guy{en}with a good eye for the number of bristles on a thorax and a good head for bigger ideas. On the first page of their book they noted that insular biogeography{en}the study of species distribution on islands{en}has played a huge role in the development of evolutionary theory, ever since Charles Darwin stepped ashore in the Galápagos. Why? Because islands are simple units that offer stark illustrations of dynamic principles. Two principles in particular interested MacArthur and Wilson: that new species arrive on an island by immigration, and that resident species are lost by extinction. The point of their theory was to explain how those principles function, interact, and thereby determine the biological richness of any given island.

But the two men were talking about "islands," not just islands. Any isolated piece of landscape or water, they noted, is subject to insular principles too. A tide pool, a cave, a stretch of riparian vegetation, a patch of northern forest surrounded by tundra? Yes, these are *ecological* islands, also governed by island dynamics. Then MacArthur and Wilson went a step further, adding a grim warning couched in cool language: "The same principles apply, and will apply to an accelerating extent in the future, to formerly continuous natural habitats now being broken up by the encroachment of civilization." We humans create islands, they were saying, as we cut and bulldoze and pave. By way of illustration, MacArthur and Wilson offered four tiny maps, like a cartoon-panel sequence, showing the loss and fragmentation of woodland in one Wisconsin township over a time span of 119 years. What had been a "mainland" of forest in 1831 was reduced to a sparse "archipelago" by 1950. It was a modest example but a vivid one. Exactly the same process of loss and fragmentation could happen{en}but must not be allowed to{en}throughout the magnificent landscapes from Yellowstone to the Yukon.

What's so dire about insularity? What's so crucial about its antithesis, the preservation of landscape connectedness? The answer to that is measured in species diversity and ecological health. A small island usually harbors fewer species than a big island. (This is empirical fact, manifest in field data from the Caribbean, Melanesia, and elsewhere.) A big island harbors fewer species than *an equal area of similar habitat* on a mainland. Why? One major reason, as explained by MacArthur and Wilson, is that small islands tend to lose species more quickly than big islands do, while big islands lose species more quickly than mainlands. And why is that?

Because a small island can support only a small population of, say, this species of reptile or that species of bird; a small population is more vulnerable to the various sorts of adversity (such as inbreeding depression, disease, climate change, food-supply failure, or competition from invasive species) that might wipe it out; and such wipeouts occur inevitably with the passage of time. Small populations go extinct under circumstances in which big populations merely fluctuate. Isolated populations go extinct under circumstances in which mainland populations refill the gaps. Net result: Fragmentation of habitat into ecological islands leads to loss of diversity in each fragment. Loss of diversity leads to ramifying dysfunction of a sort sometimes referred to as "ecosystem decay." Trophic levels begin to wobble and tip. Things fall apart. The disappearance of a predator species, for example, may allow a population explosion among a prey species, resulting in depletion of plant resources, erosion, siltation, and destruction or loss elsewhere in the ecosystem. Maintaining connectedness does the opposite, helping preserve species diversity and ecosystem integrity throughout the whole.

This is abstract stuff. Theoretical talk, hypothetical scenarios. Now let's make it concrete. The grizzly bear (as we call *Ursus arctos* in western North America) is one species that stands sorely jeopardized by the prospect of increasing insularity.

If you look at a map of grizzly bear distribution in 1920, as reconstructed from reliable sources, you'll see small, isolated populations in central Arizona, western New Mexico, southwestern Utah, and the southern Sierra Nevada of California, and along the spine of the Rockies in Colorado. All those populations are now gone. Defunct, dead. They vanished, one by one, as a result of island effects and other factors (such as hunting). Nowadays, within the lower 48 states, grizzlies survive in just five areas: the Greater Yellowstone Ecosystem, the Northern Continental Divide ecosystem around Glacier National Park, the Cabinet-Yaak ecosystem in extreme northwestern Montana, the Selkirk Mountains of northern Idaho, and the North Cascade Mountains of Washington. Of those areas, all but the North Cascades are embraced within the Y2Y zone of attention. But the Selkirks (harboring no more than a few dozen bears) and the Cabinet-Yaak (with only about twenty) are perilously circumscribed by roads, logging, and other forms of landscape conversion, with further activities looming that could isolate them completely. And the Greater Yellowstone Ecosystem, the southern linchpin of the Y2Y concept, is already an island as far as grizzly bears are concerned{en}an island on which somewhere between 300 and 600 grizzlies are marooned.

Is the Yellowstone population sufficiently large to sustain itself indefinitely against those troubles I mentioned{en}inbreeding, food-supply failure, and other forms of catastrophic bad luck? Probably not. With continued isolation on its ecological island (which grows ever smaller as human incursions proceed), the Yellowstone grizzly will be squeezed toward extinction. It might last a hundred years. Or it might founder and die out within this century. And yet the U.S. Fish and Wildlife Service, based on tenuous calculations of what constitutes "recovery" of that population, now seems intent on "de-listing" Yellowstone's grizzlies{en}that is, removing them from protection under the Endangered Species Act. Can the population *ever* recover so long as it's trapped within Yellowstone Island? I don't see how.

This isn't the place for a discussion of bear-management policy and politics. My purpose is simpler: to sketch a problem, welcoming you to contemplate its solution. In the following pages you'll find hope, beauty, vision, practical wisdom, and not a single differential equation. You'll find a wondrous collection of images and voices. Most important, you'll find new grounds to appreciate a truth that transcends mathematics: that sometimes the whole is much bigger than the sum of its parts.

David Quammen

David Quammen travels on assignment for *Harper's*, *National Geographic*, and other magazines, most often to jungles, deserts, and swamps. His accustomed beat is the world of field biology, ecology, evolutionary biology, and conservation, though he also occasionally writes about travel, history, and outdoor sports. For fifteen years, from the early 1980s to the mid-'90s, he wrote a column called "Natural Acts" for *Outside Magazine*. His work has been twice recognized with the National Magazine Award and has appeared in anthologies such as *The Best American Essays 1999*, *The Best American Travel Writing 2001*, and *American Short Story Masterpieces* (1987). His books include *The Song of the Dodo* (1996), which won the John Burroughs Medal for nature writing and several other awards; *Monster of God* (2003); and a spy novel, *The Soul of Viktor Tronko* (1987). He lives in Montana with his wife (Betsy Gaines, a conservationist), their large furry dog, and a modest supply of cats.

Outstanding Features of the Yellowstone to Yukon Ecoregion

- Actual area: 460,000 square miles (1.2 million square kilometers), 62 percent in Canada, 38 percent in the United States.
- Length: 1,990 miles, from latitude 42 degrees near Cokeville, Wyoming, to latitude 66 degrees, near the Arctic Circle, where the Peel River flows from the northern Mackenzie Mountains toward the Mackenzie River.
- Width: varies from 125 to 500 miles.
- Height: mostly above 3,500 feet.
- Tallest points: Gannet Peak, Wyoming, 13,804 feet; Grand Teton, Wyoming, 13,771 feet. In Canada: Mount Robson, British Columbia, 12,972 feet.
- Lowest point: Mackenzie River, Northwest Territories, 200 feet.
- Land cover: 1.5 percent bare rock, 18.9 percent tundra, 59 percent forested, 13.5 percent shrublands, 4.5 percent grasslands, 2.6 percent agricultural.
- Traditional territory of 31 First Nation/Native American tribes
- Time of continuous human habitation: 10,500+ years.
- Total modern human population: fewer than 3 million. Estimated time until it doubles: 30 to 40 years.
- Visitor days/year of use in parks and national forests: 130{en}150 million. Increase in Canada over the past decade: nearly 100 percent.
- Major economic activities: general tourism, recreation, hunting, fishing, oil and gas, logging, mining.
- Land ownership: more than three-quarters public property{em}state, provincial, or federal domain.
- Major river systems: Columbia, Missouri, Fraser, Peace, Red Deer, Yellowstone, South Saskatchewan, Athabasca, Mackenzie, Yukon.
- Number of fish species: 118+.
- Volcanic features: Yellowstone, Wyoming; Columbia Plateau, Idaho; Mount Edziza, British Columbia; hot springs throughout the region.
- Columbia Icefield, the largest glacial mass in the Rockies and the hydrographic apex of North America, sending meltwaters to three oceans.
- Rocky Mountain Trench, a continuous line of lowlands extending from central Montana almost to the Yukon, the longest fault system visible on the continent.
- Interior old-growth rainforest, species-rich habitats characterized by giant cedar and hemlock trees, along the moisture-catching western slopes of the Rockies.
- The Ram Plateau in the Northwest Territories, a major karstland (formation of soluble limestone), riddled with sinkholes, caves, and sudden canyons.
- The South Nahanni River area in the Northwest Territories includes the country's deepest canyon{em}4,000 feet from top to bottom and sometimes called the Grand Canyon of Canada{em}and 294-foot Virginia Falls.
- Eleven national parks; numerous state and provincial parks, wilderness areas, and ecological reserves.
- International Biosphere Reserves: Greater Yellowstone area, Waterton-Glacier International Peace Park joining Alberta and Montana, Nahanni National Park in the Northwest Territories.
- The Transboundary Flathead area of northwestern Montana and southeasternmost British Columbia holds the continent's most diverse array of large carnivores and its densest population of interior grizzlies.
- An estimated10,000 golden eagles and hundreds of bald eagles migrate along the Continental Divide each year between the southern United States and the Far North.
- Dominant ecological influences in the past: glaciation, wildfire, flood, avalanche.
- Major modern threats to ecosystem continuity: backcountry roadbuilding (current road density is .21 miles/square mile), highways and railroads, infill of valleys by sprawl, large-scale industrial development, damming and diversion of rivers.
- Solutions to ecosystem fragmentation: buffer zones to round out wildland reserves, habitat corridors to keep nature strongholds connected.
- The Yellowstone to Yukon Conservation Initiative was formulated during the mid-1990s, bringing protection efforts into line with the scale of natural systems. Canadian Harvey Locke was a notable early

proponent of the Y2Y vision, and many scientists from both nations have contributed valuable data for planning.

Y2Y: The Power of Connections

Introduction by Douglas H. Chadwick

The heart, they say, is the most rugged, enduring muscle a human possesses. It has to be to keep pumping life force through the rest of the body year after year, decade after decade, without fail. There is a region of the Rocky Mountains that manifests many of the same qualities{em}a fount of natural power from which vitality pulses out to animate the surrounding lands. In the quiet among the peaks, you can almost hear each beat. This is North America's great wild heart, and the challenge of the modern era is to keep it from breaking.

Yellowstone

Ninety-six years after the United States came into being, its legislators drew a boundary around 3,600 square miles (9,300 square kilometers) at the juncture of Wyoming, Montana, and Idaho. Of course, those miles weren't actually square. They were rough-edged, river-cut, beautifully bent and tilted, and more than a mile high on average, bursting with geologic marvels and wildlife splendor to match. Let us, the politicians said, keep this place as it is. Forever. The year was 1872. They were establishing Yellowstone as a national park, the first in the country and in the world.

Underlying this act was a recognition that an age of vanishing herds and forests was all too suddenly upon the young republic, and that the time for measuring its natural resources solely as raw materials had passed. People need riches that can be banked in the heart. They need natural beauty and wonder. They need hope and inspiration, and they need a sense of their heritage, their identity, which in the case of North America's populace is bound to an untamed frontier. Of what use are all the blessings of a free society if the blessings that nature has bestowed upon the landscape are lost? A nation risks becoming merely a location where people go about the business of existing, as in a sleep without dreams. Yellowstone National Park was a gift from a popularly elected government to its citizens and all their descendants, intended as a boon for their souls.

The setting aside of wildlands as public parkland created a new type of commons. History had never before seen such a generous blend of nature and democratic ideals. Canada quickly adopted the innovation, framing Banff National Park farther north along the Rockies in western Alberta as early as 1885 and Waterton Lakes National Park next to the Montana border in 1895. Other countries followed all through the next century, and the process continues today around the globe. Together, these areas have become modern strongholds for many of the most vital aspects of nature that renew the human spirit as well as the ecosystems we all depend upon.

Yukon

More than a thousand miles to the north of Yellowstone begins a Canadian expanse of 320,000 square miles (829,000 square kilometers) with fewer than 40,000 people. This is the Yukon Territory, and the great bulk of it remains undisturbed by roads or major developments, nearly as pristine as the day Yellowstone was declared a national park. What comes next? A few segments have been permanently protected as parks, territorial reserves, or wildlife refuges. More may follow. But must we assume that the rest of the Yukon will eventually repeat the history of realms farther south, where so much of the natural legacy that people once enjoyed has been shoved into corners or lost?

Perhaps, building on the example of Yellowstone, progress will once again be defined differently before the Yukon is largely given over to development. What if the goal were not to divide up the territory between commercial activities and scattered samples of the former landscape but to interweave human and wild communities within the context of a unique and lasting frontier? What if this same principle were applied to the great north-south coalition of mountain terrain that surges all the way between the Yukon and the world's first national park?

Yellowstone to Yukon

The essence of nature is wholeness{em}a wholeness woven from infinite complexity. Trying to save it piece by piece doesn't really make much sense. That strategy wouldn't work even if we had all the time in the world, and we most certainly do not. Overall biological diversity (the full spectrum of native organisms and ecosystems, plus all the processes and interactions associated with them) is plummeting at a rate not seen since the dinosaurs' demise.

Yet it was late in the twentieth century before the realization spread among scientists that traditional approaches to conservation were far too fragmentary, too tightly focused on special areas or individual species in crisis, to shore up the natural systems that were under assault. Grass-roots environmental groups felt the same way, for they found themselves bogged down in divisive local debates over single issues while they faced multiple problems on a wider front.

The longer researchers followed wildlife marked for study in Yellowstone Park, for instance, the more they found their subjects using a wildland mosaic nearly ten times as big as the park itself. To its wild inhabitants, the famed park was merely one room of their true home, which came to be recognized as the Greater Yellowstone Ecosystem. All through the Rockies, planners were assembling larger-scale maps and starting to analyze entire countrysides, watersheds, and plant and animal communities from a new perspective. They spoke of each node or nucleus or central swath of wildlands as a core. Then they looked for buffer zones, surrounding lands that might host certain human activities but would insulate the pristine core from acreage with still higher levels of disturbance. Going further, the planners identified pathways of intact ground leading from one core area to the next. Here were the system's linkage zones, more commonly called wildlife corridors or habitat bridges. In the end, what emerged was a pattern of hope.

During the mid-1990s, ecologists and conservationists gathered in Waterton Lakes National Park, Alberta, to share their evolving ideas. Between that conclave and follow-up meetings, a proposal for safeguarding biological diversity and natural beauty was conceived on a scale beyond anything tried in North America{em}or, one could claim, in the world. Quickly winning the support of more than 120 organizations (the number has since grown to more than two hundred) from Canada and the United States, this strategy addressed half a million square miles (1.3 million square kilometers) along almost 2,000 miles of the Continental Divide, from west-central Wyoming to the Yukon's Peel River near the Arctic Circle, and from the edge of the Great Plains halfway to the Pacific Coast. Its name is the Yellowstone to Yukon Conservation Initiative.

It has often been said that the national park system of public lands is the best idea America ever had. Y2Y (as people now refer to both the Initiative and the area) takes the concept to the next level. You could call it the rest of the best idea. This does not imply that Y2Y is a plan for some all-encompassing park, despite rumors to the contrary. The region already has eleven national parks, scores of state parks, provincial parks, and designated wildernesses, and many other relatively unspoiled areas under special management. These are nature strongholds of global significance. But they are not as strong as they need to be.

Wild species have to move around freely and mingle with others of their kind to adapt to shifting conditions over time and to avoid inbreeding, which can lead to local extinction if enough deleterious traits become concentrated in the gene pool. None of the reserves in Y2Y is big or complete enough by itself to provide this sort of ecological wriggle room. Consequently, none will be able to support its full endowment of biological diversity through the years, which means that none can truly fulfill its purpose as a sanctuary. On the positive side, a cure for the problem lies in links with other wildlands, and Y2Y is all about the power of connections.

The Initiative's first aim is to round out the region's extraordinary collection of protected places with necessary buffer zones and fasten the whole assemblage together through habitat bridges. The broader and more varied the linkages, the better, such as the series of mountain valleys wolves follow when traveling between Banff National Park and Montana's Glacier National Park. But where a narrow, winding, green strip is all that will fit through a bottleneck of development, it can still serve, like the thick streamside brush grizzlies use for cover when moving between open agricultural fields.

Once such a network is in place, step number two is to combine it with a plan for sustainable use of natural resources in adjoining landscapes. Carefully managed recreation would be one obvious type of compatible development. Or, instead of clearcutting forests and shipping the raw logs off to mills on other continents, timber companies could practice selective cutting and thinning to leave much of the forest structure intact. Local mills could turn the logs into lumber, providing extra employment. And rather than exporting the wood at that stage, the mills could supply area businesses set up to manufacture distinctive regional furniture, frames, specialty trimboard, veneers, or a hundred other items that economists term value-added products. These fetch higher prices than raw logs or lumber, and the money stays in the communities where the trees grow.

Forests cover almost 60 percent of the Y2Y region. Not surprisingly, logging is the most widespread impacts on landscapes. Tenbec, a Canadian timber company with worldwide holdings, recently forged a special agreement with the Nature Conservancy of Canada. The corporation sold several thousand acres to the Conservancy outright and donated permanent conservation easements (which restrict certain options, notably subdivision for homesites) on several thousand additional acres. Moreover, company officials voluntarily placed a ten-year moratorium on all activities except limited tree-cutting on another 89,000 acres and promised to consider renewing the ban after that. This novel pact represents a priceless reprieve for the Elk River watershed in a rapidly developing part of southeastern British Columbia, where the Y2Y region becomes vulnerably narrow near

Waterton-Glacier International Peace Park. Tenbec didn't do this for the money. The company's managers said they simply agreed with the principles of conservation.

Doing business in greener directions like this would give people and nature a chance to prosper side by side into the future as the human population of Y2Y{em}still fewer than two million within those enormous boundaries{em}expands. Both a practical strategy and a unifying vision, Y2Y may be thought of as a blueprint for bringing the forces of culture, economics, and ecology into balance. This seems like the most sensible goal in the world. Since it also seems among the hardest to achieve, maybe a better definition for Y2Y is "a much-needed experiment in the grandest of laboratories."

Taking Inventory

Described by some as the backbone of the continent and by others as its wild heart, the area from greater Yellowstone to the Yukon qualifies as a distinct ecoregion, with similar geology, climate, habitats, and native creatures throughout. It comprises North America's tallest, most rugged, and arguably most spectacular unit of topography{em}an exaltation of the land{em}and the headwaters for ten major rivers flowing into three different oceans. The dramatic differences in altitude are reflected in the spectrum of vegetation: A morning walk can drop you from wind-scraped alpine tundra lit with miniature forget-me-nots down onto a mushroomy forest floor shaded by cedar giants a thousand years old.

And Y2Y's animals...ah, the beasts that give the backcountry eyes. They form the biggest, brawniest, fiercest, shaggiest, longest-legged, far-rambling array in the Western Hemisphere. It's a pleasure just to give the roll call: grizzly, black bear, wolf, coyote, cougar, lynx, wolverine, fisher, otter, mountain goat, mountain sheep, moose, bison, caribou, elk, mule deer, white-tailed deer, golden eagle, bald eagle, osprey, peregrine falcon, prairie falcon, tundra swan, trumpeter swan, sandhill crane, whooping crane, harlequin duck, Pacific giant salamander, tailed frog, chinook salmon, bull trout.... The list goes on. And on, down canyons with free-flowing white waters, up palisades and scree slopes, across glaciers, and on through range upon mountain range. To find a more enthralling collection of megafauna amid megavistas in the New World, you would have to time-travel back to the Ice Ages.

This sweep of rough-and-tumble terrain is also the homeland of more than thirty Native American tribes, or First Nations, as they are called in Canada. Most of them retain a portion of their traditional territory along with subsistence hunting and fishing rights. Few incoming Europeans bothered trying to carve out homesteads from such steep, often snowbound terrain. Less than 3 percent of the region is classified as agricultural land today and less than 8 percent as additional grazing land. By contrast, more than 20 percent is bare rock or tundra. At least three-quarters of the total acreage consists of state or federal lands on the U.S. side and crown land (provincial or federal domain) in Canada. Although native land claims have yet to be resolved in many places north of the international line, the point is that most of Y2Y is the property{em}the holdings, the inheritance{em}of the public as a whole.

The fact that the Y2Y region never did exactly get settled, much less crowded, goes a long way toward explaining why every species of megafauna the pioneers met is present today. By twenty-first-century standards, this colossal setting is still largely of a piece. Instead of struggling to make their environment clean and healthy, residents have only, for the most part, to choose to keep it that way. However, development pressures are building as globalized markets and new technologies push industries ever farther into the hinterlands. Open-pit mining to produce coal for China's burgeoning steel industry is planned close to Waterton-Glacier International Peace Park. An ore-mining operation just opened near Alberta's Jasper National Park. Millenium-old interior cedar-hemlock forests that shelter the increasingly rare race known as mountain caribou are being leveled in British Columbia valleys to supply Asian lumber mills. New grid lines cut for the seismic test blasts used to locate oil and gas reserves run over remote mountainsides. And the list keeps lengthening like the bulldozer trails.

At the same time, a tide of new settlement has begun washing over the mountains' feet. Remote spots that once deterred newcomers are suddenly attracting all kinds of people eager to escape urban areas. A lifestyle with a rural pace and outdoor recreation is the lure for countless others yet to come{em}especially now that they can keep in touch and do business from almost anywhere via the Internet and satellite dishes.

Thinking Like a Wolverine

If Y2Y is to win support for securing crucial habitat bridges between wildlands while there is still time, some major gaps must also be bridged between the way people perceive ecosystems and the way they actually operate. This region hosts the most diverse assortment of large carnivores in the Americas. How much room will it take to keep them? In the section of the Rockies where I live, a grizzly's home range may encompass 500 square miles (1,300 square kilometers) or more. A silvertip met in Glacier National Park, Montana, one day might appear in the Great Bear Wilderness to the south the next week, then ramble east over the Blackfeet Indian Reservation,

north into Alberta ranch country, west across the Great Divide into British Columbia, and south again into Montana's Flathead National Forest.

A few years ago, researchers started attaching radio transmitters to wolverines in Glacier Park. I've spent a lot of days as a volunteer helping to track them but can hardly ever keep up. As it turns out, some males, which weigh all of 30 to 35 pounds, roam territories the size of a grizzly's home range. The wolverine labeled M8, radioed near Glacier's eastern edge, ventured west over the Lewis Range and then the Livingston, Whitefish, Salish, and Purcell ranges to take up residence around Montana's common border with Idaho and British Columbia. In the Greater Yellowstone Ecosystem, a different study recently documented a young male wolverine roving 550 miles in seven weeks. The line drawn around all its paths encompassed 23,000 square miles (59,600 square kilometers). A lynx radioed in Montana's Swan Valley was later located 250 miles north next to British Columbia's Kootenay National Park. Wolves are known to journey between Glacier's parklands and those of Banff, and one female tagged in northwestern Montana showed up in the Yukon. If you think that any park alone is sufficient to meet the needs of predators like these, you have, as they say, another think coming.

So think big. Then think bigger. Aside from the tendency of such animals to just take off and go at times, their normal home ranges or territories are too vast for many to fit entirely within a reserve. Suppose officials give out an estimate of 100 for some large carnivore in a park. That sounds encouraging. But half may regularly prowl outside the boundaries, exposed to whatever policies prevail there. Besides, if the group lacks contact with others, even twice that many individuals would represent too small a sample to avoid inbreeding. Experts say that for a typical large mammal species, at least 500 reproductive adults{em}not just 500 animals{em}are needed to maintain an adequately varied gene pool.

Thinking Like an Elk

With the exception of caribou and bison, vegetarian members of the wildlife community don't typically wander as far and wide as the carnivores do. But the hoofed animals of the Rockies do wander high and low, migrating thousands of vertical feet between seasonal ranges. In some cases, the summering sites lie miles from the wintering grounds. Juveniles may cover considerably greater distances when dispersing to seek homes of their own. Like the meat-eaters, then, the herbivores need their share of elbow room. Finally, predators, prey, and even plants continually shift ranges over generations as they adjust to the effects of avalanches, floods, disease epidemics, insect outbreaks, droughts, wildfires, and climatic cycles. Not to mention global warming.

As is typical for mountainous areas, the boundaries of most reserves within the Y2Y region were established with an emphasis on the highest of the high country, because that's where the gasp-in-awe scenery shines, and because industries seldom objected to setting aside glorious jumbles of rocks and ice that they didn't have much use for anyway. As a result, many a park ends partway down a mountainside{em}just where temperatures begin to warm and steep rubble gives way to stable soils. From this level down is where the majority of plants thrive and the majority of browsers and grazers want to be during spring to reach the earliest green growth, and again in autumn after the vegetation upslope drops its berries and leaves, and then through the deep winter.

In rugged northern terrain, the warmest, lushest, most sheltered habitats of all stretch along valley floors. Being the flattest habitats as well, they become repositories for soil and nutrients and collectors of moisture in rivers, lakes, and marshes. Life forms from orchids and currants to nesting birds and calving elk favor the low-lying areas, making them hotspots of biological diversity. However, these bottomlands are at a premium in the Y2Y ecoregion. Hemmed in by sawtooth topography, most of them are fairly narrow and widely separated from the next strip of level ground. They are also the first habitats to fill with people, for we too naturally gravitate to the valleys and neighboring foothills. Their gentle contours speak to us not only of hospitable homesites and livestock pastures but of handy bases for commerce and logical routes for highways and railroad lines.

The past bias toward the subalpine and alpine life zones for reserves is exactly why Y2Y advocates buffer zones to help protect the key seasonal ranges and fertile wetlands below. And the growing competition for limited bottomland acreage is behind the call to secure habitat bridges through valleys before dense development monopolizes them, permanently displacing wildlife communities and cutting off their movements between mountain ranges.

Supply and Demand

Although the Y2Y region remains lightly populated, studies show that its national parks and public forests support more than 130 million visitor days of recreation each year. The count is rocketing upward. Clearly, the Rockies' big heart is providing opportunities for a great many visitors from other places to find whatever it is they seek in wild and beautiful surroundings. How do we measure that? What is the value of Yellowstone Park today compared to its value in 1872? What will it be in the next century?

Looking at worth in strictly financial terms, considerable revenue is already streaming into the region because it is so well stocked with mountain panoramas, sparkling air and water, majestic creatures, and untamed places to explore. New enterprises and opportunities tied to general tourism, adventure travel, river running, cross-country skiing, hiking and camping, hunting and fishing, world-class wildlife viewing, and similar activities are multiplying like saplings at the edge of a floodplain. And as unspoiled vistas and charismatic wildlife become scarce commodities on an increasingly hard-used planet, a lot more people are going to be willing to pay a lot more money to enjoy the qualities of life stored in Y2Y. Based in the core of two affluent, stable democracies, this region has every chance of emerging as the most intact mountain ecosystem left between the polar latitudes.

The Y2Y area's business model was semicolonial. Raw materials were extracted by outside-owned corporations and shipped from the frontier to more developed areas for processing. Even industries based on renewable resources such as timber were subject to boom-and-bust cycles governed by market forces over which local folks had little or no control. Some would say the situation hasn't changed in many Rocky Mountain outposts. But the Y2Y vision is focused on a more stable, diversified economy. The ideal might be a balance of recreation-oriented operations and traditional industries retooled to avoid exploiting any single resource on a scale that diminishes others.

Yet despite the growing dominance of commerce based on the region's amenities, part of the public continues to view nature protection and economic development as opposing interests: jobs or the environment, opening up the backcountry or locking it away. It's the old-school dogma and hard to overturn. Ironically, many visitors who pass through the region's parks and take in the most magnificent expanses of country they have ever seen in their lives leave convinced that the task of saving nature has more or less been accomplished. They cannot imagine that such immense, craggy fortresses wouldn't serve to guard any number of creatures indefinitely. But the date on that mindset has expired too.

As a Matter of Fact

Since Yellowstone was declared a national park, the field of biology has added 133 years' worth of discoveries. And the findings are telling us that the notion of parks as outdoor museums where society can tuck flora and fauna away and come back at any time to find each perfectly preserved is quaint as a corset. If anything, trying to protect nature in isolated sanctuaries is a recipe for extinction.

Species are not specimens but dynamic works in progress. Communities are not collections of species so much as mixtures of organic chemicals, genes, instincts, acquired immunities, memories, social behaviors, communication techniques, and niches that are constantly evolving relative to one another. The wonder of nature is found less within individual plants, animals, microbes, or aspects of the physical environment than in the manifold linkages among them. Just as with Y2Y, the real power comes from the connections. Connections such as ravens circling and calling to lead wolves to a carcass so they will open up the tough hide. Or young grizzlies learning to raid the seed caches made by jays and industrious squirrels. Or the symbiosis of fungi, algae, and, sometimes, bacteria that forms the organisms we call lichens, and the way many live on trees and extract nitrogen from the passing air, supplying as much as half of an old-growth forest's need for this essential element.

Following the prime law of ecology{em}that everything is ultimately hitched to everything else{em}the allies of vitality are flux and flow and partnerships. The enemies are the forces that lead to separateness: fragmentation of larger landscapes, fixed borders, and confinement within habitats too small to withstand disruptive forces impinging from outside. Life on earth, biological diversity, nature; whichever name you use, it is a whole immeasurably greater than the sum of its parts, and we simply have to get better at seeing it that way in order to save it.

Because the Y2Y Initiative suggested additional conservation measures for certain public lands, some interests criticized it from the start as a threat to local economies. Opposition has been loudest in the United States, though barely more than a third of the total Y2Y area lies south of the international border and this is the portion most fractured and in need of connections. Hearing that the Initiative is controversial, many assume that it must indeed represent a fairly extreme point of view. It does not. It's hardly even an opinion.

Mountain goats, great gangling moose, silvertipped bears whose footprint alone can change your outlook on the day{em}creatures of these dimensions didn't arise in leftovers of wild landscapes. Leftovers won't long sustain them or the communities to which they belong. This isn't speculation. It is something learned from studies of genetics; from biogeography, which has shown that the smaller an island is and the farther it lies from a continent's coast, the lower its total number of species; and from documented declines in mainland parks increasingly isolated amid a sea of developed habitats. Facts are facts. Not that you can't still make a choice. If you're serious about conserving the quality of life along the backbone of the continent, look into Y2Y; if you aren't, don't. We have a limited time in which to reinforce the wholeness of nature or condemn ourselves to watching it fade like the embers

of a fire that once warmed us. As the quest for industrial commodities closes in on the last backcountry, the rarest, most precious commodity of all will surely be the freedom of the wild.

Made Fresh Daily

In contrast to the usual piecemeal approach to land management, Y2Y is a genuinely fresh plan of action. That's particularly fitting because it matches the freshly made, active land whose skyline has been rising for millions of years and continues to inch skyward today. Glaciers and icefields still cut the alpine edges to shape, while plants compete to invade the shavings we call moraines. The subalpine slopes keep coming loose in slumps, rockslides, and avalanches. Waterfalls tumble everywhere. Streams cascade at steep angles. The rivers' waters run in rapids, and the winds washing across North America's heights are strong enough to buffet you like surf. Cloudbanks and storms can materialize all at once and vanish nearly as fast. In motion, overhead and underfoot, the region feels eternally new and full of promise.

When you move beyond the outskirts of Y2Y to where the landscape has found its angle of repose, it begins to run short of surprises, particularly where every contour seems allocated to human pursuits. It is hard to pin down exactly why mountains are so invigorating by comparison. But I know that soaring terrain, soaring eagles, and soaring thoughts go together, just as wholeness in the environment is tied to wholeness in one's self. Time spent among intact landscapes and wildlife communities is potent medicine for a stressed-out era. Enough doses could heal a society.

Now, going into a town of loggers or miners and yakking about how nature knits the pysche together might not win many new friends. Better to discuss how to manage resources in ways that guarantee jobs for their children and grandchildren rather than cycles of overharvesting followed by factory closures. After all, that's part of the Initiative as well.

Humans have been trying to figure out who we are and where we are going for a very long time. The pervasive modern question of how people and their livelihoods can flourish in a place without overloading the environment is part of that long-standing quest. Y2Y offers some meaningful solutions for at least one special section of the world. Progress for its own sake is not really progress. Y2Y is.

The Initiative is also more than the subjects I have introduced so far. It is a staff and volunteers based in Canmore, Alberta, just east of Banff Park, and representatives in other provinces and states. It is funding and coordination for research projects. It is rounds of meetings and symposia. It is a growing atlas with detailed maps of resources from vegetative cover to the distribution of fish in watersheds to road densities. It is a list of CCCs{em}Critical Cores and Corridors{em}that the maps highlight as most in need of immediate attention. It is charts of economic statistics such as per capita income by industry in various districts. It is outreach programs in church basements, complete with slide shows, discussions{em}and, of course, cookies.

Y2Y is also one of the reasons wildlife overpasses were built over the Trans-Canada Highway that races through Banff National Park, and why Bow Valley Wildland Provincial Park and Spray Lakes Park were recently established next to Banff, and why a 15.6-million-acre mix of wilderness parks and special management areas, jointly known as Muskwa-Kechika, was set aside in northern British Columbia. The initiative is a factor as well in the Canadian federal government's support for expanding Nahanni National Park from a narrow ribbon in the Northwest Territories, and for rounding out Waterton-Glacier International Peace Park by adding a chunk in British Columbia's Flathead Valley, which contains interior Canada's densest grizzly population along with perhaps the single richest community of carnivores in North America. Here is an idea you can touch, a vision you can hike into, even as it continues to take shape in our minds and in books such as this.

Douglas H. Chadwick

Wildlife biologist Douglas Chadwick has traveled the globe reporting on wildlife and conservation, from the Congo headwaters to Siberia to the Great Barrier Reef. He is the critically acclaimed author of *The Fate of the Elephant* and *A Beast the Color of Winter,* as well as *The Company We Keep: America's Endangered Species* and *Enduring America.* His more than 200 articles have appeared in such publications as *National Geographic,* to which he is a frequent contributor, *Audubon*, *Defenders of Wildlife,* and *Smithsonian Magazine*. A longtime conservationist, Chadwick spent seven years studying mountain goats and other wildlife in Montana's Bob Marshall Wilderness and Glacier National Park. He lives with his family in northwestern Montana.

Southern Y2Y

Refuge by Ted Kerasote

Ready to run, we wait on the edge of Interstate 90. To our left, cars speed uphill. To our right, trucks roar down from Bozeman Pass, air brakes bawling. Separating the east and westbound lanes is a thigh-high berm of concrete.

In a momentary break in the traffic, we sprint across the icy concrete, vault the barrier, and make it to the gravel-pocked snow on the far shoulder as a pair of container trucks thunder by, blasting us with twin shocks of air.

"You wonder what the animals think," shouts Lance Craighead, the director of the Craighead Environmental Research Institute, an organization whose scientific studies provide data on how wildlife and humans might live together sustainably. One of the institute's projects is this roadkill study, focusing on 25 miles of Interstate 90 between Bozeman and Livingston, Montana. Fortunately, we haven't met the same fate as the white-tailed deer whose carcasses we've found littering the shoulders of the highway and whose deaths Craighead catalogues three times each week, along with those of other species of wildlife.

We reach a barbed-wire fence{em}up and over{em}and then we're down in a culvert, ten feet high, that animals sometimes use to travel beneath the interstate. Craighead has a camera positioned by the mouth of the culvert, its shutter occasionally tripped when a bear, deer, or mountain lion crosses an infrared beam.

Above us the traffic continues to pound, and Craighead says, "Once you get 20,000 vehicles per day, a highway is impenetrable to wildlife. Bozeman Pass gets that during peak times in the summer. On average it's 10,000 vehicles per day. The purpose of our study is to see how we can mitigate the effects of roads and facilitate wildlife migration between core habitats."

With respect to the southern portion of the Yellowstone to Yukon system, one couldn't find a better place to gauge the challenges faced by this bold conservation initiative. Interstate 90, which runs west to east between Seattle and Boston, not only splits the Bridger and Gallatin Mountains, it also cuts the entirety of the Y2Y southern region in half. At the north end of the region, in and around Glacier National Park, there are grizzlies and wolves, mountain lions and elk, moose and deer. At the south end, in and around Yellowstone National Park, there are grizzlies and wolves, mountain lions and elk, moose and deer. In a world prior to the internal combustion engine{em}say, the world of Lewis and Clark, who passed not far from here{em}these wildlife populations would have traveled back and forth, through basin and range, over col and divide, looking for food, migrating from summer to winter ranges, and intermingling their genes along the way.

Two centuries later, they are prevented from doing so by barriers like Interstate 90 as well as thousands upon thousands of miles of secondary roads, and urbanized areas such as Gallatin County, with its 74,000 people, 30,000 of whom live in the city of Bozeman itself. Thirty-four percent of these people moved here in the last decade, attracted to this part of the Lower 48 by its wildlife, its renowned wilderness, and its spectacular scenery, qualities that no one person impacts but that our aggregate presence{em}our subdivisions, our malls, our ski areas, and our airports{em}erodes day by day.

The Yellowstone to Yukon Conservation Initiative{em}composed of more than 200 organizations and hundreds of individuals{em}is trying to integrate this human influx into what remains a relatively intact natural landscape, one that stretches 2,000 miles along North America's spine from the Wind River Mountains of Wyoming to where the Yukon's Ogilvie Mountains run down to the polar sea. In one state, in one valley, Lance Craighead is doing his bit.

"We've been collecting data for four years," he tells me as he changes the film in the culvert camera, going on to explain that four years is barely enough time to collect a good data set, given the variation in the type and number of animals killed from year to year. "This year alone we've had 115 deer killed as well as 4 elk and 2 black bears, though we had 6 bears killed last year." (The complete list for 2004, when he shows it to me later, is quite a bit longer: 5 badgers, 7 great horned owls, 8 coyotes, 12 porcupines, 22 raccoons, and 39 skunks.)

After Craighead pockets the photo evidence, we sprint back across the highway and continue our drive east toward Livingston, noting the location of road-killed deer along the way. We change film in another camera site before searching the westbound lanes and returning to Craighead's office in Bozeman. There he shows me a Geographic Information Systems map of the area. GIS maps combine different layers of information. This one displays three components: the frequency of roadkill; secure wildlife habitat to the north and south of I-90; and the shortest links between these secure or "core" habitats.

It's in these locations that Craighead hopes the highway department might build overpasses for elk and underpasses for lions and black bears. The former would cost one million dollars each, the latter $500,000. But Craighead is quick to point out that these figures aren't all that expensive, seeing that interstate highways

themselves cost a million dollars per mile to construct and wildlife collisions cost U.S. motorists a billion dollars each year in damages. The work would take a few months to complete and once done would serve other species. Wolves and deer, for instance, will use either overpasses or underpasses, according to Craighead, as would many of the other animals that live in this part of the U.S. Northern Rockies: bobcats, weasels, martens, snowshoe hares.

As I stare at the two-dimensional map, with its bright colors, numbers, and graphs, I remember the feeling I had on the highway{em}watching the traffic and sensing its rumble through my feet. I try to imagine myself as a deer, headlights shining in my eyes, or a badger, staring at the concrete barriers, insurmountable for me. If the money can be allocated, this hectic and dangerous interstate could have a series of crossings that would allow wildlife to pass in relative peace.

Thoughts of overpasses, underpasses, linkages, and refuges of core habitats linger as I drive the 250 miles home to Jackson Hole, Wyoming{em}west through the shopping centers of Montana's Gallatin River Valley, south through pastoral ranch lands beneath the Madison Range, their crest of peaks dusted with snow, over Reynolds Pass and down to Idaho's Henry's Fork, where trumpeter swans float idyllically in the still water. I drive along the western boundary of Yellowstone National Park, thick with conifers{em}its high plateaus remote and already sealed off by winter{em}before passing beneath the three prominent spires that were once called "the pilot knobs" by the mountain men and are now known as the Grand, the Middle, and the South Tetons. Wending my way through the traffic and increasing number of subdivisions in Teton Valley, Idaho, I'm once again startled at the growth that's taken place in what was a small farming community: a 74 percent increase in population between the 1990 and the 2000 censuses. The road climbs over the Tetons and switchbacks down into the 40-mile-long valley known as Jackson Hole, Wyoming, its southern end busy with cars, housing developments, and an explosion of new retail stores. Atypically for Rocky Mountain valleys, however, this development has been limited to 3 percent of the land base. The other 97 percent of Teton County, Wyoming, is public land{em}national forest, elk refuge, and park.

Turning north at the Jackson town square, with its often-photographed elk-antler arches, I head in the direction of these open spaces, soon cresting the long rise that leads into Grand Teton National Park and, twenty minutes later, reaching my house in the small village of Kelly.

Directly on the Gros Ventre River, Kelly once vied for Jackson to be the county seat in the early part of the nineteenth century. It had a sawmill, stores, and a vibrant community of cattle ranchers. In 1925 the Gros Ventre River was dammed by a mudslide three and a half miles upstream from the village. Two years later the dam broke, and a wall of water destroyed Kelly, killed six people, and dashed Kelly's hopes of becoming the valley's commercial and governmental center. Instead, it became a sleepy square mile of old cabins, bordered on its southern side by the National Elk Refuge, on its eastern side by the Gros Ventre Wilderness, and on its western and northern edges by Grand Teton National Park. In fact, the village faces the eastern side of the Teton Range from across the Snake River Plain: a grand and empty prospect of sage, aspen, and cottonwoods, of elk, bison, and pronghorn antelope, of jagged mountains capped by glaciers.

Like most of the people who live in the southern part of Y2Y, most of the residents of Kelly don't make their living directly off the land. We have but a handful of hunting, fishing, and mountain guides, as well as a couple of ranchers, in the village. The rest of us make our livings as National Park Service and Forest Service employees, building contractors, nurses, doctors, physical therapists, filmmakers, writers, modem cowboys, attorneys, teachers, waitpeople, and staffers for nonprofit organizations. I can't think of anyone who wouldn't say he or she wasn't also supported by the big vistas and the pageant of wildlife that passes like a river around the village. In addition, many of us are quite literally supported by elk, antelope, and mule deer, for one of the species, sometimes all three, fill our freezers each year.

It's a refuge{em}a place of shelter in every sense of the word, one whose broad outlines were created by the intersection of geography and climate. While the prairies were plowed under, the bison and elk slaughtered, and great cities linked by railroads, this high, cold, remote place repelled settlers and was one of the last in the Lower 48 to be homesteaded. In addition, the reason that Teton County, Wyoming, is so free of sprawl{em}and that just on the other side of the Tetons, Teton County, Idaho, is now so plagued by it{em}goes back to the region's earliest conservation history. Appropriately, this history is also the Ur-story of Y2Y itself.

It begins in August 1870, when Cornelius Hedges, the U.S. District Attorney for Montana Territory, journeyed into the Yellowstone country along with an exploratory party headed by Henry D. Washburn, the surveyor general of the territory, and Lieutenant Gustavus C. Doane, his military escort. The men marveled at the geysers, bubbling mudpots, and waterfalls, and as autumn began to color the aspens they started their descent from the high country. Making a last campfire, the entire party began to discuss filing claims on the land they had seen so as to make a killing when tourists would flock to the natural wonders. In the official, National Park Service rendering of the story, Hedges took exception, saying that Yellowstone "ought to be set apart as a great National Park." Nathaniel P. Langford, another Easterner who had come along on the expedition, became so fired by Hedges's proposal that he lay awake all night thinking about it.

Returning to the East, Langford began to popularize the notion of a national park carved out of the Yellowstone country. He gave lectures and wrote two articles for *Scribner's Monthly*. Although many greeted his tales with skepticism, one person decided to verify his story. This was Ferdinand Vandiveer Hayden, the director of the Geological and Geographical Survey of the Territories. In 1871, on his next exploration, he made sure to swing through the Yellowstone country, taking in tow Thomas Moran, the landscape painter, and William Henry Jackson, one of the innovators of panoramic outdoor photography.

The stunning pictorial record the two men brought back caused even the staid *New York Times* to rethink the era's accepted wisdom that humans should civilize every corner of the globe. "There is something romantic," wrote the newspaper's editors, "in the thought that, in spite of the restless activity of our people, and the almost fabulous rapidity of their increase, vast tracts of national domain yet remain unexplored."

The revisionist history of Yellowstone's founding tells a slightly different story. It points out that the first mention of a national park in the area was made not by Hedges in 1870 but by the then territorial governor of Montana, Thomas Meagher, in 1865. No matter who should get credit for visualizing the world's first national park, the autumn of 1871 saw Congress debating a Yellowstone park bill, introduced by William Clagett, Montana's territorial delegate in Congress. Clagett, however, wasn't interested in setting aside wilderness. Rather, he wanted to protect the area's rare natural curiosities from private speculation. Congress acceded, passing the park bill precisely because it saw Yellowstone as *useless* for cultivation. In fact, it was and remains so. Without the loss of material gain, the region could therefore be turned into an amusement park and "pleasuring" ground for the people.

Only in the mid-1880s{em}as the Cinnabar and Clark's Fork Railroad tried to secure a right-of-way Yellowstone so as to reach mining claims{em}did the concept of saving nature for nature's sake enter the debate. Congressman William McAdoo of New Jersey opposed the railroad and observed that the park had allowed people to see "the inspiring sights and mysteries of nature that elevate mankind and bring it closer communion with omniscience." Then, employing a line of reasoning still commonly used in the twenty-first century, McAdoo beseeched his fellow representatives to "prefer the beautiful and sublime . . . to heartless mammon and the greed of capital." His eloquence carried the day. The Cinnabar and Clark's Fork right-of-way was defeated 107 to 65 and Yellowstone was preserved unsullied, anchoring the southern terminus of the Y2Y region and setting a worldwide precedent for the preservation of nature.

On the heels of this vote, conservation milestones followed decade by decade: National forests around Yellowstone were first set aside in 1891; Glacier National Park was created in 1910; "primitive areas," the antecedents of wilderness areas, were designated in 1940 along the Continental Divide in Montana; and in 1980 the River of No Return Wilderness, a vast area of unspoiled rivers, peaks, and forests in central Idaho, was signed into existence.

Thus{em}before the twentieth century had come to a close{em}the high Northern Rockies of the United States had been preserved from logging, mining, and road-building. In addition, a single valley{em}Jackson Hole{em}was left almost entirely pristine by one of the most surreptitious bits of philanthropy in the history of the continent. In 1926 John D. Rockefeller, Jr. came down from Yellowstone National Park on his family's summer vacation and visited the Tetons, stunned by the alpine scenery and appalled by the dance hall, stores, cabins, and telephone lines that had been built along the base of the mountains. In secret, he began to buy up ranches on the floor of Jackson Hole, knowing that if he made his plans public they would be quickly scuttled by ranchers and developers. After a tiny Grand Teton National Park was proclaimed in 1929 (one that protected only the high mountain landscape), Rockefeller began attempts to donate the ranch and riparian land he had bought to the federal government. At last, in 1950, his holdings became part of an enlarged Grand Teton National Park.

A significant part of Jackson Hole, Wyoming, was thus moved into the public estate, while Teton Valley, Idaho, just on the other side of the Tetons, remained largely in private hands. One now has unmarred vistas and wildlife, and the other has subdivisions.

A similar story can be told for much of the southern portion of Y2Y: Where land has remained in the private sector, sprawl has metastasized. The Gallatin and Bitterroot Valleys, home to Bozeman and Missoula respectively, are prime examples. Given this pattern, conservationists at the end of the twentieth century began to ask, Absent another new Rockefeller, what mechanisms do we presently have to cluster people and let the wildlife roam free?

One person who addressed this question was Harvey Locke, a fifth-generation Albertan, an attorney, and a conservationist. In 1993, he sat down with some topographic maps around a campfire in the Muskwa-Kechika region of northern British Columbia, struck by how the entire Rocky Mountain chain hung together as a place of similar fauna, flora, and landscapes. Whether he had traveled in Wyoming, Idaho, Montana, Alberta, British Columbia, or the Yukon, he saw the same moose, the same elk, the same grizzlies, the same flowers, and the same trees and glaciers. Reaching for a succinct phrase that would express this consanguinity, he hit upon "Yellowstone to Yukon," or "Y2Y" for short. The moniker also served as a way to conceptualize protecting these far-flung, interrelated ecosystems without excluding humanity.

One strategy that Locke and his many conservation-minded colleagues across the region developed drew on Rockefeller's pioneering effort{em}buy private land as it comes up for sale and make sure that it's developed in a way that protects its ecological attributes. Never has this been more important than now, as several million acres of ranch lands in the southern Y2Y are about to come onto the market. Their owners, entering their sixties and seventies, are faced with college payments, inheritance taxes, and medical expenses. Many of these ranches are ecological linchpins. Occupying the transition zone between protected public lands and densely populated, historic town centers, they offer winter range to elk, deer, and moose; they contain some of the region's most valuable wetlands, important as nesting and feeding areas for waterfowl and shorebirds; and they also help to create the celebrated visuals of the Northern Rockies: sweeping grasslands and aspen trees rising between valley floor and alpine heights.

To aid communities in their protection of these lands, the Doris Duke Charitable Foundation committed $8.2 million to the Greater Yellowstone Ecosystem in 2001. Various projects have already been completed. Conservation easements have been bought in Montana's Madison and Centennial Valleys, and a grassbank has been created outside of Cody, Wyoming, with the aid of The Nature Conservancy. Grassbanks are ranches owned by conservation organizations that make grass available to ranchers in return for some sort of conservation agreement on their properties. In this case, ranchers use TNC's irrigated pastureland while "resting" critical elk and sage grouse habitat on their properties{em}in other words, keeping it free from grazing. Some of the most extensive wetlands in the Northern Rockies have also been conserved in Idaho's Teton Valley, ensuring that habitat for waterfowl, sandhill cranes, and long-billed curlews will not be paved over. In another partnering effort, ranchers in the Blackfoot River Valley of Montana have worked with a local timber company and TNC to close down logging in the upper valley and secure wildlife habitat protection.

There isn't enough money, however, to buy conservation easements on every crucial ranch property in the Y2Y; nor does every rancher want to put a conservation easement on his or her ground and stay in the livestock business, with its hard physical work and economic uncertainties. Ranches will come up for sale; subdivision and development will occur. In turn, these new houses, stores, and roads affect the quality of life for people as well as wildlife. Therefore, when development seems unavoidable, it's crucial that it be undertaken with care if both humans and wildlife are going to find refuge in these landscapes. Unfortunately, many zoning regulations promote the opposite: sprawl, congestion, loss of wildlife. Teton Valley, Idaho, is a case in point.

Once an agricultural landscape of potato farms snuggled between the Tetons and the Big Hole Mountains, the valley now has zoning regulations that stipulate a density of one house per 20 acres when agricultural land is subdivided. Consequently, if a farmer owns 100 acres of land, all he can presently do is subdivide his property into five 20-acre lots. This creates a landscape of roads and ranchettes, deters wildlife migration, and provides little sense of community. But if one were to remove the minimum lot size and give him a bonus for clustering development{em}for instance, a two-house bonus if he clusters five houses on five adjacent, 1-acre lots{em}one would then see seven houses erected on seven 1-acre lots, with 93 acres left as open space. If clustering is done on a landscape scale, it can build small villages that give people a sense of inhabiting neighborhoods while providing wildlife the habitat it needs. People also get the space they need. Instead of feeling constrained by a checkerboard of fences and No Trespassing signs, they, too, have commons in which to roam.

Of course, some observers point out that people come to the West for privacy. This is not completely accurate. People come for clean air and water, vistas, recreational opportunities, and low crime rates{em}for what, in every sense of the word, is a refuge from an increasingly fractious and unhealthy world. Not everyone wants to live on 5 to 35 acres, with a long driveway to plow, and no neighbors nearby.

Kelly is a good example of this sort of small community surrounded by large expanses of commons. Most people in Kelly own two town lots{em}each 50 feet by 150 feet or one-third of an acre combined. This may sound like a postage stamp to those who remain captivated by the myth of the West. However, as many of us like to point out, our village lies in the middle of a 20-million-acre ranch, the Greater Yellowstone Ecosystem. Countless town dwellers across the southern Y2Y feel the same about their small towns: Wilderness and wildlife are a stone's throw away, the boundary between the wild and the civilized remaining very porous.

Three characteristics thus seem to distinguish the Y2Y initiative south of the Canadian border today. First, large areas of wildlife habitat have been, and will remain, protected in national parks, wildlife refuges, and forests. Second, a move by conservation organizations to place ranches under conservation easements is helping to preserve existing migration corridors and winter range between protected, high-altitude areas. Third, initiatives to change zoning laws can help create attractive neighborhoods for people while conserving adjacent open space as wildlife habitat. In addition, some in the ranching community are adding a fourth component to the Y2Y mix{em}running their livestock operations in a way that nurtures wildlife.

Key to this notion is miming the grazing patterns of the historic fauna of the region, bison and elk. These species once created what ecologists call a "disturbance"{em}nipping off vegetation and spreading seeds in their feces while trampling, turning over, and aerating the ground with their hooves. Local flora has evolved with these

disturbances, indeed flourishes because of them. These plant communities can still flourish in the presence of cattle{em}if, that is, the cows act like wildlife, briefly disturbing plant communities and moving on so the plants can recover.

One of the models for this sort of eco-friendly ranching has been put into practice by Karl Rappold, whose 13,000-acre ranch I visit after a late November storm turns the Rockies white. Founded in 1882, the ranch is located on the Montana Front, a sparsely populated, magical belt of country where the Great Plains meet the upthrust of the Rockies. In fact, the western boundary of the Rappold spread touches the cliffs of the Bob Marshall Wilderness Area.

A man of classic Western features{em}blue eyes, strong chin, auburn moustache, turquoise bandanna, and black cowboy hat{em}he drives his pickup toward the mountains and tells me that he understocks his ranch by current standards, running only 300 cow-calf pairs and 100 head of replacement heifers. This has allowed him to achieve a rare détente with the grizzly bears and wolves who live on his ranch and the mountains above it.

The origins of his ranching practices, he explains, go back to the days of the Depression, when his father routinely killed grizzlies who preyed on cattle. In those lean times, there was nothing else to be done; one cow might enable a family to get through the winter.

"But before my father passed away in 1986," Rappold continued, "he told me that the only regret he had was that he'd killed so many grizzly bears, and that they'd almost become extinct. He made me promise that when I took over the ranch, these big bears would always have a home. So I've worked most of my life to make sure that has happened."

His methods are simple though unconventional. He avoids conflicts with grizzlies by breeding his herd earlier in the year than is traditional. The calves are born earlier, so that when they reach summer pasture they're bigger and heavier and not such easy prey for grizzly bears or wolves. He's also worked with the local fish and game department to distribute cattle carcasses along the high perimeter of his ranch. When hungry grizzlies come out of their dens, they can fill up on the meat of dead cattle rather than moving to the lower ranch to seek out live ones. By the time the grizzlies are done with the carcasses, the grass is green, they're feeding on vegetation (grizzlies are omnivores), and they leave his cattle alone. In fact, the ranch has not lost a cow to a bear since 1959.

This sort of range management has also been profitable. Because Rappold's cattle have ample grass, they go to market at a greater weight than those of ranchers who run more cattle on similar acreage. As he likes to say, "I'm raising the same amount of beef off of 300 head that a lot of guys raise from 600. It's the pounds you put on the truck, not the number of animals, that counts."

Rappold is also outspoken about other ranchers' poor management practices. They stock too many cattle on their range, he tells me, destroying the grass for wildlife and making the cattle themselves weak and undernourished, easy pickings for bears. Ranchers also put cattle into the high country too early, and they don't look for them carefully enough in the fall{em}he has found his neighbors' cattle grazing happily in the mountains when the neighbors have claimed that their lost stock has been killed by bears.

Stopping alongside some huge grizzly tracks in the snow, which wander directly among the tracks of his cattle, he says, "The bear is somebody easy to blame. But there's been tons of occasions when I'll come up here and see fifty cows grazing on the hillside and there'll be an old bear amongst them, digging anthills up, neither one of them paying attention to the other."

What if he loses a cow to a bear someday? What will he do then? He answers without hesitation. "If a bear should kill one of my cows, it would be an act of mother nature, like an electrical storm. I don't feel the bear has to live with us. We have to learn to live with the bear. He was part of this country long before we settled it, and he should remain part of this country. If you don't like living with bears then maybe you ought to be ranching somewhere else."

I think about his words as I drive down the length of the Rockies, from near the Canadian border, back to Jackson Hole: peak and valley, river and forest, town and city. It has not been the easiest place in the world to live. I've seen 54 below. I've had the first-floor windows of my house covered with snow. Some summers, I've watched my grass turn to dust. But there is passion in this weather, and a joy of being out in it. Sometimes the human-caused changes seem overwhelming. South of my house, in the Upper Green River Basin of Wyoming, beneath the spires of the Wind River Mountains{em}in other words, at the very southernmost extent of Y2Y{em}3,000 natural gas wells have been drilled and 7,000 more are on the drawing boards as the Bush Administration attempts to win domestic energy security. The attempt can't possibly succeed, since the United States uses 25 percent of the world's oil and gas resources while only 3 percent of those resources underlie its landmass.

It's one more challenge that the Y2Y initiative faces{em}halting fossil fuel development where it impacts critical wildlife habitat as well as trying to get hydrocarbons out of the ground (where operations are under way) without decimating what's above it. Currently, energy development sits shoulder to shoulder with sprawl as the region's greatest blight and greatest failure to integrate the civilized with the wild.

Having come down the familiar, two-lane roads{em}down the Henry's Fork, over Teton Pass, through Jackson, and north into the park{em}I turn up the Gros Ventre River and there, just a few miles from the house, spy a large gray wolf. He's walking along a moraine with a jaunty step, the Tetons soaring above him into a cloud-riven sky. He has a black mask, like a malamute's, and he's watching two bull elk, bedded below him. They may very well be his dinner. His mouth opens in a happy dog grin, the wind ruffles his fur, and he settles himself comfortably in the snow with an expression that says, "Ah, life could not be better."

I would have to agree. How many places in the world can you see elk and wolves near your house? Of course, thousands upon thousands of other people would love to live in a place where they could see the same. I was one of them. Twenty years ago I came from Colorado, looking for more space, more snow, and more animals. I never looked back. Therein lies the greatest challenge faced by the Yellowstone to Yukon initiative: how to provide refuge for wildlife while creating homes for the human emigrants who want to inhabit the very same landscape. It's a work in progress, and history will judge how well we do.

Ted Kerasote

Ted Kerasote's work on natural history, wildlife, outdoor recreation, and indigenous people has been published in dozens of periodicals and anthologies, including *Audubon*, *Outside*, *Men's Journal, National Geographic Traveler*, *Salon.com, The New York Times Book Review, The Nature of Nature, The Best American Science and Nature Writing 2001*, and *The Best Adventure and Survival Stories 2003.* He is also the author of four books. One of them, *Bloodties: Nature, Culture, and the Hunt*, has been reprinted many times and remains one of the most frequently cited works on the ethics of hunting. His latest book, *Out There: In the Wild in a Wired Age*, won the 2004 National Outdoor Book Award for literature. Kerasote lives in Jackson Hole, Wyoming.

Central Y2Y

The Courage of Hope by Rick Bass

In the mid-1990s, when I first heard about the Yellowstone to Yukon concept, I got very excited. I knew there were many parts of this huge canvas of a landscape that I'd never visit, but I liked the idea that a coalition of diverse interests could work to help support an entire region, one that I believe is the spine, soul, heart, and spirit of North America. The Y2Y region is important for the astonishing diversity and vigor of life it contains{em}the wildness{em}as well as for the human cultures and communities that continue to build themselves around and into that landscape.

The Y2Y vision is broad and deep. It looks at things as seemingly disparate as salamanders and grizzlies, loons and bog orchids, as well as the intangible and immeasurable necessities that define the region for all of us who are fortunate enough to live here: the sunsets and moonrises, the howling weather, the velvet folds of uncut forest, the sheer and breathtaking slabs of rock and ice.

Y2Y reconnects these things on the ground and in our minds and hearts. To paraphrase the great Wallace Stegner, Y2Y provides a service to all of us{em}whether we live here or live thousands of miles away{em}by preserving and celebrating the *idea* of wilderness. It's important to us all, Stegner reminds us, to know that such country exists, and is protected{em}that it will always exist, even if we never set foot into it.

The central section of the Y2Y corridor is the longest leg. Beginning roughly at the U.S.{en}Canada border, on the Montana, British Columbia, and Alberta boundaries, it proceeds northward through the sometimes-lush, sometimes-icy, forested center of British Columbia, on either side of the spine of the northern Rocky Mountains, up into the immensity of the Muskwa-Kechika country, north of Fort Nelson, and into the northern Y2Y. I am blessed to be able to set foot into this country every day. Living almost literally on the U.S.{en}Canada border (only six miles separate me in this lower nation from the upper), I am chagrined when I look south toward the waves of airport expansion, golf courses, ski resorts, and scattershot first- and second-home development. I need and want, and am accustomed to, the reassurance of knowing that wilder country, and lots more of it, begins six miles north.

My own little valley, the Yaak, not quite a million acres, lies at the southernmost tip of Canada's largest mountain range, the Purcells, and is the only place where those mountains enter the United States, dwindling to a taper along the Kootenai River. The southern Purcells are compressed from having slept beneath several thousand feet of blue ice during the last period of glaciation, even while most of the other mountain landscapes around them were being carved into the dramatic near-vertical crags of rock and ice.

What is at least as dramatic, to my way of thinking, is the astounding diversity of life that is concentrated in a lower-elevation landscape like the Yaak. There's more moisture and more vegetation, and temperatures are milder; indeed, so productive is this ecosystem that nothing is known to have gone extinct here since the last Ice Age. Particularly valuable to the chain of life in the Yellowstone to Yukon country are these lower-elevation fens and bogs and marshes that support and cleanse so much of the rest of that productive ecosystem, and which will be all the more critical to that web of life in a warmer, and warming, world.

One of the things that caught my eye about the Yellowstone to Yukon Initiative initiative was the ground-zero nature of my own existence, residing in the narrowest and hence most vulnerable bottleneck of the Y2Y corridor, at the biological gateway to Canada. It concerns me hugely that in my million acres of the southern Purcells{em}one of the wildest representations of Y2Y, from a standpoint of biodiversity{em}there's not one single acre of permanent protection. I've been laboring to help correct this oversight for almost twenty years now. Soon after Y2Y was conceived, I sent a note to Harvey Locke, the Alberta conservationist and one of the founders of Y2Y, letting him know that with the Yaak at the rough midpoint between Yellowstone and the Yukon, as well as in that critical, narrowest bottleneck, I would be thinking of the venture as "Y3Y"{em}Yellowstone to Yaak to Yukon.

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Spurred by the Y2Y vision, a couple of autumns ago I traveled to Waterton-Glacier International Peace Park, another of the Y2Y hot spots, right on the U.S.{en}Canada border, in British Columbia and Alberta. I went up and over rugged Crowsnest Pass{em}yet another migratory bottleneck where wildlife habitat, highway, and steep cliffs intersect, and where conservation corridors must be established{em}and down into the soft sweet country along the Rocky Mountain Front. There, dotted with hayfields and power-generating windmills, serene prairie rolls up into the near-vertical crashing of frozen stone{em}rocks that about two hundred million years ago rested over the Yaak region before being lifted up and thrust eastward.In Waterton, where there are plans to expand

the Peace Park to include the headwaters of the North Fork of the Flathead River, I backpacked with Locke, Steve Thompson of the National Parks Conservation Association, and Adam Witkowski of Road-Rip, an organization that specializes in restoring watersheds damaged by too much roadbuilding, logging, mining, and grazing. (Recently, a new threat appeared from out of nowhere: The Canadian government has permitted major coalbed methane development just across the border, without even notifying the United States.)

On my trip into Waterton, as always happens in such big country, time fell away, so that I lost track of the hours and then, wonderfully, the days. This is one of the great gifts of the Y2Y country, and while we all sense a moral duty to safekeep the genetic and biological charge of life intact within these spectacular landscapes, it is not ignoble to remember, from time to time, what's also in it for us: the restoration and rejuvenation that our own spirits can receive from even a brief time spent in such splendor.

We saw evidence of nature's force written in the geology of the region by the massive yet sophisticated hands of time, and yet we saw life as well. A harlequin duck resting below the rapids. A black bear mother sending her cubs up an aspen tree to protect them from our ponderous approach. The improbable courage{em}or was it nonchalance?{em}with which mountain goats passed over the sheer cliffs above the proposed park expansion. And taking our lunch high on a windy peak, staring down into the unprotected Wigwam drainage{em}staring into the future, we hoped, of an area soon to be protected{em}we heard a voice singing, there in the wilderness, as a falcon hovered over us, watching us watch the country. Angels, or mountain spirits, we wondered? No, it was just a yodeler, a park ranger in shorts and knee socks on her day off, wind- and sun-burnished, exalting in the mountains' glory, and a tad surprised to find us there, tucked in behind the rocks, out of the wind's howling way. When we announced ourselves, and asked her how she felt about the proposed park expansion, she said she thought it was a wonderful plan, that we needed all the wilderness we could find, these days. And though she was polite enough not to say it, I couldn't help wondering whether she wouldn't have preferred, that day, to broaden the park beyond even the proposed expansion, in order to have her yodeling peak to herself, if only for that afternoon.

####

The Y2Y coalition is using scientists{em}geneticists, conservation biologists, hydrologists, wildlife scientists, and others{em}to help guide management proposals and to craft a plan connecting wild lands that offers our best hope of preserving a way of life that includes human communities living at the edge of a great and sometimes vast wildness. Ultimately, this chain of wildness will be only as strong as its weakest link. Again, my thoughts are drawn back to the critical low-elevation "Yaak-to-Yahk" bottleneck (between my own Yaak Valley and the east Kootenay town of Yahk in British Columbia), and to places like Crowsnest Pass{em}and despite our best plans, the animals do not always, in the peregrinations necessary to their survival, stay within those corridors we've drawn. The thing that many of them need most{em}particularly the spectacular megafauna that so define the region{em}wolverine, grizzly, lynx, wolf, caribou, mountain goat, bighorn sheep, lion, elk{em}is big country, and lots of it.

And where they no longer have this{em}where their lives and cultures are disrupted by the habitual and increasing intersection with our own{em}we *are* trying, in the best way we know how. There are places where we cannot turn back the hands of time even if we wanted to; so instead, engineers are laboring to create safe passageways, or at least avenues of reduced mortality, under and over the main arterials of our disruption.

Highway overpasses for large mammals, as well as underpasses for smaller creatures, are springing up throughout the New West, looking in part like outdoor art projects, to the point where they are not only a source of increased civic pride, as well as an extra layer (if thin) of protection against costly vehicle-animal collisions, but also a constant reminder that out there on the larger, farther, wilder landscape, there still reside the wild creatures that still, even in the twenty-first century, help give our lives meaning and shape, enriching our days and our imagination.

Such structures are no substitute for the wild, of course. I worry that as we lose more and more of our wild country, there are those among us who one day won't even know, the nature and magnitude, the wonder, of what we've lost. I worry that one day soon we will confuse scenery with spirit, and recreation with prayer. That we will find peace in the sylvan green of an artificially nourished golf course, and pride of craft in the construction of a 52,000-bed international ski lodge perched precariously atop a sliding, slipping, retreating film of dirty, vanishing ice in these last days of a cooler world.

I worry that we will one day soon inhabit a world where everything is for sale, and where the concept of leaving a piece of wild country alone and intact, free to pulse and respire under its own rhythms, will seem utterly alien to us.

And when the young and gifted photographer Florian Schultz invited me up farther into southern Canada, to visit one of his favorite places with him, a place called Mount Jumbo, 150 or so miles north of the U.S.{en}Canada border, on British Columbia's west side of the Continental Divide, I worried then, too. To an experienced fretter

such as myself, even the name seemed foreboding: *Jumbo*. Something big and therefore rare, in a world where it seems all large things are forced toward diminution.

####

I follow Florian's directions northward, along the cleavage between the East and West Kootenays, until I reach the resort town of Invermere, where I turn west and head up farther into the mountains. After a while I pass the ski resort of Panorama, and the road narrows to rocks and gravel. Florian's directions say to continue on this road until it ends.

Stones thunk and clatter against the undercarriage of my car, yellow cottonwood leaves swirl in the autumn winds, and the tops of the mountains on either side of the narrow canyon gleam with the season's first snow. The sky is blue, even as the canyon is dark and cold. Why is there even a road here in the first place?

Florian is waiting for me at the trailhead, where, after introductions, we load our packs and start up the trail toward the high ridge far above, where Florian and his partner, Emil, have been staying in a stone hut for a few days and where on this day she has chosen to relax and wait for us. As we hike higher and higher, passing through old spruce forests, more of the Jumbo Valley becomes visible through the trees, like the glimpses of light seen through the stained glass of a church window. In the high cirque of the basin, we spy a couple of old clearcuts, tiny and ridiculous{em}faint scrapings on nearly sheer slopes, where the soil has since washed away to reveal bare gray rock. I explain to Florian that this is the way it was done back in the United States, too; how industry and renegade government land-management agencies would conspire to punch a network of roads, using taxpayer money, as far into the mountains as they dared, for any bogus reason. In the case before us, a thirty-mile road, costing five million dollars, provided access to a few loads of stunted timber{em}doing priceless damage to pristine wildlife habitat in the process, and leaving behind an environmental liability that the taxpayers would then have to either assume or ignore.

The higher we climb, the more beautiful the valley below us becomes, as do the high shelves and basins into which we are climbing. We talk some about the book project, and Florian cautions me that he thinks it's important to stay positive in our message{em}to improve people's vision of this area{em}to make them gasp at the beauty herein, a beauty they had previously not known existed.

And it's here, all around us; he's right. And he's right, I know, to not want to jump right in with lamentations, the long list of threats that seem to attend every magnificent landscape and every stunning animal. To instead let the first-time voyageurs, the new recruits and acolytes to the beauty of the region, come along at their own pace; to maybe fall in love first, and *then* mature to action. It was that way for all of us; why should we, in our desperate haste now, forget the necessity that love must come first?

And yet: For places like Jumbo, such time may not exist. Even now, a ski-town permit has been issued, over widespread local as well as international opposition, and with no scientific or engineering studies. An Italian investor has received permission to build an entire village on top of the Jumbo Glacier, in the heart of the southern Purcells. Such construction would devastate the Jumbo area immediately, from a wilderness perspective; but it would also act as a catalyst for coming extinctions, causing the narrowed taper of all of the rest of the southern Purcells, including my home a few hundred miles south, to break away from the main chain of wildness, like the floe of a calving iceberg breaking into the sea.

We're nearing the ridge, sweating hard, even in the late-day crispness of September rolling over into October. The forests are burning with the orange-gold of tamarack; just beyond us, the alpine country is stippled with ice and snow, and even with a few brave wildflowers, whose entire season of life, of blossom-and-pollination, is compressed into a few weeks. Wildflowers clinging to an inch or two of soil that has been ten thousand years in the making, and for which late September and the first few days of October{em}most other plants' and most other creatures' autumn{em}is spring, summer, and autumn all rolled into one: the burst, the rush, of life, and then quick senescence, followed by the deepest and coldest of sleeps.

Each step on the trail takes us higher into this country. We are enveloped by beauty now, and by the most elegant, fitting, and hard-gotten kind of grace{em}and once more, Florian can tell my thoughts, for he says, "First, we have to make them love it."

We gain the ridge, where new valleys fall away on all sides of us, each one as beautiful as the next, and waiting to be explored{em}waiting as if they had been formed for us ten thousand years ago, in order that we might know and love and explore them, though on their own terms. We're sweat-drenched, quad-burning, and exultant.

When we finally reach the stone hut, Emil is sunning on the porch, and it feels as if we have stepped back in time a hundred years. How rare{em}and valuable{em}is such an experience these days?

We talk about Jumbo for a while and ponder aloud about southern Canada in general, fretting over the chicken-and-egg question: *Can Montana survive if the southern Purcells and Kootenays fall*? and, conversely, *Can the southern Purcells and Kootenays survive, if Montana falls*?{em}and then the day is vanishing.

Florian's anxious to rush back up to a certain peak he's been working for days, learning the arc of the sun's path and its effects upon the basin and ridges below{em}the way it ignites, near day's last gasp, the orange candletips of those larch forests below and bathes the glacier in a strange red-pink. So he and Emil gather up their hundred-pounds-or-more of equipment and hurry off, here at what feels like the top of the world, and I take a trail in the other direction, delighted by what I consider to be one of the feelings of ultimate richness: the richness of always having new country to explore.

I crest a pass in the firelight sepia of alpenglow and start laughing with pleasure, joy, awe, wonder. Always, in wild country, it is this way: you feel relieved, upon entering such territory, whether it is new to you or much familiar. You feel born again: Here lies yet another world, grander than so many others.

There's a fierce wind up on the ridge. I sit behind an upturned slab of mountain to watch the end of day, to witness that orange blush of ancient alpine larches below. Their canopy, floating far below me, seems a lake of cooling, molten orange. I sit there for a long time. The setting sun sends red sundials into the violet sky, and brilliant stars appear. My hands are numb; it feels like January, not September. In the valley behind me, the crevasses seem to grow and widen, darkening in the twilight. Call it whatever you want{em}God, Allah, Pan{em}but how could someone *not* worship the force as well as the design and spirit that made these mountains and that keeps them among us, abiding, even now?

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That evening, as we dine by candlelight in the hut, Florian hits the high points again. He's relentless at staying on message and indefatigable in his hopefulness. "We need to improve our vision," he says, "we need to be positive." There's still room for sustainable development in the region, he says, but the connectivity between the wildest places must be protected or enhanced, and there must be more protected areas. We can't afford any more conservation "black holes," such as the Yaak. The entire living organism of the wild Northern Rockies{em}the gold standard of wildness on the North American continent{em}is at stake.

"Y2Y had always been in me," Florian says, remembering what it was like when he first heard of the project. He saved his money, bought his equipment, and came over to this continent from Germany to witness what had been only a dream and to pursue that dream.

It had been much the same for Emil. She first heard about Y2Y in Mexico City, from Florian. She looked at some of his photos and decided that she had to see the country, too, even though up to that time she'd never been out of Mexico City. She had never dreamed, she says, that such a world existed. She got on a bus and journeyed north three thousand miles to see it, evincing, like Florian, another kind of courage{em}the courage of hope.

It's beautiful, this cloudless, starry night, up on Jumbo: up on the top of the world. If one doesn't think of the future, it's absolutely perfect, with the mountain's enthralling beauty matched exquisitely by its once-upon-a-time promise of geological endurance.

####

Numerous small and beautiful rock-and-ice parks stipple the landscape north of Jumbo{em}the fantastic Bugaboo Glacier Provincial Park, and the extension of the forested Selkirk Range. Even amidst such amazing and glaciated scenery, this region, like every wild region, needs an icon, a beacon of hope and wildness, and in the central Y2Y, only another 60 or so miles east of Jumbo, Mount Assiniboine is that beacon. Mountain goats climb Assiniboine's cliffs (as do some humans). Historically, grizzlies have always been drawn to the lush high basins flanking and surrounding it, and they still are.

A big mountain radiates a kind of magic, a special force and an aura, and Assiniboine is that kind of mountain. Big country radiates that same kind of force and aura, and the Rockies of southern Canada{em}despite the fragmentation of the past century{em}are still, in many places, that kind of country.

Assiniboine's beauty is not "merely" surficial, the physical elegance of an ice-sculpture crafted by the frigid claws of the ice of the ages. Wildness and ecological health surround Assiniboine. This is what the best and most wisely protected areas do: They serve as cornerstone or foundation of all the values we hope to preserve, while providing connectivity between other areas, like the links in a chain. And while it is true that the weak link in a chain determines the ultimate low-end strength of that chain, it is also true that the ultimate capacities of strength and beauty and function are measured by the strongest link; again, to the human eye, Assiniboine is as strong and as beautiful as wild country gets.

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Biggest of the big in the central Y2Y, of course, is the internationally acclaimed Jasper-Banff area: the pride of Canada, as Yellowstone is the pride of the United States. Banff was Canada's first national park, established in

1885. If we had had a crystal ball back then and had known all that was coming in the next 120 years, we probably would have wanted to make it much larger, widening its bottlenecks and stretching it all the way up through the Jasper country and William Switzer Provincial Park, and into the Muskwa-Kechika, pulling in more of the lower elevations and wetlands across which the safe passage of wildlife was, back then, taken for granted.

Banff and Jasper are the prototypical big-and-beautiful parks, comparable in many ways to the Greater Yellowstone ecosystem of the southern Y2Y. They draw in millions of visitors from all over the world to gaze not just at unspoiled nature, but at such vast quantities of it, and to hope for a glimpse of wolves, grizzlies, mountain goats, bighorn sheep, and all the other wildlife that is no longer so abundant (or perhaps not even present) elsewhere in the world.

Banff, with its spectacular visual allure, as well as its size{em}**XXX** square miles (**XXX** square kilometers){em} which allows it to support so many outlying communities, has, since its creation, been cut into two pieces by a four-lane highway. Some wildlife overpasses have been created{em}certainly, not enough{em}and even with the overpasses, there is still a drastic diminution of connectivity, with hugely greater costs for wildlife attempting such migrations; and now another major highway (Highway 3) is being expanded. The overpasses and underpasses can reduce the rate of loss, but regardless of how many are implemented, every new road, and every new car passing through, brings a cost to the entire ecosystem. If we are going to preserve even the status quo of the thing we profess to love and be inspired by, we must at least match our zeal for construction and development with the same zeal for celebration and protection, and we must reconnect these increasingly isolated islands of beauty and ecological sanity.

Despite its size, the Banff-Jasper region is also an ambivalent reminder that preservation of natural beauty can serve a local or regional economy far better than the extraction of its resources{em}and yet living proof, too, that with that preservation comes a serious responsibility to prevent the protection itself from harming the resource. "Industrial tourism," the late Edward Abbey called it, or "industrial wreckreation," as a new generation of activists call it: the danger of loving a place to death.

In the absence of the truly vast regions of wild country{em}places like the Ireland-sized Muskwa-Kechika region of the northern Y2Y{em}it is the establishment of a greater series of parks and protected lands that will carry us into the future; and the degree of connectivity between these islands{em}particularly as ecological change begins to proceed rapidly, in a warming world{em}will determine the degree of success we achieve in this preservation of wildness. Now, more than ever{em}not just for reasons of social sanity and healthy outdoor recreation, but for ecological stability{em}the stressed and changing natural world needs some extra territory within which to work its magic; needs desperately some buffer areas in which to make its supple and elegant transition.

Any list of the incredible{em}and incredibly wild{em}places in the central Y2Y will be only a partial one, at best; and any recitation of the challenges involved in protecting and managing that wildness would run the risk of sounding like quite a litany of woe indeed. *Keep it positive*, we are reminded, even while working ceaselessly to make such visions as Y2Y a reality: protecting the Columbia Wetlands, Pincher Creek country along the spectacular and sheer Rocky Mountain Front, the Selkirks and their high-elevation populations of woodland caribou, the lush Elk Valley (with its coal mines and golf courses), and so many more.

For the Y2Y vision as a whole to succeed, this middle link between the southern and northern Y2Y is absolutely vital; lose it, and we lose also the leading edges at either end. It is in many ways the foundation of the entire dream.

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"There are no hopeless cases," writes conservation biologist Dr. Michael Soulé, "only people without hope, and expensive cases. That is, given the resources, even a handful of individuals can constitute the basis of a successful effort to salvage a population or species." He is speaking of endangered species' populations, but it occurs to me that he could also be addressing the visionaries, dreamers, and activists of the Y2Y Initiative.

And one of the greatest things about Y2Y is that upon closer examination, that which seems like a fantastic dream is *not* a dream, but a reality; it still exists, even if tenuously, into this new century. The pictures in this book are real, the animals are real, the places are real, as are the spaces between them.

Beyond Y2Y's advocacy and outreach about the importance of wild places, this is another of the great values of the Initiative: the way it focuses the mind on the magnitude of the problem and yet upon the viability of the solution.

What thrills me, as a lover of wild places, is that there are people of all ages working together toward a vision of greatness: people with the energy of a Florian Schultz, aspiring toward what Wallace Stegner called "a society to match our scenery."

How much of the work is altruistic{em}performed for the benefit of future generations we will never see or know{em}and how much of it is more immediate and self-focused, given our own passionate love for this vast landscape, is hard to say and, in the end, perhaps irrelevant.

What is not irrelevant is whether we succeed or fail. The first step, as Florian would remind us all, is to open our hearts and leap: to dare to love without reservation, and then to believe.

Rick Bass

Rick Bass is the author of twenty-one books of fiction and nonfiction, including *The Ninemile Wolves; The Roadless Yaak: Reflections and Observations About One of Our Last Wilderness Areas;* and most recently a novel, *The Diezmo*. His stories have been awarded The Pushcart Prize and the O. Henry Award and have been collected in *The Best American Short Stories*. Bass is a board member of the Yaak Valley Forest Council, Round River Conservation Studies, Cabinet Resource Group, and Montana Wilderness Association. For nearly twenty years he has been active in the attempts to help protect the last roadless lands of the Yaak Valley{em}the lowest-elevation, wettest-habitat, and narrowest bottleneck of the Y2Y section of the United States. Known as Montana's only rainforest, the Yaak still doesn't have a single acre of designated wilderness.

Northern Y2Y

The Wilder Side of a Wild Walk by Karsten Heuer

If I'd defined the geography of my expectations before starting the hike from Yellowstone to the Yukon, it would have conformed nicely with the boundary between the central and northern reaches of the Y2Y region. South of Jasper, Alberta is a place of busy highways, spreading subdivisions, burgeoning ranchettes, and overcrowded parks; north is a sparsely populated and inaccessible land where wildlife still flourishes. Eighteen months and 2,200 miles later, I would realize such expectations were only partly right.

Pull out a road map of the Y2Y region and you'll see what shaped and colored my thinking. To the south, protected areas like Yellowstone, Montana's Gates of the Mountains Wilderness, and the Waterton-Glacier International Peace Park appear as islands in a grid of red lines and black dots. But to the north, lesser-known parks like the Willmore Wilderness, the Cariboo Mountains, the Tombstones, the Muskwa-Kechika Management Area, the Spatsizi Plateau, and Nahanni National Park still float in a matrix of green. Trace a 400-mile-wide swath through that greenness, run it to the Arctic Circle, and the scale of the northern reach of Y2Y begins to hit home: half of northern British Columbia, a sixth of the Northwest Territories, two-thirds of the Yukon, and the vast majority of undeveloped watersheds left in the Rocky, Cassiar, and Mackenzie Mountains. Stone, bighorn, and Dall sheep graze in the eastern-front ranges of this huge area, wolverines wander through the buckling interior mountains and, to the west, grizzly bears feed on salmon a mere 200 miles from the rugged Pacific Coast. It is a land of few towns (fewer than twenty) and few paved highways (two). A land where wildlife trails outnumber roads ten million to one.

From Banff to Y2Y

When I first heard of the audacious Y2Y vision in 1995, I was too involved with a fight for local wildlife. corridors to take it seriously (a fight that, despite five years of carefully compiled research, we lost). Houses and golf courses were approved from one side of Alberta's Bow Valley where I lived to the other, and in the course of half a decade the best low-elevation route for wildlife in and out of Banff National Park was blocked by such development. Wintering moose could no longer get to their summer range, denning bears couldn't reach their favorite berry patches, and potential prey became unavailable to a pack of hungry wolves.

As a practicing wildlife biologist, I understood that the impacts of such poorly planned development were more than local. Radio-collared wolves had moved through the area on their way to Montana, Idaho, and northern British Columbia, as had lynx, cougars{em}even elk{em}that had ventured beyond the borders of Banff Park. The routes getting blocked in Alberta's Bow Valley were part of a regional network used by wildlife to find food, mates, and new territories, and to escape fire, flood, and disease. Yet land developers and planners were entrenched in old patterns, looking no farther than their own jurisdictions. Frustrated with such parochial thinking, I soon found myself reconsidering what I'd initially dismissed as too bold a vision. If conserving regional wildlife was the goal, I realized, then nothing less than a broad-scale vision like Y2Y would suffice.

But was it possible? Did the corridors at the heart of a reserve network that spanned half a million square miles even exist? I called Canadian and U.S. colleagues and spent time in the local university library, but soon realized that what I sought couldn't be found on the phone or in reports or books. The land held the answers to my questions, and to hear and see them I would have to move like a wolf or a grizzly bear, traveling from one Y to the other, step by step and on the ground.

Looking for Grizz

If the purpose of the hike was to gauge the plausibility of Y2Y, I needed a measure, and what I settled on as I walked out of Yellowstone was the presence or absence of the wilderness-dependent grizzly bear. Where I saw signs of recent activity, I assumed the cores and corridors of Y2Y were still possible; where I didn't, I presumed they'd been lost. Having worked on numerous projects studying the reclusive animals, I knew what to look for: tracks, rub trees, digs, and scat. If I was lucky, I might even glimpse the odd animal from afar.

A snow avalanche, the end of a two-year relationship with my girlfriend and hiking partner, a couple of near-misses with lightning, and a few bear encounters all muddled the pattern, but by the time I'd covered 1,200 miles and reached Jasper, Alberta, in the fall of 1998, I figured I had a trend. Without exception, the islands of grizzly bear habitat were growing as I moved north. It took one month to traverse the Waterton-Glacier protected area complex and two months to walk the conglomerate of protected areas around Banff and Jasper, with smaller

gaps between (two weeks of cow pies, four-wheel drive trails, and subdivisions north of Yellowstone; four days of mines, cottages, and clearcuts in British Columbia's Crowsnest Pass). If all I'd heard about points north was true, then there would be little if any development from there on.

Or so I thought.

Guided by Wolverine

The grizzlies were still hibernating when I continued north on skis after a three-month break in Jasper, and I left town with a new indicator by which to measure wildness, as well as a new companion. Both were strong, beautiful, and tenacious lovers of big, open spaces. One was the wolverine; the other was my future wife.

We weren't more than a few days into what promised to be the tougher half of a tough trip before Leanne and I got turned around. Physically, not figuratively, and not once but twice. Backing out of the dead-end canyon took hours of precious effort, and so did retreating from a false pass, but after doing so we noticed what we'd missed in our initial hurry: two-by-two tracks that avoided the hidden obstructions and went north in an aesthetic, graceful line. Somewhere in the trailless outback between Mount Robson Provincial Park and the Willmore Wilderness, we traded map and compass for the wisdom of wolverine.

For the next 28 days, so long as we stayed close to the wolverine tracks crisscrossing that country, we found a way around frozen waterfalls, through the deadfall of old forest fires, and across thinly iced rivers. When we didn't, there were problems: another near-miss with an avalanche; a deadly fall stopped short by a snow shelf; and a flounder through thick bush that transformed an hourlong shortcut into a two-day ordeal. By the time we reached the town of Tumbler Ridge in the eastern foothills of British Columbia's Northern Rockies four weeks later, we were exhausted and humbled, but deeply content. The animals had taught us something about moving{em}something about flow{em}and we struggled not to lose it as the first signs of humanity crept in.

Losing Sight of the Vision

The path into Tumbler Ridge had been laced with coal mines, and it was clearcuts, gas wells, oil rigs and flare stacks that lined the trail out. The snow was melting, bears were coming out of their dens, but there were no grizzlies along the Murray, Peace, or Halfway Rivers. Bulldozers, logging trucks, and other heavy equipment were all that moved for the next seven days, and we wound through all of it in a surprised state of shock.

"Last time I saw a grizzly around here was years ago," said Bruce Simpson, a rancher we met in the Halfway River Valley. "Back when we were still at the end of the road."

Simpson's ranch wasn't anywhere near the end of the road any more. In the last ten kilometers Leanne and I had passed five new road junctions, each bristling with signs pointing to new oil and gas wells. And unlike Simpson's old neighbors, the people driving the out-of-province pickups didn't even slow down as they passed, let alone wave.

"Goin' to check their dials so they can call the numbers into head office," said Simpson once the dust had cleared. "Makin' sure enough of the black gold is still flowing south."

Like the Amazon, the Congo, and other far-flung places in the world, Bruce Simpson's once-quiet homestead was being impacted by globalization. Trees, oil, gas, and minerals that were once too remote to extract were suddenly profitable in the age of mass transportation, labor-saving technologies, and dwindling world supply{em}a trend that has by no means been limited to the Peace and Halfway River valleys of Y2Y. The Yukon's first industrial-sized lumber mill started in the southeast corner of the territory in the late 1990s; plans for new mines bordering Nahanni National Park are in the latter stages of development; and with rumors of a Mackenzie Valley pipeline flying, Albertan and Texas-based companies are racing to find oil and gas in the Peel, Porcupine, and other Arctic watersheds. Contrary to popular belief, the need to establish connections for wildlife is as urgent in the north as it is in the south.

What differs, of course, is the dynamic that threatens them. Unlike the southern end of Y2Y, where the problems are often rooted in too many people loving a place to death (overcrowding of parks, subdivision of open ranchlands into retirement homes and executive retreats), an increasing number of wild areas in the north are in trouble because too few people love them enough. Scattered over vast distances, the sparse human population holds few activists, few recreational interests, and few organized citizen groups to champion a conservation cause. Those that do are far apart, rendering the area ripe for multinational corporations to move in. Resources are still plentiful, and opposition to how, when, and where these resources are taken hardly exists.

I watched as another pair of pickups rumbled past Simpson's house, and then I slowly scanned his yard. Fences were down, the old barn was half toppled over, but beside the weed-covered and rusted farm machinery sat a well-used bulldozer and a number of newer pieces of heavy equipment.

"Things got happening so fast it was either join in or lose out," said Simpson as he followed my eyes. "Cattle prices went through the floor, cost of farming through the roof, and I wasn't left much choice." Having hit

hard times, Simpson now spent most of his days pushing more seismic line and more roads deeper into the mountains.

I wanted to tell him about other ranchers I'd met farther south, ones who'd worked with conservation groups to battle the cash squeeze, but the poverty I witnessed kept me quiet. It was an old derelict mobile home we stood beside, and out its door came a long procession of sons, daughters, daughters-in-law, and grandchildren while we talked. Despite the tax incentives, and despite the benefits for wildlife, the kind of easements that curbed suburban sprawl farther south couldn't do much for a man caught between industrial development and how to feed his family their next meal.

Towards a Higher Order

Given the threats, pressures, and lack of resources available to them, what a handful of guide-outfitters, trappers, biologists, and conservationists achieved for the area Leanne and I walked into next is nothing short of remarkable. Faced in the early 1990s with the opportunity to do something different with a chunk of fifty undeveloped watersheds, they proposed (and eventually got) a made-in-the-north solution that resulted in a block of protected areas and connecting corridors bigger than Switzerland.

For those who know the Y2Y proposal, the approach taken to establish the Muskwa-Kechika Management Area will sound familiar, and it should, for it was informed by the same science, which warns that lone protected areas are inadequate to conserve wide-ranging species. As a result, the multi-year, multi-jurisdictional planning process initiated by the New Democrat government and forwarded by northern residents and industry made conservation history in 1997: Twenty provincial parks covering four million acres were established, connected by an eleven-million-acre system of Special Management Zones. Following the core-reserve-connecting-corridor model, the parks are off limits to development, while the Special Management Zones (a.k.a. wildlife corridors) allow for carefully controlled forestry and oil and gas activity where roads and infrastructure must be removed.

Into the Big Wild

After a week of watching earth movers, tree cutters, and other oversized machinery ripping through the land, I was ready for a little wilderness-imposed humility, and it didn't take long for the roadless, bridgeless Muskwa-Kechika to deliver. Brimming with an estimated 4,000 caribou, 15,000 elk, 22,000 moose, 5,000 goats, 7,000 Stone sheep, and more predators than anyone knows, it more than lived up to its reputation as the Serengeti of North America. Within a few days of walking, Leanne and I were immersed in wildlife encounters: a wolverine lumbering within meters in an alpine meadow, another scaling a waterfall where we sat eating lunch, a curious caribou following for half an hour, grizzlies grazing around our tent as we slept, and face-to-face meetings with surprised packs of wolves. Between such moments we swam the glacier-fed rivers, waited out the storms, and did our best to traverse nameless valleys and high passes without getting lost. As days grew into weeks, and weeks into a month, the mental clutter gave way to the rhythm we'd only touched earlier that spring. It was the trails of grizzly bears, black bears, elk, caribou, wolves, deer, coyotes, caribou, and porcupines we followed now, not just wolverines, and with each footstep we felt a little more of the grace that had ended so abruptly with the mines and development around Tumbler Ridge.

It was deep within that flow, deep within our 50-day traverse of the Muskwa-Kechika, that the power of big wilderness took hold. I was alone at the time, scouting a potential route while Leanne packed camp, when the moment I'd carefully avoided all trip confronted me. Coming up the canyon behind was a large and determined bear.

It was a black bear, not a grizzly, but it didn't matter, for it had the claws, teeth, and power to injure or kill me, which seemed its intent. Unlike the dozens of bears we'd encountered in the months before, this one showed no timidity, shyness, or fear. Half-crouched and continuing its approach despite my shouts and arm-waves, it stalked me as a potential meal.

My outward reaction{em}rocks thrown, urine leaked, and profanities screamed{em}is less important than what happened inside. In the pinpoint of time where death hung in the balance, a sharp vitality took over, seconds stretched into minutes, and the textures, smells, and sights of the outer world moved within. Cold stone fused with fingers, ursid and human eyes connected, and with the babbling creek determining the tempo, an age-old dance played out. There were no houses to run to, no help to call for, no gun to draw. I had moved from the sidelines of life to the main playing field, and in the moment of reckoning, a sharp instinct picked up where the illusion of security and control left off.

When one of the fist-sized rocks connected with the bear's shoulder, it stopped and hesitated. I volleyed a whole new wave of stones and shouts in that pivotal moment, trying to wedge a crack of uncertainty into a rift of doubt. Another rock hit with a thud and the bear turned, looked back at me one last time, then fled. I stood there dazed for a few minutes, trying to orient myself in a future different from the death I'd already accepted. The

pounding subsided in my chest, shaking legs grew quiet, and what had been a rich interlude in day-to-day living yielded back to the blunt edge of conventional time.

Commitment to Place

We were different people when we emerged from the fifty-day traverse of the Muskwa-Kechika, and part of me worried that as the trip came to a close, we would find ourselves returning to a world where we no longer fit. Fortunately, our first stop back in civilization was Lower Post, a Kaska Dena community straddling the British Columbia{en}Yukon border.

Unlike the Native American communities I'd visited farther south, Lower Post wasn't an Indian reservation, and it wasn't surrounded with development that had foreclosed all possibility of living from the land. As was the case with most (but not all) First Nations in the northern reach of Y2Y, recent or still-pending land claims ensured native people the right to control natural resources within their traditional territories. For the Kaska, that meant hunting, fishing, and trapping in much of the Northern Rockies and southern Mackenzie Mountains. They had all the modern conveniences{em}a satellite dish was mounted on every stick-frame house, and inside the First Nation offices were computers hooked to the Internet{em}but as I was soon to find out, the people were different from the brash outdoorsmen and protective ranchers I'd met farther south. Forays into the surrounding wilderness weren't mere recreation. The Kaska were still deeply rooted to the land.

I had stood in front of hundreds of crowds before, but that night I was nervous as I got up to speak about Y2Y and show slides from the trip. Unlike many of the audiences I'd talked to in the towns and cities during the southern half of the trip, the chiefs and residents that had gathered in Lower Post's school gymnasium understood the cycles and needs of animals more deeply than I did. I consequently found myself glossing over the reasons behind Y2Y and homing in on what I'd seen instead. After touching on some of the key threats, I delivered my main message: In walking 2,100 miles from Yellowstone, I'd crossed only ten paved roads and five railways, and I had seen fresh sign of grizzly bears 85 per cent of the way.

When the lights came up, not only did I see hope for Y2Y reflected back in every face, but soon I was inundated with people leading me to the maps taped to the wall.

"Here, this is where I still trap," said one man, brushing his brown, weathered hand over a corner of the paper. I glanced to where he pointed, an area west of where Leanne and I had hiked, but still days from any road. "I walk there too," he beamed.

"This is where my grandfather's trail runs," said a visiting chief from Ross River, Yukon. She was a small woman, and she could hardly reach the green curving lines towards the north end of the map. "We still hunt moose in those valleys every year."

More came after her, a whole string of people eager to talk about their own ties to the land, and in each one of them I sensed the humility and respect that I had only recently discovered. Because they lived surrounded by wilderness, and because they still walked into it, each one of them had his or her own story of an aggressive moose, a charging buffalo, or a marauding bear.

By the time the last of the people had left the gymnasium that night, I'd heard enough mention of "coming economic opportunities" to know a new era was about to start in Lower Post. As in every other place once considered remote, development now knocked on the Kaska Dena's door. Meetings with oil and gas companies had already started, and there was talk of beginning a small-scale forestry program soon. But when we left the next morning and started walking the last few days into the Yukon, I was more comfortable than usual with the thought of environmental losses being weighed against economic gains. The difference wasn't in the value of the area{em}the Liard Basin where Lower Post sat was part of a critical link between the Rocky and Mackenzie Mountains{em}but in the people doing the weighing. Unlike the faceless, calculating men from distant companies driving past Bruce Simpson's ranch, the Kaska{em}and their future families{em}would have to live with the consequences of their decisions. A poorly planned seismic line, for example, would lead wolves to a favorite moose hunting ground; washouts from roads and practices like clearcutting would ruin the spawning beds of the fish they netted each fall. The checks and balances between human and nonhuman residents were still intact with the Kaska Dena, and my hunch was that despite the challenges that lay ahead, that relationship would survive.

No Boundaries, No End

We crossed the Yukon border and walked into the town of Watson Lake two days later, finishing on September 8, 1999, what had started in Yellowstone, Wyoming, 2,200 miles and 18 months before. In that time, I'd seen enough grizzly bear sign and met enough conservation-minded people for a different geography to have taken form in my mind. Sure, there were problems{em}threats to wildlife movement as real and urgent in the north as they were in the south{em}but having walked the connections as well as the islands, and having seen fresh grizzly

bear and wolverine sign 85 percent of the way, I knew that what was audacious was also possible. What had been a map of black dots, red lines, and green islands that might or might not be connected was now a geography of hope.

Snowflakes fell with the rain as we walked the last few miles into Watson Lake, and I thought of the 123,000 caribou gathering for the winter in the taiga forests at the northern tip of Y2Y. A part of me regretted not walking the final 600 miles to see such a spectacle, but to do so would have meant keeping going for at least another year. And even then the journey wouldn't have ended. No sooner would we have arrived among the caribou than they would have set off again, migrating north to their calving grounds, through Alaska's Brooks Range to the Arctic coast.

Like the grizzly bears, the wolverines, and every other wide-ranging mammal we'd followed, the caribou would tell us what our tired muscles and achy bones already knew: There are no boundaries to the Y2Y vision no borders beyond which wildlife do or don't go.

But for Leanne and me there were limits. Too skinny and sore to keep going, we stopped for a short but welcome rest.

In 2003, Karsten Heuer and Leanne Allison continued their northern adventures, following the Porcupine Caribou herd from their Yukon winter range to their endangered Alaskan calving grounds and back.

Karsten Heuer

Trained as a biologist and recipient of the 2003 Wilburforce Foundation Conservation Leadership Award, Karsten Heuer has spent the better part of the last decade studying and, in some cases, actually following wide-ranging and threatened wildlife on foot. He has worked as a wildlife biologist and park warden in the Madikwe Game Reserve in South Africa, in Canada's Yukon Territory, and in Banff and Jasper National Parks in the Canadian Rockies. Accompanied by his wife and his border collie, he walked 2,200 miles from Yellowstone to the Yukon in 1998/99, and another 1,000 miles to Alaska's Arctic National Wildlife Refuge with the 123,000-member Porcupine Caribou herd in 2003. He is author of *Walking the Big Wild: From Yellowstone to the Yukon on the Grizzly Bear's Trail* and is currently writing his second book, *Being Caribou.* He lives with his wife and son near the base of Mount Robson in Dunster, British Columbia.

Land at the End of the Trees

Dechenla by David Porter

Dechenla is a wild place where the mountains unfold to embrace the land. Pristine peaks rising as high as 10,000 feet surround a plateau that is nearly twenty miles in diameter. Dechenla, or "Land at the End of the Trees," is a subarctic oasis with open tundra and alpine lakes in the traditional territory of the Kaska Dena. It is located just beyond the Yukon border in the Northwest Territories, surrounded by the Mackenzie and Selwyn Mountains. The region has been given special significance through the International Biological Program, indicating that scientists recognize it as a unique area because of its significant natural heritage.

I am a member of the Kaska Dena, one of Canada's remote indigenous groups. The Kaska are a group of five communities in northern British Columbia and the Yukon who govern themselves as a single nation. Our traditional territory consists of 93,000 square miles of resource-rich land. It covers 25 percent of the Yukon, 10 percent of British Columbia, and adjacent lands in the Northwest Territories, including Dechenla.

The welfare of my people is inextricably linked to the land and animals that share it with us. We are constructing a Kaska Conservation Initiative to develop a conservation strategy for places like Dechenla and all of the Kaska Traditional Territory. We are attempting to learn from the bad decisions that have occurred in southern Canada and the Lower 48 states. Our efforts are founded on the principles of conservation that our people have always practiced.

Dechenla is a gathering place that has provided subsistence for people and animals for thousands of years. Biologists say more than 130 species of birds have been recorded at Dechenla. Visitors say this is a rare and magical place where the world still exists as it once was. In the summer months, four herds of mountain caribou walk this land in sight of moose, Dall sheep, wolves, grizzly bears, wolverines, and gyrfalcons.

For the Kaska Dena, Dechenla is an ancient spiritual place on the Dene Etene, or "the people's trail." The trail follows the natural corridor that runs from the Yukon to Yellowstone, a long stretch of land that binds all Dene together. It is believed that some Athapaskan ancestors left our northern land and traveled down the Dene Etene. Today, there are sixty groups of Athapaskan-speaking people in North America, including the Tutchone and the Sekani in Canada's North and the Apache and the Navajo in the United States.

Trails in the northern region of the Dene Etene remain an important part of aboriginal life. They provide access to hunting grounds, seasonal camps, and remote communities. In the Kaska Dena territory alone, the network of trails stretches over a thousand miles, from Kwadacha in British Columbia to Dechenla in the Northwest Territories.

The Kaska Dena and other northern subsistence-based indigenous groups, such as the Vuntut Gwich'in, who live in Old Crow, north of the Arctic Circle, are more fortunate than many of North America's aboriginal people. The land has provided for our people for millennia, and many still depend on wildlife for subsistence. We appreciate all that we have, and we view it as a sacred responsibility to care for the land and the animals that inhabit it. We must ensure that it will continue to provide for our people in the future as well as it has in the past.

Although we still enjoy an abundance of wildlife on our lands with a wealth of species, we listen with grave concern as elders and scientists tell us that some species in the south are at risk of extinction and many species are being sentenced to genetic islands that they can't escape. Transportation corridors, oil and gas fields, and mining interests continue to encroach on rare and wild spaces. We fear the effects development can have on our territory as industry marches north on a quest for resources. For us, conservation measures are imperative to ensure the longevity of all species and to maintain our traditional way of life.

There is a clear need to spark the ancient connection to the land once again, not only for the benefit of the Kaska Dena, but for all people. The tone and timbre of discussions about the future of development in this region must continue to be reframed and broadened to engage citizens, governments, industry, and organizations in a cooperative effort. Organizations must work together to maintain a wilderness that will allow wildlife to move freely across artificial political boundaries. Industry and government have extracted tremendous wealth out of the Rocky Mountains and the surrounding region, and they have an obligation to participate in efforts to protect our shrinking wild world.

The aboriginal people of North America have the potential to play a leadership role as this conservation dialogue unfolds. North America's indigenous people are the largest single private landowners in Canada and the United States. In northern Canada alone, we own over 250,000 square miles of land, much of it with subsurface rights. That is an area as big as Alberta, bigger than California. Many northern land claim and treaty agreements have set aside large tracts of land for conservation purposes.

Our elders will guide us in our efforts to manage our lands. While some in scientific circles may still question the value of traditional knowledge, Kaska elders have repeatedly demonstrated the value of traditional knowledge in conservation planning efforts. For example, for years, Kaska elders told scientists about a particular area near Ross River, Yukon, that supported a healthy moose population. It was a place that could always be counted on to sustain our people. Recent government surveys have confirmed this assertion and revealed that this area has the highest densities of moose ever recorded in the Yukon. We strongly believe that traditional knowledge should be used in all land, wildlife, and resource planning efforts and be given an equal weight with scientific method.

While our elders' wisdom will guide our decisions, engaging youth in conservation efforts offers the greatest hope for long-term success. Many philosophies of the old ones are being taught to the young. Annual youth camps bring elders and biologists together at different sites throughout our traditional territory to share traditional and scientific knowledge with young people. Participants at a recent camp at Moose Lake, British Columbia, constructed a moose-skin boat{em}an art once feared lost that is now being rediscovered. We are willing to share our knowledge with others as well. In 2000, we hosted youth from seven foreign countries and twenty-two First Nations at a special Millennium Youth Camp on the Turnagain River in British Columbia. In addition to learning survival skills, participants learned how to make beadwork moccasins and how to make bannock, a traditional flat bread, over an open fire.

Our conservation efforts will succeed. In fact, many significant contributions to conservation have been initiated by aboriginal people. Canada's indigenous people have insisted that most land claim agreements between First Nations and government have one or more special management areas where environmental and cultural values take precedence over development. Special management areas include national parks, national park reserves, national historic sites, migratory bird and wildlife sanctuaries, and watershed protection areas as well as other places where careful management is required. The objective with these areas is to maintain important features of the natural or cultural environment to benefit the public while respecting the rights of indigenous people.

Other Kaska Dena conservation efforts include negotiating a Memorandum of Understanding with the governments of Canada and the Yukon in 2002 that initiated an ecosystem-based forestry management process for a 110,000-square-kilometer region in the southeast Yukon.

Now it is our task to apply our skills and knowledge to conserve the valuable habitat in the much larger Yellowstone to Yukon region, as industrial encroachment continues to threaten some of North America's most important wild spaces.

For the Kaska Dena, conservation success will mean certainty that the plants and animals who share the land with us will thrive in the future, and that all people will be able to find a spiritual place in North America's shrinking wilderness.

David Porter

Dave Porter is a Kaska Dena leader who spent his early years on a trap line near Good Hope Lake in British Columbia. His accomplished career includes journalism, politics, communications, and public service on behalf of Canadian aboriginal organizations as well as governments in the Yukon, British Columbia, and the Northwest Territories. He was founding chairman of Northern Native Broadcasting, Yukon, and was a two-term Vice-Chair of the Council for Yukon Indians. He has served as Deputy Premier of the Yukon and as Assistant Deputy Minister of Aboriginal Affairs for British Columbia. As the first Oil and Gas Commissioner in British Columbia, he strove to build an open regulatory environment that would bring various interests in the province to a common table. In 2004 he was elected to the First Nations Summit, which works on behalf of First Nations involved in the treaty negotiation process in British Columbia. He is committed to preserving indigenous culture and creating greater opportunity for aboriginal youth.

Epilogue by Robert F. Kennedy, Jr.

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LEAVE ONE PAGE. EPILOGUE SHOULD RUN 500 WORDS.

Where We Are and Where We Go from Here

Y2Y Today by Harvey Locke and Gary Tabor

The vision of the Yellowstone to Yukon Conservation Initiative (Y2Y){em}*People working together to ensure that the world-renowned wilderness, wildlife, native plants, and natural processes of the Yellowstone to Yukon region continue to function as an interconnected web of life, capable of supporting all of the natural and human communities that reside within it, for now and for future generations{em}*has come a very long way in a very short time. Since 1993 the effort to realize a unified ecosystem linked from one end of the region to the other has grown from a simple idea to an ongoing movement that is already making significant differences in the protection of wildlife habitats and movement corridors and in the ways that people think about their role in caring for the land.

People working together: Those three words are essential to the continuing realization of the Yellowstone to Yukon dream. It began with scientific researchers developing a clear understanding of what is at stake in this astonishing region. "Look at the populations of fourteen key carnivores and ungulates and you'll find that the only place left in North America with a high density of all those species is Y2Y," explains Rob Buffler, Executive Director of the Yellowstone to Yukon Conservation Initiative. "The science is helping us understand the continental significance of the landscape."

Scientific studies have identified critical core habitats and linkage corridors that require protection and innovative management to preserve the spectacular ecological diversity that unifies Y2Y and defines its innate wildness. From the Greater Yellowstone Ecosystem north through the Salmon-Selway-Bitterroot Mountains, the Northern Continental Divide Ecosystem, the Canadian Rocky Mountain Parks complex, and the Muskwa-Kechika all the way to the wild expanses of the Yukon and the Northwest Territories, researchers are making remarkable progress in designing practical proposals that will help advance protection and management goals.

We are now past defining vision and well into the second phase of Yellowstone to Yukon, that of encouraging individuals, organizations, foundations, and governments to engage in the actual work of making proposals realities by safeguarding critical habitat, establishing wildlife movement corridors, and completing a multitude of other stewardship projects that will have a lasting impact on the quality of this continental-scale "wildlife highway" that is the Y2Y bioregion.

There have already been many successes on the ground, including the construction of wildlife road-crossing structures, the establishment of new parks, the designation of special management areas on public lands, and certification of some sustainable forestry areas. In places like Montana and Alberta's Rocky Mountain Front, private landowners working with land trusts are finding ways to ensure that their properties remain wildlife-friendly. Larger-scale efforts are under way, as well. For example, the Yellowstone to Yukon Conservation Initiative worked with Nature Conservancy of Canada and the forestry company Tembec, Inc., to secure almost 450 square kilometers of forested private lands in the Elk and Flathead Valleys, allowing wildlife to move more freely through portions of southeastern British Columbia and southwestern Alberta. Strongly supported by the East Kootenay Environmental Society (now Wildsight), the Canadian Parks and Wilderness Society, the Montana Chapter of The Nature Conservancy, and donors from across the continent, the acquisition represents the biggest private conservation project of its kind ever undertaken in Canada.

Public interest and involvement in Y2Y has been encouraged by many gifted and committed individuals. Spurred on by American conservationist Ernie LaBelle, the National Geographic Society in 2000. published Douglas Chadwick's *Yellowstone to Yukon,* the first book on the Y2Y vision. Canadian park warden and biologist Karsten Heuer walked from Yellowstone to the Yukon and in 2004 produced a book of his own{em}*Walking the Big Wild: From Yellowstone to the Yukon on the Grizzly Bear's Trail.* Other foot travelers, including Walkin' Jim Stoltz and Josh Burnim, have journeyed through significant portions of the Y2Y landscape, then brought their stories and songs to classrooms and community gatherings throughout the region. Grade school teachers and college professors alike are including the Y2Y concept in their courses. Several Ph.D. dissertations and a number of masters' theses have focused attention on issues surrounding Y2Y. Local, national, and international media have featured the Yellowstone to Yukon idea.

A crucial aspect of the Yellowstone to Yukon Conservation Initiative is the understanding that the well-being of the people of the region is interconnected with the health and vitality of the land and its wild creatures. First Nations and Native Americans have always known this and are increasingly sharing their wisdom and taking an active role in the management of the region for the benefit of all species. In Wyoming the Shoshone tribe has established the Wind River Alliance to coordinate the efforts of conservation groups improving the water quality of Wind River Watershed. In the Northwest Territories, the Deh Cho First Nations are supporting a major expansion of Nahanni National Park, and in British Columbia the Kaska Tribal Council and members of the Kaska Dena have been key to the creation and protection of the Muskwa-Kechika Management Area. In northern Canada, the Deh Cho, Kaska Dena, and Tetl'it Gwich'in First Nations are turning the Y2Y vision into reality by striving to build successful, vibrant communities and economies on principles of conservation planning that protect and connect critical wildlife habitats.

Under the umbrella of the Yellowstone to Yukon Conservation Initiative, a host of conservation groups, businesses, scientists, and other advocates are assembling the pieces of the Yellowstone to Yukon puzzle. The Y2Y network today includes over two-hundred nonprofit organizations, business, and charitable foundations, about evenly split between those in the United States and those in Canada. Working cooperatively, they are supporting one another's ventures and learning from their successes how the efforts of everyone across the region can contribute to the whole.

Ensuring the ecological integrity of an area so immense and diverse may seem daunting, but there are precedents for success. The establishment of Yellowstone National Park in 1872 was a revolutionary concept for its time, as was the formation of Banff National Park a few years later. With the creation of Waterton-Glacier International Peace Park in 1932, Canada and the United States recognized that political borders are meaningless to Nature. Those leading examples of setting aside lands for the sake of wildlife and of present and future generations have influenced the formation of the many more parks, designated wilderness areas, and other protected lands not only in the Yellowstone to Yukon region but also around the world.

In many cases, the boundaries of those protected areas were drawn without a full understanding or acknowledgment of the greater ecosystem surrounding and ultimately connecting the many islands of wild land. If we have learned anything from wildlife, it is that lines on a map mean nothing. Animals and plants do not distinguish between protected and unprotected lands{em}there is simply the place where they live. For many species, that home stretches from Yellowstone to the Yukon.

The challenges for conserving the ecosystem of the Y2Y region are immense, filled with opportunities for individuals and organizations to educate one another, share ideas, and seek out

solutions. It will take at least one lifetime, and perhaps several, before the goals of Y2Y are fully realized; but the vision is in place, and the momentum necessary to continue has been developed. Across the entire region, people are applying their talents and energies with tremendous enthusiasm, secure in the knowledge that they are engaged in an effort that is truly important, possible to achieve, and of great value today and for generations to come.

The website of the Yellowstone to Yukon Conservation Initiative (www.y2y.net) contains a wealth of information for individuals, organizations, and foundations who want to help advance the vision of Y2Y. Here are some possibilities:

- Visit the website and join the Yellowstone to Yukon Conservation Initiative. Monetary contributions provide a tremendous boost for programs designed to maintain one of the world's most cherished mountain environments.
- Stay informed about current issues through Y2Y links to publications, and take action on issues that concern you. Your connection to Y2Y helps sustain the landscape connection of the Y2Y region.
- Volunteer time, energy, and ideas. More than two hundred organizations, businesses, and charitable foundations are actively involved in forwarding the vision of Y2Y. Many have opportunities for volunteers to help with projects.

Just as Yellowstone and Banff National Parks have served as benchmarks in the preservation of wild lands, Y2Y is a beacon of what is possible for the protection of ecosystems that encompass far more than a few designated parks and forests. The beginnings of other conservation initiatives around the world (Baja to Bering in the Eastern Pacific, Algonquin to Adirondacks in eastern North America, the Trans-Limpopo effort in southern Africa, the Gondwana Link in Australia, and the Cantabric-Pyrenees-Alps Initiative in southern Europe, to name a few) resonate with the energy and success of the Y2Y vision. Yellowstone to Yukon is an idea whose time has come, and a testament to the power of a vision when people apply knowledge, initiative, and their hearts to creating a better future.

Harvey Locke

Harvey Locke grew up in southern Alberta. His family, among the area's earliest European settlers, has been in Bow Valley for seven generations. Locke first visited Yellowstone in 1979 and knew intuitively there was a connection between it and the Canadian Rockies. This interest led him to help create the Yellowstone to Yukon Conservation Initiative, for which he now serves as strategic advisor. He also serves as a program advisor to Tides Canada Foundation; senior advisor, conservation, to the Canadian Parks and Wilderness Society; an advisor to the Canadian Boreal Initiative; a director emeritus of The Wildlands Project; a member of the World Commission on Protected Areas; a member of the executive committee of the Eighth World Wilderness Congress; and a trustee of the Eleanor Luxton Historical Foundation. In 1999 *Time* Canada magazine named him one of Canada's leaders for the twenty-first century.

Gary Tabor

Gary Tabor is the head of Wilburforce Foundation's Bozeman, Montana, office and its Yellowstone to Yukon Program, which promotes science and conservation to maintain ecological connectivity between parks and protected areas in the U.S. and Canadian Rocky Mountains. He was trained as a wildlife veterinarian and ecologist. His career spans international and North American wildlife conservation domains, including seven years in East Africa and one year in South America. After helping to establish several protected areas abroad, Gary was asked by his African colleagues to name any of his successes back home. This epiphany led to his catalytic involvement in helping to transform the Y2Y vision from theory to reality{em}first as Associate Director of the Henry P. Kendall Foundation in 1995 and now with Wilburforce.

Yellowstone to Yukon

Epilogue by Robert Kennedy, Jr.

The stunningly beautiful photographs of Florian Shultz and these marvelous essays bring to life one of the biggest and most spectacular wild places in North America: the mountainous backbone of the continent that is the Yellowstone to Yukon region. This natural garden of Eden is home to a vast array of living beings. It is a refuge for species such as the wolf, grizzly, and trumpeter swan that have been eliminated or drastically reduced elsewhere. At its heart is wilderness, a resource that enriches humanity and has played a particularly critical role in defining the culture and national character of Canada and the US. David Suzuki reminds us that wilderness links us to a unique spiritual legacy, to the seasons and the tides, and the 10,000 generations of human beings who lived before the laptops.

Europeans destroyed the last of their wilderness 1000 years ago. But in the US and Canada, we have managed to preserve some vestiges, such as those illuminated on these pages, thanks to leaders who recognized our strong cultural and historical connections to wilderness. Out of our wilderness experience we grew in self reliance, physical courage and fortitude. Following the close of the frontier 100 years ago, concern mounted that Americans would lose these traits and become soft. This fear led Teddy Roosevelt to recreate himself as a frontiersman, and drove President Kennedy to climb Mount Kennedy, the tallest unclimbed peak in the Canadian Rockies, and take our family hiking in national parks and paddling on whitewater rivers. He saw these adventures as frontier metaphors that allowed us to struggle with nature without destroying it.

Today the challenge of living with wild nature without harming what we love is crystallized in the battle over the future of the Yellowstone to Yukon region. Here, even in what appears to be some of the most remote country in the continent, the pace of development is escalating. As several authors point out in this book, we now know that the parks and wilderness areas are too small and isolated to maintain the wildlife they were intended to protect.

This comes at a time when new technologies, combined with aggressive energy policies on both sides of the 49th parallel, are turning the last habitat for bighorn sheep, wolves and trout into industrialized zones with pipelines, pump stations, and oil rigs. In Canada, whole mountaintops are being removed to dig coal near Waterton and Jasper national parks. Ancient forests are being clearcut and habitat destroyed for wildlife that has no where else to go. Native trout populations are collapsing as a result of dams and water developments.

Tragically, the environmental crisis here is repeated around the world.
Ocean fisheries have dropped to 10 percent of their 1950's levels, the earth is warming, the ice caps are melting and sea levels are rising. Asthma rates in this country are doubling every five years. A UN report showed that 30 percent of the world's mammals

are imperiled. All this at a time when our president is engaged in the radical destruction of 30 years of environmental law.

Why is this happening? Because of the domination of both governments by large corporations that are driven to maximize short-term profits at the expense of the interests of future generations. Massive governmental subsidies to energy, lumber, mining and agribusiness – with some of the largest subsidies occurring in the west -- are driving the destruction of the last remaining wild places such as the Y2Y region.

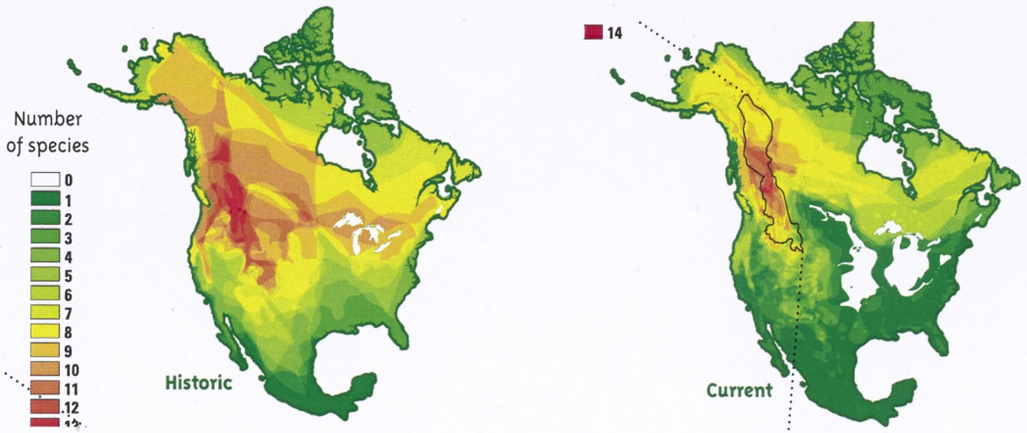
To enrich a wealthy few, both governments are borrowing from our children, poisoning our water and air, destroying our public lands and sacrificing our health. No place is so exempt from this exploitation. Not the wilderness that shaped our culture, not Yellowstone, our nation's oldest national park, nor the magnificent Canadian mountain parks. Not the last few grizzly bears hanging on by a thread in lower-48 states and Alberta.

Here, in the wild heart of North America, we must take a stand. We must stand firm on the principle of wilderness that has shaped our identity and spirit. We must stand up for wild creatures who have no voice in government. We must stand and fight against the forces of short-term profit over the interests of future generations. We must also learn to live the wisdom expressed on these pages on living respectfully and humbly with wild nature. We must put into action the scientific understanding described here of how to maintain natural corridors between ecosystems.

If we are to prevail, no one can sit on the sidelines. The pressures are mounting and the window of opportunity is closing rapidly. Faced with such powerful forces for development, we must find new ways of working together, each and every one of us, contributing what we can to make this vision of a connected wildland complex from the Yellowstone to the Yukon a reality.

This means making all the tools of democracy work. Protesting and litigating harmful proposals and efforts to rollback environmental laws. Passing legislation to protect new parks and wilderness areas. Working with First Nations to sustain their cultural traditions and preserve the land and wildlife upon which they depend. Buying lands for conservation purposes. Developing new initiatives at the local level to keep the water and air clean and the wildlife and human communities healthy. Taking back the political process. At bottom, this will require courage, a commitment to community, and a willingness to make sacrifices on behalf of future generations – all qualities we learned through our wilderness experience.

If we fail and allow these last wild places to be destroyed, we will diminish ourselves and impoverish our children. If we succeed, we will rediscover what it means to be an American – Canada and US. And we will give the world an example of what conservation can mean, which will be as significant for our time as the establishment of Yellowstone and the Canadian Mountain parks were over a century ago.



habitat<I> on a mainland. Why? One major reason, as explained by MacArthur and Wilson, is that small islands tend to lose species more quickly than big islands do, while big islands lose species more quickly than mainlands. And why is that? Because a small island can support only a small population of, say, this species of reptile or that species of bird; a small population is more vulnerable to the various sorts of adversity (such as inbreeding depression, disease, climate change, food-supply failure, or competition from invasive species) that might wipe it out; and such wipeouts occur inevitably with the passage of time. Small populations go extinct under circumstances in which big populations merely fluctuate. Isolated populations go extinct under circumstances in which mainland populations refill the gaps. Net result: Fragmentation of habitat into ecological islands leads to loss of diversity in each fragment. Loss of diversity leads to ramifying dysfunction of a sort sometimes referred to as "ecosystem decay." Trophic levels begin to wobble and tip. Things fall apart. The disappearance of a predator species, for example, may allow a population explosion among a prey species, resulting in depletion of plant resources, erosion, siltation, and destruction or loss elsewhere in the ecosystem. Maintaining connectedness does the opposite, helping preserve species diversity and ecosystem integrity throughout the whole.

This is abstract stuff. Theoretical talk, hypothetical scenarios. Now let's make it concrete. The grizzly bear (as we call <I>Ursus arctos<I> in western North America) is one species that stands sorely jeopardized by the prospect of increasing insularity.

If you look at a map of grizzly bear distribution in 1920, as reconstructed from reliable sources, you'll see small, isolated populations in central Arizona, western New Mexico, southwestern Utah, and the southern Sierra Nevada of California, and along the spine of the Rockies in Colorado. All those populations are now gone. Defunct, dead. They vanished, one by one, as a result of island effects and other factors (such as hunting). Nowadays, within the lower 48 states, grizzlies survive in just five areas: the Greater Yellowstone Ecosystem, the Northern Continental Divide ecosystem around Glacier National Park, the Cabinet-Yaak ecosystem in extreme northwestern Montana, the Selkirk Mountains of northern Idaho, and the North Cascade Mountains of Washington. Of those areas, all but the North Cascades are embraced within the Y2Y zone of attention. But the Selkirks (harboring no more than a few dozen bears) and the Cabinet-Yaak (with only about twenty) are perilously circumscribed by roads, logging, and other forms of landscape conversion, with further activities looming that could isolate them completely. And the Greater Yellowstone Ecosystem, the southern linchpin of the Y2Y concept, is already an island as far as grizzly bears are concerned–an island on which somewhere between 300 and 600 grizzlies are marooned.

Is the Yellowstone population sufficiently large to sustain itself indefinitely against those troubles I mentioned–inbreeding, food-supply failure, and other forms of catastrophic bad luck? Probably not. With continued isolation on its ecological island (which grows ever smaller as human incursions proceed), the Yellowstone grizzly will be squeezed toward extinction. It might last a hundred years. Or it might founder and die out within this century. And yet the U.S. Fish and Wildlife Service, based on tenuous calculations of what constitutes "recovery" of that population, now seems intent on "de-listing" Yellowstone's grizzlies–that is, removing them from protection under the Endangered Species Act. Can the population <I>ever<I> recover so long as it's trapped within Yellowstone Island? I don't see how.

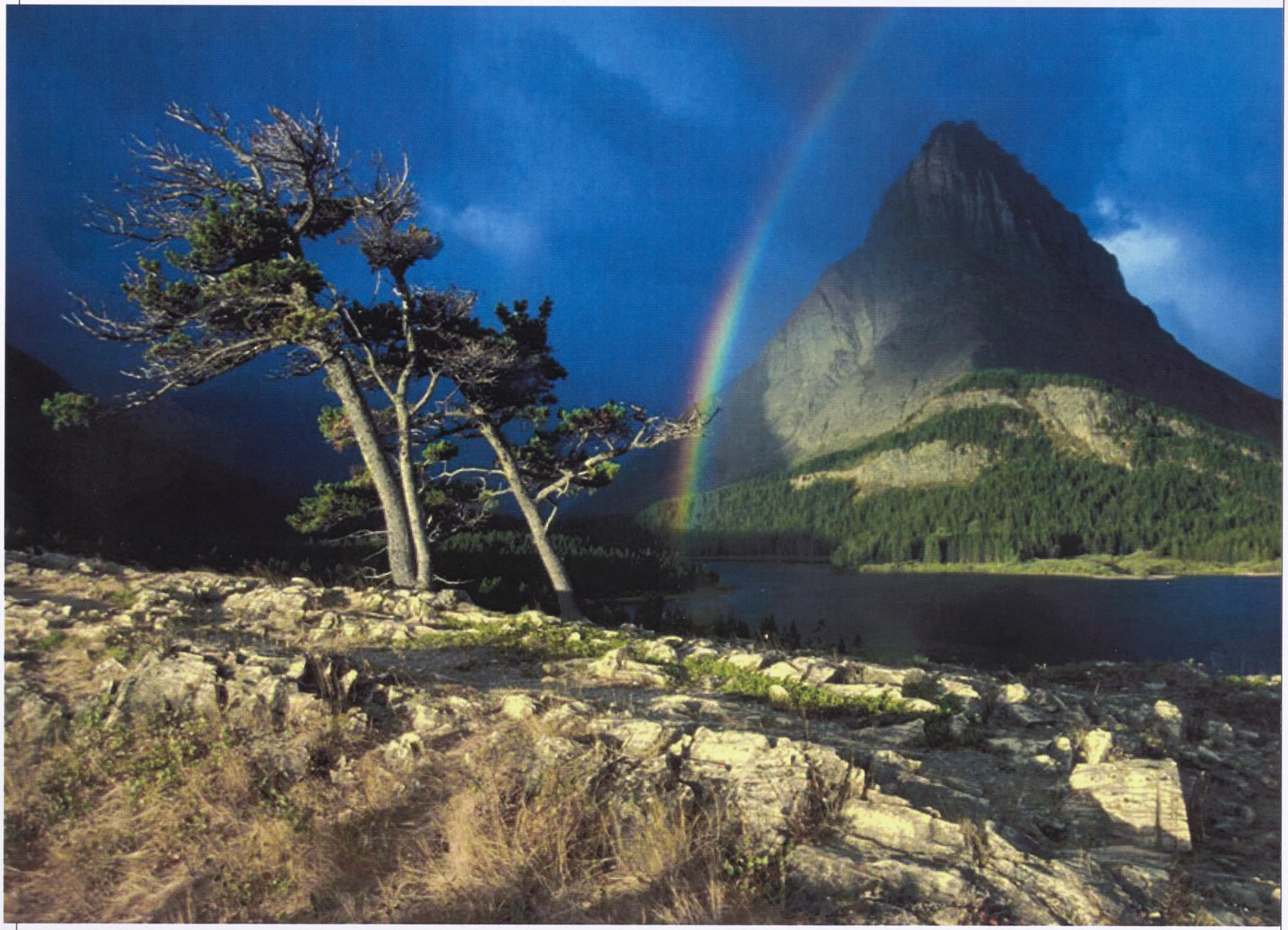
This isn't the place for a discussion of bear-management policy and politics. My purpose is simpler: to sketch a problem, welcoming you to contemplate its solution. In the following pages you'll find hope, beauty, vision, practical wisdom, and not a single differential equation. You'll find a wondrous collection of images and voices. Most important, you'll find new grounds to appreciate a truth that transcends mathematics: that sometimes the whole is much bigger than the sum of its parts.

Opposite, right: Our cultures reflect the places where people live and the ways we have found to exist within them.

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Preface by David Quammen

Almost forty years ago, in 1967, two young biologists published a dry little book filled with mathematical equations, schematic diagrams, swooping curves on coordinate graphs, and careful deductions, all grounded in field data from places like Trinidad, Bali, and Krakatau. It wasn't natural history in any old-fashioned sense. It was a technical monograph aimed at other biologists, especially those with a bent toward theoretical modeling and an appetite for calculus. But it triggered a major shift in perspective within the science of ecology, during the 1970s and later, that led not just toward new ideas but also toward urgent actions, including the founding of what we now call conservation biology. From that little book, and from work by other ecologists (such as Michael Soulé, Jared Diamond, Daniel Simberloff, Michael Gilpin, Thomas Lovejoy, Mark Shaffer, and many others) that it inspired, came important implications--some general, some specific--for the design and management of nature reserves, national parks, and other wild lands. One of those implications is that the Y2Y Conservation Initiative is utterly crucial to the fate of species and ecosystems in western North American.

That book was <I>The Theory of Island Biogeography<I>, by Robert H. MacArthur and Edward O. Wilson. MacArthur was a mathematical wizard who had done his early ecological fieldwork on warblers. Wilson was a myrmecologist–an ant guy–with a good eye for the number of bristles on a thorax and a good head for bigger ideas. On the first page of their book they noted that insular biogeography–the study of species distribution on islands–has played a huge role in the development of evolutionary theory, ever since Charles Darwin stepped ashore in the Galápagos. Why? Because islands are simple units that offer stark illustrations of dynamic principles. Two principles in particular interested MacArthur and Wilson: that new species arrive on an island by immigration, and that resident species are lost by extinction. The point of their theory was to explain how those principles function, interact, and thereby determine the biological richness of any given island.

But the two men were talking about "islands," not just islands. Any isolated piece of landscape or water, they noted, is subject to insular principles too. A tide pool, a cave, a stretch of riparian vegetation, a patch of northern forest surrounded by tundra? Yes, these are <I>ecological<I> islands, also governed by island dynamics. Then MacArthur and Wilson went a step further, adding a grim warning couched in cool language: "The same principles apply, and will apply to an accelerating extent in the future, to formerly continuous natural habitats now being broken up by the encroachment of civilization." We humans create islands, they were saying, as we cut and bulldoze and pave. By way of illustration, MacArthur and Wilson offered four tiny maps, like a cartoon-panel sequence, showing the loss and fragmentation of woodland in one Wisconsin township over a time span of 119 years. What had been a "mainland" of forest in 1831 was reduced to a sparse "archipelago" by 1950. It was a modest example but a vivid one. Exactly the same process of loss and fragmentation could happen–but must not be allowed to–throughout the magnificent landscapes from Yellowstone to the Yukon.

What's so dire about insularity? What's so crucial about its antithesis, the preservation of landscape connectedness? The answer to that is measured in species diversity and ecological health. A small island usually harbors fewer species than a big island. (This is empirical fact, manifest in field data from the Caribbean, Melanesia, and elsewhere.) A big island harbors fewer species than <I>an equal area of similar

Opposite, right: Our cultures reflect the places where people live and the ways we have found to exist within them.



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DAVID QUAMMEN

David Quammen travels on assignment for *Harper's, National Geographic,* and other magazines, most often to jungles, deserts, and swamps. His accustomed beat is the world of field biology, ecology, evolutionary biology, and conservation, though he also occasionally writes about travel, history, and outdoor sports. For fifteen years, from the early 1980s to the mid-'90s, he wrote a column called "Natural Acts" for *Outside Magazine.* His work has been twice recognized with the National Magazine Award and has appeared in anthologies such as *The Best American Essays 1999, The Best American Travel Writing 2001,* and *American Short Story Masterpieces* (1987). His books include *The Song of the Dodo* (1996), which won the John Burroughs Medal for nature writing and several other awards; *Monster of God* (2003); and a spy novel, *The Soul of Viktor Tronko* (1987). He lives in Montana with his wife (Betsy Gaines, a conservationist), their large furry dog, and a modest supply of cats.

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ESSAY BY COLIN G. CALLOWAY

Lewis and Clark: Just another cog in the wheel of history

If American history west of the Mississippi "begins" with Lewis and Clark, then Indian history and, by extension, the history of the United States seems pretty simple: "Indians owned the West, and then they lost it." But the story was never simple. People built societies, and societies changed over time. The people who survived dealt effectively with challenges from environment, drought, disease, population growth and decline, new and closed opportunities. They balanced tradition and innovation, weighed war and peace, and endured encounters with Indian, Spanish, French, British, and, eventually, American neighbors and newcomers.

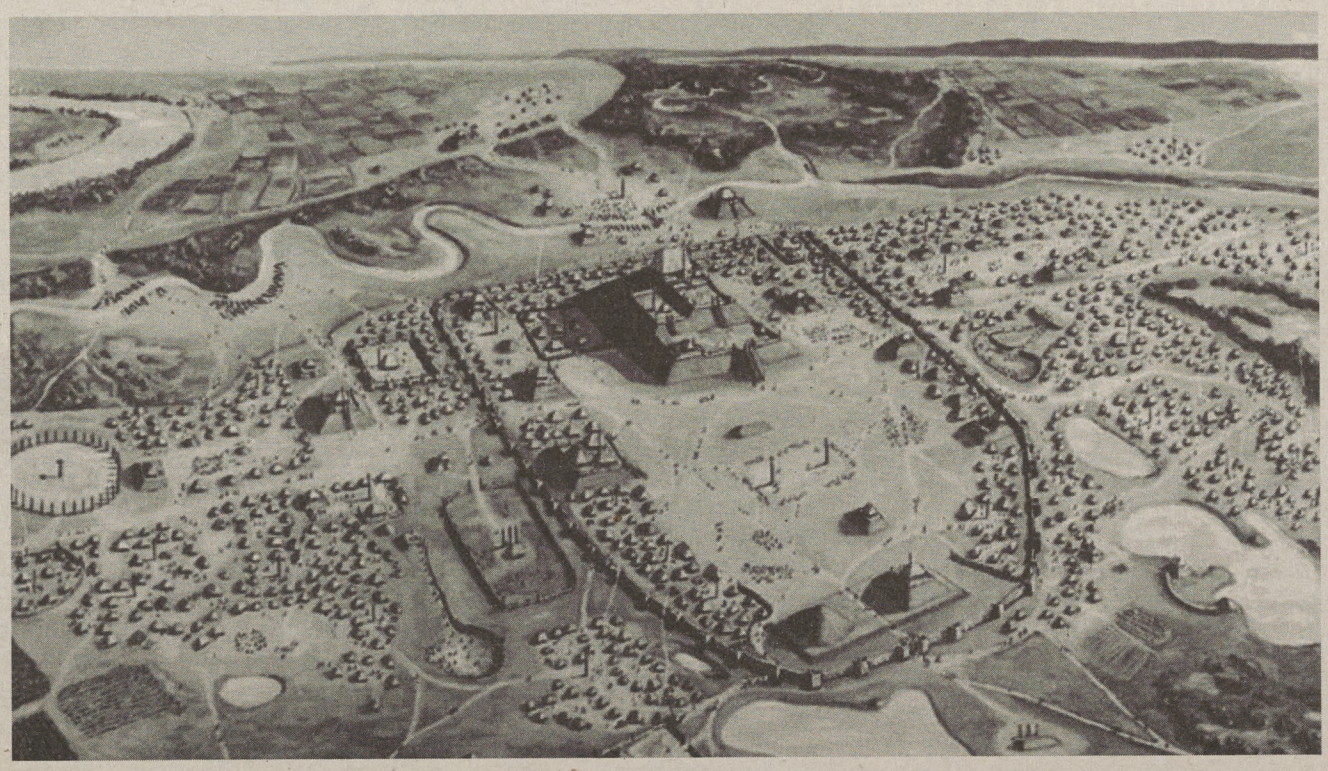
Some communities collapsed, and some peoples "disappeared" to the extent that they amalgamated with other peoples and remade themselves. Nations like the Blackfeet, Lakotas, Osages and Comanches had established, were in the process of establishing, or were trying to hold onto impressive regional and interregional hegemonies. Other less powerful or less fortunately situated peoples like the Shoshones, Crows and Pawnees saw the coming of Americans as an opportunity rather than a harbinger of disaster. The fact that some of the people Lewis and Clark met had "never seen a white man" did not mean they had not seen change.

Lewis and Clark did not see an unchanging West; they saw "a snapshot of time and place." It was a landscape that had evolved over millions of years, and an environment that had been shaped by Indian and animal life for thousands of years. Crops, technologies, and rituals from Mesoamerica; flora and fauna, plagues, and peoples from Europe; and indigenous pioneers had all altered the West long before Lewis and Clark arrived.

By the time the explorers headed out from St. Louis, many of the people who had previously inhabited the West were gone. Some had died only a couple of years before, when another smallpox epidemic swept the Missouri Valley. Others had been gone for centuries, and places like Mesa Verde and Cahokia, an ancient city near the site of present-day St. Louis that had once bustled with activity, were long silent. In other places, Indian inhabitants remained where they had lived from time beyond memory; it was the Spanish, French and English, who had competed for their trade, their lands, their allegiance, or their souls, who had come and gone.

Long before it became a part of "America," the West was a land of combined races and cultures. Indians and Europeans who had lived together for generations produced mixed communities and people of mixed descent. Indian and European cultures produced a new Hispanic culture in the Southwest. Franco-Indian families and communities persisted in the Great Lakes, Louisiana and the Midwest. Multicultural individuals, many of them former captives, moved along intersecting Indian and European exchange networks and webs of kinship relations built by their experiences. In 1806, Thomas

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Lewis and Clark passed within miles of Cahokia, the largest town in pre-Columbian North America, located near modern-day St. Louis. Between 900 A.D. and 1500 A.D., Cahokia was a political, economic and ceremonial center that may have supported more than 30,000 people. COPYRIGHT ART GROSSMANN, ST. LOUIS, CAHOKIA MOUNDS MUSEUM SOCIETY, COURTESY OF UNIVERSITY OF CHICAGO PRESS

Wheel of history

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Freeman and Peter Custis described the settlers living on the banks of the Cane River near Natchitoches as a "... mixture of French, Spanish, Indian, and Negro blood."

Now came the Americans. The Osages remembered seeing them on the left bank of the Mississippi, "chopping trees and building and plowing and swearing." They had hair on their faces like French voyageurs, "and soon the Little Ones were calling them Heavy Eyebrows as well, but knowing them to be Long Knives."

Jefferson did little to allay Osage apprehensions. He told Osage and other delegates in Washington in 1806 that the United States had peaceful intentions, but "we are strong, we are numerous as the stars in the heaven, and we are all gunmen." As Lewis and Clark scholar James Ronda notes, the image of "an American nation armed and on the move" was not lost on the Indians. When Zebulon Pike and a party of Americans ascended the Mississippi in 1806, Indians went out of their way to avoid meeting them, having "the idea of our being a very vindictive, ferocious, and warlike people." Lewis and Clark brought the promise of a new power in the West. Indian people recognized the new power as more aggressive than its predecessors, but at the same time, they saw little to suggest that these newcomers would last any longer than the ones that had come and gone before.

But the changes would run deeper than that. Ronda notes that when Lewis and Clark arrived on the Pacific Coast in December 1805, they came at the wrong time and from the wrong direction as far as Native peoples were concerned — they were accustomed to trading with traders from the sea in the spring and fall. But Lewis and Clark "wanted to reshape the landscape of time," Ronda writes. "Days and months once measured in seasons and salmon runs were now to be calculated by calendars and journal entries."

Lewis and Clark reshaped time in other ways. By their feat, they created a new calendar: American history in the West unfolded after Lewis and Clark; anything that happened before was B.L.C. (before Lewis and Clark). Millennia became concentrated into one "pre-American" time frame, and with it a nation's sense of its own ancient experiences became stunted or lost entirely. Did the people who inhabited Cahokia for 700 years think there would be a time when Cahokia no longer existed? Did the Anasazi and Hohokam who irrigated the deserts of the Southwest know that their systems and the way of life they supported would ultimately fail? Could the people who lived for thousands of years on buffalo or salmon ever have imagined that the source of their life could become polluted, or disappear entirely?



Anasazi pueblo ruins dating from around 800 A.D., photo circa 1890-1910. WESTERN HISTORY/GENEALOGY DEPARTMENT, DENVER PUBLIC LIBRARY

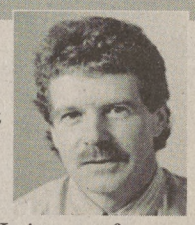
Charting the creation and subsequent decline of both Cheyenne and settler society in 19th century Colorado, historian Elliott West says simply: "Everything passes ... no one escapes."

American expansion and occupation of the West occurred in the blink of an eye, historically speaking. In the late 19th century, buffalo were exterminated to make way for cattle, Indians were dispossessed to make way for ranchers and farmers. At the end of the 20th century, buffalo started returning, and the cattle industry struggled to survive. And farming communities on the Northern Plains experienced population decline, while Indian populations in reservation communities increased to reach precontact levels.

At the beginning of the 21st century, the American West has an economy and a way of life that depend on oil and water. But gauged against the long span of human history in the West, this way of life is still a baby — and the chances of it surviving infancy are not good. In the end, automobiles and oil may not be that different from horses and buffalo.

In 1997-'98, massive floods and snowstorms hit the American West. The Western United States had not been singled out for special treatment: All over the world, the climate anomaly known as El Niño disrupted weather patterns and caused chaos. In the wake of El Niño, scientists and historians gained new understanding of how the global weather system affects human societies and how short-term climate shifts have shaped history. After about 3000 B.C., people began living in more sedentary and concentrated farming societies. Populations grew, and they became more vulnerable to short-term climate changes such as El Niño. In 2180 B.C., for example, devastating droughts, triggered ultimately by interactions between the atmosphere and the ocean on the other side of the world, struck the Nile Valley and toppled the Old Kingdom of ancient Egypt. Fifteen hundred years ago, the civilization of the Moche warrior-priests in northern Peru collapsed under the impact of droughts followed by torrential rains and flooding. A drought cycle gave the coup de grâce to a Mayan civilization that placed great stress on the fragile Central American lowlands. "The lesson," concludes archaeologist Brian Fagan, "is simple: The ultimate equation of history balances the needs of the population and the carrying capacity of the land. When carrying capacity is exceeded and technology or social engineering cannot restore the balance, all humanity can do is disperse — if there is the space to do so."

There is no American exceptionalism. Charting the creation and subsequent decline of both Cheyenne and settler society in 19th-century Colorado, historian Elliott West says simply: "Everything passes, ... no one escapes." It's a simple reminder of the human condition and a simple lesson from history. But it's a lesson lost in American history if we look on Jamestown, Santa Fe, the American Revolution, and the Lewis and Clark expedition as opening chapters in a story of nation building and progress, a story that, because it is our story, we assume will be different from everybody else's. It won't. The cycles of history will continue as they always have, and, ultimately, the only truly exceptional thing about American history will be that it happened in America.



Colin Calloway is the author of One Vast Winter Count *(University of Nebraska Press), from which this essay was taken. He is a professor of history and chair of the Native American Studies program at Dartmouth College.*

University of Colorado at Boulder

Center of the American West

Macky 229
282 UCB
Boulder, Colorado 80309-0282
303-492-4879, Fax: 303-492-1671
E-mail: CenterWest@colorado.edu
http://www.centerwest.org/

May 25, 2005

Mr. Ivan Doig
Mrs. Carol Doig
17277 15th Ave NW
Seattle, WA 98177

Ivan and Carol

Dear Mr. and Mrs. Doig:

We have had a remarkable year of accomplishments at the Center of the American West. The Center has never been so active in its production of reports, books, and in its presentation of energizing and memorable public events. The West continues to be a region of extraordinary complexity and controversy, and the Center remains an honest and trusted broker helping with many of these regional challenges. We also have been working hard on our internal organization to ensure that we run as efficiently as possible. As our organization grows, we are careful to keep our administrative costs down and to channel new funding into educational programs and publications.

The Center of the American West now needs your support more than ever. Your gift will allow us to continue to build our productivity and have a positive impact on the American West.

The Center's reputation as a resource for offering creative approaches to the region's challenges continues to grow and take us into new territory. In the past few months, I have had the honor of giving keynote speeches at prestigious events across the West: the Andrus Center for Public Policy in Boise; the public release of Colorado College's "State of the Rockies Report Card"; the American Association of Geographers; and the famed Cowboy Poetry Gathering in Elko, Nevada. The Center has also been invited to participate in several important future events and projects, including the White House Conference on Cooperative Conservation, and a collaboration with the Sonoran Institute, the Brookings Institution, and the Western Governors' Association on regional economic prosperity and growth. I will act as moderator at the annual meeting of the Colorado Oil and Gas Association and as panelist at the Council of Energy Resource Tribes Conference held on the Morongo Reservation. Opportunities like these extend far beyond my highest hopes and dreams, and they offer examples of the high opinion in which the Center is held by many individuals and groups.

The Center is also working hard to complete a number of publications. In the next few months, we will release two new reports, one on legislative strategies for dealing with water pollution emitted by abandoned Western mines and the other on future settlement and population growth in the West. Using the Center's characteristic mix of good humor, solid information, and accessible prose, these reports will help Westerners respond effectively to two key issues facing their region. We are also working on a book based on the personal interviews I conducted with the former and current Secretaries of the Interior. This book will

Over Please →

bring a fresh understanding of the crucial role of the Department of the Interior in this region. Two other books, *Healing the West* and *The Handbook for Westerners*, are also nearing completion. Our Center associates Bill Travis and Hannah Gosnell have recently published an article, "Ranchland Ownership Dynamics in the Rocky Mountain West" in the journal *Rangeland Ecology and Management*. In the Center's best tradition, these authors are continuing to bridge the worlds of academic research and key changes in the "real world" of the West.

In the meantime, we have also returned to our earlier commitment to Western arts and music. Our 2005 Distinguished Lecturer, Nick Forster, famed for his work with the bluegrass band Hot Rize and now host of the NPR show "etown," entertained a Center of the American West audience with a talk on the legendary country and western music star, Bob Wills. The Center ventured into entirely new territory with its event "Totally Yodelly," an evening of yodeling and its history in the West. And, at a time when the public's confidence in the quality of Native American studies at CU is a bit shaken, the Center was proud to host two fine events: a book launching of Distinguished Law Professor and Center cofounder Charles Wilkinson's *Blood Struggle: The Rise of Modern Indian Nations*; and an event celebrating the creation of an interactive website on the Arapahoe people and their long history in Colorado (http://www.colorado.edu/csilw/newarapproj2.htm). As always, the celebration of our annual Thompson Awards for Western American Writing put the spotlight on a great group of CU students. Finally, the Center devoted an evening to a new documentary film that chronicles the first one hundred years of the U. S. Forest Service. The event included a memorable public conversation with the leading Forest Service officials in our area.

This fall the Center continues its programs with the awarding of the prestigious Wallace Stegner Award to celebrated author Terry Tempest Williams on November 2; an event on the creation and management of the Grand Staircase National Monument in Utah on September 27; and an exploration of wolf reintroduction with a group including author Pam Houston on November 21. We will also inaugurate a lecture series on water in the West, and next spring we will bring back former Secretary of the Interior James Watt to kick off a conference on property rights in the West.

We are proud of our good relations with the partisans and advocates engaged with so many diverse issues. The Center of the American West pursues its mission with vigor, enthusiasm, and good cheer. Your financial gift to our Center will help us maintain this high level of activity and production.

Sincerely,

Patty

Patricia Nelson Limerick
Chair of the Board and Faculty Director

Well, For heaven's sake, a fundraising letter provides a peculiar occasion to let you know that I am doing pretty well - still stricken with melancholy and grief episodically, but anchored by the Center & its community.

P. S. Please send your gift by June 30 so that we can include you in our fiscal end-of-year list of donors!

(your offer of the Montana outing was breathtaking. I am still contemplating it.)

SIDE EFFECTS

Found in Arkansas: Hope on Wings

NYT May 3 '05

By JAMES GORMAN



A John James Audubon engraving of ivory-billed woodpeckers, formerly a reminder of loss.

Massachusetts Audubon Society/Associated Press

Emily Dickinson was right: hope is the thing with feathers. What she didn't know was that it lives in an Arkansas swamp and has a big ivory bill.

On Thursday, the day that scientists announced the first confirmed sighting of an ivory-billed woodpecker in 60 years, I went for a short paddle in the Cache River National Wildlife Refuge, where the bird was seen. I was with four other people, two from the Cornell Lab of Ornithology, which had made a major effort to confirm the sighting, and two from the Nature Conservancy, which has been buying land in the area. And I was trying to adjust to the good news.

In fact, I had always preferred Woody Allen's take on Dickinson's poem: "How wrong Emily Dickinson was! Hope is not the 'thing with feathers.' The thing with feathers has turned out be my nephew. I must take him to a specialist in Zurich."

Furthermore, as a journalist, I'm not used to good news. There's just not that much of it. So the report that the ivory bill lived took me off guard. I got a bit overexcited and flew down to Little Rock from New York, drove out to Bayou de View in the refuge and got in a canoe.

On a slow bayou, the two canoes slipped through water tupelo and cypress, on slate-colored water, and I talked with Elliott Swarthout and Peter Wrege of the Cornell Lab about the off kilter beauty of swamps and the thing with feathers.

The common wisdom had been that the ivory bill was gone for good, not a bird anymore but a symbol, a reminder of loss. It once lived in southern swamps and bottom land and depended on large areas of old forest, since it needed dead trees for nesting

Continued on Page 4



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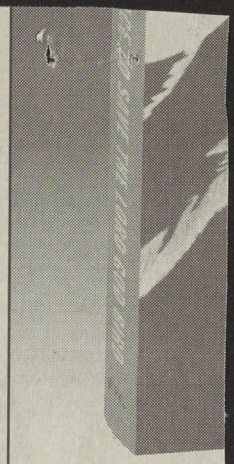
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Found in an Arkansas Swamp: Hope With Wings

Continued From First Science Page

and for feeding on grubs and beetles beneath the bark. Logging squeezed out the ivory bill, turning it into an accusatory ghost.

This was no subspecies of salamander threatened by a housing development. It was the biggest of its kind, something Americans always love. It had a 30-inch wingspan and a jackhammer beak. Audubon called it the "great chieftain of the woodpecker tribe" and others called it the Lord God bird because when people saw it, they said, "Lord God!" But it was gone, one of the natural treasures that a growing country stepped on and broke.

When I talked to experts during a hunt for the ivory bill in Louisiana three years ago, even some of the most dedicated searchers held out little chance of success. Outside the small circle of ivory bill seekers, the bird seemed a lost cause, a particularly sad lost cause for me because I have a soft spot for swampy places. Give me a dark slough over a sunlit meadow any day. Walking through the Louisiana bottom land was both exhilarating, because this part had been saved, and painful, because so much had been lost.

Tim Gallagher, who wrote "The Grail Bird" about the search and the sighting of the ivory bill, said that Bobby Harrison, his partner on the search, wept when he saw the bird fly in front of his canoe. I know of at least one person with no connection to the search who wept on reading the news, and I'm sure he was not alone.

Why was the discovery so powerful?

I think it is the reason for the bird's survival. It wasn't a miracle. It wasn't luck. And it wasn't simply the resilience of nature, although that helped. The reason for the astonishing re-emergence of a mysterious bird is as mundane as can be. It is habitat preservation, achieved by hard, tedious work, like lobbying, legislating and fund-raising.



Clark Jones/Cornell Lab of Ornithology

An ivory-billed woodpecker, thought to be extinct, was recently sighted in the Cache River National Wildlife Refuge in Arkansas.

There was luck involved, of course. But my favorite comment about luck was made by Branch Rickey, who said, "Luck is the residue of design." Chance favors the protected wetland.

Think about where the bird was found, in a national wildlife refuge, and in an area, the Big Woods of Arkansas, that conservation organizations and government agencies had targeted as crucial for preservation. Just south of the Cache River refuge is the White River National Wildlife Refuge. State refuges are nearby. And the Nature Conservancy has been buying up land in that area.

The same is true about other likely spots. The hunt in Louisiana was in the state's Pearl River Wildlife Management Area. When I talked to Scott Simon, the state director of the Nature Conservancy in Arkansas, he said that Arkansas, a poor state, had voted for an eighth-of-a-cent sales tax for conservation, not a large amount, but a tax nonetheless.

I think the reason the discovery is so moving is that so many people worked so hard to save and protect land, telling themselves there may be an ivory bill out there, and that protecting the bottomland had to be important. I'm not sure they all believed it, but they acted as if they did.

As did the searchers. Mr. Swarthout showed me one spot on the bayou where observers on his team would sit in a canoe and wait and watch, for perhaps 10 or 12 hours. The refuge is a beautiful place, the bird is great, but sitting in a canoe for 12 hours has to be tedious and uncomfortable.

It is possible that this is the last ivory bill, that it won't appear again. And we have to trust the judgment and expertise of the scientists involved on the sighting because there is no crystal-clear photograph. Instead, there are detailed observations and an analysis of a blurry bit of videotape.

In most cases, I might hesitate to allow myself to join in the celebration. But I'm going with the experts in this case.

I am giving in to hope. Perhaps there are more ivory bills. I really hope so. The thing with feathers has got me in its grip.

ment that expands Cornell's study of paleontology and its ties to the Museum of the Earth — a soaring, $11 million celebration

where many became inspired to follow his lead. He collected thousands of fossil marine invertebrates — mainly shells — in Arkan-

As Mr. Harris neared retirement, he planned to leave his library and fossil collection to Cornell on the condition that it fur-

tories and printing presses for publishing his two scientific journals, Palaeontographica Americana, which first appeared in 1916,

OBSERVATORY

HENRY FOUNTAIN

Always Looking Ahead

Like bats, dolphins and porpoises use echolocation to navigate and hunt prey. But how these marine mammals make use of their sonar-like ability is not precisely known.

A study of finless porpoises in China, however, has shed some light on the subject. Chinese and Japanese researchers discovered that the porpoises use their sonar to inspect the area ahead of them, presumably for predators or obstacles, before swimming into it silently. By inspecting an area much farther than they swim, they give themselves a comfortable margin for error.

The researchers developed a sonar-monitoring device that they attached to eight porpoises in an oxbow lake on the Yangtze River. The device has two small hydrophones, or sonar receivers, a microprocessor and a memory chip for logging the data.

When the porpoise makes its echolocating clicks, any return echoes off objects are received by the hydrophones at slightly different times. By measuring the time difference, the distance to the object can be calculated. The animals also were outfitted with electronic tags to record swimming speed and other data.

The researchers found that the porpoises would use their sonar at relatively long range — up to 250 feet ahead — before turning it off and swimming into the area. Since they swam for only about 70 feet without

sonar, the porpoises were effecti
giving themselves a good sa
margin in case a predator eme
or they missed underwater debr
another obstacle.

In the study, which is publish
Proceedings B of the Royal Soc
the researchers also observed
happens when a porpoise encou
a school of fish or other prey. In
case, the animal focuses its son
the prey (often first spotting it
a distance of about 100 feet) an
proaches it. It keeps the s
trained on the target, usuall
about 35 feet or so, until it can se
prey visually or a capture is ma

A Bug and a Foodie

Sophistication can be measur
a lot of ways, including diet. The
gourmand won't eat just anyt
food has to be just so.

Now along come the collembo
or springtails, to knock all thos
phisticates down a peg. Accordi
a study being published online b
ology Letters by researchers
Denmark and Sweden, spring
are very choosy about what th
eat. Even a tiny, wingless bug
feeds on soil and leaf litter can
gourmand, it seems.

Springtails (they get their n
from a forked structure on thei
dersides that they use to flip i
air) like to eat fungus, and scie
had once thought they would ea
about any fungus growing on d
ing matter.

When Fruit Flies Send a Messy Message

In the home, the fruit fly can be a telltale indicator of neglect. When Drosophila melanogaster starts flitting around your fruit bowl, you know there's a forgotten peach in there somewhere.

On a much larger scale, the tiny fly can also be a useful marker for environmental neglect, Australian researchers report.

They've shown that over two decades in eastern Australia, fruit flies have undergone a genetic change as the climate has warmed.

"Fruit flies are model organisms for studying all sorts of things genetically," said Dr. Ary Hoffmann, a professor at the University of Melbourne and an author of a report on the finding published last week in the journal Science. "What you've got here is a situation where in nature over a short period of time, they have been adapting to climate change."

Dr. Hoffmann and his colleagues focused on one gene related to metabolism. This gene has two forms, or alleles — one that is adapted to hotter, tropical conditions, the other to cooler conditions.

Studying the genetic makeup of fruit flies along the east coast and comparing the data to similar analyses from 1979 and 1982, the researchers saw the tropical allele starting to show up in areas where the cold allele had been predominant.

Average temperatures in eastern Australia have increased by about 1 degree Fahrenheit over that period. This being the Southern Hemisphere, the colder allele had been more common in the southern parts of the coast, and the tropical allele more common toward the north, closer to the Equator.

"The genetic constitution of the population is shifting so it's more like the form seen in the north," Dr. Hoffmann said.

It's likely that other organisms will show similar



Felipe Galindo

genetic changes, Dr. Hoffmann added, so they may prove useful as markers for climate change in other regions. "What we need to start looking at is any single widespread species that covers a range and see if it shows this kind of change," he said.

But it would also be interesting to look for climate-related genetic changes in species that have a very restricted range — those that are stuck in a rain forest, for example. "In that case, they can't move," Dr. Hoffmann said. "But there may be rapid adaptation at a basic level."

Dreams Ride On Freud's Royal Road, Study Finds

NYT March 23, '04

By ANAHAD O'CONNOR

More than a century ago, Freud proposed that dreams concealed subconscious wishes and desires, a theory that has in recent decades fallen from scientific favor.

A new study, however, may add weight to the idea that what people suppress during the day returns when they close their eyes at night.

Deliberately blocking thoughts about someone before going to sleep, the researchers found, made it more likely that the person would appear in a dream that night.

In the study, by scientists at Harvard and the University of Texas at San Antonio, college students were asked to choose someone they knew and then either concentrate on or suppress thoughts about that person five minutes before bedtime. Another group of students was told simply to pick a person and then to think about anything at all.

Psychologists have argued about thought suppression and dream interpretation for decades, though few researchers have put the theories to the test.

"Not surprisingly, any kind of thinking about something increases the likelihood that it will show up in a dream," said Dr. Daniel M. Wegner, a professor of psychology at Harvard and the lead author of the study. "But trying to suppress something increases the chances even more, indicating that the meanings of our dreams involve things we've tried to sweep under the rug."

The study is being published in the April issue of the journal Psychological Science.

Thoughts suppressed during the daytime pop up in dreams at night.

The findings seem to fall in line with the idea that dreams express complicated desires and unfulfilled wishes, as Freud, who called dreams the "royal road to the unconscious," noted long ago. But Dr. Wegner does not completely agree with that assertion.

In the study, he asked some of the students to picture people they were attracted to but not involved with, assuming that emotions like desire and longing would color the results. But whether the students focused on someone they had strong feelings about or someone they regarded neutrally made little difference, Dr. Wegner found.

More likely, he said, the subjects were merely incorporating into their dreams what Freud described as the daytime residue of thoughts and events. Much of that residue is processed by the prefrontal cortex, which governs thought processes.

During sleep, Dr. Wegner said, the cortex loosens its grip on distractions tuned out earlier in the day.

As a result, studies show, people who try to quit smoking have dreams about cigarettes, or an actor who is gearing up for a big show has nightmares about going blank on stage. Going to bed lifts the lid on all the thoughts that the mind keeps under wraps.

"A lot of the things we dream about tend to be negative, because they're the things we're most likely to deliberately keep out of our minds," Dr. Wegner said. "It's often the most awful things we can think about that we crowd into our dreams."

Concerted efforts to block things, experts say, give them special value and can have the unintended effect of making them more memorable.

In a study several years ago, for example, Dr. Wegner showed somewhat paradoxically that telling people not to think about a white bear made them obsessed with that very thought. In the courtroom, other researchers have found, telling a jury to disregard a witness's testimony can actually increase its influence.

"If you're suppressing thoughts about someone, you're telling your brain it's more important than the shirt you wore or what you had for lunch," said Dr. Robert A. Stickgold, an assistant professor of psychiatry at the Harvard Medical School, who was not involved in the study. "It's probably one of a hundred ways that material gets tagged for dreams."

Dr. Stickgold has shown that people with amnesia can have vivid dreams about something that they did the day before, despite having no conscious recollection of an event.

After praising the new findings, he cautioned that interpreting them as scientific evidence of Freudian repression would be a stretch.

Unlike repressed thoughts that might be unknowingly buried in the subconscious, he said, the memories looked at in Dr. Wegner's study were still fully available.

"This helps to tease apart what the brain's rules are for memory," Dr. Stickgold said. "It doesn't really give Freud another leg up. But I'm sure it'll cause a tempest in the teapot."

incontinent, it was at the same time I was potty training Jason, and I kept thinking, if only I can get Jason trained, then there'll only be one set of diapers.

Well, to do that, I had this idea of painting the wall behind the toilet bright red, leaving the door open and hoping that Jason might respond to that. Well, Charles saw it and started to use the toilet again. His problem had been one of perception, I realized. He didn't see the toilet anymore, and that's why he'd become incontinent. But the red paint drew his attention. Well, physicians now know that nobody with Alzheimer's needs to be incontinent. You have to make things visible on their terms.

There are a lot of other areas where this also is true. For instance, if a patient has trouble eating with utensils and is making a mess all over the place, you give them finger foods. Lighting is another thing one can fix. My husband's behavior tended to change when the sun went down. This is common with Alzheimer's patients. So I bought lots of lights and kept turning them up. I closed the curtains, so he couldn't see outside. That way, the sunlight was inside rather than outside. That made a difference.

Q. *How did habilitation become your profession?*

A. Charles died after four years. Afterward, I went to live with my parents in Wellesley. I took a job as a nurse's aide at a nursing home there. Caregiving was the one thing I knew how to do. Without support from outside authorities, the nursing home began incorporating habilitative methods with dementia patients.

Then, I started going to meetings of the Alzheimer's Association in Boston, which was really getting seriously started then, and sharing my ideas. The whole thing grew. I began consulting. It's what I do today. Right now, I am working with an architect and an interior designer on how to design houses that people with Alzheimer's can successfully live in.

Q. *How did you meet your second husband, Edward Coste?*

A. On a blind date 15 years ago. My hairdresser thought we'd be a good match. I didn't want to go on any date, but my son Jason was about to leave for college, and he said: "You're not going to have me to take care of you. Let's find someone to take care of you."

It was a lighthearted thing.

Well, my hairdresser was right. It was love at first sight. Teddy has diabetes. I sometimes tell him: "You take your insulin. If anything happens to you, I am going to be angry. I'm not 32 anymore, and I'm not doing this a second time."

Vanishing Rite



Times

dents who attend. Dr. Maier said he routinely received letters of thanks from families after the events.

Medical students at the State University of New York at Stonybrook keep a two-month diary of their time in the dissection laboratory as a part of a course on medicine in society.

"Some say they're not affected by it and it hasn't changed them at all," said Dr. Jack Coulehan, a professor of preventive medicine there, but a majority record a cascade of emotions, which the class then discusses.

At the Yale School of Medicine, practicing doctors periodically visit the first-year anatomy course to describe some of their dying patients to the students and to talk about the doctor's role in dealing with terminal illness and death.

"In medicine now there's a big emphasis on teaching students professionalism," said Dr. Lawrence J. Rizzolo, the director of the Yale course. "In anatomy we begin the discussion — how the student will function as a professional, learning how to react to an uncomfortable situation, facing death and dying. We get them in touch with their feelings."

When the anatomy course ends, the Yale students thank their donors, as they call the cadavers, in a ceremony that includes original poems and musical compositions. Every first-year student attends, Dr. Rizzolo said, and the service has come to celebrate not only the rite of passage of the anatomy course but also the students' immersion in medicine.

"Studying medicine is a privilege, and the service paid homage to that," said Zach Goldberger, a Yale student who performed an original piano elegy at the ceremony his class held three years ago.

Two years ago, Yale students created a colorful quilt to commemorate the anatomy course, with panels dedicated to each cadaver in their course.

Asked to contemplate medical education without cadaver dissection, Yale students were unenthusiastic.

"It's not just about the information," said Dagan Coppock, a fourth-year medical student. "It's about the process."

Mr. Coppock called the anatomy class "a powerful, sacred experience."

Without dissection, students would never get to see "how it all fits together," said his classmate Kavita Mariwalla.

"It gives you a real appreciation for the beauty of the human body," she said. "It's amazing. You are so thankful for it. It made me stand in awe."

An Epic Gave Finns A Lot to Sing About

By CORI ELLISON

You may not think you know a thing about the "Kalevala," but if you're acquainted with Tolkien's "Lord of the Rings" trilogy, the heavy-metal band Amorphis, or Don Rosa's Donald Duck cartoon books, you've got a running start.

And if you want to dig deeper, check out the New Jersey Symphony Orchestra's Northern Lights Festival, featuring several works by Sibelius and running through Jan. 23, or any of the several other Finnish musical events taking place around New York this month. If you do, you'll also learn a lot about why Finland's artistic clout so far exceeds its size.

The "Kalevala" is Finland's national epic, a hefty volume full of voyages, battles and magic, very much like the Scandinavian "Edda," the Anglo-Saxon "Beowulf," the German "Nibelungenlied" or the Indian "Mahabharata." But unlike those tomes, it is basically a reworking by a single individual — and a modern one — rather than a rough-and-ready collection of unvarnished folk poetry.

It was Elias Lonnrot (1802-84), a country doctor and folklore scholar who, by sheer force of will, created the "Kalevala." Be-

Music from the far North, Page 10.

ginning in 1828, he made 11 expeditions, ranging as far south as Estonia, as far north as Finnish Lapland, as far west as the Tampere area (100 miles northwest of Helsinki) and as far east as Russian Karelia, in search of the ancient sung poetry, or "runo," tradition then alive in the Eastern Orthodox regions of Finland, though long banned in the Lutheran areas.

Lonnrot sought out accomlished runo singers, the best of hom could remember thouands of lines. He could not read write music, but notated the



Associated Press

Jean Sibelius (in 1938), who was inspired by the "Kalevala."

runos he heard by numbering the strings of his kantele, the five-stringed zither that is the national musical instrument of Finland.

Lonnrot then organized the material into a unified body of poetry, as Homer had with the "Iliad" and the "Odyssey." Lonnrot selected the best variants of each story and assembled them into a coherent whole, writing his own connective passages where necessary and imposing his own timeline to create a logically flowing chain of events.

He conflated characters to streamline the action and transformed dialect passages into newly minted literary Finnish. On Feb. 28, 1835, Lonnrot completed the first phase of his work on the "Kalevala," and ever

Continued on Page 10

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E: LEFT: STILL FROM *THE PHANTOM OF THE OPERA*



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The 'Kalevala': An Epic That Has Given Finns a Lot to Sing About

Continued From Weekend Page 1

since, Feb. 28 has been celebrated as Kalevala Day, the birthday of Finnish culture.

Such a freakishly wonderful event could have happened only at that precise split second of history. The German poet Johann Gottfried von Herder was urging Europeans to seek their cultural identity in their ancient folklore, which he termed "the mirror of the soul of the people." Finland, a province of Sweden since 1155, had been annexed as an autonomous Grand Duchy of the Russian Empire in 1809 and was beginning to hatch dreams of nationhood.

But Finland in 1809 was a far cry from the sleekly sophisticated, Nokia-obsessed nation we know today. The country's educated elite then spoke Swedish, while Finnish was the tongue of servants and peasants.

Longfellow's Source

During the first millennium A.D. the animistic tribes living near the Gulf of Finland, and speaking an exotic, non-Indo-European language nothing like that of their Scandinavian and Slavic neighbors, laid the foundation of "Kalevala" poetry. This poetry, sung in a narrow, five-note melodic range, lacked both rhyme and stanza structure, but it hewed to a single, all-purpose metric formula that served as a memory aid, so that the unlettered Finns could easily remember old poems and improvise new ones.

This "Kalevala meter" is trochaic tetrameter, or four two-syllable feet, in a long-short pattern, similar to Longfellow's "Song of Hiawatha":

By the shores of Gitche Gumee,
By the shining Big-Sea-Water,
Stood the wigwam of Nokomis.

Longfellow, a contemporary of Lonnrot, had co-opted the Finnish epic's meter, alliteration and even some plot points, trying, as he wrote, "to do for the old Indian legends what the unknown Finnish poets had done for theirs."

The "Kalevala," the epic of the people of Kaleva, is dominated by the character of Vainamoinen, a shaman and sorcerer who can charm wild beasts with his kantele and use words as weapons. He is the Gandalf-like "eternal sage" who establishes the land of Kaleva and leads and teaches its people.

Promise of Prosperity

The "Lord of the Rings" parallels don't end there. Tolkien fashioned Quenya, the lyrical lingo of Middle Earth's elves, after the click and lilt of spoken Finnish. Both the "Kalevala" and Tolkien's saga, modeled after it, outline a hero's journey in pursuit of a powerful sacred object, replete with shape-shifting, demons and magical plants and animals.

The "Kalevala" depicts the continuing struggle between the good Kaleva (read the Finns), from whose perspective the story is told, and the bad Pohjola from the foggy north (perhaps the Sami people of Lapland). On a deeper, more esoteric level, the "Kalevala" may be read as a contest between light and darkness, good and evil.

The central myth of the "Kalevala" is the story of the Sampo, a mysterious object forged by Vainamoinen's brother, the blacksmith Ilmarinen. We are never told what the Sampo actually is, but it has often been imagined as a sort of magic mill that churns out salt, grain and gold. The Sampo's metaphorical meaning is clear enough: it is the source of prosperity and good fortune.

The "Kalevala" swiftly became the de facto collective memory of the Finns, a boost to their national self-esteem, a rallying point for Finnish independence and, eventually, a wellspring of artistic inspiration. It brought a small, obscure nation to the world's attention, raising the Finns to a historical status alongside other old European peoples, while highlighting their uniqueness.

Creating an Identity

Lonnrot published an expanded "New Kalevala" in 1849, but it would be years before any of it was set to music. Finland was then a political and economic backwater, and Finnish classical music was in its infancy. It slavishly imitated the music of central Europe, the only model it knew. So even the first "Kalevala"-based concert works, like the "Kullervo Overture" (1860) by Filip von Schantz, merely stuffed the epic's sprawling subject matter into a tidy Western musical matrix.

Enter the Karelianists, a group of young Finnish artists who revered the "Kalevala" as the cornerstone of Finnish culture.

The Karelianist movement peaked in the 1890's and continued until shortly after Finland achieved its independence, in 1917. Its ranks included the poet Eino Leino, the architect Eliel Saarinen and the painter Akseli Gallen-Kallela, whose vivid images of "Kalevala" scenes are still the ones etched in most Finns' minds.

These Karelianists also gave the world Jean Sibelius (1865-1957), who, through his embrace of the "Kalevala," would become as great a national symbol and source of pride as the epic itself. His music, the composer Erkki Salmenhaara said, "was stylistically influenced to a great extent by the modality, endless repetition and narrow compass of ancient Finnish folk music and the rhythm of 'Kalevala' poetry — much like primitive Russian folk music was later to influence the music of Stravinsky."

Cori Ellison is the dramaturge at the New York City Opera.

A National Music

Sibelius was a Swedish speaker by birth, unable to speak a word of Finnish until he was about 8. His mother enrolled him in one of the first schools in Finland to use Finnish as the teaching language, which opened up to him the world of the "Kalevala."

Like many Finnish composers before and since, Sibelius felt humbled at the thought of setting the "Kalevala" to music. But he tamed his fears enough to write the symphonic poem "Kullervo" (1892), which put him on the international musical map and, more important, planted the seeds of a national musical language. Rather than idealizing the subject matter, Sibelius took an archaic-flavored, musically radical approach that embraced both the tale's ancient nature and its modern guise.

After "Kullervo" Sibelius planned a "Kalevala" opera, "Building of the Boat," with Vainamoinen as the main character. When this project was scuttled, its musical materials were absorbed into the "Lemminkainen Suite" (1896), four tone poems on the exploits of the epic's Don Juan figure.

Sibelius had gone on a poetry-collecting jaunt to eastern Karelia in 1892, but he rarely used direct quotes from folk songs or runo tunes, and disparaged their significance in his works, probably for fear of being branded provincial.

Though digging for traces of runo tunes in Sibelius's works has been frowned upon in Finland, the folk song scholar A. O. Vaisanen found numerous runo tunes in his work. In the first tableau of "Karelia" (1893), the composer used direct folk music quotes and brought actual runo singers on stage to perform them.

More significant than Sibelius's quotations of folk songs is the way that the musical heritage of the "Kalevala" merged seamlessly with his personal musical voice. The narrow melodic range of the runo themes gave birth to his distinctive brand of symphonic motifs, and the endless repetition of "Kalevala" tunes sparked his new ornamental variation technique.

The modality of "Kalevala" music helped Sibelius distance himself from the constricting major-minor tonality of Western music. In 1896, Sibelius wrote: "I had to yield to the tonality stemming from ancient folk songs. Now it is apparent that our present system of tonality is crumbling."

As the 20th century wore on, enthusiasm for the "Kalevala" waxed and waned, and Karelianism was sometimes stereotyped as conservative jingoism or a retreat from reality. Modernists saw the "Kalevala" culture as a hindrance to the universal aspirations of their art. When the "Kalevala" did influence 20th-century music, it tended to do so more generally, as an emphasis on ancient, mythical sensibilities.

The youngest generation of Finnish classical composers has taken scant interest in the "Kalevala," but the epic seems to intrigue young musicians of a more popular stripe. In the 1980's, the folk music band Vrttina began with pure runo singing but more recently has raised hackles among purists for its fusion work.

Edward Vesala, a powerful, shamanlike jazz musician, recorded two "Kalevala"-flavored discs, "Snow" (1987) and "Ode to the Death of Jazz" (1990), before his death in 1999. The progressive rock band Kalevala recently released a triple CD, "Kalevala — A Finnish Progressive Rock Epic," on which 30 international bands explore themes and tunes inspired by the "Kalevala."

Made for Heavy Metal

Of all popular musical styles, heavy metal would seem perfectly matched to the moody Goth fantasy of the "Kalevala." In 1994, Amorphis, Finland's best-known metal band, began exploring the "Kalevala" in its album "Tales From the Thousand Lakes."

Clearly, the impact of the "Kalevala" has been extraordinary, both within and outside Finland. Beyond the realm of high art, Finland's streets, businesses and merchandise (including Kalevala-Koru's imposing replicas of Iron Age jewelry) bear names drawn from the epic, and "Kalevala" tarot decks, video games and comic books abound, including Don Rosa's "Tale of the Sampo," featuring Donald Duck.

The epic has been translated into 51 languages, including Arabic, Chinese, Esperanto, Greek, Hindi, Swahili — and even Yiddish.

Perhaps the most unusual aspect of the "Kalevala," however, is the fact that the heroism it celebrates is accomplished not through physical strength or violence, but through magical songs. If that's not the key to Finland's success story, what is?



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Jack Vartoogian/FrontRowPhotos

Where to Hear Music From the Far North

A listing of concerts this month featuring works by Jean Sibelius and others. Manhattan concert sites include Avery Fisher Hall, (212) 875-5030; and Carnegie Hall, (212) 247-7800. Tickets range from $25 to $90 at Avery Fisher Hall and $24 to $82 at Carnegie Hall. In New Jersey this month there is the Northern Lights Festival, presented by the New Jersey Symphony Orchestra. Its sites include the Newark Museum, 49 Washington Street, at Washington Place, (973) 596-6550; the State Theater, 15 Livingston Avenue at Monument Square, New Brunswick, (877) 782-8311; the New Jersey Performing Arts Center, Prudential Hall, 1 Center Street, Newark, (888) 466-5722; Patriots Theater, War Memorial, Memorial Drive, Trenton, directions, www.thewarmemorial.com or call (609) 984-8400; Bergen Performing Arts Center, 30 North Van Brunt Street, Englewood, (201) 227-1030; Count Basie Theater, 99 Monmouth Street, Red Bank, (732) 842-9000; Richardson Auditorium, Alexander Hall, Princeton University, (609) 258-5000. Tickets range from $20 to $82. In addition, the Fourth International Sibelius Conference is planned Jan. 16 through Jan. 20 at the University of North Texas in Denton; information: (940) 565-2791, www.music.unt.edu/the. A schedule of concerts:

Tonight

PRUDENTIAL HALL Sibelius's "Finlandia"; Stenhammar's Piano Concerto No. 1 in B flat minor; Tobias's "Nocturne"; Svendsen's Symphony No. 2 in B flat. New Jersey Symphony Orchestra; Per Tengstrand, pianist; Neeme Jarvi, conductor. 8 p.m. Also Sunday at 3 p.m. at the same location and tomorrow night at 8 at the War Memorial.

Thursday

PRUDENTIAL HALL Sibelius's Symphony No. 5 in E flat; Gade's overture "Hamlet"; and Grieg's Piano Concerto in A minor; New Jersey Symphony Orchestra; Yujia Wang, pianist; Anu Tali, conductor. 7:30 p.m. Also Jan. 15 at 8 p.m. at the same location, Jan. 14 at 8 p.m. at the War Memorial and Jan. 16 at 3 p.m. at the State Theater.

Jan. 20

BERGEN PERFORMING ARTS CENTER Sibelius's Violin Concerto in D minor and "Legends"; Nielsen's "Maskarade" Overture; New Jersey Symphony Orchestra; Pekka Kuusisto, violinist; Tuomas Hill, actor; Neeme Jarvi, conductor. 8 p.m. Also Jan. 21 and Jan. 23 at Prudential Hall and Jan. 22 at the Count Basie Theater.

RICHARDSON AUDITORIUM Sibelius's String Quartet; Grieg's String Quartet in F and Nordheim's "Five Songs"; Oslo String Quartet. 8 p.m.; tickets, $25.

AVERY FISHER HALL Sibelius's Symphony No. 1; Fauré's "Pelléas et Mélisande"; and Kernis's "Lament and Prayer"; New York Philharmonic; Glenn Dicterow, violinist; Lorin Maazel, conductor. 7:30 p.m. Also Jan. 21 at 11 a.m. and Jan. 22 at 8 p.m.

Jan. 21

NEWARK MUSEUM "Interplay," with a bilingual re-creation of the "Kalevala," film footage of the Sibelius funeral cortege and an exploration of the role of music and music education in Finland; the Kalevala Trio; the Montclair State University Singers; Pekka Kuusisto, violinist; Joseph Horowitz, host. 5:30 p.m. Tickets, $10.

Jan. 24

CARNEGIE HALL Sibelius's Symphony No. 5; Sallinen's Symphony No. 8; Grieg's Piano Concerto in A minor; Cincinnati Symphony Orchestra; Lars Vogt, pianist; Paavo Jarvi, conductor. 8 p.m.

Jan. 30

AVERY FISHER HALL Sibelius's Symphony No. 2 in D; Prokofiev's Piano Concerto No. 1 in D flat; Tchaikovsky's Piano Concerto No. 3 in E flat, "Pohjola's Daughter"; Lahti Symphony Orchestra, Osmo Vanska, conductor; Louis Lortie, pianist. 3 p.m.



Agence France-Presse

Finland's music and an epic inspiration: top left, Neeme Jarvi, musical director of the New Jersey Symphony, who conceived its Northern Lights Festival, which began last night; middle left, Sir Ian McKellen in "The Lord of the Rings: The Return of the King," which owes much to the "Kalevala"; bottom left, the Finnish violinist Pekka Kuusisto, who will perform in the festival, and the Finnish conductor Osmo Vanska, who will conduct the Lahti Symphony Orchestra at Avery Fisher Hall later this month; above, Jean Sibelius in the 1950's.

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Inward Bound

Stephen LaBerge offers the ultimate dream vacation, teaching you to control what unfolds in your mind while you sleep.

By Lawrence Osborne

Like many people, I do not dream well. I suffer from bouts of insomnia and, when I can fall asleep, I have a stubborn inability to remember my dreams. I suspect that they are witty and dangerous, like those that are forever being recounted by the well-rested people around me, but I do not know for sure. "To sleep: perchance to dream," Hamlet famously sighed. But if you don't dream, sleep is a boring affair — and so, some would argue, is life.

Fortunately, there is now a tourist retreat for those, like me, who wish to connect more deeply with their nocturnal visions. While other travelers may choose to visit cathedrals or scale mountains, tourists on this getaway mostly lie on their backs and dream. What could be more exotic, after all, than the inner chambers of your own psyche?

One evening this past March, at the Kalani eco-resort on the coast of the Big Island of Hawaii, I gathered with 15 other hopeful dreamers for a nine-day vacation. The trip was arranged by an organization in Palo Alto called the Lucidity Institute, which promotes the use of dream research for "the enhancement of human health and well-being." In a traditional Hawaiian room with a high ceiling of wooden beams and windows opening onto thickets of papaya trees, we sat in a circle as a tropical storm erupted outside. Along with the smell of rotting jungle flowers, there was a gentle quirkiness in the air, an atmosphere that you would imagine accompanied demonstrations of mesmerism in the drawing rooms of 18th-century Vienna.

Before us stood our guide, Stephen LaBerge, a dream scientist who conducted research in the psychology department at Stanford for more than 20 years. A slender and rather boyish man in his 50's, dressed in baggy shorts, an aloha shirt and

Illustrations by Maira Kalman




Rêve
Lucide

flip-flops, he bounced around the room as he spoke. "Some of you are in for a treat," he said. "You are about to enter a magic realm, the ultimate human freedom!" LaBerge was here to teach us how to achieve a "lucid dream" — the rare sort of dream in which you become aware that you are dreaming and are sometimes able to guide or manipulate the events that occur. During a lucid dream it is possible for the dreamer (or "oneironaut," as LaBerge puts it) to think reasonably clearly, remember the conditions of waking life and act voluntarily, all while remaining soundly, restfully asleep.

Flying is one popular activity in lucid dreams. Sex is another.

As a clue to the nature of consciousness, lucid dreaming is an important, if minor, natural phenomenon. LaBerge devoted his early career in the 70's to the scientific investigation of it. But academic knowledge is not all. As the founder of the Lucidity Institute, LaBerge has become equally dedicated to acquiring (and, for a fee, imparting) practical insights about how to dream more skillfully and more often. He explained to our group what he sees as the possible therapeutic benefits of lucid dreaming, which range from the concrete to the New Age: overcoming the fear of nightmares; increasing your creativity; assuaging grief for the death of a loved one; bridging the gap between dreams and waking life. I was slightly disappointed that he did not mention what one Web site that discusses lucid dreaming describes as enjoying "peak sexual experiences in complete safety."

Our vacation would be organized around specialized sleep schedules and stimulating group outings to beautiful, dreamlike locales on the island. LaBerge would instruct us throughout the week in various techniques to help us take control of a dream — for instance, inducing a tactile experience each time we realized we were dreaming, like rubbing our hands together or spinning our bodies. We were also given capsules of a nutritional supplement called galantamine. Derived from the common snowdrop flower, galantamine has been shown to stimulate a neurotransmitter called acetylcholine, which is thought to heighten cognitive faculties, including those responsible for dreaming.

Finally, each participant was given a NovaDreamer, an electronic sleep mask that LaBerge and an engineer created in the 90's. Worn by a sleeping subject, it uses special sensors to detect the rapid eye movement, or REM, that marks the onset of dreaming. As soon as you begin to dream, the NovaDreamer shines a thin beam of red light onto your eyelid. A red light then appears in your dream. If correctly calibrated, the light will manage to jolt you into awareness without actually waking you up, thereby bringing about lucidity. The mask also features a button, the Reality Check, that activates a blinking light. If you are not sure whether you are awake or asleep, you try to press the button: if the light blinks, you are likely awake; if not, you are probably only dreaming that you pressed it and are still asleep.

As we prepared to go off to our rooms for our first night of sleep, NovaDreamers and galantamine in hand, LaBerge gave us a canny wink. "Think of me as Hermes guiding you into the Underworld!" he said. "May you be lucid tonight!"

ACCOUNTS OF LUCID dreaming go back at least as far as the ancient Greeks. Tibetan monks have long trained themselves to enter their dreams consciously, treating dream life as continuous with waking life. In the West, lucid dreaming was first explored systematically by the 19th-century aristocrat Marquis d'Hervey de Saint-Denys, whose book "Dreams and How to Guide Them" was published in 1867. The marquis conducted numerous dream experiments on himself, including one in which he had different women of his acquaintance wear different perfumes; when the various perfumes were sprinkled in succession on his pillow before bed each night, he dreamed of each woman in turn.

The actual term "lucid dream" was coined in 1913 by the Dutch writer Frederik van Eeden in his work "A Study of Dreams." Van Eeden observed about 500 of his own dreams, which he divided into nine basic types. The "most interesting and worthy of the most careful observation and study," he wrote, were lucid dreams. He reported that he experienced and chronicled 352 examples of lucid dreams between 1898 and 1912.

Nonetheless, for many years critics doubted that the dreaming brain was capable of lucidity, arguing that such episodes were more like a trance or hallucination. Either way, there was no hard proof. But in the late 1970's, LaBerge, who was working toward a Ph.D. in psychophysiology at Stanford, helped to change that. Existing sleep studies had already established that some eye movements during REM sleep turned out to correspond to the reported direction of a dreamer's gaze. (For example, a subject might wake and recount a dream in which he was looking up in the sky; this would square with upward-looking eye movements registered during his REM sleep.) So LaBerge and his fellow researchers simply asked lucid dreamers to carry out certain eye movements in their dreams when they became lucid. Sure enough, the prearranged eye movement appeared during REM, suggesting that the subjects had indeed been lucid and able to control their actions during their dreams.



During a lucid dream
all while remaining soundly

LaBerge used this strategy in a series of subsequent studies that demonstrated other correlations between the dreamer's subjective reports of his dream behavior and his recorded physiology. As he has written, LaBerge and his fellow researchers have found, for instance, "that time intervals estimated in lucid dreams are very close to actual clock time; that dreamed breathing corresponds to actual respiration; that dreamed movements result in corresponding patterns of muscle twitching; and that dreamed sexual activity is associated with physiological responses very similar to those that accompany actual sexual activity."

Inspired by LaBerge's scientific credentials, I repaired to my room, which was in one of the resort's airy Hawaiian lodges, and put on my NovaDreamer. It was only 10:30 p.m., but the resort was silent; the rain softened, and I could hear the frogs shrill. I lay down and set the NovaDreamer to its weakest setting. Almost at once, I was asleep — or I thought I was. In the total darkness of the NovaDreamer it was difficult to say, though I did have a vivid image in my mind of the spiders clinging to the webs that were slung across my paneless window.

At 7 a.m. I awoke to the sound of the wailing conch that called all dreamers to the collective lanai, or veranda, for breakfast. I found that I had slept beautifully but that I had not, in fact, dreamed (or at least had not recalled my dreams). On the lanai I found a lone Englishman and fellow dreamer named John, a laconic Internet millionaire who, like the rest of the members of the group, had paid $2,000 (not including air fare to Hawaii) for the trip. He was sipping his coffee and watching little birds flit around his scrambled curried tofu. Additional dream tourists joined us: Philippe, a Canadian circus artist with the experimental Mystic Family Circus in San Francisco, and Leo, a soft-spoken ex-soldier from Tennessee who said that he was on a global odyssey to rediscover himself after a nearly fatal motorbike accident. Others in our band were more circumspect. Anna, a middle-aged marriage counselor from Rome, looked strangely out of place amid the foliage with her platinum curls and wary glances. Sitting down with us, she admitted that she, like me, was having trouble dreaming. "Tonight, however, . . . " she said, tapping her eyes to indicate a NovaDreamer.

Lawrence Osborne, a frequent contributor to the magazine, is the author most recently of "The Accidental Connoisseur: An Irreverent Journey Through the Wine World."

ILLUSTRATION BY MAIRA KALMAN

The basic pattern of our days and nights was soon established. After breakfast, LaBerge would lecture on the subject of cognition and consciousness, and we would discuss our dreams. Later we would disperse for the afternoon according to our whims or band together for a hike to the nearby Kilauea volcano. In the evenings, we gathered for another lecture that featured memory games to condition us to recognize "dreamsigns" — preset clues that are designed to remind us in our dreams that we are not in waking life. The memory games were followed by screenings of dreamlike films that were supposed to show us, at an intellectual level, the fragility of our perceptual sense of reality — movies like Luis Buñuel's "That Obscure Object of Desire" or David Cronenberg's "Existenz." These were mixed with playful cognition games familiar to children, like making a point in your visual sphere disappear in your blind spot, the "hole" in our visual construction of the world created by a gap in the retina where the optic nerve passes through.

"So you see," LaBerge explained, "there is no experiential difference between what we see in our blind spots and what we see elsewhere." Similarly, in Buñuel's famous film, few notice that the heroine is played by two different actresses — we expect one character, so we see one character. "This illustrates the role of expectation in our experience," he said, "waking or dreaming."

it is possible to think reasonably clearly and to act voluntarily, asleep. Flying is one popular activity; sex is another.

In the latter half of this century, behavioral psychologists and other scientists often dismissed the significance of dreams. The Nobel Laureate Francis Crick famously declared that dreams were little more than the rubbish of the mind being cleared out for the night. Dreams, in this view, are just the brain's white noise as it reorders itself during sleep — a pseudo-profound illusion of meaningfulness.

But LaBerge, like Freud before him, cannot accept this. Where Freud, however, thought of the unconscious as seething with repressed energies — and of dreams as messages generated by those energies — LaBerge says he thinks dreams may play a less combative role in our psyche. "I think that the dreaming brain," he says, "is doing something very simple. Namely, exactly what it does whenever it is working: constructing a model of the world." He adds that dreams may play a critical and continuing role in the evolution of human culture by expanding the range and variability of our stock of ideas. "Darwinian evolution," he has written, "requires a variable population, a selective pressure and a means of reproduction of successful variations." It is possible that dreaming offers us a broad assortment of new ways of seeing and acting, some of which are adaptive in the changing environment. Thus, like useful genetic mutations, they are passed along to successive generations as part of our cultural evolution.

At some level, LaBerge argues, dreams will always remain difficult to elucidate because, though they are physical phenomena, they are important to us as mental experiences and sensations. "The dream body," he says, "is sensual but unphysical. It's also primeval. Curiously, we don't dream about writing, for example, because it's a relatively recent skill we've acquired; but we frequently dream about overcoming difficulty or danger because that's a human experience that goes back thousands of years." LaBerge is not concerned by the prospect that psychology or evolutionary science may never elucidate the significance of dreams. Even if dreams are some sort of biological side product or accident, he argues, they are still experiences. For us, dreams are narratives, which gives them emotional power, despite (or perhaps because of) the fact that they are often cryptic or puzzling.

"Dreams may not be messages," he says, "but they are our own most intimately personal creations. As such, they are unmistakably colored by who and what we are, and could become."

AS THE DAYS PASSED, my fellow dreamers and I found ourselves dreaming consistently, and our dreams were more intense than usual. Some of us were having lucid dreams; others (like me) were not. Every morning, LaBerge would ask us the same questions: "Is everyone awake? Are you sure?" My dreams were becoming more vivid and noticeably long, with a sometimes sinister tone. I wondered if, in the event of a nightmare, I'd be capable of turning it around, spinning my dream body, or rubbing my dream hands, until I gained control.

My morning routine was to wander down to the black lava cliffs and swim in the ocean, mulling over the dreams I had the night before. Wandering through the jungle afterward, I couldn't help noting how dreamlike the landscape was, with its tunnels of papaya trees and ghostly palm groves, and how within me waking and sleeping life seemed to be merging together day by day.

On our last night of vacation, LaBerge took us to a collection of sulfuric hot pools near the sea. Wreathed in steam, the class bobbed about under the moon. Afterward, a few of us drove to a mostly abandoned village nearby, buried by a lava flow a few years earlier. We sat outside at a driftwood cafe that served only kava, a drink made from a mildly intoxicating root. That night, high on kava, I fell asleep.

During the night I woke and saw that the resort was bathed in milky moonlight. A few yoga types were doing exercises in the nude. I threw a towel round me and walked down to the swimming pool. The water looked extraordinarily silvery, and in a corner of the pool was Anna, my fellow dream tourist, swimming quietly by herself in a rubber bathing cap. We greeted and commented on how neither of us could sleep. We were sorry to be going; the trip had proved a curiously gentle experience. As I slipped into the water, we talked confidentially.

"I'm going back to Rome," she said, "to sort out other people's problems, but I haven't sorted out my own."

"Do you think we're awake now?" I asked abruptly.

As I swam around her, I noticed that her body had become young and slim and that her hair had grown inordinately long, floating around her like kelp. I'm dreaming, I thought, and I reached up to touch the Reality Check button on my NovaDreamer. Nothing: I was definitely dreaming. It was a shame, I thought, marveling at Anna's newfound form, but what did I expect? In reality, she was sound asleep in her room — as indeed was I.

Life, they say, imitates art, but perhaps life also imitates dreams. In one conversation with my fellow dream tourists, someone said that life itself was just a very effective lucid dream technique. It seemed like a banal statement at the time, but on my way back home, as I passed through Honolulu airport, I spied Anna all alone in the airport bookstore, staring into space. It was strange, for I felt as if we really had met and spoken in the pool the night before. So I left her there without saying hello, and vowed to take control the next time I had a dream. ■

7.18.04

Style

House of Games

Go tell the Spartans that Calatrava's renovated Olympic Stadium is almost ready.

BY Herbert Muschamp

PHOTOGRAPHS BY Todd Eberle



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Utah State University
0740 Old Main Hill
Logan, Utah 84322-0740
435.797.1301 FAX 435.797.3899
www.usu.edu/history/whq/index.html
whq@hass.usu.edu
Utah State University

David Rich Lewis
Editor
Michael J. Lansing
Visiting Assistant Editor
Ona Siporin
Assistant Editor
Carolyn W. Doyle
Executive Manager

18 June 2004

Dear Ivan Doig,

Just a Followup Note to see if you have an interest in writing a "Field Note" about the meaning and importance of your work — what you do — for Western Historians. I know how busy you are, but I'm committed to openning the WHQ to other voices and approaches. I'd like your help, and love to give you a forum.

Please let me know if you'd like to discuss the possibility. Otherwise I'll not bother you out of respect for your time and work.

All Best Wishes,

David R. Lewis

DLewis@hass.usu.edu
435-797-1299

17 July '04

Dear David Rich Lewis--

I suppose the twinned facts that it's taken me this long to respond to your eminently reasonable letters and that I don't have time this Saturday afternoon to fire up the computer but am giving you the Royal (standard typewriter) treatment instead says more about my schedule crunch than anything else I can delineate. I'm nearing the halfway point on the manuscript of my next novel, and after that I have a contract for a non-fiction book about the West as if appears in my books, but I can't promise that any of that can wend its way to WHQ. I am filing you away and will look things over when I get to that non-fiction book; but in any case, I'm two or three years from being able to consider anything like "Field Notes." I do commend you for the feature; I liked Thom Ross's a lot. All best wishes in filling the roster for it.

Sincerely,

Norman Dong

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UTAH STATE UNIVERSITY
0740 OLD MAIN HILL
LOGAN, UTAH 84322-0740
435.797.1301 FAX 435.797.3899
www.usu.edu/history/whq/index.html
whq@hass.usu.edu
Utah State University

DAVID RICH LEWIS
Editor

MICHAEL J. LANSING
Visiting Assistant Editor

ONA SIPORIN
Assistant Editor

CAROLYN W. DOYLE
Executive Manager

28 April 2004

Ivan Doig
17277 15th Avenue NW
Seattle, WA 98177-3846

Dear Ivan Doig:

I'm writing to see if I can start a conversation with you about writing an essay for the readers of the *Western Historical Quarterly*. Let me explain.

We have a feature in the *WHQ* called "Field Notes" that is directed toward public history and the art of doing history. We publish it twice a year. Basically, "Field Notes" is an invited essay of 2000 to 2500 words max, one that is written as a professional experience with, assessment of, or advocacy for a particular subject, place, or method. We look for essays in which people talk about how they "do" history, particularly in a public setting, rather than a heavily documented essay addressing narrowly academic or scholarly debates. We want to raise awareness of the activities of these individuals and the resources they make available. We want to assess how the profession is dealing with these items/activities or how the profession could benefit from knowing about these things. We have had archivists write about available resources and archives; historians write about doing history in a public setting; accounts of historic sites and reenactments; discussions of museum displays/exhibits; and articles about art or by artists discussing their art. My intent is to reach out to include literature and music as well. We do not send these essays out for peer evaluation, but deal with them as in-house publications. We see them as less formal and more personal statements, with the bottom line of telling western historians why they should pay attention to these subjects or resources.

So, I'm writing to see if I can tempt you to write about the art you practice so well—the intersections of history and fiction and memory and place. The specific topic and the timing of delivery are ultimately flexible. You might want to discuss your perceptions of western history from your present vantage point and comment on the field; offer a more biographical meditation on how you moved from history to historical memory and literature; suggest what others following that path are likely to encounter and what they'll need; discuss what literature and historical fiction has to offer historians, and why they should pay attention to it. I'm just throwing out ideas in hopes that you'll have a better one, and be intrigued enough with the offer of a bully pulpit to think about it instead of following your gut instinct to say "No."

I know you're incredibly busy, but please consider my offer as a positive opportunity to promote what you do and what you think historians should confront as they go about their profession. Please take a minute and look at some of the "Field Notes" we've published over the last decade (they typically appear in the second and fourth number of each volume year—summer and winter). It's an eclectic lot. If you don't have copies, let me know and I'd be happy to send you a few. Keep an eye out for our Summer 2004 issue which should arrive the first of June—a "Field Notes" by Seattle-based artist Thom Ross with his paintings in COLOR!

Please feel free to contact me—I'd be happy to talk with you about the possibilities.

All best wishes for you and your work. Peace,

David Rich Lewis
Editor
Profesor of History
dlewis@hass.usu.edu
435-797-1299

ANNALS OF SCIENCE

SLEEP

Some must watch while some must sleep,
Thus runs the world away. —"*Hamlet.*"

Atkinson Morley's Hospital, in Wimbledon, a rambling, two-story building of gray-yellow brick, is a sister hospital of St. George's, Tooting, and it specializes in neurosurgical, neurological, and psychiatric cases. It also houses—under the aegis of St. George's chief psychiatrist, Professor A. H. Crisp—one of the National Health Service's last surviving sleep laboratories. Atkinson Morley's was built in the grand Victorian manner, and some of that grandeur lingers in the spacious wards. The offices and some areas for research, however, have been chopped out of larger rooms, so some of them are as high as they are wide. This makes the bedroom where the sleep laboratory's patients spend the night seem out of proportion: the window is unnaturally tall, the walls are unnaturally close, the ceiling is full of shadows. The room is furnished simply: a bed with an adjustable reading light above it, a small clothes closet, an uncomfortable-looking armchair upholstered in plastic, a battered writing desk and chair. An ordinary bedroom, in fact, except for a video camera high on the wall above the desk, a microphone hanging dead center from the ceiling, and a panel of sockets behind the bed for electrodes that the patients wear when they sleep. There is a large electric clock immediately above the headboard, and off to one side, pointing toward the ceiling, is an infrared lamp, a flared cylinder that looks like a giant's flashlight. The bedroom is insulated from the main corridor by a small room piled with junked equipment.

The sleep laboratory's observation room, next door, is twice the size of the bedroom, and is crammed with gear. A polygraph machine takes up most of the wall beneath a high window. Opposite are a steel sink, a draining board, and a regiment of mugs. (Tea-drinking is part of the ritual of sleep observation.) There are waist-high kitchen cabinets along the side walls, their tops piled with books, reprints of scientific papers, and files—mostly marked "Confidential"—along with a computer and a printer. Hanging from a rack on one wall are bunches of bright-colored electrodes. The rest of the furniture is basic: a wooden desk, a steel filing cabinet, two uncomfortable tubular-steel armchairs, a little table, a stool, a sagging easy chair without arms. In the center of the room stand a large television set and a video recorder, both of them elderly and battered.

Sharon Borrow, who is in charge of the laboratory, is a small, thin woman with startled eyes and a soft voice. She looks pale and tired, and there are dark circles under her eyes—understandably, given the nature of her work. She also seems, at first, preternaturally shy, but as the night goes on shyness merges with something else, something to do with the job itself: watching strangers while they sleep makes her uneasy; it seems to her an invasion of privacy, and she counteracts this with an intense concern to put people at ease, to soothe their anxieties and make them feel at home.

Above all, she is concerned for the patient, who, this particular evening, is an athletic young man in his middle twenties. He has a round face, a large mouth, wiry hair cut short, and businesslike spectacles. As is true of everyone who shows up at the sleep laboratory, the patient—call him Max—was referred by his local doctor to Dr. Crisp's unit at St. George's, where he was given a two-hour interview and a series of psychological tests. Max suffers from what is called a parasomnia, which "The Encyclopedia of Sleep and Sleep Disorders" defines as a disorder "of arousal, partial arousal, and sleep-stage transition," such as sleepwalking, rather than a primary sleep complaint, like insomnia or narcolepsy. Max's particular parasomnia, however, is different; it is a disorder quite common in very young children but rare in adults. Since long before he can remember, he has been rocking while he sleeps. Sometimes he rocks himself consciously, in order to get to sleep. "It's very comforting," he explains. "It's like being a baby. And because it's so comfortable I associate it with home. It's not something I do in a strange bed." But more often he rocks while he is asleep, sometimes gently, sometimes violently. This rocking



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scares him, he says, because it means he is out of control. It also upsets whomever he happens to be in bed with—so much that, these days, he mostly prefers to sleep alone. "When I'm alone, I know I can rock and it won't upset anyone," he says.

Max is an articulate young man, highly intelligent and not at all reticent about his troubles, which seem to be many. As a baby, he was a head-banger—"I used to bang my head so violently that I'd wake my brother in the next room"—and he has always been frightened of the dark; he slept with a night-light beside his bed until he was older than he cares to say, and even now he can't sleep with closed windows or drawn curtains. He talks about his troubles compellingly, and in such detail that, although his manner is matter-of-fact, something else seems to be going on between the lines: he wants to understand, he wants to be helped, he wants to be absolved of his scary nighttime self.



That may happen; in due course, perhaps, he will be referred for psychotherapy. But that is not Sharon Borrow's brief. What she will do is wire him up to her polygraph machine and record elements of his physiological activity while he sleeps. That information, suitably annotated by her, will be analyzed by a computer, which will print out its findings and also turn them into an elegant, colored graph of his night's sleep: the time he spends in the five stages of sleep—including his dream time, in what is known as rapid-eye-movement, or REM sleep—and also his periods of wakefulness. "We are not here to cure sleep disorders," Sharon says. "Our role is an investigative one. All we can do is confirm a diagnosis, check out the senior resident's clinical impression against the polygraphic evidence. We can rule things out, refine a problem and make it clearer. Then it's up to the psychiatrists to decide what to do."

Max settles into the sagging armchair and tilts his head back warily, as though for a shave. Sharon cuts nine pieces of adhesive tape and lines them up on the edge of the sink. Then she takes a rope of electric leads from the rack on the wall and carefully disentangles them. The leads are bright pink, and each has a plug at one end and a little silver-chloride cup at the other. Using a huge syringe, she injects a saline jelly into the cups, and then she tapes them to Max's head: two under the chin, one above and one below each eye, one behind each ear, and one in the middle of his forehead. While she is doing this, she keeps up a steady flow of reassuring chat, explaining each move, asking Max if he is comfortable. He replies amiably, trying to seem unconcerned, but every so often, when she disappears from his sight, he rolls his eyes like a frightened horse. There are eleven wires in all, and the last two have to be fixed to the back of his scalp—a process that is not easy, because his hair, though short, is thick and springy. Sharon dunks a strip of gauze into an ether-based physiological glue, parts his hair with a comb, presses one electrode into place, slaps the sticky gauze over it, then dries it with cold air from a compressor. By the time she has finished with the second electrode, the laboratory stinks of ether, and Max looks as if he were wearing two thin-spread strips of concrete on the back of his head.

At eleven-fifteen, we go into the bedroom, and Max, wearing his Medusa's mane of wires, climbs tentatively into bed. Sharon plugs the electrodes into the panel behind the bed, plumps his pillows, shows him an electric bell he can ring if he needs her, opens the curtains and the window just so, turns off the light, and goes back to the laboratory to check the equipment. Once she is sure that the polygraph, the video, and the bell are working properly, she switches them off and returns to the bedroom. She tells Max to read until he feels sleepy, and then buzz her.

Each patient spends two nights at the hospital, the first to acclimatize him to the strange bed and stranger headgear, the second to record his sleep. But parasomnias are quirky and unreliable—sometimes they happen, sometimes they don't—so Max will be recorded both nights.

At twelve-thirty, he rings the bell, and we go back in to say good night. Sharon fusses around, making sure that the bell is where it should be, the glass of water is full, the bed and the window and the curtains are the way

he wants them. He seems quite easy now with the electronic snakes in his hair, and his eyelids are heavy.

Sharon pauses at the door. "From now on, you won't be alone," she says apologetically.

Back in the observation room, she switches on the equipment again. The image on the video monitor is cloudy, badly defined. Max, lying moodily on his back, is easy to see in the infrared light, but you can read the clock behind his head only by comparing it with its twin above the polygraph.

The polygraph itself is an intricate-looking machine, about three feet long and shaped like a table. At one end are ranks of knobs and switches, a broad sheet of paper unrolls itself through a slot near the center, and in between is a row of twelve horizontal pens, of which only the farther six are in use. The first pair, the electro-oculogram (EOG), record the eye movements; the middle pair, the electroencephalogram (EEG), record electrical activity in the brain; the third pair, the electromyogram (EMG), record muscle activity from the electrodes under Max's chin. The polygraph paper unfolds itself from a huge box beneath the machine, moves up through the slot, across the table and over its edge, then slowly and silently folds itself into a metal tray. This will continue until Sharon is convinced that the patient is sleeping soundly. Then she will switch the recording from the polygraph to a tape machine, and she herself will try to catch some sleep. In an average night, a third of a mile of paper will be covered by the pens' delicate, nervous marks.

THE pattern of human sleep is more or less universal. When Max is settling down but is still awake, the EEG records what are known as alpha waves, which are low voltage and fast (eight to thirteen cycles per second); he blinks periodically, making the EOG jump; the pens of the EMG zigzag wildly when he moves. After less than ten minutes, the brain waves begin to slow down, blinking is replaced by slow, rolling movements of the eyes, the EMG flattens, and Max drifts into Stage 1 sleep. This is a nebulous state from which one can as easily go back into waking as on into sleep. Real sleep, Stage 2, begins either with the first of a succession of sleep spindles or with a K-complex. Sleep spindles are short bursts of fast EEG activity, and they get their name from how they look on the graph—jagged and closely bunched. A K-complex also has a distinctive EEG signature: a sharp high-voltage negative wave followed by a slow positive wave. Gradually, the EEG waves become larger and slower, eye movement stops, the EMG flattens out. When these large, slow waves—delta waves, they are called—occupy twenty per cent of one page of the graph, the subject is in Stage 3 sleep; when they take up more than fifty per cent, he is in Stage 4, the deepest sleep of all. This is the time for sleepwalking and night terrors—parasomnias—and it can last for forty-five minutes, and often longer.

Falling asleep is like deep-sea diving: the progress is down and down, toward deeper and deeper sleep—downward from Stage 1 to Stage 4—while the brain waves expand and slow and increase their voltage, from alpha waves to delta waves. Then, suddenly, without warning, the sleeper comes up for air: blood pressure varies, heart rhythm and breathing quicken, oxygen consumption in the brain increases, its neurons fire as busily as they do during waking, and the EEG records low-voltage, mixed-frequency brain waves. Although the body is still sleeping, the brain is behaving almost as it does when the body is awake.

There are two major differences between this kind of sleep and the waking state. The first, and oddest, is that although the body is virtually as still as death, the eyes, beneath their closed lids, are moving wildly—which is why the phase is called rapid-eye-movement sleep. (Most mammals—with a few incongruous exceptions, such as the spiny anteater—have regular periods of REM sleep, and so do some birds and reptiles. The discovery, in 1953, of this strange physical characteristic was the breakthrough that changed all subsequent sleep research.) The second major difference is that in REM sleep the EMG is usually flat; in other words, the skeletal muscles are paralyzed, and movement is impossible. Another, more accurate name for this condition is paradoxical sleep: the brain is active, the body is shut down. Instead of responding to the signals from his brain, getting up, and going about his business, the sleeper dreams.



In a normal night, REM sleep occurs four or five times in spells of ten to thirty minutes. The first REM sleep is usually brief—about fifteen minutes in adults—but as night goes on the dreaming periods lengthen and become more frequent. The average sleeper in an average night dreams for an hour and a half or two hours. If he lives out his allotted threescore years and ten, he will spend about twenty-three of them asleep and, however little he subsequently remembers, between five and six of those twenty-three years vividly dreaming.

The paper unfolds itself steadily through the polygraph. By one-ten, the EEG waves are spacious and slow, and Max is in Stage 4 sleep. Sharon bends over the graph, studying it for long periods, checking the pens, plotting his progress aloud for my benefit. Every so often, the EEG pens zigzag frantically, in ways that seem unrelated to the peaceful figure on the video monitor.

"Artifacts," Sharon says. "Maybe someone has switched a light on somewhere in the building. It's not physiological. Believe me."

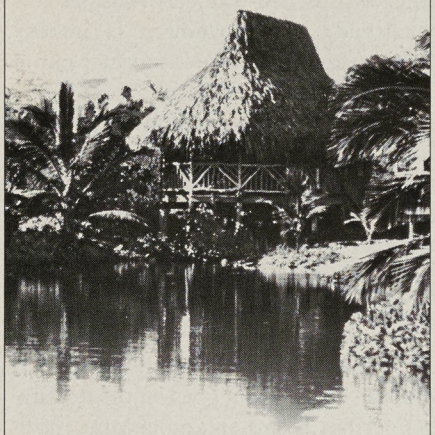
Earlier in the evening, the senior resident, Dr. Tony Katz, had told me that the polygraph was a notoriously tricky instrument to read, and that Sharon was one of the few people in the country who knew how to do it accurately. It seems that she is proving him right.

As we watch, Max stirs and partly wakes. The pens recording the EMG go briefly crazy. He settles again and lies still, but the EMG goes on twitching.

"Muscle contraction," Sharon says.

Ten minutes later, Max half wakes. He drinks some water, rearranges his pillows, rolls over onto his stomach, slips partly into sleep, and then surfaces again. He pulls the blanket up, pushes it back, moves fretfully from

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side to side. All this muscular activity provokes an insane drumming from the EMG pens. Finally, he rolls to his side, one leg bent, the other straight, and seems to sleep.

Sharon fetches a rolled-up mat of foam rubber, sheets, a pillow, and a duvet, and prepares to camp out in the observation room, if and when Max ever settles.

By two-fifteen, he appears to be sleeping peacefully, but Sharon, who is constantly checking the graph, is not convinced. Whatever his state, nothing much is happening, so I call it a day and cross the corridor to a bedroom I have been allotted, opposite the laboratory. Sharon says she will wake me if Max starts rocking. The night nurse, sitting in the corridor outside, legs propped on a chair, rug over her knees, looks up from her fat Nevil Shute paperback and smiles wearily. I undress, climb into bed, and drift off almost immediately.

And almost immediately Sharon is knocking on the door, urgently whispering, "It's started."

I pull on my clothes and look at my watch: two-thirty. When I blunder back across the corridor, the night nurse waves ironically.

Max is lying on his side, rocking quickly and rhythmically. To and fro, to and fro. The pens of the polygraph scratch and shudder. While I watch the video monitor, Sharon pores over the graph. He's sleeping, she says, but she can't tell which stage he is in. She won't know until she has examined the graph in detail in the morning. She checks the clock and scribbles a note on the graph, and then we both stand in front of the monitor and watch, fascinated.

A sleeping person is always a mystery, present and absent at the same time, seemingly peaceful yet really off on wild adventures in strange landscapes. But this is different. Max is not dreaming—that much, at least, we know from the polygraph. He is in the grip of some primeval rhythm, to and fro, a strategy he probably developed as an infant to allay his anxieties and soothe himself to sleep. According to Sharon, "to go from head-banging to rocking is a triumph of adaptation." But gradually this adaptive strategy has acquired a life of its own, and now it takes him over when his defenses are down. No wonder it scares him.

And no wonder Sharon is embarrassed by the nature of her work. I feel that we shouldn't be there, watching, commenting, taking notes. What we are witnessing is something intensely private—so private that even Max doesn't know about it. It is as though we were watching his doppelgänger, his secret, hidden night self.

For five minutes, he goes on rocking rhythmically and obsessively. To and fro, to and fro. Then it's over, as suddenly as it started. He sighs heavily and sinks again into sleep. The graph steadies.

Max is sleeping deeply when I get up at seven. At nine-thirty, he is still sleeping and looks set to go on until noon. I leave Sharon to it.

THE following evening, Sharon takes the precaution of letting Max choose his own pillows—he likes them soft. He seems easy and relaxed. He has had a swim and a long walk, he says, and he feels good. Soon after midnight, he is ready for sleep.

Sharon has adjusted the video camera, and the image is clearer and sharper than it was last night. Max lies on his back, hands clasped demurely over his stomach. The electrodes under his chin look like an ornamental beard. Without moving, he is asleep in minutes.

"It's the pillows," Sharon says. "Comforting as well as comfortable."

The same endless sheet of paper is unwinding through the polygraph, but this time the nearer six pens are in action, giving a parallel reading of the two nights' sleep. The difference is extraordinary—particularly the EMG, which tonight is almost flat. Clearly, the night of acclimatization has had an effect: the restlessness and anxiety have disappeared, and Max is sleeping easily, as though he were enjoying himself.

After about an hour, Max turns onto his side and presses the top of his head against the wall, like a baby cuddling against his mother. Then he settles back into deep sleep. We sip tea, Sharon reads and I watch, the paper feeds itself smoothly through the machine, the pens do their work in silence. The only sounds are the whirring of a fan and, on the monitor, Max's deep, slow breathing.

At one-thirty, Max wakes, drinks some water, stretches, rolls onto his stomach, then onto his back, and finally settles on his side with one leg drawn

up and his hands tucked beneath it. Sharon checks the graph, then watches him attentively. The expression on her face is protective. When a moth flies in through his open window, she says, in a worried voice, "He's frightened of moths." But, of course, although we can see the creature in the infrared light, Max could not, even if he were awake.

"Night can be very threatening," Sharon says. "Things loom larger at two in the morning than at midday."

I remark that Max seems much more peaceful than he was last night.

"I've heard some patients say that the sleep lab itself is the cure," Sharon replies. "And why not? They're being observed, measured, contained. Someone is taking them seriously."

By 2 A.M., we are both sleepy. Sharon brings in her mattress roll and unstraps it. "I don't think anything is going to happen," she says.

This time, however, she is wrong. Ten minutes later, Max wakes partly, yawns prodigiously, then immediately begins to rock. The recording pens set up their hullabaloo. He rocks from side to side, raptly and steadily. The movement is eerie, intense, ritualistic.

The rocking goes on for five long minutes. When it began, Max was technically awake. By the time it has finished, he is asleep. After ten minutes of apparent sleep, he wakes again, drinks more water, blows his nose loudly. More yawning and twisting about. He seems unable to get comfortable, and at two-twenty-eight he starts rocking again. This time, according to the polygraph, he is fully awake; the rhythm is determined, infantile, primitive. It lasts for just one minute. Then he sighs deeply and slips straight into Stage 2 sleep.

Sharon looks relieved. "I don't know why he rocks," she says, "but it certainly does the trick. Look how sweetly he's sleeping."

The next morning, Max is up and about by eight o'clock, cheerful and pleased with himself. "Slept like a baby," he announces. "I feel great."

When Sharon tells him yes, he did rock, and it's all on the graph and videotape, he seems doubly pleased.

"We'll analyze the material and be in touch," she says. "There'll be a follow-up interview in a couple of weeks."

She, too, seems pleased: by the good shape her patient is in on this fine morning, and by the fact that his parasomnia manifested itself and she has the material she needs.

I give Max a lift into town through the morning rush hour. He is relaxed and talkative, but what he talks about is the subject that obsesses many of the young in these hard times: how difficult it is to find a job, even with the best qualifications. He does not mention his sleep problems, and when I ask casually if he thinks Dr. Katz will recommend psychotherapy, he shrugs and says airily, "I'm not really bothered by the rocking. In fact, I rather like it. It's comforting—it sends me to sleep. It's other people who object."

"Then why go to the sleep lab?"

Another dismissive shrug. "I wanted to know. I wanted to be sure. Anyway, they say it's a very rare type of behavior. Maybe it'll be useful for them to have it on record."

When I drop him off, he strides away down Marylebone Road, seemingly full of purpose—a man refreshed, relieved; absolved, for the moment, of his troubles. Perhaps Sharon was right: the sleep laboratory itself is the cure.

I NEVER found out what happened to Max. When I went back to Atkinson Morley's, three weeks later, his case was filed away, like all the others, in a file marked "Confidential"; and in sleep research, as in psychoanalysis, confidentiality is an inviolable part of the deal between the patient and the clinician. I was told just one detail, and that had to do with sleep research, not with Max. Parasomnias usually start in Stage 4 sleep. "Sleepwalkers move from deepest sleep to waking without being cognitively aware," Sharon said. "They are awakened by an internal event." Max, however, rocked when he was awake, and he rocked in Stages 1 and 2 sleep. He even rocked in REM sleep, which is theoretically impossible, since the muscles are paralyzed in REM. But he never rocked in Stage 3 or 4. "Academically, it's a very interesting case," Sharon said.

I was back at the laboratory to find out what it was like to have my own sleep monitored. Sleep, even when you are sleeping with someone else, is the most private of all experiences. Your dreams may be full of people and places and strange events, but you share them with no one—at least while

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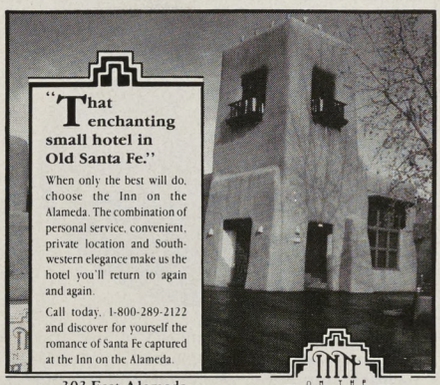
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they are happening. And your activity—the tossing and turning and snoring, the partial waking and broken fragments of speech—all take place without your knowing anything about them. So, in principle, it seems unnatural for a person or a machine to be watching, recording, analyzing a process that is a total mystery to you yourself. But knowing of Sharon's embarrassment, even after years of experience, made it easier.

I sat in the beat-up easy chair while she attached the electrodes. First, she rubbed the skin with industrial alcohol, "to facilitate contact," she said. It felt like a bracing aftershave. Then the electrodes went on: chin, near the eyes, center of the forehead, behind the ears. They felt weightless, not at all uncomfortable. There was a pause, while the room filled with the stench of ether. Sharon parted what hair is left on the back of my head and held the electrode in place gently with one finger. The strips of glue-soaked gauze felt icy at first, then stiff as wood when they dried. They seemed to complete a circle with the electrode in the middle of my forehead, like a hat one size too small, but within a couple of minutes the sense of restriction had gone, and I was no longer bothered by them.

Sharon gathered the leads from the electrodes into a neat pink bunch and handed it to me. As we walked next door to the bedroom, she questioned me solicitously. Did I feel comfortable? Was there anything I needed? Was there anything she'd forgotten? While she checked the equipment, plumped the pillows, and filled a glass of water at the sink in the adjoining junk room, I looked out the enormous window at the spread of lights in the dormitory suburbs to the south. I could see cars on the A-3 bypass, and the brightly lit windows of a train moving briefly between two masses of shadow. But immediately beyond the hospital there was nothing but blackness. A pleasant breeze blew through the window, stirring the curtains.

I got into bed carefully, trying not to muddle the electrode leads while Sharon plugged them into the panel at the head of the bed. She went next door to test the equipment, then returned, removed one of the electrodes under my chin, reinjected it with saline jelly, taped it back in place, and checked it against a green-and-red dial on the panel. "We have a problem with contact and impedance," she said. I twisted around to watch. No matter how much she fussed with the contact, the needle on the little dial refused to move from red to green. Finally, she said, "I think it's the dial that's not working. The polygraph will pick it up O.K."

I asked what would happen to the electrodes when I moved around or rolled over in my sleep. "Nothing at all," she said. "In a couple of minutes, you won't even know they're there."

And she was right. Going to bed with electrodes taped to your skull and knowing that they will record, while you sleep, things you yourself know nothing about—physiological events inside your brain, your muscular activity, your eye movements—seems like a surefire way of ruining a night's rest. And at first the electronic headdress felt awkward: the electrodes got in the way when I moved; they made me lie stiff-necked, like a figure on a medieval tomb. But we take technology for granted now; seeing yourself on a television screen, hearing your voice played back on a tape recorder, reading off your life statistics from a computer printout have become part of the natural process. Within minutes, I had forgotten all about the electrodes. Even so, I was glad I was undergoing only a routine recording—the kind they give to insomniacs, not to those who suffer from parasomnias—for it meant that the video camera and the microphone would be switched off. No one would actually be watching me sleep; no one would hear me snore.

Sharon said good night and turned off the lights. At my request, the curtains were open, and a faint sodium-orange light from the window emphasized the strange proportions of the room: long and narrow and absurdly high. The wallpaper went up to what would already have been a fair height—eight or nine feet—but the room rose, painted not papered, six feet above that. It was the kind of misshapen space you come across more often in dreams than in waking life.

I lay watching the shadows and the stripes of orange light on the distant



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ceiling. I could hear the hum of traffic on the bypass and the mechanical whine of a generator, faint and monotonous, from some far wing of the building. I pictured the polygraph needles scratching away in the next room and thought guiltily but vaguely that I, too, should be writing it all down.

The next thing I knew, the room was full of morning light. I rolled over and looked at my watch: it was six o'clock. I had had no dreams that I could remember, the glass of water by the bed was untouched, the electrodes on my head were all in place. I was grateful for such a sweet night's sleep, but I also felt that I had somehow missed the point of being there.

Sharon had told me she always woke at seven, however late she went to sleep, and I could see no reason to disturb her. I turned away from the window, and the next time I woke it was seven o'clock. Sharon, looking scrubbed and cheerful, came in when I rang the bell, and carefully untaped the electrodes from my head. When I told her that I'd had a great night's sleep, she seemed relieved as well as pleased.

The day was warm and bright, and I went to the window to sniff the morning air. The bedroom was at the back of the hospital. Beyond was a little field with a marquee and a red wind sock. (Atkinson Morley's is the regional headquarters for neurosurgical injuries, and the field is a landing strip for air ambulances.) As I watched, a hawk alit in one of the trees surrounding the field and settled down to eat its breakfast. Beyond the field were a gasometer, a short section of bypass, scattered houses and trees, then the rolling Surrey hills.



I showered and dressed, and joined Sharon in the observation room for coffee and cornflakes. She said that it would be at least a month before the computer finished analyzing the polygraph readings and produced a graph of my night's sleep. She pulled a section of folded paper from the metal tray at the instrument's foot and spread it out. The peaks and dips and nervous squiggles appeared to have nothing to do with my deep, dreamless sleep, but she studied them carefully and seemed satisfied.

"Look at this." She pointed to a sequence of curves on the EOG that looked like the kind of waves a surfer dreams about. "That's a really classic rolling-eye movement." From the way she spoke, I realized she was paying me a compliment.

And why not? I thought. I've done everything a model patient should do; I've slept like a baby.

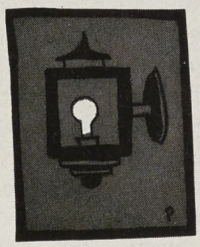
But not according to the computer, which eventually produced a printout and a statistical analysis of the various stages of my sleep, as well as a colored graph. What had felt like a long night's rest had in fact lasted just over six and a half hours, and in that period I had awakened and fallen back to sleep twenty-three times before my final waking. Most of those wakings were so brief that they hardly registered on the graph's horizontal time scale, but one had lasted a full ten minutes, and the grand total for the night was forty-three minutes. Yet the only time I could remember waking up was when I rolled over and looked at my watch at six o'clock. I thought that on that occasion I had gone straight back to sleep, but according to the polygraph I had been awake for a full five minutes. I had awakened momentarily from Stage 4 sleep a couple of times and from REM five times; the rest of the wakings were from Stage 2. Stage 2 does not count as deep sleep, but it is still real sleep, unlike Stage 1, so perhaps that is why I knew nothing about my waking episodes.

I also remembered nothing about my dreams, although I had had the standard five periods of REM sleep—two of them broken by momentary wakings and relapses to Stage 2. I had also been dreaming for ten minutes immediately before I woke at six, and was having a fragmentary dream when I woke for good an hour later. But none of the dreams had left a trace behind them.

In other words, the scientifically recorded reality of my night's sleep bore no relationship at all to my subjective experience of it. Although I had had the impression of a long night of dreamless and undisturbed rest, in fact the time from my first dropping off to my final waking up was a mere six hours and thirty-two minutes, and during that period I had really slept for only five hours and forty-nine minutes, including sixty-five minutes in REM sleep. According to the computer,

this gave me a "sleep efficiency" of eighty-nine per cent.

Statistically, this was about right for my age group, whose sleep efficiency averages ninety per cent. I was awake longer than the average (eleven per cent of the time instead of eight per cent), spent less than average time in Stage 1 (two per cent instead of ten per cent), about average time in Stage 2 (fifty-six per cent), far longer in deep sleep, Stages 3 and 4 (fifteen per cent instead of three per cent), and a little below average in REM (seventeen per cent instead of twenty-three per cent). There was just one very brief episode of "movement time" and eight tiny "minor arousals," which are scarcely more than muscular twitches. (Technically, a "minor arousal" is defined as a burst of muscular activity that occupies at least twenty per cent of an "epoch," or page of the graph; a burst of fifty per cent or more is called "movement time.") Together, they amounted to less than a minute. (Each page represents a third of a minute.) That meant that the computer rated the movement time and its percentage as zero. So at least my impression of having slept peacefully was justified.



But if I hadn't tossed and turned I hadn't slept much, either. I was dismayed by the number of times I had apparently awakened, and I put it to Sharon that an insomniac's graph would not have looked much different from mine. Not true, she said. It was just a question of age: as you get older, you need less sleep; you spend progressively more time awake and in light sleep, less in deep sleep and REM. But that was not how it had felt, and I have had enough bad nights in my time to know the difference.

I slept badly when I was young, woke often, and was troubled by my dreams. When I was around thirty and my life seemed to be coming apart in my hands, I had a brief period when I was unable to sleep more than a couple of hours each night. But that is a classic symptom of depression, and thirty years later I was no longer depressed. Or, rather, no longer clinically depressed. Instead, as I grew older I seemed to sleep better, more deeply, more gratefully each night. By the time I had reached my middle fifties, I could hardly wait to go to bed at night, and often found it hard to think of a good reason for getting up the next morning. Maybe that, too, was a symptom of depression. If so, it was a different kind of depression, and one I had less trouble living with. Now, in my sixties, I find that what may once have been a symptom has settled into habit, and I have given up making excuses for my partiality to sleep. The fact is, I am addicted to it, the way I'm addicted to coffee, and will take whatever is on offer: eight hours is fine, and seven seems like too little. I drop off quickly and usually remember nothing—not even my dreams. Of course, I don't wake altogether refreshed. After a certain age, someone has said, if you wake up without any aches and pains it means you are dead. But at least I don't feel cheated. And that is precisely how I felt when I learned from the polygraph that my good night's sleep had in fact been an hour and a half shorter than usual, and that for eleven per cent of the time—forty-three minutes—I had been awake.

My first reaction was disbelief: I felt that I had slept well, but the machines said I hadn't; one of us had to be wrong. Or perhaps we were both reporting accurately two quite different events, and the problem with sleep research was the same as the problem with most literary biographies: no matter how accurate the facts and painstaking the methods—all the survivors interviewed, the sources double-checked, the footnotes amazing—the results are insidiously skewed. What is missing is everything that makes the subject's work his own: the constantly shifting give-and-take between him and the other people in his life, allied to the feel, the tone, of a specific place at a specific time—Paris in the twenties, London in the sixties. What is missing, in other words, is how it felt to be that person in that world—all the details and overtones that are simply not available, whatever the good will and faultless research, to someone who wasn't there and can't make the necessary leap of imagination. That was also true in the sleep laboratory: with an event as subjective as sleep, the polygraph recording and the computer-generated information were bound to be partial, but imagination was not appropriate



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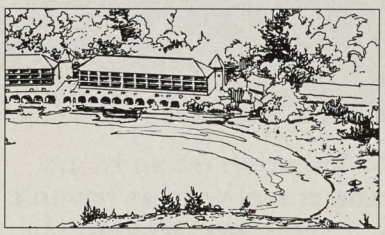
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Yet I wasn't imagining how I had felt. A good night's sleep is restorative—among other reasons, Sharon explained, because during slow-wave sleep there are large secretions of anabolic hormone that help tissue synthesis and regeneration—and when I woke, I felt restored. When I told Sharon that I probably would have been feeling lousy if I'd known that I had had so little sleep, she said, "We all wake more than we think we do."

It was an answer that deepened the mystery instead of explaining it. After all, it is a curious kind of wakefulness that can occur without your being aware of it. Sharon and I seemed to be using the same ordinary words to mean utterly different things. So I looked up "wakefulness" in "The Encyclopedia of Sleep and Sleep Disorders":

> A brain state that occurs in the absence of sleep in an otherwise healthy individual. It is the state of being awake that is characterized by EEG wave patterns dominated by alpha rhythm, or electrocortical activity, between 8 Hz and 13 Hz. This alpha activity is most pronounced when the eyes are closed and the subject is relaxed. . . . In addition to the characteristic alpha activity of wakefulness, there are also beta rhythms, which occur particularly with increased alertness, motor activity and in response to environmental stimuli. Wakefulness is often subdivided into quiet wakefulness, where an individual is resting in a relaxed condition, compared with a period of active wakefulness, when the individual is more alert and may be engaged in talking or other motor activities.

Now I knew. In Sharon's terms, most of the wakefulness I had experienced was technical, not subjectively real: a change of brain rhythm, a physiological event so brief that it registered as no more than a double vertical line on the computer graph. For the layman, the kind of waking that sets the pens of the polygraph jiggling is as paradoxical as REM sleep seemed when it was first discovered.

That in itself was no surprise. It is one of the truisms of sleep research that many insomniacs, when wired up to a polygraph, will swear they never got a wink of sleep, while the machine registers a near-normal night's repose. It is also true that the brain remains almost as active during sleep as it is when awake. Earlier in this century, physiologists like Sherrington and Pavlov assumed that the purpose of sleep was to rest the brain as well as the body. This has now been shown to be untrue. In his brilliant study of sleep, "The Dreaming Brain," Professor J. Allan Hobson writes:

> When microelectrodes were inserted into the cerebral cortex . . . investigators . . . observed that as many neurons turned on as turned off during sleep, and that almost all the cells in the brain were spectacularly active during REM sleep. Clearly, a general theory of neural rest during sleep can be only partially correct and is particularly controverted.

In other words, sleep itself is paradoxical, a condition in which none of the waking rules apply, including the rules about waking itself. Waking, dreaming, and all the other mental events that take place while we sleep leave, at best, only a passing trace on the memory—a trace that usually vanishes unless you write it down straightaway. Mental life goes on in a pure culture, as it were, unconnected with the senses. It is often deeply tinged with emotion, but that, too, takes place in a pure culture; it connects with your waking life only later, when you think about it—when you literally take it to heart.

And that is precisely the area that cannot, as yet, be measured in a laboratory. Sleep is a comparatively new field of research, because it depends on technology that has been developed only recently and is still being developed. Neuroscientists now have extraordinarily refined techniques for recording what happens in the brain, when it is awake or asleep, but there are still no precise methods for measuring subjective experience. Until there are, sleep researchers and laymen are going to have trouble understanding one another. "He sleeps well who knows not that he sleeps ill," Francis Bacon wrote. We define wakefulness in terms of consciousness, of being awake to the fact that we are awake. Sharon and her colleagues define it as something else entirely. From my experience in the sleep laboratory, I assumed that that something else was highly technical, something registered in microvolts and recorded on graph paper and computer printouts. But when I asked Sharon "You mean sleep is nothing like we imagine it?" all she said was "It's very subjective."

—A. Alvarez

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I poured over the proof for typos, my wife poured over the proof, my friends poured over it. I was certain that my job hung in the balance.—*Robert Wyatt in the Nashville Tennessean.*

It does.

Northwestern Bears Hit Hard by Humans

By JIM ROBBINS

HELENA, Mont. — The two large protected grizzly bear populations that remain in the United States, one in and around Glacier National Park and the other around Yellowstone, were hit hard this year by an unusually high number of deaths caused by humans.

In the Northern Continental Divide Ecosystem, 31 bears were killed illegally or had to be destroyed in a mountain habitat of six million acres that has Glacier National Park and federal wilderness areas at its core. That is the largest number of deaths caused by humans in the region since 1974, when the grizzly was listed as threatened under the Endangered Species Act. In recent years, the most killed annually was 19, in both 1998 and 2000.

More worrisome is that 18 of the dead bears were females, which are more important than males to the reproductive health of the entire population. Officials estimate the total number of bears in the ecosystem at more than 500.

In the Yellowstone region, where federal wildlife officials are trying to remove the bear's endangered designation, 19 bears were killed, 9 of them female.

Dr. Chris Servheen, the grizzly bear recovery coordinator for the United States Fish and Wildlife Service in Missoula, said that even though the mortality for females was higher than expected, it was not a threat to the population's long-term viability.

Environmentalists say it is. "They're downplaying the problem because it doesn't fit their political agenda of delisting the bear," said Louisa Willcox, director of the Wild Bears Project for the Natural Resources Defense Council, in Livingston, Mont. "It's a really big problem."

Environmentalists contend that the Bush administration is pushing to remove protections from the bear to allow federal land managers to increase logging and oil and gas development on federal forest lands around Yellowstone, despite a lack of evidence the population can succeed on its own.

Dr. Servheen denies that and says he is confident that the number of Yellowstone grizzlies, a type of brown bear, is still healthy enough to fend without endangered status. "This is the most intensively studied brown bear population in the world," Dr. Servheen said.

In the Yellowstone area, most of the bears were killed by hunters in Wyoming, south of the park, who said they were threatened by grizzlies.

Three factors are at the root of this year's deaths in Glacier, experts say. First, more bears than ever seem to be present, and they are moving into new areas. Second, the region is growing rapidly, and many new homes are being built in undeveloped mountain valleys. Third, this year was a poor one for wild bear foods, especially huckleberries.



Karen Nichols

A grizzly in Glacier National Park region, where 31 bears were illegally killed or had to be destroyed this year.

As bears left wild lands in search of food, they moved into residential areas, where they found garbage, bird seed, pet food and livestock grain. One grizzly bear pulled out window frames on a house to get inside and eat dog food.

"A bear's whole life is finding food," Dr. Servheen said. "When they find garbage, they remember that."

If a bear becomes conditioned to finding food and loses its fear of people "it becomes very dangerous and needs to be destroyed," Dr. Servheen said. Moving bears to remote locations does not work well, he said. They quickly find their way back.

In an effort to avoid grizzly deaths caused by humans, Dr. Servheen said, next year biologists will try to teach newcomers to bear country how to use bearproof trash cans, post bird feeders out of reach and properly store livestock grain. People who do not comply will be cited and subject to fines. "It's unacceptable for bears to die because people are sloppy," Mr. Servheen said.

The other major category of dead bears this year was "vandal kills." Eight grizzlies were found either shot or poisoned. Rewards have been offered and law enforcement officials say they have gotten more aggressive because of the large number of bear deaths. Population biologists find it hard to assess the effect of illegal kills because they do not know how many go undiscovered.

This year, biologists began a study to find out how many bears there are in the Northern Continental Divide Ecosystem. Researchers placed barbed wire with a scent on trees and as bears came by and rubbed the wire, they left hair. Some 33,000 hair samples have been collected, and the DNA is being analyzed. Results will be published in two years.

Based on anecdotal evidence, Dr. Servheen says the number of bears in Northern Continental Divide Ecosystem has increased sharply since the 1970's, when they were protected as a threatened species. Then, for example, very few bears lived along the Rocky Mountain Front on the eastern side of the ecosystem, he said, and now there are 50 to 80.

Circular Symbols of a Dream Telescope, Yet to Be Built



What does it take to see forever? These circles painted on the parking lot at the Carnegie Observatories in Pasadena, Calif., are a full-scale representation of a new telescope that the observatory and its partners hope to build by 2016.

Composed of 7 mirrors each more than 27 feet across, the Giant Magellan Telescope, as it is called, is to have the light-gathering power of a 83-foot diameter telescope, four times the power of any now on earth.

To show that it can be done, the Giant Magellan collaboration announced yesterday that it would begin to cast the first of the 27-foot mirrors this summer at the University of Arizona.

"This has happened a lot faster than I would have anticipated," said Dr. Wendy Freedman, leader of the project, who acknowledged that there was a long way to go. "The partners are serious about making this happen and are committing significant amounts of funding to move forward."

Science Times

The New York Times

In Autism, New Goal Is Finding It Soon Enough to

By ANAHAD O'CONNOR

SEATTLE — Sitting in a small evaluation room at the University of Washington, apprehension written on her face, Christa Zamora turned her eyes toward her son Connor and contemplated his future.

A talkative and animated 2-year-old, Connor appears normal, Ms. Zamora said, but it is too soon to be certain. Doctors diagnosed autism in her older son, Cameron, just before he turned 3. And with Connor, who is also at risk for developing the devastating neurological disorder, which runs in families, she has decided to be proactive, enrolling him in an early diagnosis study for children as young as 16 months.

"I'm very concerned," said Ms. Zamora, who is also worried about her third child, a boy due in February. "Connor seems to be past the danger zone. But Cameron repeats himself a lot, and sometimes I see Connor doing the very same things."

Across the country, thousands of toddlers like Connor are joining studies that could signal new hope for a baffling childhood disorder.

For years, autism was rarely noticed before the age of 2, its symptoms overlooked by busy parents or so subtle that pediatricians missed them. According to federal figures, only a third of the 6-year-olds who were receiving treatment for autism in 2002 had been identified by age 4.

> Doctors hope 'to be able to identify these kids at birth.'

But in the last two years much has changed. Propelled by an explosion of public awareness and growing evidence that early treatment with behavioral therapy can improve a child's chances, scientists have set out to diagnose the disorder as early as possible, and slowly, more children with autism are being identified before they turn 2.

Already, the average age of diagnosis in Britain has tumbled from roughly 43 months to 38 months or younger in only a few years, a pattern experts see emerging in the United States. And studies now under way could sharply alter the landscape of early detection by allowing physicians to routinely screen children before age 2, perhaps even in infancy.

"Part of it is that parents are more interested, and that pediatricians are getting a lot more sophisticated at detecting it," said Dr. Fred Volkmar, a professor of child psychiatry at Yale. "As these things have come together, there's no question we're seeing a lot more parents who are coming forward

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Looks

The New York Times

American Prairie Overlooked No More

A Vast Expanse Long Spurned Is Now Perceived as Priceless

By STEPHEN KINZER

WILMINGTON, Ill. — Ever since European pioneers first saw North America's midsection more than 200 years ago, most people have considered its vast expanse of prairie to be "the great American desert," a barren landscape meant to be either crossed or plowed under.

More than 90 percent of it has been turned into farms, towns and commercial developments. Even many environmentalists working to protect spectacular mountain ranges, wild rivers and old-growth forests have viewed the prairie as little more than empty land.

That perception is rapidly changing. Across the Midwest and beyond, projects to preserve or restore prairie landscapes are winning broad support. Environmental groups are investing millions of dollars in them. When naturalists who run prairie preserves call for volunteer help, they are often overwhelmed by the number of people who turn up.

On a recent morning here at the country's newest prairie preserve, the Midewin National Tallgrass Prairie, Bill Glass, an ecologist who is helping to plan its future, strolled like a proud father among long rows of wild quinine, porcupine grass and other native plants.

"We'll use seeds from these plants to restore a beautiful prairie covering thousands of acres," Mr. Glass said. "This has become a major field of interest for environmental scientists, but what's really amazing is how many ordinary people also want to be part of it. Somehow, this landscape touches people."

Midewin (pronounced mih-DAY-win) is the first federally designated, government-owned native-grass preserve in the United States. Five thousand acres of it opened in early June, and all 20,000 acres, with 48 miles of hiking and bicycle trails, are to be accessible within a decade or two. Because the preserve is barely an hour's drive southwest of downtown Chicago, its supervisor, Logan Lee, an officer of the United States Forest Service, says she expects it to draw large numbers of visitors.

"The amount of enthusiasm and commitment has been a phenomenal eye-opener to me," Ms. Lee said. "People may not have appreciated this landscape in the past, but what I'm seeing tells me that attitude has changed completely."

Scientists and others who have watched this surging interest in prairie landscapes say it has several causes. Some see it as stemming from broader trends, including nostalgia for the Great Plains that is fed by everything from fascination with the Lewis and Clark expedition to films like "Open Range" and "Dances With Wolves." In recent years, many Americans have also become interested in cultures of the Plains Indians.

Because about 40 percent of North American bird species are native to the prairie, many people who enjoy bird-watching also support restoration projects. So do those who see tourist potential in restoring the landscape that existed here before European settlers arrived.

"People are leaving small towns, communities are declining, and the depopulation of the Great Plains is accelerating," said Rob McKim, a vice president of the Nature Conservancy, which owns the country's largest network of prairie preserves and is spending more than $15 million this year to maintain and expand them. "So now people are looking at buffalo grazing, eco-tourism and other ways to conserve and restore what was once the American Serengeti."

> 'We're suddenly discovering that we value native landscapes.'

Some specialists believe that people who join this growing save-the-prairie movement are responding to primal urges.

"Grasslands are tattooed on our genes," said James R. Petterson, a spokesman for the Nature Conservancy. "Our ancient ancestors evolved on the high, grassy plains of East Africa. We humans are programmed to prefer parklike vistas and wide-open, sunlit spaces."

Others have a more pragmatic explanation.

"This landscape has been on the brink of disappearing," said Harvey Payne, director of the 39,000-acre Tallgrass Prairie Preserve in Oklahoma. "The general public, academic specialists and our political leaders are sensing that if we don't do something now to protect it, we aren't going to have any left."

In May, the Tallgrass Prairie Preserve opened a new research station that includes classrooms, laboratories and space for specimen storage.

"It's just amazing, the number of people who want to learn about the prairie," Mr. Payne said. "Even people who live here, people who in the past took this landscape pretty much for granted, are holding the prairie more dear to their hearts."

A task force appointed by Gov. Kathleen Sebelius of Kansas recommended in early June that plans to erect turbine towers for generating wind power should be limited so they do not mar the landscape of the Flint Hills, home to two-thirds of the country's surviving tallgrass prairie. The task force also urged state agencies to begin promoting tourism in the area.

One major scientific breakthrough of modern prairie studies has been the discovery that two practices — buffalo grazing and periodic burning — are essential to the health of prairies. At many preserves, buffaloes, which eat prairie grasses and so keep them from overwhelming leafy plants, either have been introduced or are to be introduced. And controlled burns, which allow prairie plants to renew themselves, take place several times each year, often attracting crowds of spectators.

Four years ago Jan Jantzen, a former college administrator who lives near Emporia, Kan., started a company that offers horseback tours of the prairie. He also gives visitors a chance to witness and help manage controlled burns. At the last one, in April, he offered to accommodate 20 people, but ended up with 60 over a two-day period.

"The interest people have in the prairie from all over the country — really from all over the world — is becoming quite extreme," Mr. Jantzen said. "Tourism out here is still a new idea, but as soon as some of us guys start driving new pickups and our neighbors realize that we didn't make the money from running cattle or raising crops, their interest is really going to pick up."

The cachet of this landscape has become so strong that thousands of businesses across the Midwest now use the word "prairie" in their names. Lincoln, Neb., has a Prairie Dental Clinic, and Grandview, Mo., a Prairie Framing Company. In Corralville, Iowa, there is Prairie Auto Sales.

When a housing development in northern Illinois called Prairie Crossing is completed in a couple of years, it will have 362 homes clustered near a restored 190-acre prairie.

"Our first development manager didn't want to use the name 'Prairie Crossing,' because he said it sounded unkempt," said Victoria P. Ranney, president of the development company. "But it has turned out to be a very big plus, because now there are so many people who are realizing how beautiful this landscape can be.

"People are so excited when they see what comes up after a prairie burn: the grasses and herbs and flowers, plus all the birds and butterflies and other kinds of wildlife. It's something that makes ordinary people into—I don't want to use the word 'fanatics,' but incredibly committed advocates for this environment."

Artists have also begun to discover the prairie, and "prairie art" is emerging as a new genre. A show of this art called "Homage to the Flint Hills" was unveiled at the State Capitol in Topeka, Kan., in March and is to move to various locations around Kansas in the next two years.

"Because the prairie is very stark, paintings of it tend to convey an abstracted feel of color and light," said Joan Parker, one of the artists represented in the show. "They're a middle ground between landscape and contemporary abstraction."

Publishing houses are also taking advantage of growing public interest in the prairie landscape. This spring the University of Iowa Press reprinted the 1982 book widely credited with setting off the modern fascination with prairies, "Where the Sky Began: Land of the Tallgrass Prairie," by John Madson.

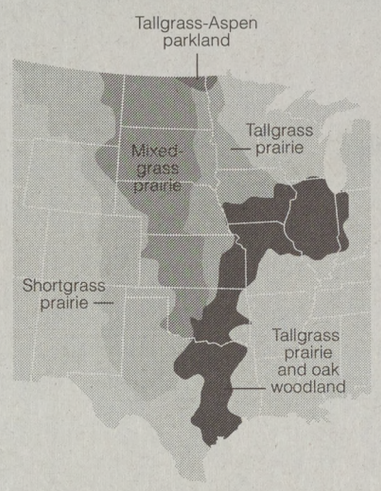
The same press has also just published "Prairie: A North American Guide," which describes prairie preserves in 10 states and 2 Canadian provinces. Later this year the University of Nebraska Press will publish "Encyclopedia of the Great Plains, " a six-pound reference volume with contributions from more than 1,000 scholars.

"Our aesthetic is changing," said Stephen R. Jones, co-author of "The North American Prairie," a new 510-page field guide that is the most comprehensive catalog of prairie landscapes ever published for a general readership. "We're suddenly discovering that we value native landscapes, and that has led to a groundswell of interest in prairies.

"I see it everywhere I go. Seventeen years ago I wrote another book on this subject, and I can assure you there's been a quantum leap since then."

Where the Prairies Once Stretched

Historic extent of prairies in the central United States.



Source: "The North American Prairie," by Stephen R. Jones and Ruth Carol Cushman

The New York Times



Kenneth Dickerman for The New York Times

Joshua Barrenger, a college student majoring in environmental science, caring for seedlings that will be planted at the government's Midewin National Tallgrass Prairie, southwest of Chicago.



James Gibbard/The Tulsa World

At the Tallgrass Prairie Preserve in Oklahoma, buffaloes were herded to a location where they could be vaccinated. Buffalo grazing, along with controlled burns, is essential to the life of a prairie.

THE REACH OF WAR: The Saudi Amnesty

THE INSURGENTS

Saudis Offer Limited Amnesty to Rebels

By NEIL MacFARQUHAR

JIDDA, Saudi Arabia, June 23 — The Saudi government announced a one-month amnesty on Wednesday, starting at once, for anyone involved in extremist activities.

The offer suggested that the country's rulers, while shaken by two months of terrorist violence, believe their grip on power to be firm.

In a speech broadcast across Saudi Arabia and the Arab world, Crown Prince Abdullah vowed that those who turned themselves in over the next month would face no state prosecution, although he left open the possibility for relatives of the victims to demand justice under Islamic law.

"We offer a chance for whoever belongs to the misguided group and is still at large following involvement in terrorism operations to repent, plead guilty and voluntarily surrender," said the crown prince, who is the country's effective ruler, according to the translation provided by the Saudi Press Agency.

"We, government and people, want to open the door of penance and security for whoever is wise enough to take it; and whoever takes the chance will be safe," he added. "But should he be obstinate, he will face a resolute force."

The kingdom has made similar offers in the past, although few have responded. But it has never made such a gesture with quite the same emphasis.

Saudi experts saw the move as a quick follow-up to the success the security forces had last week in killing or capturing major members of the most violent cell linked to Al Qaeda in the country within hours of its announcement that it had beheaded Paul M. Johnson Jr., its American hostage.

With the cell's most effective leaders eliminated, the amnesty is intended to divest the insurgent underground of its younger members and new recruits, these experts believe. The targets of the amnesty, the experts say, are those who have not yet shed blood and who might be tempted to change their ways.

"There are many new and young recruits who have not yet been implicated and it is those individuals who can evidently turn themselves in and who the state is aiming at with its pardon," said Abdel Rahman Lahem, a lawyer and expert on Islamic extremists.



Saudi TV, via Associated Press

Crown Prince Abdullah of Saudi Arabia is shown in an image from television as he offered amnesty to Muslim militants who surrender.

"The others who are directly and hugely implicated in criminal acts I don't think would give themselves up," he said. "These groups are motivated by very strong convictions and they don't even acknowledge the legitimacy of the state in the first place."

Until last weekend, many Saudis and foreigners living here felt that the kingdom was lurching out of control, in view of eight attacks in rapid succession that left some 50 people dead. But the sudden decimation of such a major terrorist cell has given much of the country, not least the royal family, the sense that the terrorist threat, while not eliminated, is manageable.

"We are still here despite the fact that every 10 years we have the same question: 'Will the royal family survive?' " Prince Saud al-Faisal, the foreign minister, told a small group of reporters on Wednesday. "We keep proving resilient in that."

The royal family, he added, "represents something of significance for the unity of this country, which should not be forgotten."

Still, the threat of instability has not disappeared entirely, with more than a dozen men on the government's most-wanted list still at large.

In Riyadh over the past five days, security forces have continued pressing their searches, sealing off entire neighborhoods and checking the occupants of individual houses as helicopters hovered overhead looking for anyone trying to flee. They also have yet to locate the body of Mr. Johnson — and may not be able to do so, given that the four men who are believed to have kidnapped him were all shot dead.

Another 12 men were captured, and Saudi news reports have suggested that 2 or 3 of them were on the original most-wanted list of 26 suspects published late last year. One of them surrendered and 9 have been killed, leaving some 16 whose fate is not publicly known. The Saudi government does not always make public the names of those it detains.

Those 16 are not all among the most important terrorists in the country, Saudi and Western experts point out. Although much about their lives remains unknown, the men, who range in age from around 20 to almost 40, break down into three main categories, the experts say.

Three of them are religious sheiks who are believed to provide the Islamic justifications for violence. At least two more are experienced fighters who might take over mission planning for the group that calls itself Al Qaeda on the Arabian Peninsula, since the most-wanted member of the group, Abdelaziz al-Muqrin, was killed last Friday. The remainder are said to be foot soldiers for the Qaeda group about whom little is known.



European Pressphoto Agency

Saudi citizens looked at a car that was riddled by gunfire last week at a Riyadh gas station. Abdelaziz al-Muqrin, a leader of the Qaeda organization in Saudi Arabia, was killed in the shooting.

Preliminary attention focused on Saleh al-Awfi, a 33-year-old former Saudi prison guard and veteran of Islamic militant groups' training camps in Afghanistan. Many believe he is the most likely new leader of the group. He also has a penchant for writing colloquial poetry about their exploits. A second is Rakan al-Saikan, one of many men whose names are sometimes linked to the 2002 attack on the American destroyer Cole in Yemen. He may have been one of those captured last week, Saudi officials said.

Faris al-Zahrani, 27, is considered the most prominent and dangerous of the religious scholars. Mr. Zahrani wrote a book justifying the killing of Saudi police officers. There are persistent rumors that he was among those captured last week after being shot in the leg.

Another religious sheik is Abdullah al-Rashoud, who spoke out vociferously about the government's recent removal of the administration of girls' education from the religious authority.

Two of those on the list are Moroccans — Karim al-Miati and Hussein al-Huski. Mr. Miati is an explosives expert, but Mr. Huski remains a mysterious figure.

There are believed to be some 2,000 members of Al Qaeda who have worked in the kingdom in recent years, with some 350 of them being really active and the rest supporters willing to provide logistics or other help, one expert said.

Between 1,000 and 1,200 are in jail, he added, with many of the rest either on the run or gone to Iraq or elsewhere to take up holy war against the West. Recent news reports noted that the threatening tapes made by violent insurgent groups in Iraq have included the voice of at least one speaker with a Saudi accent.

The majority on the list of most-wanted suspects are from Suweidi, a poor Riyadh neighborhood where a BBC cameraman was shot dead and a correspondent critically wounded early this month. Western reporters no longer go there.

Saudi reporters describe it as an ultra-conservative place, where barbers refuse to shave customers because they believe that the Prophet Muhammad ordained that all men must grow beards. Tailors there will not sew long thobes — the robes worn by Saudi men — insisting only on the above-the-ankle type that is believed to have been prevalent in Muhammad's era.

In addition, the newsstands will not sell newspapers considered too secular. For example, religious conservatives denounce the Saudi paper Al Watan — The Nation — calling it Al Wathan — The Idol. Similarly, they refer to Al Sharq Al Awsat — The Middle East — as Al Shar Al Awsak — the Dirtiest Evil.

The royal family stresses the need to isolate the insurgents from religious conservatives because their interests are different.

"First of all they don't believe in jihad and that jihad is right as the terrorists claim it to be," Prince Saud said, adding "Their objective is not to create a greater Muslim state, as Al Qaeda's is."

North Korea Is Studying Softer Stance From the U.S.

By JOSEPH KAHN

BEIJING, June 23 — The United States presented North Korea with a proposal on Wednesday for phasing out its nuclear program in exchange for aid and security guarantees, as



About-Face on North Korea: Allies Helped

By DAVID E. SANGER

WASHINGTON, June 23 — President Bush's concrete offer to cajole North Korea to give up its nuclear weapons program is a turning point for an administration previously caught between two conflicting approaches to one of the world's most isolated, impoverished and dangerous nations.

News Analysis

One camp, encompassing many in the Pentagon and Vice President Dick Cheney's office, has argued for further isolating North Korea's government with a serious offer — even one laden with conditions for full disclosure, full dismantlement and full inspections that they expect North Korea will reject.

"My hunch is that it's going to be very hard to get North Korea to give up its nuclear weapons," no matter how good the offer, said Kurt Campbell, a former senior Pentagon official during the Clinton administration. He was speaking at a conference on proliferation challenges that was taking place here just as the administration was changing course.

South Korea, pressing to engage North Korea, began negotiating aid packages and military agreements. China reportedly paid North Korea millions of dollars just to come to the negotiating table, and publicly began questioning the validity of some of Washington's intelligence about North Korea's second nuclear program. That program was created with help from the Pakistani scientist Abdul Qadeer Khan.

And Senator John Kerry, the presumptive Democratic nominee, was beginning to charge that Mr. Bush

Montana's Worst



Woods notes, "People develop a 'sense of place' through experience and knowledge of a particular area. A sense of place emerges through knowledge of the history, geography and geology of an area, its flora and fauna, the legends of a place, and a growing sense of the land and its history after living there for a time."[31]

Families, traditions, and ties to the land remain vital and strong in Kona, now more than two centuries after cattle and horses first landed there. Residents are proud of the achievements of their ancestors who were hard-working, courageous, strong, and able to think fast in the saddle. It was not easy to rope wild steers crashing through a rain forest or to swim on horseback through the surf with snorting bulls. Milking sixty cows at dawn every day was hard work. Making butter, salting it, and packing it in wooden kegs for the Honolulu market required skill and ingenuity. Building roads from the seashore up to five thousand feet on the slopes of Mauna Loa demanded back-breaking labor. However, as land prices in Hawai'i rose and returns on beef cattle nose-dived, many ranches had to be sold or broken up. Others have embraced eco-tourism with trail rides and tours, pursued diversified agriculture with hot-house tomatoes and gourmet coffee, or focused on their beef, determined to survive by courting the tastes of gourmet chefs and consumers.



Though ties to the land remain strong in Kona, rising land prices have forced many ranches to be sold or divided. Surviving ranches have diversified, embracing ecotourism and new crops, including coffee (above).

Hawai'i's unique ranching heritage remains a vital, valuable part of the fiftieth state's colorful history. No Hawaiian parade is complete without mounted units: men, women, children, and horses all bedecked with flower and fern *lei*. Visitors and residents alike enjoy rodeo and cutting competitions, trail rides across mountain pastures, and historical tours to old ranch homes with horses or four-wheel-drive vehicles. Folklorist Lynn Martin put it well: "A common thread that binds the ranching community together is a deep love for the *'aina* (the land) and a willingness to enjoy nature in all of her unpredictable moods, including her fiery volcanic rage and her breezy gentility. Patience and strength, forged from long years of simplicity and hard work, seem to be the backbone of the paniolo and his family."[32]

The many distinctive and unusual elements of paniolo life in Hawai'i remind us that all history, even broad comparative studies, begins as local history. In Kona the integration and diversification of agricultural activities mark the ranching experience. The same ranch might produce cattle (butter, hides, tallow, and meat), sheep (wool and mutton), wild goat hides, coffee, macadamia nuts, pigs, and more. Most cowboys and ranchers lived in small communities, with a few stores, a church or two, and social amenities often not available on the mainland cattle frontier.[33]

Na paniolo come from every ethnic group that ever landed on Hawai'i's shore. The language they spoke was a medley of many voices, but Hawaiian words dominated among place names for water holes, landmarks, native plants and foodstuffs, colors of hides, and names of horses. The incredible landscape, constantly reshaped by earthquakes and lava flows, distinguishes and colors Hawaiian ranch history. Herding cattle and galloping horses across rough *a'a* lava fields and smoother pahoehoe takes a special kind of cowboy—the Kona paniolo.

This article is a product of the KONA HISTORICAL SOCIETY's Kona Heritage Ranch Project and its committee members who are from long-time Kona ranching families. RICHARD W. SLATTA is professor of history at North Carolina State University. He has published seven books, including *The Mythical West* (2001) and *The Cowboy Encyclopedia* (1994). KU'ULANI AULD, who grew up on the Mahealani Ranch, is project director of the Kona Heritage Ranch Project and also heads up the Ranching Committee. MAILE MELROSE, a Kona historian, is the great-granddaughter of Henry Nicholas Greenwell, one of Kona's earliest ranchers. The authors thank the Ranching Committee for its work, contribution to this article, and commitment to preserving Kona's history and heritage.

31. Quotation from http://makingsenseofplace.com/, accessed February 2004. See also Yi-Fu Tuan, *Space and Place: The Perspective of Experience* (St. Paul, Minn., 1977); Yi-Fu Tuan, *Topophilia: A Study of Environmental Perception, Attitudes and Values* (Englewood Cliffs, N.J., 1974).

32. Lynn J. Martin, ed., *Na Paniolo o Hawai'i* (Honolulu, 1987), 15.

33. Richard W. Slatta, *Comparing Cowboys and Frontiers: New Perspectives on the History of the Americas* (Norman, 1997); Richard W. Slatta, "The Whys and Wherefores of Comparative Frontier History," *Journal of the West*, 42 (Winter 2003), 8–13. On the Greenwell Ranch, according to Elizabeth Greenwell Richards, all the cowboys lived "down at the cowboy village, . . . right across from Jack's [Greenwell] on the mauka side. That's where they all had their houses." Elizabeth Greenwell Richards, interview by Jill Olson, Jean Greenwell, and Sheree Chase, June 24, 1992, transcript, p. 30, KHS.

Natural Disaster

The 1964 Flood on the Blackfeet Indian Reservation

by Aaron Parrett

IN THE SECOND WEEK OF JUNE 1964, the worst natural disaster in Montana's recorded history descended on the state in the form of heavy rains that quickly turned once picturesque creeks into raging, mile-wide rivers. Dams, roads, and railroads washed out, homes and ranches were swept away, and thirty people died. The area affected by the flooding amounted to nearly thirty thousand square miles, or roughly 20 percent of the state. By Thursday, June 11, President Lyndon Johnson had declared nine counties in northwest and north-central Montana a federal disaster area. When mopping-up operations ended, damages stood at an estimated at $62 million.[1]

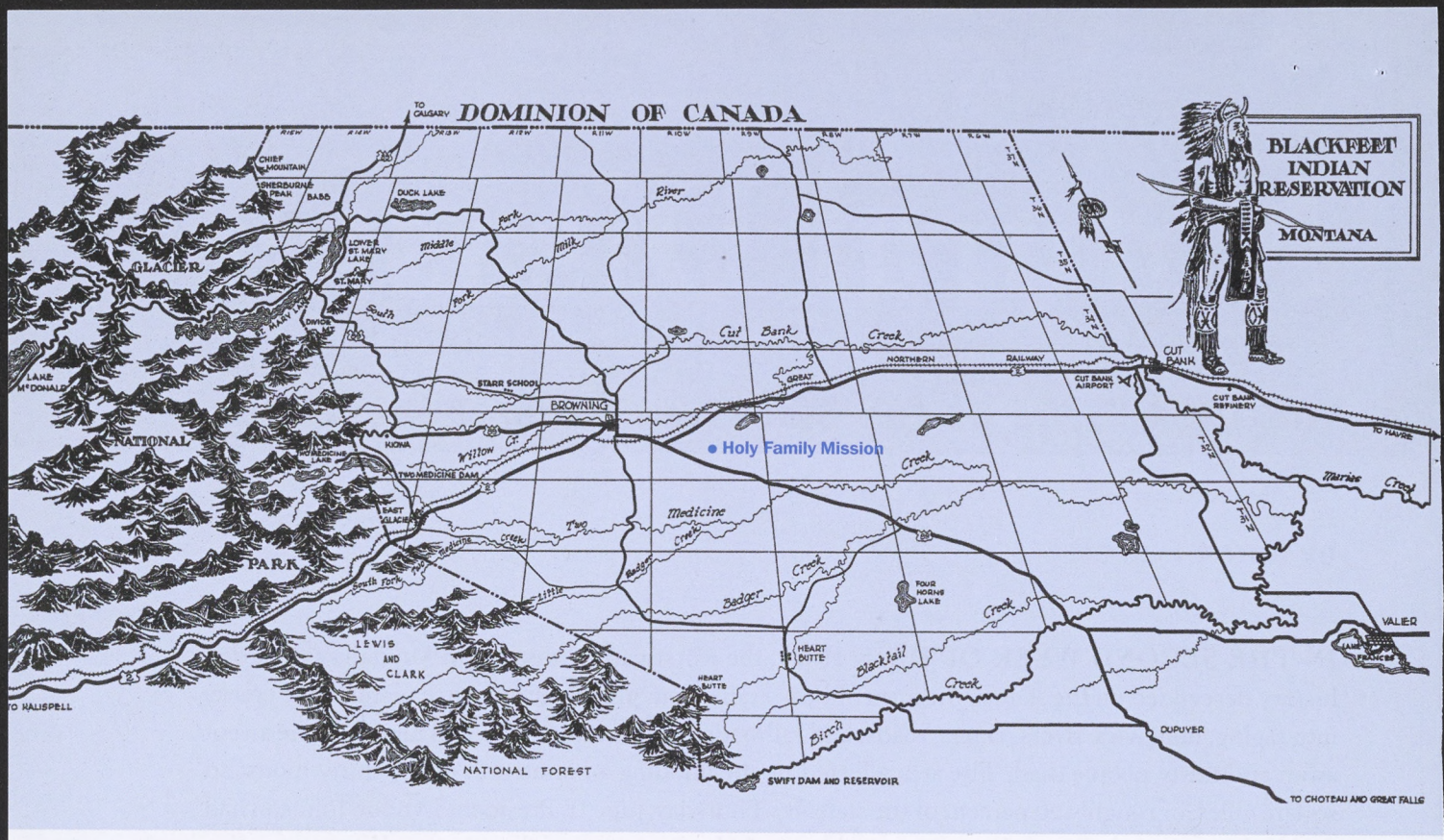
In its official report, the United States Geological Survey (USGS) offered a comprehensive analysis of the meteorological and hydrological conditions that created the flooding. The first and most important factor was the inordinately heavy precipitation that preceded the storm. While precipitation levels were normal from January through March, and mountain snow pack was actually less than normal through March, heavy snowfall in April brought mountain snow cover to well above average by the end of the month. In early May an unusually heavy snowstorm deposited record snowfall. Also contributing to the flooding were below-normal temperatures from March to May that delayed significant snowmelt. By the end of May the nearly saturated soil in the mountains could absorb little additional moisture.[2]

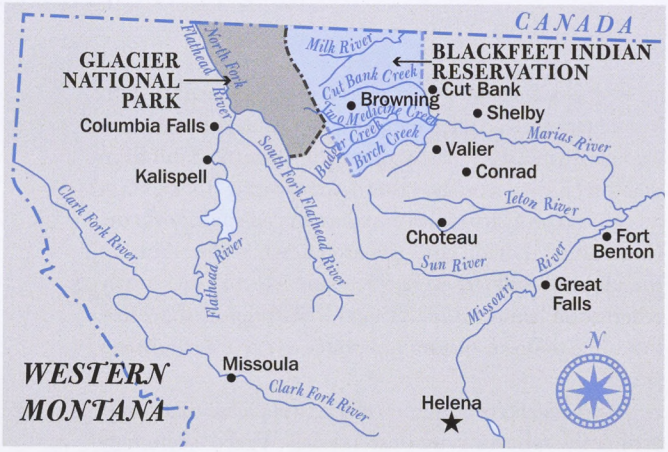
These conditions combined with an unprecedented weather system that swept into the state in early June. According to the United States Weather Bureau's official report, when June began, "moist air from the Gulf of Mexico was spreading north and north-northwest over the western plains and central Rocky Mountains." Through a phenomenon known as "orographic lifting," this moist air mass moved against the mountains in northwestern Montana, where cooler temperatures caused heavy rain. Ordinarily, moist air masses originating from the Gulf drop their precipitation on the eastern slopes of the Rockies. But this was no ordinary rainstorm: the air mass spilled over the Continental Divide and generated what the Weather Bureau referred to as a "lee-side storm" of nearly unfathomable magnitude. A 1995 USGS report suggested that such a storm occurs only once every five thousand years.[3]

In practical terms, the storm's arrival meant that places ordinarily reporting modest rainfall logged seemingly apocalyptic amounts for the twenty-four-hour period between June 7 and 8: 8-plus inches in Browning, 10 inches at Lake McDonald in Glacier National Park, 13 inches southwest of Augusta, and 11 inches at Heart Butte. It also meant major flooding occurred, especially on the Flathead River on the west side of the mountains and the Sun and Marias Rivers and their tributaries on the east. As the flooding developed, the media focused its attention on the cities of Great Falls and Kalispell, where damage was dramatic and easily documented from air and land.[4]

On June 7 and 8, 1964, the worst natural disaster in Montana's recorded history occurred as a massive storm dropped heavy rain on late-season mountain snowpack. The resulting flood covered roughly 20 percent of the state, but the Blackfeet Indian Reservation suffered the brunt of the disaster, with thirty lives lost, hundreds of homes and ranches inundated, and the reservation's infrastructure severely damaged. Among the property destroyed was the bridge over Cut Bank Creek six miles west of Browning, shown at left on June 9.

MHS Photograph Archives, Helena





Without question, however, the worst of the damage occurred roughly one hundred miles northwest of Great Falls on the Blackfeet Indian Reservation, where "raging rivers destroyed 265 homes, 20,000 acres of hayland along the creeks, two large dams, . . . irrigation facilities on which 37,000 acres of cropland depended, barns corrals, sheds, and livestock, all bridges and much of the Reservation road system, and, most tragic of all, claimed all the casualties of the entire flood area, thirty lives." As Bob Norris, an announcer for Shelby radio station KSEN, put it: "Tragedy was to be found everywhere, but if any single segment of the population was hit and hit hardest, it was the Blackfeet Indians on the Reservation."[5]

The way the flooding affected the Blackfeet Reservation versus the way the public perceived the event exposes an interesting disparity. A two-page photo spread in *Life* offers a good example of how media coverage failed to make clear that the brunt of the disaster hit the reservation. Though the article noted "at least 30 were drowned, 100 were missing and over 1,200 were left homeless," the brief text made no mention of the reservation and the accompanying photos of Great Falls seemed to suggest that the victims were from the Great Falls area. A *Newsweek* article that appeared a few days later focused on the damage to the reservation, but the accompanying photograph, which had no caption, showed a bridge washed out by the Teton River south of Choteau, forty miles away.[6]

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1. U.S. Army Corps of Engineers, "Report of the Flood of June 1964 in the Upper Missouri River Basin in Montana," in F. C. Boner and Frank Stermitz, *Floods of June 1964 in Northwestern Montana*, U.S. Geological Survey Water-Supply Paper 1840-B (Washington, D.C., 1967), 1–4. The $62 million is the equivalent of $367 million in 2003 dollars. Robert C. Sahr's Consumer Price Index Conversion Factors, oregonstate.edu/dept/pol_sci/fac/Sahr/cv2003.pdf, accessed September 18, 2003.

2. Boner and Stermitz, *Floods of June 1964*, B13, B5, B6. In an August 11, 2003, telephone interview, Boner noted, "When you have rainfall on top of existing melting snow, you are facing a potential flooding situation." In early June 1964 an unusually heavy rain fell on late-season snowpack.

3. Ibid., B18; Charles Parrett, "Regionalization of Annual Precipitation Maxima in Montana," in *Association of State Dam Safety Officials 1995 Annual Conference Proceedings* (Lexington, Ky., 1995), 654.

4. Boner and Stermitz, *Floods of June 1964*, 10, B29–B45. Although the dam at Hungry Horse Reservoir controlled flooding on the South Fork of the Flathead, the "Flathead River upstream from Flathead Lake underwent the most severe flooding of modern times. All main bridges upstream from Columbia Falls were washed out or rendered unusable." Ibid., B66–67.

5. Helen West, *Flood: The Story of the 1964 Blackfeet Disaster* (Kalispell, Mont., 1970), 4–5; Bob Norris, sound recording of KSEN radio broadcast, n.d. [June 1964], Oral History 79, Montana Historical Society Archives, Helena.

6. *Life*, June 19, 1964, 38–39; "Montana: 'The Dam is Busted,'" *Newsweek*, June 22, 1964, 30–31.

On the west side of the divide, the *Hungry Horse News* concentrated its coverage on the extensive damage to areas around Kalispell and Columbia Falls. Local newspaperman Mel Ruder even won a Pulitzer Prize for his coverage of the flooding. But aside from its normal reprinting of John Tatsey's column from the reservation's paper, the *Browning Glacier Reporter*, the *Hungry Horse News* made no mention of the reservation damage in the weeks following the flood. The *Browning Glacier Reporter* provided the best coverage of the events on the reservation, but its usefulness as a primary news source was limited by its small circulation and weekly publication schedule. The issue for the week of the flood came out three days after the worst had passed.[7]



Courtesy the artist

Although flooding was widespread on the reservation, the most devastating effects were seen on the two streams where dams failed: Two Medicine and Birch Creeks. Blackfeet artist Gary Schildt later drew his interpretation of these disasters, *Flooding River*, to illustrate Helen B. West's *Flood: The Story of the 1964 Blackfeet Disaster* (p. 37).

The neglect of the flood's effects on the Blackfeet Reservation is a result of both the media's tendency to marginalize minority cultures and the contingencies of the event itself. For a few days, the reservation (already isolated and remote) was almost completely cut off from the rest of the world. While this isolation was largely responsible for the paucity of media coverage at the time, the lack of attention in later reports and in historical scholarship reflects the dominant culture's tendency to minimize or overlook such events when the worst of the damage is experienced by a minority population. Perhaps the most subtle way the history of minority peoples is suppressed is through unconscious neglect. Fortunately, the flood's fortieth anniversary offers an opportunity to recover its significance as Montana's worst natural disaster and as an event whose primary locus was the Blackfeet Reservation.

For Great Falls, the urban center closest to the reservation and the largest city in the state, newspaper coverage of the flooding began on Monday, June 8, when the city's afternoon paper, the *Great Falls Leader*, ran the bold headline "Sun River Threatens Great Falls." By Monday afternoon families were evacuating the Sun River district with assistance from Malmstrom Air Force Base personnel, civil defense units, and local government agencies. Great Falls citizens were able to move their possessions to the dry storage opened at the local fairgrounds. Given that the Sun River did not crest until 12:45 A.M. Wednesday, the biggest difference between the flood's effect on the Blackfeet and Great Falls residents was in the availability of advance warning. Whereas many reservation residents had no time to plan an escape, citizens in Great Falls had at least twenty-four hours to vacate their properties and move their possessions to higher ground.[8]

The morning paper, the *Great Falls Tribune*, began its flood coverage on Tuesday, June 9, with a lead article that focused on the local threat. This article mistakenly attributed the status of "chief troublemaker" to the Sun River rather than to the tributaries of the Marias, confusing readers about the flood's geography and reinforcing the notion that the Sun River was responsible for the deaths announced by the headline "Dam-Buster Floods Kill at Least 8; Fearful Residents Evacuate." A front-page sidebar described the "dam-busting floods that swept down Monday from Montana's northwestern mountains," but information was limited because communication with the reservation had been broken. Only one other brief article, "Indian Families Isolated in 2 Browning Areas," mentioned the situation on the reservation.[9]

By June 10 headlines in both Great Falls papers were devoted almost entirely to the damage in the city and its outlying areas. The *Great Falls Tribune*'s lead article ran under the dramatic headline "Rampaging Sun River Hammers at Southwest Great Falls Homes," while a front-page sidebar vaguely noted "deadly destructive floodwaters poured over lowlands at record levels Tuesday leaving at least 30 dead upstream, dozens missing, and hundred [*sic*] homeless." In this context, "upstream" made little sense, given that the flooding creeks and rivers that were responsible for the deaths sent their waters into the Missouri *downstream* from Great Falls via the Marias. Neither

7. Tom Lawrence, *Pictures, a Park, and a Pulitzer: Mel Ruder and the Hungry Horse News* (Helena, Mont., 2000), 8–9.

8. *Great Falls (Mont.) Tribune*, June 8, 9, 1964. On June 10 the *Great Falls Leader* reported a peak water level of 24.6 feet at the Fourteenth Street Southwest Bridge, 5.5 feet higher than during the 1953 flood.

9. *Great Falls (Mont.) Tribune*, June 9, 1964. Eight of the state's major highways were closed, four of them on or near the Blackfeet Reservation. Closures listed in the June 9 *Great Falls Tribune* included U.S. 2 near Essex, U.S. 89 south of Babb, the Browning to Babb secondary road, and Montana 49 near East Glacier.



News coverage concentrated on the flooding in Great Falls (right) and in the Kalispell and Columbia Falls areas west of the Continental Divide. These reports attributed "chief troublemaker" to the Sun River rather than to the tributaries of the Marias River that flow through the Blackfeet Reservation.

did "upstream" clearly indicate that the majority of the missing and homeless were Indians. The article went on to repeat the misconception that the "chief troublemaker and record breaker was the Sun River," reinforcing the notion that the Sun River was responsible for the destruction.[10]

A June 9 *Great Falls Leader* article was just as vague about the dams' collapse. According to the paper's lead article, "A Civil Defense leader said the bodies of 26 flood victims were found Tuesday in one area of Northern Montana." Only later did readers learn that "all the bodies were found in Glacier County and most were taken to a mission south of Browning." It would fall to the *New York Times*, famous for its fact-checking standards, to provide a more accurate description. A June 10 front-page *Times* article carefully separated events that occurred in the Sun River drainage from those on the tributaries of the Marias. Aside from a few sentences about the reservation in a follow-up article on June 11, however, even the *Times* remained vague about specifics.[11]

By Thursday the newspapers' views of the events were gaining clarity, but details took back seat to coverage of the cresting Sun River near Great Falls. To its credit, the *Great Falls Leader* devoted a front-page sidebar to the collapse of the dam on Birch Creek, offering chilling eyewitness descriptions of the wall of water that swept down the valley. However, the article failed to point out that Birch Creek marks the southern border of the reservation or that, as a tributary of the Marias, its waters enter the Missouri at Loma, fifty miles downstream from Great Falls.[12]

In the aftermath of the flood, Great Falls newspapers continued to blur details in a way that subsumed the reservation tragedy into the record of the flooding at Great Falls. On June 14, for example, the *Great Falls Leader* reported: "At least 30 persons were dead, 38 missing and thousands homeless as the massive flood crest moved down the Missouri River over lowland areas past Great Falls, the state's largest city." Newswires disseminated this information nationwide, leaving readers to infer that the dead and missing were all victims of flooding on the streams flowing into the Sun River and that the flooding culminated in Great Falls. Newspaper coverage in the following weeks

10. *Great Falls (Mont.) Tribune*, June 10, 1964. Not until the final paragraphs on page 2 did readers learn that the victims were from outside Great Falls and the Sun River area. Even then, neither the reservation nor the ethnicity of the victims was mentioned. The article also confused details of the two dam failures. The *Life* article, which apparently relied on the Great Falls papers for much of its information, reinforced these misconceptions.

11. *Great Falls (Mont.) Leader*, June 9, 1964; *New York Times*, June 10, 11, 1964. The misinformation about the number of bodies recovered raised the ire of the Glacier County coroner, Bill Riddle, who stated that only ten people had been confirmed dead at press time on June 11. *Browning (Mont.) Glacier Reporter*, June 11, 1964.

12. *Great Falls (Mont.) Leader*, June 11, 1964.



MHS Photograph Archives, Helena

concentrated on mopping-up operations and flood-control plans.[13]

Within two months of the disaster, the *Great Falls Tribune* and the *Great Falls Leader* compiled a magazine-style edition of the flood coverage that sold for one dollar. The cover bore the title "Montana Flood 1964" in bold letters; its subtitle promised "The Story of Flood Week in Montana—June 1964." As a rehashing of the newspapers' flood coverage, the magazine was representative of the mainstream media news: it emphasized dramatic aerial photographs of flood-ravaged homes and neighborhoods around Great Falls, washed-out bridges, and shots of anguished survivors juxtaposed with scenes of somber officials gathered around planning tables. The text flowed in typical newspaper style: paragraphs seldom more than a few sentences long jumped from locale to locale in an attempt to convey the sense of crisis wrought by the flood. Also typical was a dearth of details about the Blackfeet tragedies. Full-page photographs with brief captions filled two-thirds of the book, but only two photographs—one of Secretary of the Interior Stewart L. Udall shaking hands with "Old" Chief White Calf during Udall's June 13 visit—were of Indians.[14]

Testimony at a special House subcommittee meeting in August 1964 further downplayed the flood's impact on the reservation, focusing instead on the damage to urban areas and what could be done to protect them in the future. In his opening to the proceedings, Montana Congressman James F. Battin referred to Great Falls but made no mention of the Blackfeet. Bureau of Indian Affairs land operations officer Will J. Pitner submitted a financial summary of the reservation's $10 million in flood damages in lieu of a statement.[15]

Fortunately, there are two written accounts of the Blackfeet disaster: the Bureau of Indian Affairs (BIA) official report filed by John R. "Bob" White in July 1964 and a short book commissioned by the Blackfeet Tribal Council and written by Helen B. West, an archivist's assistant at the Museum of the Plains Indian in Browning. From these two sources it is possible to piece together events on the Blackfeet Reservation during the 1964 flood.[16]

In the mountains to the west of the reservation, the storm started sometime around midnight on June 7, feeding small streams that were already carrying runoff from melting snow. Though it rained throughout the day on Sunday, most residents registered no alarm. George Kipp even remarked to his wife that it was "a million dollar rain" in view of the drought of the last four years. Twenty-four hours later, rain was still pouring down relentlessly. In Browning, rain gauges registered nearly seven inches, half the average yearly precipitation of 14.74 inches.[17]

At eight o'clock Monday morning agency superintendent William W. Grissom waded into his Browning office. After sending home employees whose basement offices were swamped with several inches of water, Grissom drove to the agency's auxiliary office, "the Barracks," where he encountered the first intimation of impending disaster: a report of a man trapped by high water in the Two Medicine Valley about ten miles south of Browning.[18]

13. Ibid., June 14, 1964. The *Great Falls Leader* first used the phrase "chief troublemaker" in reference to the Sun on June 8.

14. *Great Falls (Mont.) Tribune* and *Great Falls (Mont.) Leader*, *Montana Flood 1964* (Great Falls, Mont., 1964).

15. House Committee on Public Works, *Hearing before the Special Subcommittee on Montana Flood Damage of the Committee on Public Works*, 88th Cong., 2d sess., 1964, 2, 16.

16. West, *Flood*; Bureau of Indian Affairs, "The Blackfeet Flood," 1964, typescript produced by the Billings Area Office, copy in the Montana Historical Society Library and Archives, Helena (hereafter MHS). Neither report was written by an Indian, but the Blackfeet Tribal Council had made it clear that its intention in commissioning West was to produce an account that focused on the Blackfeet perspective. West, *Flood*, preface.

17. West, *Flood*, 5; Bureau of Indian Affairs, "Blackfeet Flood," 1.

18. Bureau of Indian Affairs, "Blackfeet Flood," 3.



MHS Photograph Archives, Helena

According to news reports, most of the bodies of those who drowned were taken to the flooded Holy Family Mission on Two Medicine Creek (above), a few miles southeast of Browning.

Appointed superintendent only three weeks prior, Grissom had spent ten years working in soil and moisture conservation and range management on the reservation. He was intimately familiar with the region's topology and geography and knew that streams would soon be at flood stage. He was also well aware that many of the reservation's sixty-five hundred residents lived near the creek bottoms that provided pasturage and a ready supply of firewood.

Within an hour of the first notice of the high water, over a dozen agency employees were racing to Two Medicine Valley, Badger Valley, and other drainages to alert residents and provide assistance to those in danger. Because telephone service had failed in various parts of the reservation early that morning, agency employees relied almost entirely on two-way radios to direct rescue efforts. According to the BIA report, Superintendent Grissom's desk became the "nerve center for all the rescue work in the field." Radio station KSEN also was instrumental in communicating essential information and established itself as one of the reservation's only links to the outside world. On the air, KSEN coordinated messages among the sheriff's offices, ham radio operators, and rescue workers—a crude but effective means of transmitting information.[19]

Meanwhile, crew members for the Blackfeet Irrigation Project had been out 6:30 A.M. cutting the water flowing into canals. When water master John Reid saw that Badger Creek was rising at a frightening rate, he radioed the project office at the Barracks. By 7:30 project personnel had begun warning people along Badger Creek to evacuate. By 9:30 Superintendent Grissom had dispatched two bureau school buses to the flood zones south of Browning to pick up evacuees—one went into the Blacktail Creek and Badger Creek drainages and the other to the Two Medicine Valley. Although high water trapped the first bus in the Grandview School area, the other gathered several loads of refugees and brought them to the relief center set up in Browning.[20]

One of the flood's most tragic incidents occurred in the Two Medicine Valley. Around 9:30 A.M. agency road superintendent Elmer Morigeau was traveling along a gravel road roughly parallel to Two Medicine Creek, which was already out of its banks and creeping toward Highway 89, when he saw a flatbed truck with



Great Falls Tribune, June 14, 1964

Blackfeet elder "Old" Chief White Calf greets Secretary of the Interior Stewart L. Udall with a handshake during Udall's visit to review flood damage. Standing between them is Tribal Council Chairman Walter Wetzel, and at left is interpreter Earl Old Person.



MHS Photograph Archives, Helena

On the windswept plains of the reservation, protected creek bottoms were favored locations for homes and ranches, putting many in harm's way during the flood. The buildings in the photograph above are part of a Blackfeet Irrigation Project work camp used during the construction of Two Medicine Dam and canals. The mountains in the distance are on the eastern edge of Glacier National Park.

twenty-one people crowded onto it swaying through water up to its wheel wells. Morigeau continued down the road, offering assistance and making sure that families were moving out. When he eventually drove back toward the highway, he found the truck in serious danger.[21]

Unable to follow a rough two-track through the meadow, the driver had driven into a depression and stalled. Two adults and three children managed to struggle to shore, but when the highway above the meadow washed out, water almost immediately rose to within a foot of the top of the cab, leaving sixteen people trapped. Currents "estimated at 25 knots or more" had formed both in front and behind the pickup, making it "impossible for the strongest swimmer to reach the truck from shore" one hundred yards away. Two Medicine Creek, normally a pastoral stream only ten yards across, now carried uprooted trees and buildings torn loose from their moorings. Morigeau radioed Grissom and urged him to send a boat.[22]

In an attempt to rescue the truck's occupants, several people waded out to a high point of land and improvised a lifeline from barbed wire cut from a nearby fence and a spare tire as a buoy. The rushing floodwaters and torrential rain made communication difficult, and rescue attempts failed repeatedly. According to one account, the occupants understood what the rescuers intended. " 'We understood all right,' Fay Grant said, 'But what could we do? The children were too little to send in alone [on the tire] and we couldn't go ourselves and leave them behind on the truck.' " In the end, rescuers pulled two people to safety and rescued five others by boat. In one of the few *Great Falls Tribune* articles devoted to the Blackfeet flood, Nellie Buel recounted the ordeal: "One by one Lucille's [Guardipee] children floated away. The baby first, two-months-old, who had been clinging to Lucille's neck, and then the others. Then Fay's little five-year-old floated away." The flood claimed the lives of nine people who had been trapped on the truck, eight of them children.[23]

19. Ibid., 31.
20. Ibid., 7.
21. Ibid., 10.
22. Ibid., 12.

23. West, *Flood*, 22; *Great Falls (Mont.) Tribune*, June 11, 1964. West lists the victims as Rose Grant, eighty-four; Elaine Guardipee, four; Keith Guardipee, two; Alvin Guardipee, three; Terry Lee Guardipee, two months; Robbie Grant Jr., five; Rolanda Rose Grant, three; Galela Lynn Cobell, fourteen; and Lorraine Long Time Sleeping, five. In a July 23 letter to the editor of the *Browning Glacier Reporter*, Lucille Guardipee wrote: "I've been hearing rumors yet—people wondering why all my children drowned and why I didn't. I wish some of those people had been in my place at that time—they'd know the reason. . . . People are saying we were warned and why didn't we leave then? We were not warned. I sure wish people would quit talking because I feel bad enough and to hear these remarks and rumors makes me feel that I'm to blame for the death of my children. I tried my best to save them, but God took them. No one will ever know how lonely I feel. I don't want to hear any more rumors like this."



MHS Photograph Archives, Helena

Despite efforts to evacuate people below Two Medicine Dam (above, June 9, 1964), nine residents drowned in the rising creek.

Like their counterparts in the Two Medicine Valley, early-rising residents along Birch Creek took note of the rising waters below Swift Dam, a rock-filled earthen dam built in 1914. By 10:00 A.M. the Merle Tatsey family, who lived ten miles below the dam, had decided that the situation warranted their leaving for Browning. An hour later, after securing the house and getting the children ready, Ramona Tatsey looked out the southwest window and saw huge trees along the creek being washed away. "They were falling like they were being chopped down," she later remarked. To avoid the wall of water they could see sweeping down the valley, the entire family, including the Tatseys' elderly father, scrambled up a hillside in time to watch their homes destroyed. They then began walking toward Heart Butte. A truck that happened along drove them a few miles before becoming mired in the mud. It took them nearly seven hours to make it to the David Hall place less than eight miles away.[24]

The Tatseys were fortunate in their escape: nineteen others died within minutes of the dam's collapse.[25] As Shelby radio station KSEN announcer Bob Norris later described the event, Swift Dam caved in with "a great cracking sound like a giant thunder and lightning bolt," and "thousands of tons of cascading water roared down into

24. West, *Flood*, 30; Bureau of Indian Affairs, "Blackfeet Flood," 17. At 157 feet high, Swift Dam was the largest dam of its kind in the United States.

25. Many of the victims listed in the BIA report were children: Thomas Hall III, twelve; Margerie Hall, ten; Martha Hall, eight; Kathy Hall, six; Marlin Hall, four; Edward Hall, two; Jody Hall, one; Mrs. Tom Hall Jr., thirty-three; Peggy Bradley, eight; Jerry Wayne Thomas, three; Linda Arnoux, sixteen; Sam New Breast Jr., thirty-five; Mrs. Sam New Breast (no age listed); Patricia New Breast (no age listed, child); Ernest Lauffer, fifty-eight; Gilbert England, forty-three; Ralph Oberlack, sixty-five; Joe Hamline, fifty-two; and Bean Theakson, forty-five. Bureau of Indian Affairs, "Blackfeet Flood," 14, 19. In addition to victims killed on Two Medicine and Birch Creeks, two men died earlier: Stanford Creighton, a Blood man from Cardston, Alberta, died of exposure on Kennedy Creek after driving off the road, and highway crewman Ivan "Happy" Williams drowned in Divide Creek when he washed away in his truck trying to save fuel tanks near the creek. West, *Flood*, 7–8.

26. Norris, KSEN sound recording. Both Two Medicine and Swift Dams were otherwise stable structures subjected to sudden influxes of water that caused overtopping. The failure of Two Medicine Dam may have been slowed somewhat by slightly better engineering. Both dams had a rock-filled core, but Two Medicine Dam also incorporated riprap in the form of log cribbing. Bureau of Indian Affairs, "Blackfeet Flood," 20. For a history and analysis of the surprisingly high rate of failure for earth dams, see Nicholas J. Schnitter's *A History of Dams* (Rotterdam, 1994), 158, where he states, "Of some 380 embankments constructed [in the U.S.] between 1850 and 1930, over 9% failed."

27. Bureau of Indian Affairs, "Blackfeet Flood," 19.

28. West, *Flood*, 38. The normal discharge at the mouth of the Mississippi River is about 610,000 cubic feet per second.

29. By afternoon Superintendent Grissom was able to arrange for a plane to make an emergency survey to determine whether any survivors were still in need of rescue and to assess damages. He had also requested assistance from Malmstrom Air Force Base, but the weather was too bad for helicopters to fly. Ibid., 25, 28–30.

30. "Report on Civil Defense Activities in Montana during Flood 8–15 June 1964," typescript report by the Montana Office of Civil Defense, copy in MHS. White categorically stated, "The record also should make it clear that most of the destruction in the valley occurred before the dam broke." Bureau of Indian Affairs, "Blackfeet Flood," 22.

the valley, snuffing out homes and lives in a matter of seconds."[26] Approximately thirty-one thousand acre-feet of water, used for irrigation and to supply drinking water to the town of Valier, rushed downstream at a rate of 880,000 cubic feet per second, overwhelming nearly everything in its path.[27] The resulting crest "reached a height of twenty to forty feet, sweeping all before it: trees, power lines, homes, cattle, horses and bodies of those who had no chance."[28] A pilot hired by KSEN later estimated that a wall of water thirty feet high was making its way through the valley toward Highway 89 at a rate of twenty-two miles an hour.[29]

"Thousands of tons of cascading water roared down into the valley."

According to the report filed by State Civil Defense Deputy Director Howard A. McKinney, authorities received word of Swift Dam's failure at 1:00 P.M. In retrospect, there was little that could have been done. By the time it dawned on the authorities that the dam might succumb to the intense pressure of the water building up behind it, it was too late for house-to-house warnings because "bridges to the north had all been washed out."[30]

Officials were also concerned about Two Medicine Dam, an earthen dam constructed in 1912 by the Bureau of Reclamation to provide water for the Blackfeet Irrigation Project. That morning agency engineer Mark Stout had dispatched Harvey Brown to check the dam, but high water already blocked Highway 2 through East Glacier and the Looking Glass Mountain Highway. Jack B. Dodd, assistant Glacier superintendent, volunteered to send a ranger from West Glacier. Around 11:30 A.M., the ranger reported that water was within two feet of the top of the dam. Stout quickly called KSEN, and a short time later reporter Frank Krshka reported in a live radio broadcast from East Glacier: "Last reports we had was that the water



MHS Photograph Archives, Helena

This 1940s photograph taken by Ella Mad Plume Yellow Wolf shows Two Medicine Dam intact.



J. J. Palmer, photographer, Glacier National Park, West Glacier, Montana

Contrast Two Medicine Dam on June 16, 1964, with the 1940s photograph above.

now is coming over the top of the dam and of course if it starts eroding behind the dam, the great fear is of losing the dam." Two Medicine Dam gave way around 5:00 P.M.[31]

Throughout the afternoon, rescuers worked feverishly in the Birch Creek, Two Medicine Creek, and Cut Bank Creek drainages. By the time residents near the Starr School began to evacuate, Cut Bank Creek was rising fast. Agency forester Robert C. Brown radioed for a rescue boat, but the aluminum craft with its three-horsepower motor was no match for the powerful currents. Abandoning the boat, expert horsemen Floyd and Gordon Takes Gun rode into the floodwaters with lariats and rescued twenty-seven people. By late afternoon, the water was too high for the horses, and a larger boat arrived to rescue the remaining families.



Courtesy the artist

Just minutes before the crest from the collapse of Two Medicine Dam arrived, weary rescuers managed to save Les Heuscher, who had been trapped by rising water more than fourteen hours earlier. Gary Schildt depicted Heuscher's situation in *Man in Tree*, in Helen B. West's *Flood: The Story of the 1964 Blackfeet Disaster* (p. 27).

In the midst of these efforts, the rescue of Les Heuscher, the first person reported trapped, continued. An employee of rancher Merle Magee, Heuscher had stepped out of his cabin around 5:00 A.M. Monday to find Two Medicine Creek up to his doorstep. He alerted the Magees, then waded over to shed to release livestock, but rapidly rising water forced him to climb a tree. By the time the Magees returned from Browning with help, the water was moving too swiftly for boats. Throughout the day Heuscher remained in his tenuous perch. At 7:00 P.M. the rescuers received word that the Two Medicine Dam had failed and that they had only twenty minutes to save Heuscher before the flood crest arrived. Their final attempt succeeded by a hair's breadth: "They pulled him into the boat, returned to shore, and watched as, a few minutes later, the crest hit, taking all of Magee's remaining buildings with it downstream."[32]

Irregular communications compounded the difficulty of rescue efforts. The agency could at times receive calls, but none could be made. To alert the county welfare department and the Red Cross representative in Cut Bank, for example, the "Browning police contacted the Cut Bank police department by radio. They asked the Cut Bank police to phone the officials Mrs. Babineau [head of the welfare department] wished to reach, and to request those officials to call Mrs. Babineau at the Browning police station." The same arrangement was used for other essential calls.[33]

The isolation was not merely a problem of telephone connections: washed-out roads and bridges physically cut the reservation off from the rest of the world. Only Highway 2 to Cut Bank, though at times water covered, remained passable. Because of the reservation's physical isolation and the difficulty sending out communications, most of the rest of the state was unaware of the crisis. As White remarked in the last pages of his report, "Much of Montana wasn't well informed on the Blackfeet situation. . . . Great Falls and Kalispell attracted most of the attention of the news media."[34]

Though the rain stopped falling sometime in the afternoon on Monday, June 8, the floodwaters did not begin to subside until around 8:00 P.M. By this time, the water released by the collapse of Two Medicine Dam had been absorbed by the Tiber Reservoir. Rescue operations continued throughout the day on Tuesday. By Wednesday the waters were receding and the long, laborious business of cleaning up began.

Those forced to evacuate their homes near Great Falls were able to return within a few days and begin shoveling mud from their basements and replacing damaged floors and furniture. The situation on the reservation was altogether different: many residents no longer had homes. Ten days after the flood, Superintendent Grissom reported 256 homes destroyed or damaged in the flood; 135 families were living in tents. One resident's comment captured the sense of resignation felt by many who had suffered through the flood only to find themselves homeless: "At first, everyone was joking and happy about their narrow escapes. Then, when they were told they could go home, everyone realized that there were no homes to go to." By June 25, at the urging of Senators Mike Mansfield and Lee Metcalf, Congress had approved $12 million in relief funds, $8.2 million earmarked for the BIA in Browning. Officials estimated at the time that

31. Norris, KSEN sound recording.
32. West, *Flood*, 15.
33. Bureau of Indian Affairs, "Blackfeet Flood," 32.
34. Ibid., 36.



Detail, MHS Photograph Archives, Helena

In the flood's aftermath, the Blackfeet Tribal Business Council declared June 8 an annual day of mourning in remembrance of those who lost their lives. Above, flood waters from Two Medicine Creek still covered U.S. 89 and nearby structures on June 9.

a complete recovery on the reservation would take two years.[35]

For weeks after the floodwaters subsided, volunteers combed the prairies and meadows for bodies in the piles of brush and silt along the stream banks. Only days after the worst had passed the Blackfeet Tribal Business Council voted to declare June 8 an annual day of mourning "in remembrance of those who lost their lives during the flood." A memorial service is held every June at the Museum of the Plains Indian in Browning.[36]

"Everyone realized that there were no homes to go to."

In recent decades multiculturalist scholars have begun to document how mainstream media accounts of events become the semi-official narratives that eventually emerge as "standard" history, a process that overwhelms minority voices as the event is articulated and retold. As literary critic James Clifford has observed, "Whenever marginal peoples come into a historical or ethnographic space that has been defined by the Western imagination, their voices, points of view, and 'distinct histories' tend to disappear with astonishing rapidity." This process is not always an overtly sinister enterprise involving rifles or smallpox-infested blankets. Often marginalization results from a failure of awareness on the part of historians and the mainstream media. In the case of the 1964 flood, disregard for the tragic experience of the Blackfeet may have been partly benign due to communication difficulties and the geographical isolation of the area, but the end result has been a diminished understanding and appreciation of an Indian tragedy.[37]

35. *Browning (Mont.) Glacier Reporter*, June 18, 25, 1964; West, *Flood*. The September 17, 1964, *Browning Glacier Reporter* announced that 129 new homes were under construction in Browning and were expected to be "installed on site" before winter.

36. *Browning (Mont.) Glacier Reporter*, June 18, 1964; Trish Kuka, assistant to Chief Earl Old Person, telephone conversation, August 11, 2003. Martha Hall's body was not found until July 15.

37. James Clifford, *The Predicament of Culture: Twentieth-Century Ethnography, Literature and Art* (Cambridge, Mass., 1988), 5. See Arnold Krupat's "Postcolonialism, Ideology, and Native American Literature," in *The Turn to the Native: Studies in Criticism and Culture* (Lincoln, 1996), 30–54, for a detailed discussion of this process.

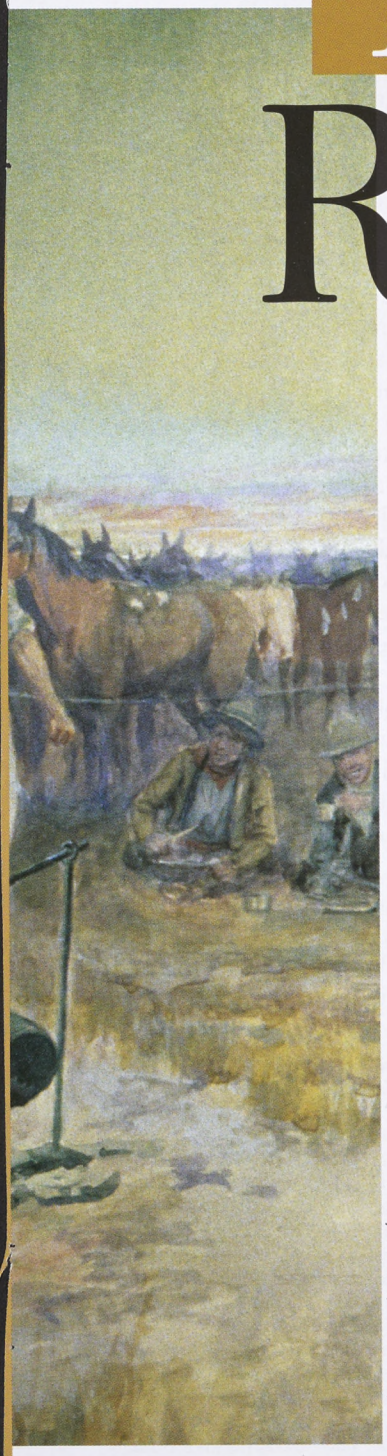
AARON PARRETT is assistant professor of English at the University of Great Falls. Ashgate Press recently published his *The Translunar Narrative in the Western Tradition* (2004), a critical history of narratives about traveling to the moon.

The Charles M. Russell–Malcolm Mackay Collaboration



Bronc to Breakfast (1908, watercolor, 20" x 26⅜"). Between 1911 and 1932, New York stockbroker and Montana rancher Malcolm Mackay amassed one of the finest collections of works by cowboy artist Charles M. Russell. As this patron-artist relationship grew, so did a personal friendship between the two men and their families. One of Mackay's first acquisitions, *Bronc to Breakfast*, was exhibited in St. Louis in March 1910 and offered for sale at a price of five hundred dollars.

'I Want It Real Bad'



Mackay Collection, MHS Museum, Helena

by Brian W. Dippie

Nearly a century ago a twenty-nine-year-old Wall Street broker took a gamble on an artist whose work he admired. When Malcolm Mackay bought his first Charles M. Russell paintings in 1911, Charlie Russell was not quite Charlie Russell yet. He was undeniably famous. His work had appeared in national magazines and as illustrations in a number of books. A major calendar company was reproducing his paintings in color. He had been awarded an important commission by the State of Montana to paint a mural—of the Lewis and Clark Expedition, as it turned out—for the State Capitol in Helena. And that very year he had been honored with a major one-man exhibition in a New York gallery. But in 1911 Charlie Russell was not yet a monument, nor a myth. He was a working artist, and selling his art was how the Russells made their living. Nancy Russell, his wife of nearly fifteen years, was the business end of their partnership and in matters of business the mandatory go-between.

The relationship between Charlie Russell and Malcolm Mackay eventually evolved into a full-blown friendship. The superb collection of Russells that Mackay formed was the result of something more than a good eye, which Mackay had. It was the result of a thriving collaboration between artist and patron. The happy circumstances that brought Malcolm S. Mackay's collection to the Montana Historical Society in 1952 need not be repeated here. That story has already been well told by Vivian Paladin and Kirby Lambert. My focus is on the collaboration between patron and artist that produced the Mackay Collection of Russell art.[1]

Malcolm S. Mackay was born in 1881, the year after Russell came to Montana as a sixteen-year-old. Mackay's father held a seat on the New York stock exchange, and Malcolm as a young man went to work as a stockbroker in his father's Wall Street firm. He devoted his summers to a lifelong passion—bird and game hunting—that eventually took him west. He first visited Red Lodge, Montana, in 1901 and acquired a small ranch near Roscoe with a partner. He added to it substantially after he assumed sole ownership, running cattle under the Lazy EL brand on what was eventually a seventeen-thousand-acre spread. He met his future wife, Helen Raynor, in Montana, and they married in 1907. For the rest of his days, he divided his time between Wall Street, the family home in Tenafly, New Jersey, and his Montana ranch, which provided a natural bond between artist and future patron.[2]



Malcolm S. Mackay, *Cow Range and Hunting Trail* (New York, 1925), opp. p. 78



MHS Photograph Archives, Helena

While hunting in the West, Malcolm Mackay (top) fell in love with Montana and the cowboy life. In 1901, with a partner, Charlie Wright, he acquired a ranch near Roscoe. Six years later Mackay married Wright's niece, Helen Raynor (above). For the rest of their lives, Helena and Malcolm Mackay divided their time between the family home in Tenafly, New Jersey, and the Montana ranch.

The Mackay family could never quite recall when Malcolm first met Charlie Russell. They had not yet met in February 1908 when Mackay exchanged letters with Nancy Russell. "I have heard my friend Bob Leavens of Billings speak of your husband so often that I feel as if I am not exactly a stranger to you all—I have ridden the range a good deal with Bob and he and I both think that Charley Russell's drawings of Cow boy life are in a class all by themselves—I would like to get a few of Mr Russells originals—As regards subject why I liked the one of 'Cowboy's roping a silvertip'—'A Bad Hoss' 'The Trail Boss' Stringing out on the circle—The strenuous life." All the subjects named had been reproduced as postcards and color prints, indicating that Mackay had not seen a Russell original in 1908, as his letter proceeds to make clear: "I would like any picture of puncher's in action—I dont suppose any of the above could be bought but any thing similar to these is what I want—In regard [to] size I dont want too big a picture something about medium—How about oil's does Mr Russell do any thing in colors I would like a painting best." Having asked for a price, Mackay concluded: "If you ever hit the East again I would be pleased to meet you and your husband."[3]

What followed was unalloyed Nancy Russell. She responded immediately, scenting a sale. She had two oils on hand—*The Smoke of a .45* and another, just returned by the calendar company that would be reproducing it, that "will suit you without doubt," she told Mackay:

> This picture is called "Jerked Down." It is a cowpuncher riding a green bronk. He has roped a cow that has got a side pull on him and jerked his horse down. A young steer has one hind leg over the rope that holds the cow. Another puncher is trying to get his rope on

1. Vivian A. Paladin, "Origins and Odyssey of a Collection," in *C M Russell: The Mackay Collection* (Helena, Mont., 1979); Kirby Lambert, "Montana's Last Best Chance: The Malcolm S. Mackay Collection of Charles M. Russell Art," *Russell's West*, 5, no. 2 (1997), 3–9. The literature on patronage and western art continues to grow, understandably where artists had individual patrons (Karl Bodmer, Alfred Jacob Miller), but also where institutional patrons, from the federal government to private corporations, played an important role in commissioning art. Similarly, useful studies about the formation of the collections of some of the leading western art museums now exist. Patrons' concerns and the part they played in shaping the content of western art highlight the interaction between art and commerce.

2. See Malcolm S. Mackay, *Cow Range and Hunting Trail* (New York, 1925); and, for a recent attempt to place Mackay in a western/mythic context, Bonnie Christensen, *Red Lodge and the Mythic West: Coal Miners to Cowboys* (Lawrence, Kans., 2002), chap. 4.

3. " 'His Paintings Were All Truthful': 'Bud' Mackay Recalls Personality of 'CMR,' " *Hoofprints*, 4 (Spring–Summer, 1974), 6; Malcolm S. Mackay to Nancy C. Russell, February 13, 1908, Helen E. and Homer E. Britzman Collection (hereafter Britzman Collection), Taylor Museum for Southwestern Studies of the Colorado Springs Fine Arts Center, Colorado Springs, Colorado (hereafter Taylor Museum).

AMERICAN PRAIRIE FOUNDATION

www.americanprairie.org Tel: 406-585-4600 Fax: 406-585-7910

P.O. Box 908, Bozeman, MT 59771
104 E. Main, Ste 202, Bozeman, MT 59715

June 11, 2004

Mr. Ivan Doig
17277 15th Avenue, NW
Seattle, WA 98177

Dear Ivan,

Hope you can join us in this project right out in your home territory. Best to Carol.

Annick Smith

The two of us, Susan O'Connor and Annick Smith, are p
about the prairies of eastern Montana. The land we will
Russell Wildlife Refuge, although we may also consider
western plains if their subject is relevant or complement
about prairie life—animal, vegetable, geologic, and hum
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personal memoir to social, economic, or environmental
for stories that celebrate, discover, probe, travel through
and insights.

We are inviting you to participate in this book because your voice is strong and unique, and we believe that whatever subject you wish to write about will be a story worth listening to.

As you have surely guessed, our purposes are educational, political, and environmental, as well as literary. And since this is an entirely nonprofit publication, we cannot offer you a large sum of money or anything beyond first serial rights. We can, however, invite you to take a safari or a guided trip into the Montana prairies, and we hope you will become allied with us in what we believe is a great environmental effort--a project initiated by The American Prairie Foundation [see enclosed material].

The Foundation is working to create the largest wildlife reserve in the lower forty eight states and protect one of the world's most imperiled ecosystems. The ultimate reserve will be twice as large as Yellowstone Park. Barbed wire fences will be pulled down; cattle will be replaced with free-roaming bison; elk, deer, bear, wolves, eagles, wildcats, ferrets, and prairie dogs will reappear in viable populations; and the bunchgrass, wildflower, butterfly and bird life of the old grasslands will be given a chance to come back. The preserve will include restored riparian areas and wetlands where native fish and aquatic creatures can spawn and thrive. The reserve is also being designed for visitors around the world to experience spectacular wildlife, and the surrounding local communities will experience a dramatic increase in economic opportunities, including spending from visitors, and the creation of new jobs.

To do this, the American Prairie Foundation's staff is working with public and private entities dedicated to conservation, and with Indian tribes in the region, as well as land-owners and business people. They are acquiring and helping to manage lands that will, as the project progresses, be accessible to the public for educational purposes, for recreation, for scientific research, and for fishing and hunting. But they cannot carry such an immense project to completion without abundant public understanding and support.

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June 11, 2004

Mr. Ivan Doig
17277 15th Avenue, NW
Seattle, WA 98177

Dear Ivan,

The two of us, Susan O'Connor and Annick Smith, are putting together an anthology of essays about the prairies of eastern Montana. The land we will focus on is adjacent to the Charles M. Russell Wildlife Refuge, although we may also consider essays about other areas of the western plains if their subject is relevant or complementary. We are looking for original stories about prairie life—animal, vegetable, geologic, and human. The narratives may be set in the present time, in historic eras, or in the deep periods we call prehistoric. Topics may range from personal memoir to social, economic, or environmental studies. But above all, we are looking for stories that celebrate, discover, probe, travel through, and unearth compelling information and insights.

We are inviting you to participate in this book because your voice is strong and unique, and we believe that whatever subject you wish to write about will be a story worth listening to.

As you have surely guessed, our purposes are educational, political, and environmental, as well as literary. And since this is an entirely nonprofit publication, we cannot offer you a large sum of money or anything beyond first serial rights. We can, however, invite you to take a safari or a guided trip into the Montana prairies, and we hope you will become allied with us in what we believe is a great environmental effort--a project initiated by The American Prairie Foundation [see enclosed material].

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18 June '04

Dear Susan--

Received your letter about the prairie anthology, sent to my I think by Annick, but I'm sorry to say it reaches me too late for me to participate. I'm committed now to a long stretch of writing on my next novel, have just done a Nature Conservancy piece somewhat along the lines of what you're seeking, so on and so on. I know I'm missing some good company, but that can't be helped. All best wishes for the success of your project.

Sincerely,

We believe good art is an effective way to engage the public's enthusiasm, understanding, and imagination. Yellowstone Park could not have been created without the excitement it generated among millions. And Thomas Moran's paintings were a key to that emotional connection. On a more global level, the Serengeti Game Preserve in Africa, although far smaller than the preserve envisioned by the American Prairie Foundation, has an almost mythical status caused by writers such as Ernest Hemingway. We want this anthology to be a way for our readers to understand the significance of the prairie and to allow them to identify with it even if they live in New York or Los Angeles or Paris.

The American Prairie Foundation has been bringing artists, funders, and scientists together on Serengeti type safaris to experience the land. These excursions have captivated the imaginations and inspired an amazing commitment from those attending. So, if you are interested in writing a piece for this anthology, please let us know soon, and we will try to include you on one of the two safaris that will explore the prairie this summer; or we can arrange a site visit with author Richard Manning, who is on staff, or with one of us. The safaris are great fun and, aside from giving participants an experience similar to seeing the plains of Africa, they leave one humbled by the enormous expanse of our own native prairie and its potential to be protected in perpetuity.

The book we envision will include about twenty authors with contributions ranging from 10 to 20 pages. Some of the others we are asking to contribute are: Peter Matthiesen, Tom McGuane, Gretel Erlich, Judy Blunt, Annie Dillard, Rick Bass, William Kittredge, Louise Erdrich, Sherman Alexie, Terry Tempest Williams, and Barry Lopez. As we mentioned earlier, you will have the serial rights to your piece, a tour of the prairies, and first hand information as the plan evolves over time. In addition, the book will include photographs from a few notable photographers, including Lee Friedlander.

We are optimistic about the success of the American Prairie project and hope you will join us in this effort to form a corridor from Canada to the Missouri River where native grasses once again flourish and animals roam at large. Please join us in this exciting adventure.

In order to plan this summer's safaris and tours, and to get started on the stories for this anthology, we would like to hear from you before May. Thanks in advance for thinking about this request. We know your time is precious and much in demand.

Best regards,

Susan O'Connor

Annick Smith

PROJECT SUMMARY
March 2004

"I ascended to the top of the cutt bluff this morning, from whence I had a most delightful view of the country, the whole of which except the vally formed by the missouri is void of timber or underbrush, exposing to the first glance of the spectator immence herds of Buffaloe, Elk, deer and Antelopes feeding in one common and boundless pasture..."
Meriwether Lewis, April 22, 1805

The Vision

American Prairie Foundation (APF) is working to create the largest wildlife reserve in the lower forty eight states. Our strategy centers on the purchase of private land to combine with existing areas of public lands already conserved (such as the Charles M. Russell National Wildlife Refuge), and result in a multi-million acre wildlife reserve within 15-20 years. Phase One of our efforts focuses on the acquisition of five to seven key properties and will total roughly 300,000 acres. Phase One will be one of the largest temperate grasslands reserves in the world, and sufficiently large enough for more than 2,000 wild bison and to restore all the original flora and fauna with the exception of the top predators, namely grizzlies and wolves. In Phase One we will put all the crucial biodiversity pieces in place and then, as much as possible, let the ecosystem run unfettered, with minimum human intervention. Phase One, in and of itself, will be a huge success and will leverage existing areas of conservation to allow for a fully functioning prairie ecosystem and create new opportunities for the surrounding communities.

American Prairie Foundation and World Wildlife Fund are working together, with the cooperation of other partners, to make this vision a reality. Our strategy and approach consists of interwoven components:

Strategy and Approach

1. Private investments in land guided by sound science: American Prairie Foundation's goal is to use private-sector funding to acquire several hundred thousand acres of private lands at fair-market value from willing sellers. These private lands are so-called "base properties" that allow us to secure leases for an even greater acreage of public lands, primarily those of the U.S. Bureau of Land Management (BLM). Private funding and land ownership also hold another major advantage: They enable us to apply the best science to implementing bold and innovative wildlife restoration techniques within which we might otherwise not be able to engage. Each dollar invested is therefore highly leveraged. The estimated total cost of purchasing private lands, obtaining leases of associated public lands, and creating an endowment for long-term management is only $125 per acre of private/public land over the first five years.

2. A diversified approach to economic sustainability: The reserve's economic sustainability is based on several strategies, including the creation of an endowment that will pay for managing the land in perpetuity, and tapping the reserve's potential to foster entrepreneurship and business development in local communities. APF and its partners also plan to directly invest more than $10 million annually in the local economy through land acquisition, purchase of equipment, supplies and services, contracting and employment of local people, expenditures in land and wildlife management, property tax payments and investments in financial institutions. Furthermore, APF tailors acquisitions to help meet the personal needs of the landowner through life estates, annuities to reduce tax burdens, and other flexible approaches. Prairie and wildlife restoration significantly increases expenditures on outdoor recreation, education programs, and prairie and wildlife research in the region. The result is more revenues for motels, restaurants, sporting goods stores, gas stations, outfitters and others who service these visitors and programs. This dual approach of investments in the land by The Prairie Foundation and diversified economic opportunities for local communities provides a solid foundation for the economic sustainability and public backing of the reserve.

3. A broad spectrum of public benefits: We are supporting the broader public benefits of the reserve by providing public access that is compatible with conservation goals, by being good stewards of the land, and by building strong relationships and mutual respect with local communities and landowners. Of increasing concern across the American West is the loss of access to private and public lands as "no trespassing" signs pop up and property owners reserve use of their land for an exclusive few. The public is being locked out of lands to which they once had access for hiking, camping, hunting, wildlife watching, nature education, hunting and other outdoor experiences. In cooperation with both private and public land managers, we wish to ensure that private and public lands can be enjoyed by the public while maintaining their wildlife values.

The Opportunity: An Area of National and Global Importance

Temperate grasslands have been largely overlooked by conservationists, with serious consequences for wildlife. Globally and in North America's Great Plains in particular, only 1% of the land has been conserved for wildlife. This oversight is reflected by the precarious status of many species in the Northern High Plains and our project area. For example, of 39 species of plants and animals that are largely found only in the Northern High Plains and thus depend on this prairie region for survival, 74% are imperiled according to state, provincial and federal agencies. We therefore urgently need to greatly expand the amount of prairie land devoted to conserving wildlife. Our project area in northeast Montana offers a rare opportunity to address this conservation need on a grand scale. Here we can rapidly reconstruct a natural prairie ecosystem of native species, habitats, and ecological relationships. Several key features converge to make the area of national and global importance for conservation:

- **Intact habitat:** Thanks to the stewardship of private, public and tribal landowners, more than 90% of the prairie in this area has never been turned by a plow. This provides an extraordinary advantage, compared to most other regions of the Great Plains that are under cultivation, for rapidly restoring the wildlife of this complex ecosystem.

- **Large mammals:** Thousands of elk, pronghorn, mule deer, white-tailed deer, and bighorn sheep inhabit the region alongside various predators including mountain lions and bobcats. Massive herds of wild bison can readily be reestablished here, and the wolves and grizzlies will return when there is sufficient prey. Scientists estimate that North America's Great Plains once harbored an abundance of large mammals equal to Africa's famous Serengeti Plains.

- **A constellation of nationally recognized lands:** The Charles M. Russell National Wildlife Refuge (includes the UL Bend Wilderness Area), the National Wild and Scenic Upper Missouri River, the Upper Missouri River Breaks National Monument, and other smaller conservation areas offer various degrees of wildlife protection in the region. However, many of these areas include little prairie habitat and are too disconnected for large scale wildlife conservation. Restoration of adjacent prairie lands will compliment and glue together these islands of conservation into a whole much greater than the sum of the parts.

- **Other imperiled and unique wildlife:** This area is important for many smaller imperiled species of wildlife, such as the burrowing owl, mountain plover, swift fox, and black-footed ferrets, one of the world's most endangered mammals. It supports the largest number of endemic (found no where else) species of prairie birds in North America, and provides hunting grounds for ferruginous hawks, golden eagles and other raptors.

- **The Missouri River and its tributaries:** The Missouri River is home to the paddlefish and the endangered pallid sturgeon, both ancient species that can reach more than 6 feet in length. At least 40 species of native fish inhabit the river and its tributaries. Waterfowl, beaver and other wildlife also thrive in this region's wetlands.

PROJECT SUMMARY
March 2004

The Need for Action

Several factors put the outstanding conservation values of the region in jeopardy and give urgency to assembling and restoring a large prairie reserve:

- **Sodbusting**: The killer threat of all activities continues to convert yet untilled and largely intact native grassland to cropland. Government agricultural subsidies encourage this trend. Once plowed, the job of restoring land to prairie is very expensive and difficult.

- **Loss of wild American bison:** The American bison, the Western Hemisphere's largest land animal and a symbol of our native prairie, was eradicated from the prairies in the 1880s and nearly driven to extinction. Today, only a few bison herds are not genetically tainted because of cross-breeding with cattle, and 90% of the herds are losing their wildness because they are being bred for meat production. Wild bison and their pivotal role in the prairie ecosystem will be a footnote in history if we do not act soon.

- **Decline of prairie birds:** Prairie birds have undergone steeper population declines than any other group of bird species in North America due to habitat loss and fragmentation and other causes. Large areas of intact native prairie are needed if this trend is to be reversed.

- **Shooting and poisoning of prairie dogs:** Ongoing shooting and poisoning of the black-tailed prairie dog has made it a candidate for listing under the Endangered Species Act. The wellbeing of myriad species, including the highly endangered blackfooted ferret, depends on healthy prairie dog populations.

- **Invasion by non-native species:** Exotic weeds are invading the project area because of inappropriate grazing practices, tillage, roads and other human activities. These non-native species crowd out native ones and, once established, are often difficult to eradicate.

- **A narrow window of opportunity:** Many ranches are currently for sale and many more will come on the market over the next 10 years as the current generation of ranch owners retires and their children leave in search of a better economic future. We therefore have a narrow window of opportunity to purchase these ranches for conservation purposes rather than for them to be sold to private developers and others who would "lock up" the land and preclude the ecologically seemless management of this landscape and their enjoyment by the public.

Conclusion

The American Prairie Restoration Project presents an unparalleled opportunity in land management and biodiversity conservation in terms of geographic scale, cost effectiveness, and restoration of a spectacular wildlife heritage. The potential for the private sector to lead the way in transforming a landscape—in this case a vast prairie ecosystem of global importance for conservation—has never been greater. The American Prairie Restoration Project is the catalyst for forging together lands that can be seamlessly managed, where thousands of bison can again roam free, to create a 3.6 million acre prairie reserve. With the support of the American public, we can again enjoy the wildlife spectacle that stirred Lewis and Clark when they led the Corps of Discovery through these lands.

PROJECT AREA PHOTOS





Above: Missouri Breaks, north of the CMR. Below: sign post in Phillips County.





Above: View of the Little Rocky Mountains. Right: a Sage Grouse lek (Phillips County).



Missouri River Breaks National Monument

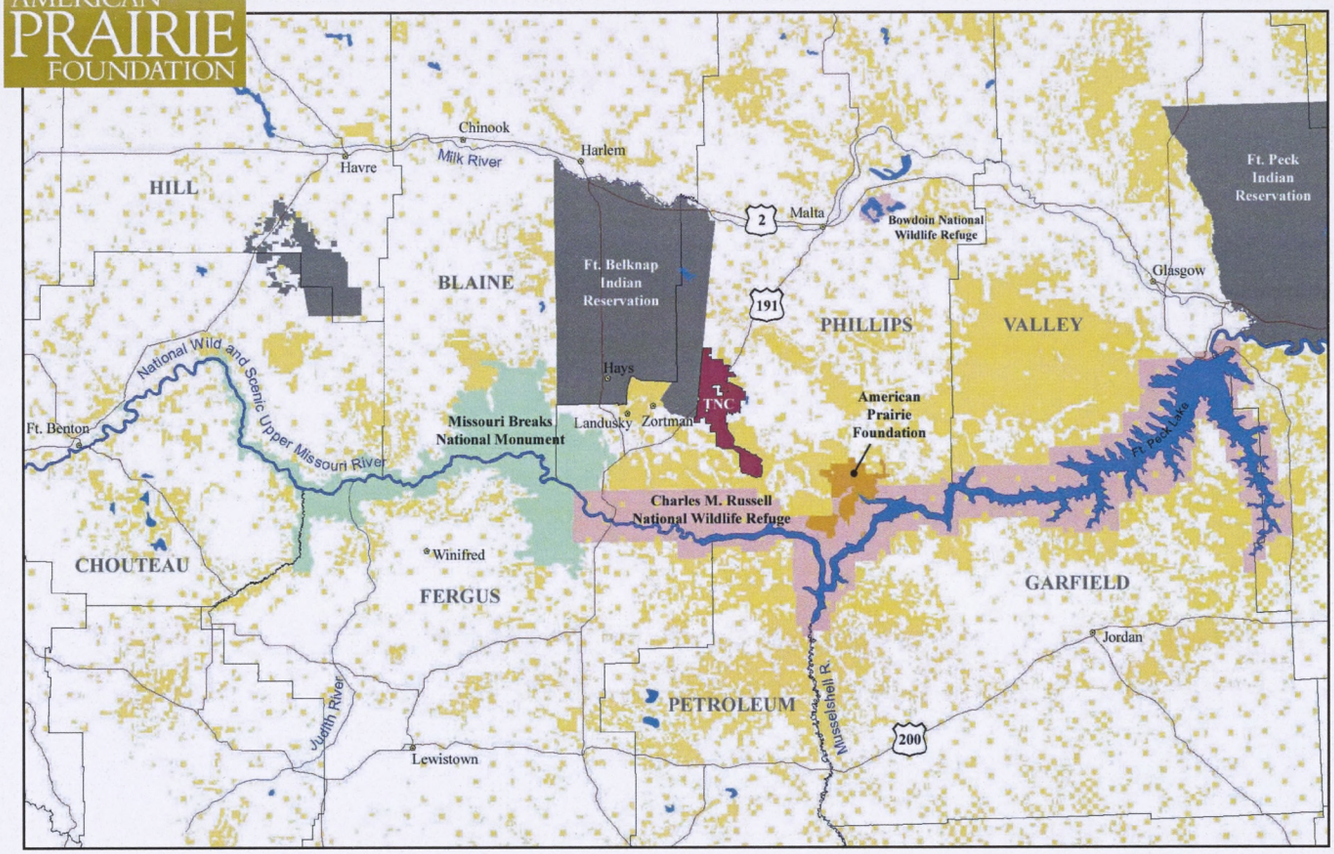




Lecture on the Prairie, Missouri River Breaks, north of the CMR

AMERICAN PRAIRIE FOUNDATION

PROJECT AREA MAP



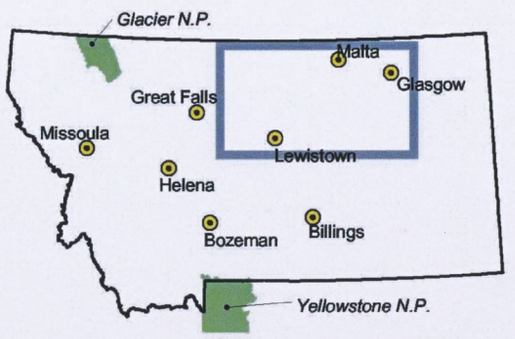
LEGEND

LAND OWNERSHIP

- National Monument (BLM)
- Bureau of Land Management and Other Public Lands
- US Fish and Wildlife Service
- Tribal Lands
- Private Lands

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AREA OF DETAIL WITHIN MONTANA



Hibernation, Insulation and Caffeination

NYT 1/31/04

By Bernd Heinrich

BURLINGTON, Vt.

An emeritus professor rolling naked in the snow at minus-20 degrees Fahrenheit and yelling like a banshee is either exhibiting an amazing remission from seasonal affected disorder or he is performing a slight (O.K., a not-so-slight) act of braggadocio. In any case, I jumped right back into the sauna after 20 seconds, having briefly experienced an altered state of mind.

This was during my annual week-long session on "Winter Ecology" with a dozen biology students at my log cabin in the woods of western Maine. The idea is to stop reading about nature and start experiencing it; it is impossible to teach even the brightest scholars how coffee tastes unless you let them drink it. We had chosen mid-January for our winter-tasting. We picked a good time: there was snow aplenty and temperatures were appropriate. And by the way, everyone survived — every single one.

The differences between just barely surviving the cold for a half-minute and living through the whole winter outdoors are, of course, not trivial. Animals can show us how they manage, and their ways are stunningly diverse. From the personal experience of an average guy, I can vouch for the main ingredients needed for human survival: insulation, granola bars and coffee. (More on that later.) Most people in this environment do not suffer from a calorie or beverage deficit; we're seldom totally out of reach of a store.

But I'm not so sanguine about that first ingredient, insulation. The key is multiple layers or a thick layer of tightly sealed air. My L. L. Bean gear is usually adequate, but, as I learned empirically, that depends on where you are. Some years ago I was up north in Inuit country, in a little village full of dogs and 40-pound "sausages" of walrus blubber buried under the tundra to ferment. I saw some men loading up a sled with enough fuel canisters for their Yamaha snowmobiles to drive at least once around the North Pole; I asked to get on. "No way," was the answer, "unless you get rid of those white man's clothes."

I purchased a pair of sealskin gloves that reached up to my elbows, and a beautiful handmade parka of raw caribou hides, trimmed with wolf fur, that hung down to my knees. The fellows lent me sealskin boots and caribou pants, and I was set. I looked like the Yeti. And felt like a king. I stayed warm as we rode some 60 miles on a minus-40-degree night; by daylight we arrived at char-fishing and wolf- and caribou-hunting camp, where the char were piled up like pulpwood and skinned animal carcasses were strewn all around. The lesson: In the far north, if you want to be up and about with the warm-blooded animals, you've got to dress like them. I still keep my Inuit duds, but so far I have never had a call to use them in balmy New England.

> What one animal doesn't adapt to winter? You.

Most of the mammals in the north change into a denser and deeper winter coat by late fall. Their signal for coat change is the "photoperiod" — the relative hours of daylight and dark. Man, a primate adapted from the tropics, survives by taking his coat from them. Our recently invented substitutes are a serviceable but pale imitation.

Birds' insulation is, per weight, even better. The chickadees get up on even the coldest morning at first dawn to search for food. Their body core temperatures are slightly higher than ours, and the insulating layer of feathers is less than an inch thick. Heat loss through the feathers is reduced by raising them, which is why many small birds look rounder and fatter as the winter drags on.

Fluffing out to retard heat loss serves little purpose without constant heat production. That takes fueling with food, and the fuel costs rise sharply in winter, often just as the fuel supplies start to dwindle. That is why, like us, many other winter animals reduce their fuel costs by at times turning down their thermostat, huddling and seeking shelter.

Northern flying squirrels bivouac in snug nests made of shredded cedar and birch bark, and may huddle together in same-sex groups of 10 or more. In contrast, chipmunks gather food stores by fall and feed on them in their subterranean dens; then they enter light torpor when the nuts run out. Woodchucks store their energy in fat and hibernate deeply all winter. Those without energy-saving tricks or access to enough food are forced to migrate.

In looking at what different animals do to survive in the winter, one sees different but consistent patterns to solve the same problem. The fascinating part is to see how all of these solutions are fine-tuned to very specific circumstances.

My Winter Ecology students prepared themselves for the week by bringing a large supply of food. With pleasure, I surveyed a mound of cheese from Vermont, fruit from Florida, raisins and nuts from California, flour and oats from the Midwest, chocolate made of cocoa, sugar and milk all from I know not where. On any walk into the woods we were laden with munchies, because we never found anything to eat along the way. Otherwise, we would not have survived even if we had spears and bows to procure lunch.

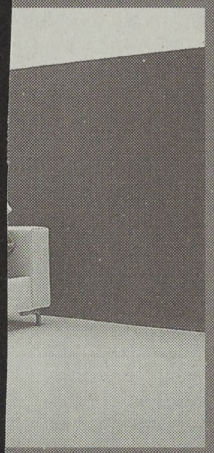
As a teenager I had the romantic notion of staying in these woods for a year and "living off the land" like an aboriginal hunter. But I've sat up in a tree for hours, for days, hoping for a glimpse of a deer — long enough to realize that this activity, subsidized by imported calories, would cost more energy than it could bring back. I could feel that my shivering was similarly burning off the calories of my candy bars, dissipating them into the icy void.

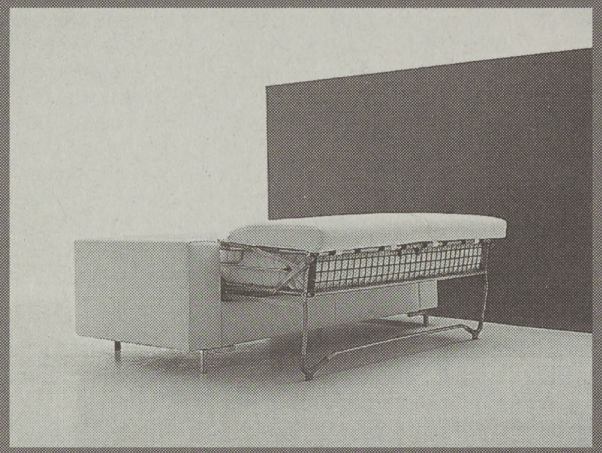
I could not but help contemplate the strategy that the Ice-Age Neanderthals might have used in the forests of central Europe, where they did not have access to the plenitude of the seacoast. Might they have hibernated, like bears? Bears have the ability to gorge and fatten up when food is abundant and then remain inactive for long periods — and some of us seem almost pre-adapted along those lines.

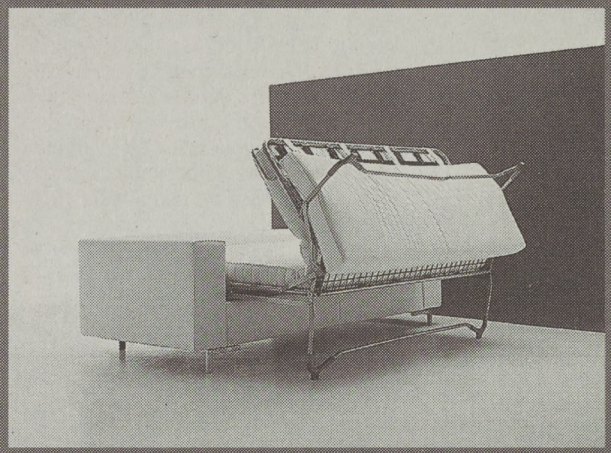
In the winter I usually feel myself getting drowsy near 4:30 p.m. when it starts to get dark. An artificial light keeps me up a little longer, but not much. I'm able to get by with remarkably few hours of waking time, and I'm certain they would be much shorter still if they were not extended by light at one end, and the promise of a cup of coffee at the other.

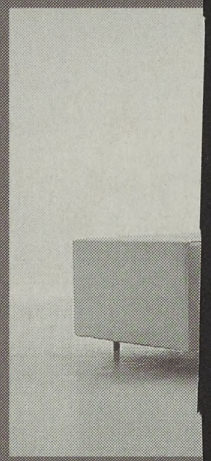
So perhaps I am a victim of seasonal affected disorder, with its slowness and melancholy. It is considered a pathological condition, but I wonder. I'm now inclined to think it's not a disease, but a vestigial remnant of an adaptive hibernation response. If you live in the woods, where the lights stay dim and the cabin cold, a naked romp in the snow after a hot sauna may be just the right winter survival trick to shock you back to life. □

Bernd Heinrich, emeritus professor at the University of Vermont, is the author of "Winter World: The Ingenuity of Animal Survival."









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In 1928, Aldo Leopold left the U.S. Forest Service to take the lead in establishing a new profession of game management, modeled on the profession of forestry. He began by conducting game surveys and authoring a text for the new field. In 1933, he accepted a chair of game management with the University of Wisconsin where he began to train a generation of leaders in the wildlife field. Leopold continued to develop intellectually and in 1939, he transformed his course in 'game management' to 'wildlife ecology.' On the fiftieth anniversary of the publication of Leopold's Sand County Almanac we are pleased to offer this new view of Leopold's early teachings by Leopold biographer Curt Meine.

READING THE LANDSCAPE:

ALDO LEOPOLD AND WILDLIFE ECOLOGY 118

In the spring of 1939 Aldo Leopold offered a new course, Wildlife Ecology 118, at the University of Wisconsin in Madison. After joining the university faculty in 1933, Leopold developed an undergraduate course that he called "Survey of Game Management," which he taught each spring from 1934 to 1938. But rapid changes in the field of ecology, the practice of wildlife management, and the philosophy of conservation prompted Leopold to overhaul and expand the earlier survey course. Revamped and retitled, it was apparently the first course offered in the United States—perhaps anywhere—under the designation "Wildlife Ecology." The shift in title was significant. It captured fundamental changes in Leopold's approach to the emerging field and in the conservation movement in general.

The class drew forty-five students, ten more than its predecessor had at its peak.[1] Among them was Lawrence Monthey, a twenty-year-old soil science student from Wisconsin. Monthey's class notes have been preserved by his family and are now available to researchers at the Forest History Society. These notes constitute the most complete extant record of Leopold's instruction at a critical juncture in the evolution of his ideas. Moreover, Monthey's notes provide a student's-eye view of a master professor at the very moment when an ecological approach to land and wildlife management was first taking hold in academia and in the conservation professions. As such they provide a valuable benchmark against which to measure changes in the teaching and training of wildlife biologists, other conservation scientists and resource managers, and students in general.

LAYING THE GROUNDWORK

In the 1930s the midwestern land grant universities, the University of Wisconsin in particular, were laboratories for new approaches to agricultural and ecological science, land conservation, and extension services. The regional landscape was dotted with such innovators as Victor Shelford at the University of Illinois, Paul Errington at the University of Iowa, John E. Weaver at the University of Nebraska, and Paul B. Sears at the University of Oklahoma. At the University of Wisconsin, Leopold joined a faculty that included Richard T. Ely and George S. Wehrwein in agricultural economics, Norman Fassett

BY CURT MEINE

in botany, and Chancey Juday in limnology. Leopold's chair of Game Management in the university's Department of Agricultural Economics brought focus to an already rich capacity in conservation and the natural sciences.

More generally, trends in ecology and the conservation professions were setting the stage for Leopold's innovations. Community ecologists were bridging the long-standing gap between plant and animal ecology, a process symbolized by the publication in 1939 of Frederick Clements and Victor Shelford's *Bio-ecology*.[2] Shelford, through his work in the Ecological Society of America, had begun to stress the scientific significance of preserved natural areas. Even before the Dust Bowl storms began to blow (and in earnest afterwards), the voices of soil conservation—Sears, Hugh Hammond Bennett, Walter Lowdermilk—emphasized the connection between soil erosion and anthropogenic vegetation change. In the forests of the upper Great Lakes, Raphael Zon and other forest researchers were investigating the commercial and ecological viability of selection cutting systems.

In the late 1920s and early 1930s, Leopold made his own revolutionary contribution, one that would have implications for all the conservation fields. By connecting the dynamics of "wild life" populations to the dynamics of their habitats, Leopold triggered a tectonic shift in conservation's intellectual foundations. In his landmark 1933 text *Game Management*, Leopold effectively melded his extensive experience as forester and game manager with the emerging ideas of scientific ecology, especially as outlined by Charles Elton in *Animal Ecology* (1927). *Game Management* grew out of a series of lectures that Leopold offered in early 1929 at the University of Wisconsin before he formally joined the faculty. *Game Management*, in turn, provided the basic framework for "Survey of Game Management," which he first taught in the spring of 1934.

Over the next two years, the field of *game* management broadened into a more inclusive *wildlife* management movement.[3] Changes in Leopold's teaching agenda reflected this expansion. In addition to the survey course, Leopold also offered a short course in game management for young farmers. He was disconcerted, however, by the degree to which even farm children had lost their familiarity with wildlife. "Most farms are devoid of wildlife," he noted, "and the farm boy is just as ignorant as if he came from town."[4] This was something of a revelation to Leopold, and sensitized him to the need for a more general introduction to conservation issues and ideas.

As early as July 1935, Leopold expressed concern that his nascent academic program had "an important hiatus": it lacked "a general cultural course in conservation." Neither the short course nor the survey course was "particularly aimed at the student who may want to understand the conservation movement simply as one of the qualifications for effective citizenship."[5] This sentiment may well have reflected the arrival of the Dust Bowl storms earlier that spring (an event that coincided with Leopold's first use of the term "land ethic").[6] At the same time, Wisconsin was passing its landmark conservation education law, which mandated the teaching of conservation in all the state's public schools. "Wisconsin," Leopold wrote in September 1936, was thus "the first to see that the really basic problem lay in the education of the public, rather than in the training of professional managers."[7]



PHOTO BY ROBERT C. OETKING, COURTESY OF THE UNIVERSITY OF WISCONSIN ARCHIVES

During 1939 Aldo Leopold taught the first class in Wildlife Ecology. Leopold is shown here, in 1942, examining Hungarian partridge specimens.

This presented an immediate dilemma for Leopold. His time was limited, but the field needed both well-trained professionals and a better-informed public. He chose to focus his professional instruction on a select few graduate students while bringing the lessons of ecology and integrated land conservation to as broad a range of undergraduates as possible.[8] In a university report outlining this latter need, Leopold noted that "the objective [of university instruction] should be to create a body of public opinion capable of *critical* support of conservation policies. The principal present defect in the conservation movement is that public enthusiasm has outstripped public discrimination."[9]

To meet this need Leopold hoped to develop, in partnership with other university experts, a unified course of study in conservation. The effort came to only partial fruition, but it did lead to the important appointment in 1937 of John T. Curtis to the university's botany department. Curtis, with Leopold, Fassett, and horticulturist William Longenecker, would provide much of the faculty leadership for the unprecedented ecological restoration and research efforts at the university's newly established arboretum.[10]

Just as conservation's pedagogical challenge was expanding, so was the professional niche of game management. When he first joined the university, Leopold saw game management as a discrete new field of conservation—an extension, in effect, of agronomy, up the food chain. Through improvements in the type and spatial distribution of cover vegetation, farmers

could produce a "crop" of wild game, to their economic, recreational, and aesthetic benefit. But his hopes for any achievement of this goal were soon tempered. By 1936 he would describe the new field to his university overseers as "increasingly intermeshed with the whole gamut of land uses, land problems, and land agencies."[11] He further noted that in focusing on the economic benefits of "game cropping" he had underestimated landowner interest in other elements of the landscape—"wildflowers, songbirds, fish, fur, etc."

In response to these various needs, Leopold began to rethink his own role as teacher. In a January 1938 memo he wrote, "The university in general gets very little from me. The brief technical course in Game Management is not what it most wants or needs. Ecology, geography, and policy would be more [to the] point, especially for prospective teachers and private citizens."[12] A new course, "covering the whole wildlife field," was needed.[13] At first he thought to call the new course "Game Ecology and Geography." Through the spring and summer of 1938 he further refined the idea, finally adopting the title "Wildlife Ecology."

In October 1938 Leopold prepared a course announcement for prospective enrollees: "There is a growing demand for university courses in those aspects of ecology underlying conservation. To help meet this need there is offered a new course in wildlife ecology." The course had not yet been formally approved by the university's Faculty Committee on Courses but was soon thereafter. At the same time, Leopold changed his own title. Where he had always signed his correspondence "Professor of Game Management," he now shifted to "Professor of Wildlife Management."[14]

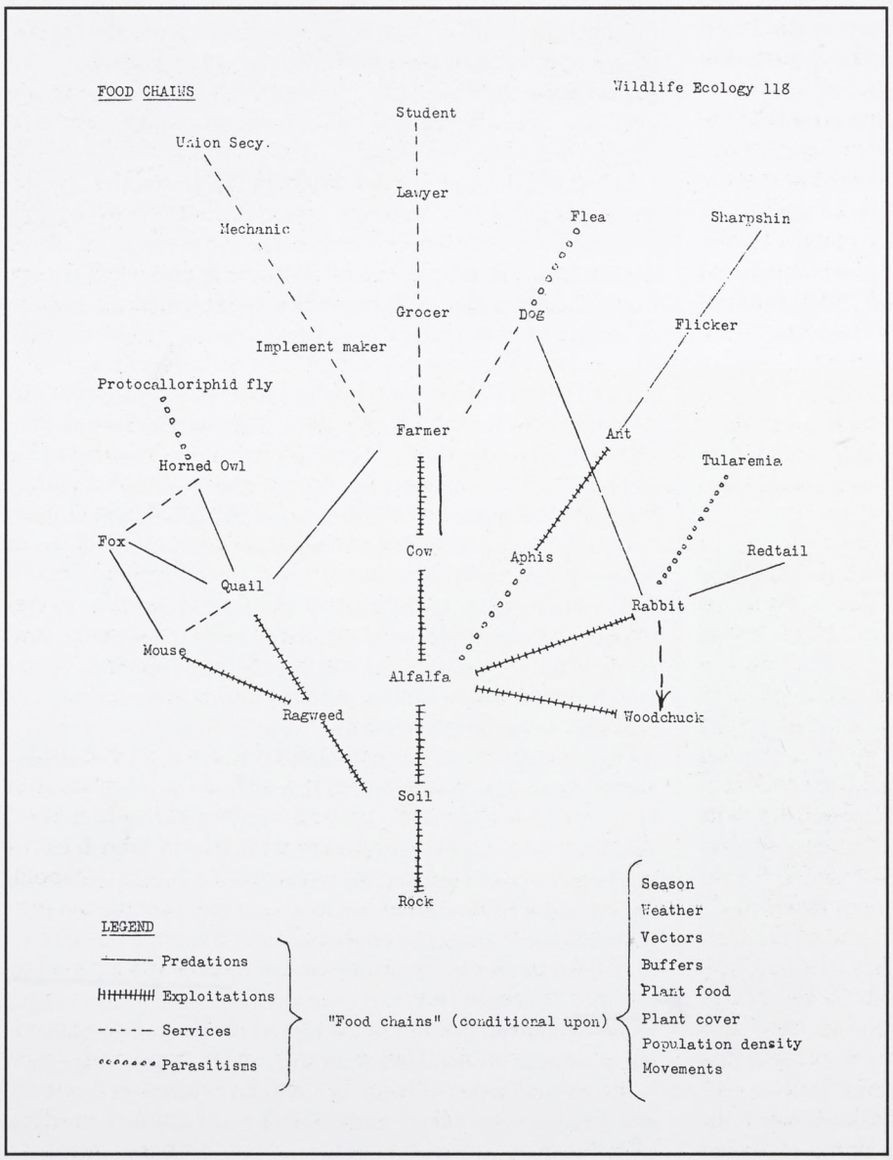
WILDLIFE ECOLOGY 118

Leopold defined a powerfully simple aim for the course: "to develop the ability to read landscape, i.e., to discern and interpret ecological forces in terms of land-use history and conservation." This meant something very different from technical instruction in game management; the intent was to give students of wildlife management and allied fields a context in which to understand and build their technique. Leopold sought a diverse audience. He hoped to bring in students from four not necessarily overlapping groups. In his words:

1. Biologists who seek an antidote for over-specialization in laboratory work.
2. Naturalists who seek to extend their understanding beyond the identification of species.
3. Conservationists who wish to visualize the natural mechanisms which conservation seeks to control.
4. Students in any field who wish to understand how land-use determines plants and plants determine animals.

Leopold limited enrollment to higher-level undergraduates and beginning graduate students who were familiar with common birds, mammals, and wild and agricultural plants, but otherwise he established no formal prerequisites. Students were required to do "a considerable amount of library work," as no single textbook—even Leopold's *Game Management*—covered the course's subject matter. Students were also required to attend Leopold's twice-weekly lectures and to participate in a half-dozen Saturday field trips.

The focus of the student's efforts was an "individual assignment in field work or reading." After meeting with Leopold, the student was to select a project that would "integrate the subject matter of the course with the student's major academic field... or his major personal interest." This allowed Leopold to engage each student's strengths. "Thus," he advised, "the agronomist or botanist may be assigned a food-cover



Leopold's version of the food chain shared with students in Wildlife Ecology 118.

survey; the landscaper a design problem in food and cover plantings; the entomologist or zoologist selected readings on animal food habits; the history student selected readings in conservation history; the biology teacher selected readings in conservation teaching materials." From the beginning, Leopold sought through the course to establish "the role of wildlife in a liberal education" (as he would entitle a 1942 article).[15]

Wildlife Ecology 118 convened on February 21, 1939. The first section of the course, covering the first six weeks, addressed "the structure and properties of animal communities." In these lectures, Leopold explained basic principles and concepts in community ecology, population biology, and autecology: food chains, biotic pyramids, trophic levels, breeding potential, limiting factors, population density and dynamics, carrying capacity, saturation, minimum populations, extinction and extirpation, population cycles, migration, other population movements, social organization, and animal behavior and physiology. This amounted to a distilled version of his prior survey course, now expanded to include a broader range of species and habitat types.

Importantly, Leopold did not launch immediately into explanation of these organizing concepts but introduced them subtly. In his first three lectures, Leopold presented a series of seven landscape case studies and three animal species "biographies." Through the case studies, Leopold introduced his students to the art of reading landscape. They heard from one of the art's premier practitioners. The cases—"History of Roadsides," "History of a Prairie Coulee," "History of the Ragweed Patch, Faville Grove," "History of Central Wisconsin Marshes," "History of Northern Wisconsin," "Evolution of the Fencerow," "History of a Tussock Marsh"—covered communities and landscape features that would have been familiar to most students. But Leopold's adept use of dynamized natural history, which he saw as the hallmark of modern ecology, would have prompted them to look again. Using elegant diagrams and clear text, Leopold walked them through landscape histories:



PHOTO COURTESY OF THE ALDO LEOPOLD FOUNDATION ARCHIVES

Leopold used a series of case studies to help students "learn to read the landscape", whether it was a fence row, a Wisconsin marsh, or forest succession. Here, Leopold instructs student during the winter at the Arboretum.

- Twenty years of incremental road improvements had extinguished the remnant prairie flora, started a gully, and killed a nearby bur oak, while "the landscape engineer in charge of highway beautification plants an elm."
- A century of haying, burning, ditching, and reflooding had radically altered the central Wisconsin marshes, and "the net effects of the ecological overturn are as yet by no means clear."
- The sequence of fencing—from fenceless field, to log fence, to rail fence and hedge, to wire fence, to metal and concrete fence, to electric fence—changed the vegetative composition of field borders, altered the role of fire, affected animal movements, reconfigured predator-prey dynamics, and reduced floral and faunal diversity. ("Ultimately …electric fences mean the complete subjugation of fencerow growths").

Each case study concluded with a series of incisive questions. From the prairie coulee case study: "What is the meaning of the term "wheat gully"? When a watershed begins to display floods and gullies, is the deterioration of the soil far advanced or has it just begun? When pastured woods are closed to grazing, does the original undergrowth reappear, or do we get a new set of species? Why? Was the wooded area in 1870 greater or less than in 1840?"

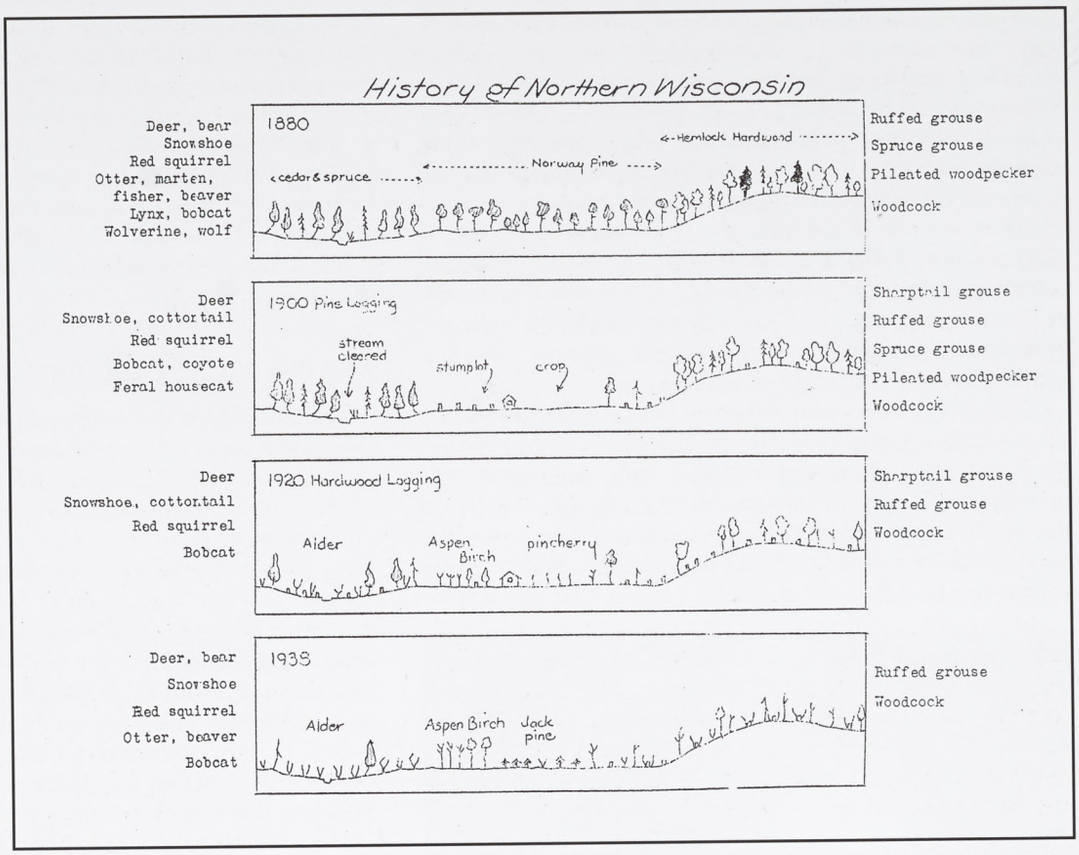
Through the case studies, Leopold illustrated the "fundamental principle in all ecology": the composition of the fauna depends on the presence of plants, and the presence of plants depends on the interaction of soils and human beings over time. The three species "biographies"—of pheasant, bobwhite quail, and great horned owl—stressed a similarly dynamic view of populations: a given population has a certain breeding potential, and over the course of a year faces a series of environmental contingencies that check its potential growth and determine its final level before the cycle begins again. From the beginning, Leopold included humans as "a part of the system, a part of the animal community." (To illustrate this, Leopold's food chain diagrams included such sequences as rock-soil-alfalfa-cow-farmer-grocer-lawyer-student.)[16]

Led thus gently to the understanding that landscapes and populations *change*, Leopold's students could more easily comprehend the then unfamiliar building blocks of scientific ecology. They would have quickly realized, too, that their professor was after something more than rote memorization of ecological facts. Leopold had articulated this concern in a 1938 address at the University of Missouri. In that address, entitled "Natural History: the Forgotten Science," Leopold criticized "the lopsidedness and sterility of biological education as a means of building citizens." He asked his audience to "go afield with some typical bright student and ask him some questions. We can safely assume he knows how angiosperms and cats are put together, but let us test his comprehension of how the land is put together."[17] Leopold was after perception, judgment, and insight, while evoking enjoyment of the unfolding story of the land. "It was a course," Joseph Hickey later recalled, "in thinking."[18]

In the next series of lectures, Leopold covered territoriality, home range, edge effects, and plant succession, which together with the previously covered concepts would "lead to an understanding of most ecological pictures." Leopold focused in one

lecture on the types of local ecological evidence that can be helpful in interpreting field sites: the presence of particular relict plant species; plant growth forms and patterns of plant formations; stump fences and farmstead plantings; bear clawings, road scars, fire scars, and ice scars. Later in the course, Lawrence Monthey summarized "what you need to know for ecological deduction":

1. Animals and their plant needs
2. Plants (at least by sight)
3. Soil origin (geology, phys[ical] geog[raphy])
4. Soils and Agricultural practices (including silviculture, if any)
5. Administrative factors (plantings, poaching, laws if any)
6. Local History (including archeology)
7. Properties of diagnostic materials
8. Climatic history (hard winters, droughts, floods.)



Leopold's diagram of land-use changes in northern Wisconsin shows the movement from forest to farm and back to forest.

That Monthey was absorbing Leopold's lessons, and honing his own perception, is evident from his choice of a case study for a class exercise. "A very real case of plant successions came to me as I helped a resident of Lake Forest improve and manage a rather large lawn. The fact that the whole story occurred in the brief span of 4–5 years makes it all the more interesting—and leaves it well in mind." Leopold always appreciated students who could find drama in even ordinary landscapes; he would certainly have appreciated Monthey's account of the lawn's "succession" (" opening the [oak] stand . . . spelled 'finis' to the mosses which need a moist, shady, acid location").

Leopold turned next in his sequence of lectures to a basic review of field techniques in wildlife management: censusing; trapping; banding; and determination of food habits, sex, and age. Leopold supplemented all his lectures with extensive lists of supplementary readings, drawing upon his personal book and reprint library of some 3,000 titles. Literally and figuratively, Leopold provided access to the most current literature in the field. As the weather warmed through April and May, Leopold arranged field trips to several sites where his graduate students were carrying out research. In the field, students had the chance to try out their newly acquired skills in landscape perception.[19]

In the final weeks of class, Leopold departed somewhat from his prepared outline, but followed his general intent to expand upon the course's earlier themes and settings. Moving beyond the local and known landscapes of Wisconsin, he shared with his students his own field experiences from two very different regions: the intensively managed forests of Germany and the semi-arid wild mountains of the American Southwest and adjacent Mexico.[20] He devoted one lecture to the history of conservation, essentially building upon his opening chapter from *Game Management* by comparing the "wildlife chronologies" of Asia, Britain, the "Germanic Countries," North America, and Wisconsin.

Leopold's final lectures covered conservation philosophy, ethics, and economics. Unfortunately, Monthey's notes from these sessions are rather scattered (end-of-spring-semester attention spans being then, surely, what they remain today). However, we can glean from them basic elements of Leopold's emerging conservation worldview. Monthey noted: "'Flow of energy' a better term than 'Balance of Nature' in describing the biota." Thus did Leopold long ago dispense with the "balance of nature" image that is in disrepute among today's ecologists and postmodern socio-environmental critics.[21] Under the heading "Conservation Motives," Monthey wrote: "Conservation of one resource at the expense of another." Leopold was increasingly aware—and critical—of the tendency among conservationists to treat separate components of the land rather than land as an integrated whole. This would lead him, in the remaining decade of life, to call directly and explicitly for "a reversal of specialization; instead of learning more and more about less and less, we must learn more and more about the whole biotic landscape."[22]

Finally, Monthey's notes refer to "A new motivation for conservation arising from 1. Our inability to define 'value' 2. Our desire to mitigate the violence." Here Leopold appears to be referring directly to the text of his landmark essay "A Biotic View of Land," which he would deliver as an address just three weeks later, on June 21, 1939, at a joint meeting of the Society of American Foresters and the Ecological Society of America. "New principle in conservation," Monthey concludes: "let's preserve *all* of the elements of a landscape." This expression of "proto-conservation biology" tracks closely Leopold's clear statement in "A Biotic View of Land": "The only sure conclusion is that the biota as a whole is useful, and biota includes not only plants and animals, but soils and waters as well."[23]

Leopold's students were in fact receiving the latest iteration of Leopold's evolving conservation philosophy, as expressed in the forthcoming "Biotic View of Land." Published later in 1939 in the *Journal of Forestry*, "A Biotic View" marked in many ways the fulfillment of Leopold's intellectual development over the previous decade. Readers find Leopold exploring the same themes that he developed in Wildlife Ecology 118: the need for broader understanding of the structure and function of biotic communities; the dynamic rather than static view of nature; the "unprecedented violence, rapidity, and scope" of modern human impacts on the biota; a comparison of human impacts in different parts of the globe; and a call for all conservation fields to converge and agree upon a new ecological foundation for management decisions and techniques. In both the essay and the class, Leopold was putting his intellectual pieces together. His students, in fact, witnessed the formation of a new conservation paradigm.



PHOTO BY ROBERT MCCABE, COURTESY OF THE UNIVERSITY OF WISCONSIN ARCHIVES

Leopold examining tamarack seedlings in 1947 approximately one year before his death. He was after perception, judgement and insight. His students would consider his course on wildlife ecology a course "in thinking."

WHITHER WILDLIFE ECOLOGY 118?

Lawrence Monthey performed well in Wildlife Ecology 118. His student paper on the "sky dance" of the woodcock earned an A (Leopold called it a "first-rate job" and asked for a copy to add to his woodcock file). Leopold's evident respect for his students comes through in other subtle ways. For one assignment, Monthey reviewed a 1938 article by Carl Sauer, "The Theme of Plant and Animal Destruction in Economic History."[24] With the cheekiness that is the special prerogative of undergraduates, Monthey took both Sauer and Leopold to task for their "attitude of wistful thinking for the 'good old days' when nature was in tune." "Personally," he continued, "I think that the young conservationists of today, the future leaders who must face the critical problem of the near future, must lose this sentiment and strive toward a new balance in lieu of what has happened." A knowing Leopold remarked in the margin: "Good."

The spring 1939 cohort of "young conservationists" experienced something of a golden moment in the development of ecological instruction. When the course reconvened, in the spring of 1940, the specter of world war already loomed. A year later the United States went to war, and student enrollments began to decline. Leopold continued to offer the course through the war years, but to diminished numbers. At the height of the war, only eight students signed up.

Enrollments began to recover in 1945, and Leopold was soon forced to teach the course with assistants. Over the next three years, the GI Bill swelled the campus with students. Leopold last taught the full course in 1947. By then, Leopold had streamlined the course somewhat. Much of the original substance of the course was retained, but the basic structure had evolved. Leopold continued to introduce the course with a basic overview of landscape composition and change, then moved into reviews of population ecology, Wisconsin-based wildlife ecology studies, community ecology, and ecological case studies from other regions. He seems actually to have downplayed the formal treatment of conservation philosophy, apparently choosing to weave it into the larger fabric of the class (even as he working on the final synthesis of "The Land Ethic.")[25]

Upon Leopold's death in April 1948, his former student and newly hired colleague Joe Hickey took over the class. Hickey continued to offer the course to new generations of conservationists into the 1970s. The course is still taught at the University of Wisconsin by Dr. Stanley Temple, under the title *Wildlife Ecology 318: Principles of Wildlife Ecology.*

But Leopold's course is somewhat remarkable in the degree to which it has withstood the buffeting of postwar-era changes in

academia and science. In many universities, whole organism biology—not to mention whole system ecology—has withered away in the deep shadows of well-funded microbiology, molecular genetics, and biotechnology programs. Ecology, forestry, and the other conservation sciences find themselves increasingly in the thrall of powerful statistical models, computer-generated analyses, and impressive geographic information systems. The type of "old-fashioned" natural history upon which Leopold and his generation based their instruction is itself becoming endangered.

For conservation, the decline of natural history is not merely a matter of nostalgic regret but of real consequences. In a recent discussion of this loss, conservation biologist Reed Noss writes, "already the limiting factor in many cases is unavailability of basic data on the life histories of species, interactions among species, and ecological processes. How can we expect [data] to be analyzed and interpreted with insight and wisdom by people who have never seen the species in question and scarcely ever take their eyes off the computer screen."[26] Noss notes that even the field trip, "the core experience of any good organismic biology or ecology course," is becoming endangered due to the cost of travel, liability concerns, and competing demands on student time.

Yet, low rumblings of a counter-response can also be heard. As traditional disciplines reinvent themselves, and new "interdisciplines" such as conservation biology and restoration ecology carve out necessary academic niches, students are

MEASURING UP: LAWRENCE MONTHEY AND THE LAND ETHIC

BY ROGER MONTHEY AND KARIE KIRKPATRICK

In the dusty attic of his old farmhouse, Roger Monthey discovered his father's class notes from Aldo Leopold's first wildlife ecology course offered at the University of Wisconsin in 1939. Monthey, currently the Forest Stewardship Program Representative for the USDA Forest Service in Durham, New Hampshire, graciously made these notes available to researchers at the Forest History Society.

Roger's father, Lawrence (L. G.) Monthey, was tragically killed in an auto accident in 1985. Following his days at the University of Wisconsin, Monthey entered the U.S. Army during World War II, and after the war he returned to Wisconsin, where he purchased 115 acres of woodland and farmland near Madison in 1953. He worked for twelve years as an editor with the American Society of Agronomy and later with the University of Wisconsin Cooperative Extension in Madison. In the later years of his life, he was a wild foods expert for the Environmental Resources Unit at UW-Madison and conducted wild plant and mushroom seminars throughout the state of Wisconsin for which he received wide recognition.

It is difficult to gauge how much influence Leopold's wildlife ecology class had on Monthey's subsequent stewardship activities. Lawrence Monthey, a soil science student at the university, had a "Johnny Appleseed" trait about him all his life, planting trees wherever he went. After purchasing his farm, he received each spring free trees from the local Isaak Walton League and planted them in shelterbelts to protect the house from fierce winter winds. He also applied for and received federal assistance from the former Soil Conservation Service and Agriculture Stabilization and Conservation Service (currently the Natural Resources Conservation Service and Farm Services Administration) to install ditches to reduce surface erosion from farm fields and to let some of the fields go fallow under the old Soil Bank Program. He worked out agreements with the farmers who leased his farm fields to leave sodded waterways, to retain vegetated fence rows, and eventually to apply low tillage planting methods.

With regard to woodlot management and wildlife, Monthey's biggest achievement was to allow the natural regeneration of about twenty acres of trees, which at the time of the farm's purchase was blue grass pasture with only a few bur oak trees. Today, this area is a beautiful stand of red, white, and bur oaks, shagbark hickory, and a few planted black walnut and white ash that provide habitat for white-tailed deer, wild turkey, cottontail rabbits, and gray squirrels. Monthey showed that time can heal the land, and that forests and associated wildlife communities can be restored that once were just distant memories. Aldo Leopold probably would have considered Monthey's participation in these activities as measuring up to his view of a land ethic.



COURTESY THE CAPITAL TIMES

Lawrence G. Monthey not only left us his class notes from Aldo Leopold's first class on Wildlife Ecology, he left a lasting legacy in those he helped to understand and enjoy wild plants in our environment.

being asked to reengage with their local landscapes. For these students enrolled in courses bearing diverse labels in varied departments, the primary objective of Leopold's original wildlife ecology course remains unshakably relevant. To understand the world they live and work in, students must "develop the ability to read landscape… to discern and interpret ecological forces in terms of land-use history and conservation."

This was the goal of Aldo Leopold's teaching. To perceive one's place with critical insight, to peer into the drama of the land's workings, to understand one's fellow creatures on their own terms in their own worlds—these were the foundations upon which not only training in conservation but also satisfaction in life were to be built. In one of his last Wildlife Ecology 118 lectures, Leopold let his students know what to expect from him, and from the land: "I am trying to teach you that this alphabet of 'natural objects' (soils and rivers, birds and beasts) spells out a story, which he who runs may read—if he knows how. Once you learn to read the land, I have no fear of what you will do to it, or with it. And I know many pleasant things it will do to you."[27] □

Curt Meine, Research Associate,
International Crane Foundation.

NOTES

1. Aldo Leopold, "Chair of Wildlife Management, University of Wisconsin," 16 March 1939. Series 9/25/3, Box 1, Department of Wildlife Ecology Papers, University of Wisconsin Archives.
2. Frederick E. Clements and Victor E. Shelford, *Bio-ecology* (New York: John Wiley and Sons, 1939).
3. See Curt Meine, *Aldo Leopold: His Life and Work* (Madison: University of Wisconsin Press, 1988), 340–66.
4. Aldo Leopold, "Report of Chair of Game Management to Wisconsin Alumni Research Foundation," 15 June 1937, Series 9/25/3, Box 1, Department of Wildlife Ecology Papers, University of Wisconsin Archives.
5. Aldo Leopold, "Memorandum for Dean Christensen," 29 July 1935. Series 9/25/3, Box 1, Department of Wildlife Ecology Papers, University of Wisconsin Archives.
6. See Aldo Leopold, "Land Pathology," in *The River of the Mother of God and Other Essays by Aldo Leopold*, ed. Susan L. Flader and J. Baird Callicott (Madison: University of Wisconsin Press, 1991), 212–17.
7. Aldo Leopold, "Report to the Wisconsin Alumni Research Foundation on the Chair of Game Management, 1934–36, 25 September 1936, Series 9/25/3, Box 1, Department of Wildlife Ecology Papers, University of Wisconsin Archives.
8. Leopold, "Chair of Wildlife Management."
9. Aldo Leopold (Chair, Committee on Wildlife Conservation), *The University and Conservation of Wisconsin Wildlife*, Bulletin of the University of Wisconsin, Science Inquiry Publication no. 3, February 1937.
10. Curt Meine, "Reimagining the Prairie: Aldo Leopold and the Origins of Prairie Restoration," in *Recovering the Prairie*, ed. Robert Sayre (Madison: University of Wisconsin Press, in press).
11. Leopold, "Report to the Wisconsin Alumni Research Foundation."
12. Aldo Leopold, "Memo on Chair of Game Management," 28 January 1938, Series 9/25/3, Box 1, Department of Wildlife Ecology Papers, University of Wisconsin Archives.
13. Leopold, "Chair of Wildlife Management."
14. Meine, *Aldo Leopold: His Life and Work*, 387.
15. Aldo Leopold, "The Role of Wildlife in a Liberal Education," in *The River of the Mother of God*, ed. Flader and Callicott, 301–5.
16. See Aldo Leopold, "The Role of Wildlife in a Liberal Education."
17. Aldo Leopold, "Natural History: The Forgotten Science," manuscript, 26 April 1938, Series 9/25/10–6, Box 16, Aldo Leopold Papers, University of Wisconsin Archives.
18. Joseph J. Hickey, in *Aldo Leopold: Mentor*, ed. Richard E. McCabe (Madison: Department of Wildlife Ecology, University of Wisconsin), 49.
19. Invariably, the greater the number of students in Leopold's class, the more difficult teaching in the field became. Joe Hickey recalled that, during the years he worked with Leopold, field trips "were somewhat marred by the high ratio of students per prof. [Leopold] was a thrilling teacher to accompany in the field when the party was rather small (say only four)." Hickey, in *Aldo Leopold*, 49.
20. Leopold's reading of these landscapes can be found in a variety of accounts. For Germany, see Leopold, "Deer and Dauerwald in Germany: I. History," *Journal of Forestry* 34:4 (April 1936), 366–375; and "Deer and Dauerwald in Germany: II. Ecology and Policy," *Journal of Forestry* 34: no. 5 (May 1936): 460–66. For Mexico, see Leopold, "Conservationist in Mexico," *American Forests* 43: no. 3 (March 1937): 118–20.
21. Leopold's explicit avoidance of the term and concept of "the balance of nature" dates to the mid-1920s. For his later discussion, see Leopold, "A Biotic View of Land," *Journal of Forestry* 37: no. 9 (September 1939): 727–30.
22. Aldo Leopold, in *Round River: From the Journals of Aldo Leopold*, ed. Luna B. Leopold (New York: Oxford University Press, 1953), 159. See also Aldo Leopold, "Conservation: In Whole or In Part," in *The River of the Mother of God*, ed. Flader and Callicott, 310–19.
23. Leopold, "A Biotic View of Land."
24. Sauer's essay was published in the November 1938 issue of the *Journal of Farm Economics*.
25. See Hickey in *Aldo Leopold*, 47; "Wherefore Wildlife Ecology?" in *The River of the Mother of God*, ed. Flader and Callicott, 336–37; Meine, *Aldo Leopold*, 500–505.
26. Reed Noss, "Does Conservation Biology Need Natural History?" *Wild Earth* 8: no. 3 (Fall 1998):10–14.
27. Leopold, "Wherefore Wildlife Ecology?"

It's Not Easy Being Green

Conservation biologists strive to document — and arrest — man's destruction of nature.

THE IDEA OF BIODIVERSITY

Philosophies of Paradise.
By David Takacs.
393 pp. Baltimore:
The Johns Hopkins University Press.
$35.95.

By John Horgan

PRACTITIONERS of science studies are feeling a bit beleaguered these days. These scholars scrutinize scientists as though they were merely members of another tribe, like teen-age mall rats or the Taliban, compelled by their own peculiar cultural influences. Needless to say, some scientists have not taken kindly to this treatment. In recent meetings and books, scientists have denounced science studies as pretentious gibberish at best, and at worst as a left-wing plot to undermine science.

Some science studies invite such criticism simply by choice of topics. There seems little point to probing the cultural soil within which, say, the theory of stellar fusion took root; the salient fact is that the theory is true. But when applied to the right field and carefully done, science studies more than proves its worth. It points the way to a science that is more self-aware and thus more capable of achieving what the philosopher Sandra Harding calls "strong objectivity." "The Idea of Biodiversity" demonstrates the genre's potential. The author, David Takacs, who obtained a joint degree in science studies and environmental science from Cornell University and who now teaches at California State University, Monterey Bay, scrutinizes conservation biology, whose adherents are attempting both to document humanity's destruction of nature and to arrest it. This analysis is timely, coming as it does when an anti-environmental "brownlash" has the green movement on its heels. In the confessional mode that post-modern anthropologists call "I-witnessing," Mr. Takacs emphasizes that his is a biased account. He believes that the questions raised by conservation biologists are the most important facing humanity today, and he shares their passionate love of nature. Yet he also thinks conservation biologists need to be more self-critical, especially since they mix scientific aims — the discovery of truths about nature — with political ones.

Early on, he shows how proto-conservation biologists like Aldo Leopold and Rachel Carson placed their facts at the service of their beliefs to persuade society to take better care of nature. He includes extended profiles of Inbio, a Costa Rican preserve that has become a kind of laboratory for testing conservation strategies, and of Edward O. Wilson, who has transformed himself over the last two decades from the dark prince of sociobiology into the archangel of the environmental movement.

But the core of the book consists of Mr. Takacs's interviews with more than a score of conservation biologists, ranging from the tough-talking Cassandra Paul Ehrlich, who has been warning about the dangers of overpopulation for decades, to Thomas Eisner, the St. Francis of bugs. Mr. Takacs asks his sources various questions: What is biodiversity? How should it best be protected? Can science achieve complete objectivity? Then he ponders the responses. His goal is not to play "Gotcha!" or to flaunt his own cleverness, as some scurrilous science critics do, but to reveal tensions and contradictions that he believes should be recognized, if not resolved. He shows, for example, how Mr. Wilson, Mr. Eisner and others manufactured the buzzword "biodiversity" during the 1980's to serve their political ends. The word conveys much the same meaning as "nature" or "wildlife" but adds a glossy scientific sheen. As Mr. Takacs puts it, the term "is a tool for a zealous defense of a particular social construction of nature."

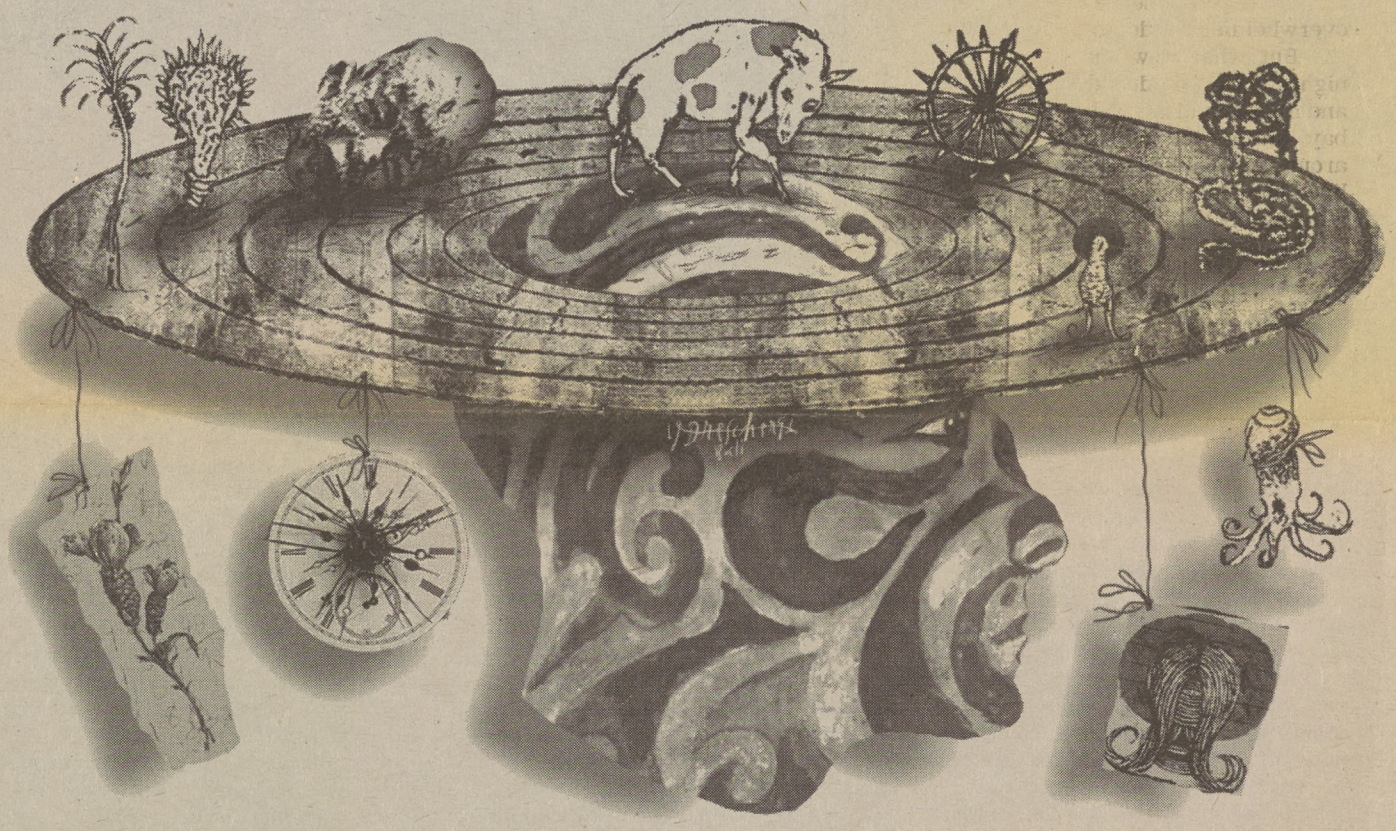
Unfortunately, as science evolves, the meaning of such terms may change in ways that are not always politically expedient. Ecologists once implied that nature exists in a state of equilibrium and harmony disrupted only by human intervention, but they now depict nature as dynamic, mutable; it is a process rather than a collection of things. This shift in perspective has spurred a debate over whether the Endangered Species Act should be abandoned for a more "holistic" approach that focuses on "habitats" or "ecosystems" rather than on individual species. But as one biologist notes drily, ecosystems "have no big, brown eyes to endear themselves to the public." Environmentalists are also deeply divided over the degree to which their programs should respect the cultures of indigenous people, and all people, for that matter. Some advocate policies — such as mandatory birth control and restrictions on the rights of Indians to convert jungle into farmland — that would sharply curtail human diversity.

One of Mr. Takacs's central concerns is the increasingly popular proposal that preserving biodiversity makes economic sense; a nameless weed or beetle in that patch of threatened rain forest may contain an enzyme that can cure cancer or the common cold. Some biologists admit that they adopt this argument not because they believe it, but because it helps to enlist governments and companies in the cause. Mr. Takacs fears that if the claims are shown to be exaggerated, they may backfire. Moreover, he writes, "these economic arguments allow the hubristic, violent way we treat the earth to continue."

"The Idea of Biodiversity" does not have the flair of, say, one of Mr. Wilson's lyrical polemics. I wish Mr. Takacs had reworked his manuscript once more to prune redundancies and jargon. (Stephen Hawking once said that every formula in a science book reduces its potential readership by half; surely the same is true of the awful word "normative," which Mr. Takacs and other academics unaccountably find irresistible.)

Mr. Takacs beats some rather obvious points to death — like the squishiness of such terms as "biodiversity" and "nature" — and the long, unedited excerpts from his interviews become wearying at times. On the other hand, the rawness of the material allows — even invites — readers to draw their own conclusions rather than merely to submit to those presented by Mr. Takacs. My own reading left me rather ambivalent. Although I try to color myself green, I was disturbed by the self-righteousness and absolutism of conservationists like Hugh Iltis, who declares we must do all we can to save every species on earth. This goal seems neither realistic nor reasonable. I'm delighted that my children do not encounter wolves in our backyard, or elephants, or malaria, as inhabitants of less developed regions do. The declaration that "biodiversity is good" recalls the antiwar axiom that "nuclear war is bad." No sane person would disagree with either sentiment. Contention arises when one considers how these values should be reconciled with others, like our desire for freedom or comfort or consumer products. And, as David Takacs shows, knowing how to balance these competing values can be extremely difficult.

That said, I'm not sure I agree with Mr. Takacs that conservation biologists should spend more time examining their motives and assumptions. Would the world really be better off if eco-warriors like Mr. Ehrlich or Mr. Wilson began indulging in Hamlet-style introspection, given that their opponents are hardly likely to do the same? In some areas of science, as in the law, the adversary system may be a necessary evil. □



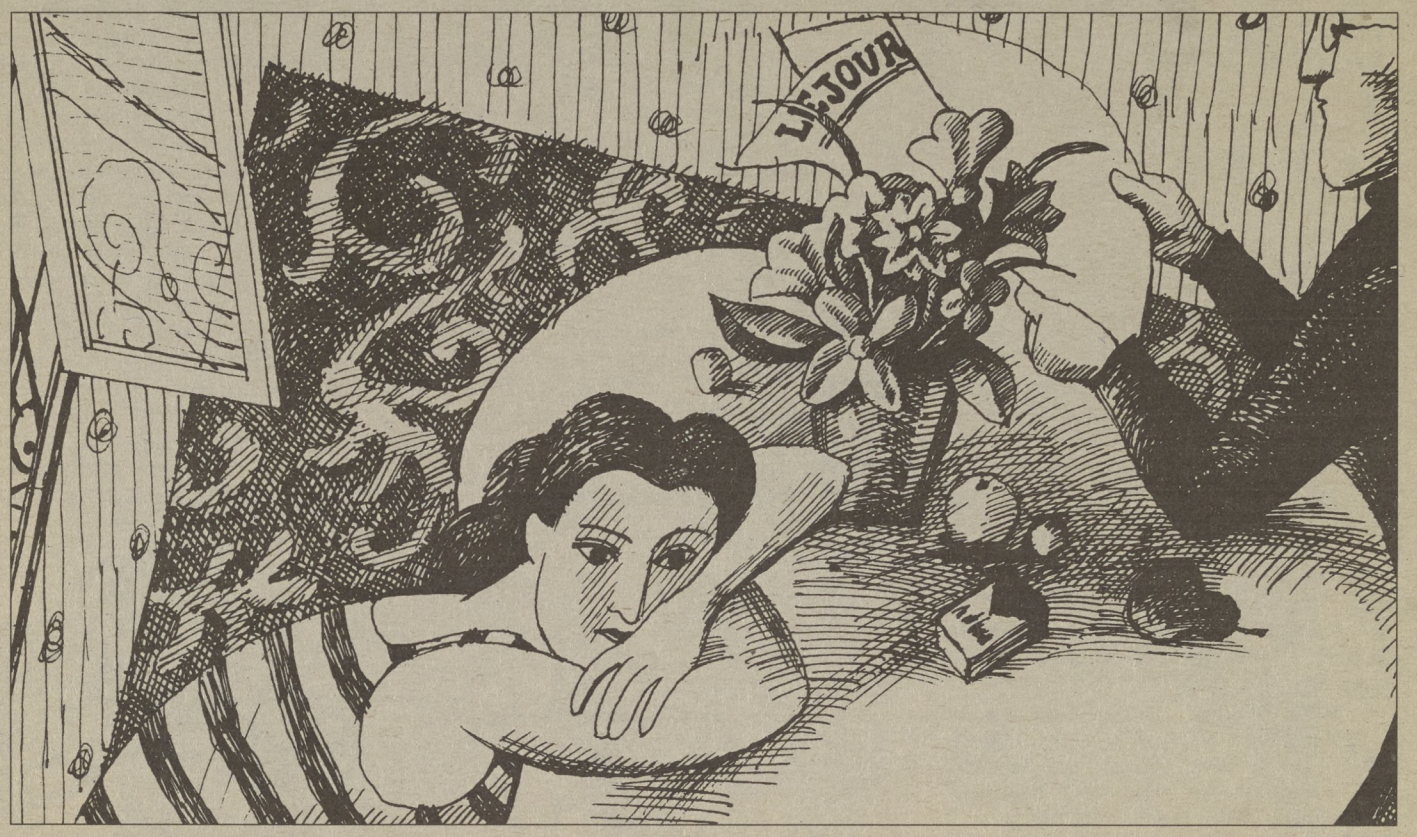
HENRIK DRESCHER

John Horgan, a senior writer at Scientific American, is the author of "The End of Science."

Excess Baggage

Francine Prose's novellas are about Americans who bring their problems with them to Europe.

GUIDED TOURS OF HELL
Novellas.
By Francine Prose.
241 pp. New York:
Metropolitan Books/
Henry Holt & Company. $23.



VLAD GUZNER

By David Lodge

THE adventures of Americans in Europe constitute a long and distinguished literary tradition, which starts with Washington Irving and continues through Mark Twain, Henry James and Edith Wharton to Ernest Hemingway and F. Scott Fitzgerald. Traditionally, the American characters have been "innocents abroad," variously exploited, betrayed, toughened or transformed by their exposure to European "experience."

Francine Prose, coming late to the tradition, creates Americans who are already experienced, loaded with cultural knowledge and burdened with ironic self-consciousness. This is a distinctively Jewish contribution to what James called the "international theme." What would modern American literature be like without its Jewish writers — without their wit and knowingness, their intimate familiarity with guilt and anxiety? The question is rhetorical; but Francine Prose has these qualities in abundance.

"Guided Tours of Hell" consists of two irresistibly readable novellas about Americans who bring their problems — professional, sexual, psychological — with them to Europe. In this environment, at once strange and familiar, new (to them) and yet palpably old, crammed with historic ghosts (Danton, Marie Antoinette, Kafka, the countless victims of the Holocaust are among those who haunt these pages), the characters' problems come to a head more urgently and insistently than they would at home, and are purged in cathartic epiphanies both tragic and farcical.

The central figure in the title story is a New Yorker named Landau, a less than successful playwright on the subsidized theater circuit, author of a one-woman show called "To Kafka From Felice" (composed of imagined reconstructions of letters written by Kafka's long-suffering fiancée), on the strength of which he is invited to an international Kafka conference in Prague. Every conference has its sightseeing excursion, but this one's destination is rather unusual: a Nazi concentration camp. "On the bus to the death camp": the story's opening words establish the convergence of the unspeakable and the banal in Landau's situation, tormenting him both in body and in soul.

He is racked with indigestion from the fatty excesses of the Czech diet and consumed with jealousy of the star of the conference, Jiri Krakauer, poet, occupant of an endowed chair in modern European history at Princeton, legendary survivor of the very camp they are visiting, where he was reputedly the lover of Kafka's sister, Ottla. Landau is also uncomfortably aware of the sterility of his marriage to Mimi, whose income as a Manhattan therapist supports his literary career; of the unwanted advances of a fellow conferee named Natalie Zigbaum, professor of Slavic languages from Vassar, whose snide wisecracks articulate his own nastiest private thoughts; and of the indifference of the delectable Eva Kaprova, the Czech congress organizer, who is all too obviously smitten with Jiri as he conducts them around the camp with a proprietorial swagger: "Mesdames et Messieurs. The tunnel to the gallows. Another amazing miracle of Nazi engineering."

In what was the SS canteen, now converted to a restaurant for the tourists, Jiri, recovered from an alarming coughing fit, tells his captive audience the extraordinary tale of how he snatched erotic bliss out from under the very nose of the Nazi camp *Kommandant*, a story Landau is convinced is a tissue of plagiarism and wish fulfillment. As Jiri reaches the ironic postwar epilogue to his yarn, Landau accuses him of being a liar:

" 'And what have I lied about?' Jiri says evenly. 'About the six million dead?' ... Of course, Landau doesn't think that. But of course he can't say so. He can't say: I believe in the Holocaust. He'd feel like an absolute jerk. What did he think he was doing? Defending the six million against this dying mediocre writer?"

This is a very characteristic piece of Ms. Prose's writing. Landau seems to be reporting on himself from an ironic, third-person distance, despairingly observing his own contradictions, impotence and bad faith. There are similar passages in the second novella, "Three Pigs in Five Days." For example: "She should have asked if it meant anything, his sending her to Paris without him. Any sane person would have asked. But not, apparently, Nina."

NINA is the infatuated assistant of Leo, who edits a newsletter for Francophile American tourists called Allo. On their frequent trips to Paris, they combine erotic indulgence with sampling choice hotels, but when Leo sends Nina to check out the Hotel Danton on her own, she fears this means the end of their relationship. The hotel, to judge by the noises coming through the walls, seems to be a whorehouse; the *patronne* claims to be a deserted mistress of Leo's; the television in Nina's shabby room shows nothing but documentaries about pigs being slaughtered — or are these all hallucinatory projections of her paranoia?

Nina is on the verge of cracking up when Leo appears at her door: apparently he sent her ahead to take advantage of a frequent-flier program, and she missed the explanation. Or did she? Perhaps Leo just made up this story as an alibi for his own change of mind. Nina's relief is fragile; her confidence in herself and in Leo's devotion goes up and down as they embark upon a whimsical "Paris Death Trip" dreamed up by Leo to amuse his readers: "We'll go to the Catacombs. The cemeteries. Père Lachaise. ... We'll check out the Conciergerie, the prison where Marie Antoinette spent her last night."

Ms. Prose is very good on the mood swings induced by tourism and its insane insistence that every minute of every day should be packed with instruction and pleasure — the excessive euphoria when trivial things go well, the equally excessive chagrin when they don't. Leo's project starts auspiciously with breakfast in a more luxurious hotel than the Danton, but when Nina wants to visit the grave of Simone de Beauvoir, a shrine covered with votive offerings from dedicated feminists and betrayed mistresses, Leo, who has something of Sartre's selfish arrogance but not a whit of his genius, complains about the time it takes to find it. And as they stumble through the dark and clammy corridors of the Catacombs (they should have brought a flashlight), Nina feels as if they are re-enacting the myth of Orpheus and Eurydice — but is unable to interpret its meaning with any confidence. Is it a story about love being stronger than death, or the reverse? Is it a warning to men or to women?

Historical and literary analogues to Nina's situation accumulate to the point of overload. In the Conciergerie, she and Leo are disappointed by the tacky tableau of Marie Antoinette's last night, but hear from a fellow tourist the story of Danton embracing the disinterred corpse of his recently buried wife in the throes of his grief, which seems to Nina the epitome of sublime romantic love, "a magic key, rolling back the stone prison roof like the top of a sardine can." Leo cynically informs her that within a year Danton was remarried to a nubile 16-year-old, but he fails to spoil her vision. She has already decided that "she and Leo would edge apart. Leo wouldn't dig up her grave or come down to hell to save her." Unlike Landau, she is free of her obsessions at last. □

David Lodge's latest book is a collection of essays, "The Practice of Writing."