

"Lucid and thorough—a fantastic guide to North America's largest ecosystem."

PUBLISHERS WEEKLY

CANDACE SAVAGE

PRAIRIE

A NATURAL HISTORY

UPDATED, WITH A NEW PREFACE





{ PRAIRIE }



CANDACE SAVAGE

PRAIRIE
A NATURAL HISTORY

{ updated, with a new preface }

PRINCIPAL PHOTOGRAPHY BY JAMES R. PAGE

ILLUSTRATIONS BY JOAN A. WILLIAMS

 David Suzuki Foundation

 GREYSTONE BOOKS
an imprint of
Greystone Publishing Inc.
Vancouver/Toronto/Delhi

ADVISORY PANEL

RICHARD CANNINGS

Consulting Biologist

Penticton, British Columbia

SYDNEY CANNINGS

Coordinator

NatureServe Yukon

Yukon Territorial Government

Whitehorse, Yukon

DR. KENNETH F. HIGGINS

Professor emeritus

Department of Wildlife and Fisheries Sciences

South Dakota State University

Brookings, South Dakota

DR. JOHN JANOVY

Varner Professor of Biological Sciences

University of Nebraska

Lincoln, Nebraska

DR. DAN JOHNSON

Professor of Environmental Science Department of Geography

University of Lethbridge

Lethbridge, Alberta

DR. DOUGLAS H. JOHNSON

Research Statistician and Senior Scientist

Grasslands Ecosystem Initiative

Northern Prairie Wildlife

Research Center

United States Geological Survey

Jamestown, North Dakota

DR. HENRY MURKIN

National Director Conservation

Ducks Unlimited Canada

Oak Hammock Marsh

Conservation Centre

Stonewall, Manitoba

DR. PAUL G. RISSER

Chair

University of Oklahoma

Research Cabinet

Oklahoma City, Oklahoma

JOAN A. WILLIAMS

Consulting Biologist

Calgary, Alberta



All rights reserved. No part of this book may be reproduced, stored in a retrieval system or transmitted, in any form or by any means, without the prior written consent of the publisher or a license from The Canadian Copyright Licensing Agency (Access Copyright).

For a copyright licence, visit www.accesscopyright.ca or call toll free to 1-800-893-5777.

Greystone Books

An imprint of D&M Publishers Inc.

2323 Quebec Street, Suite 200

Vancouver BC Canada V5T 4R6

www.greystonebooks.com

David Suzuki Foundation

2211 West 4th Avenue, Suite 200

Vancouver BC Canada V6K 4M5

Cataloguing data available from Library and Archives Canada

ISBN 978-1-55365-588-6 (pb)

ISBN 978-1-55365-899-3 (ebook)

Editing by Nancy Fligg

Copy editing by Barbara Tomlin and Lara Kord

Cover design by Naomi MacDougall

Front cover photograph by Joel Sartore/National Geographic/Getty Images

Cartography by the Canadian Plains Research Centre

Distributed in the U.S. by Publishers Group West

We gratefully acknowledge the financial support of the Canada Council for the Arts, the British Columbia Arts Council, the Province of British Columbia through the Book Publishing Tax Credit, and the Government of Canada through the Canada Book Fund for our publishing activities.



CONTENTS

[PREFACE TO THE SECOND EDITION](#)

[ACKNOWLEDGMENTS](#)

[ONE: *Where Is Here?*](#)

[TWO: *Digging into the Past*](#)

[THREE: *The Geography of Grass*](#)

[FOUR: *Secrets of the Soil*](#)

[FIVE: *Home on the Range*](#)

[SIX: *Water of Life*](#)

[SEVEN: *Prairie Woodlands*](#)

[EIGHT: *The Nature of Farming*](#)

[NINE: *Long-Range Forecast*](#)

[FOR MORE INFORMATION](#)

[APPENDICES](#)

[MAP CREDITS](#)



There is no way to hold back the future. But we can shape the course of events by engaging—fully, deeply, and passionately—with the present. . . This approach is sometimes referred to as a strategy of “no regrets,” because the work is worth doing now, no matter what happens next.

EVEN NOW, SEVEN years after the fact, I can vividly recall the moment when I wrote those words, read them back to myself, and realized that I was done. My book on grassland ecology and conservation, the impossible project that had occupied me night and day for so many years, was finally finished. At the time, my main emotion was not so much elation—the satisfaction of a job well done—as giddy relief that I had managed to get the thing completed, somehow. It hadn’t been easy. Just as I sat down to write the concluding chapter, my partner, Keith, was diagnosed with advanced prostate cancer. (Don’t worry: he’s alive and well.) A couple of weeks later, my father suffered a stroke and died in hospital.

No matter what happens next. Being alive is a risky business, and the inevitable conclusion of our life stories is not what, given our druthers, most of us would choose. We’re born; we die. And between the time when the lights switch on and the lights switch off, what are we to do? Let’s assume that you and I number among the fortunate minority of humanity who enjoy reasonable access to the basic necessities: food, clothing, shelter, and community. With our survival needs met, how do we “improve each shining hour” so that our brief lives are not a flash in the pan but a flash of brilliance? How do we craft lives of purpose and significance?

. . . *because the work is worth doing* . . . These questions lurk, like ephemeral companions, at the edge of our field of vision. For me, the answers have often turned out to be comically understated: growing carrots in my garden, playing fiddle tunes on my accordion, or stringing words one after another to form sentences. But none of these activities can compare with the simple, animal pleasure of scuffing across a dusty stretch of half-wild prairie somewhere in the back of beyond, with hot licks of meadowlark song filling the air. Enveloped in the sounds and scents of the grasslands, I am a child again, holding my mother’s hand, as memories of her own sage-scented prairie childhood rise up to meet her. The Great Plains grasslands are old, older than memory. For visitants like us, this ancient land offers a grounding in continuance.

Something kindles inside me when I sit on a lichen-covered boulder and realize that it has sat there for ten thousand years, ever since the retreat of the glaciers. Or when I lie on my back in the grass, soaking up the sun, and feel the Earth pressing against me as if it were holding me up. Whatever it was that lit the spark of life in the beginning of time is still present here, in the grass, wind, sunshine, and rain, in the birds and animals. Working to preserve and restore grassland ecosystems is an act of reverence for the crazy caper of life, which gave birth to us and all our flying, walking, swimming, and slithering relations. It is an expression of gratitude for the mundane gift of being here.

There is no point in pretending that everything is hunky-dory for the wildlife and wild places of the Great Plains. In my home region of the Canadian prairies alone, more than two dozen species have been added to the at-risk list since this book was first released seven years ago, and another dozen have been “uplisted” to a more critical status. Only two listed species appear to have made significant gains during the same span of years: a tiny fish called the bigmouth shiner, which has been found in new locations and is no longer thought to be at risk, and the swift fox, a cat-sized canid that went from Extirpated to merely Endangered, thanks to a long-term reintroduction effort. Meanwhile, the status of

prairie birds as a group continues to worsen year by year, as formerly abundant species, like the Common (now uncommon) Nighthawk, become the focus of concern.

The fundamental problem for most prairie species is loss of habitat. To this day, we continue to lose wetlands to drainage, river-flow to dams, and both native and tame grasslands to cultivation. In the Great Plains states, for example, millions of acres of marginal cropland that were seeded to hay in the 1980s and 1990s under the Conservation Reserve Program—and that have provided living space for wildlife ever since—are currently being ploughed up for the production of biofuels. As for the surviving wild prairie, it is in declining health due to the incursions of invasive plants and the relentless, dendritic expansion of oil-and-gas exploration and other human demands. If you are looking for a place where the conservation needs are urgent and your help is required now, look no further.

. . . *a strategy of “no regrets,”* . . . I can’t promise you that a united force of grass-huggers will succeed in striking a happy balance between prairie people and the more-than-human world. It’s pretty clear, however, what will happen if we do not make the attempt. From my own small experience of engagement (as board member for the Nature Conservancy of Canada and a partner in a restoration project, among other things), I can tell you that, even though the context is often disheartening, the work of conservation can be exciting, inspiring, and fun. The prairie ecosystem is battered, but it is also adaptable and tough. Repeat after me: Things can change for the better.

There is no way to hold back the future. But we can shape the course of events by engaging—fully, deeply, and passionately—with the present. And so we begin again.

Eastend, Saskatchewan
April 2010

THE AUTHOR IS deeply indebted to the dedicated and creative people who contributed their talents to this project, in particular photographer James R. Page, artist Joan A. Williams, editor Nancy Flight, designers George Vaitkunas and Naomi MacDougall, and cartographers Lorena Patino and Diane Perrick. This book owes much of its beauty and merit to their efforts.

The information presented here is based on scientific research conducted by biologists at universities, research institutes, and other publicly supported agencies in every province and state across the Great Plains. Although there are too many of them to mention individually, they have each earned a vote of thanks from everyone who loves the grasslands. The experts who served on the advisory panel for this project deserve special acknowledgment, since they found time in their busy schedules not only to read all or part of the manuscript but also to offer many invaluable corrections and clarifications. Many others generously shared their time and knowledge, notably: Steve Adair, Ducks Unlimited; M.G. Anderson, Brian Gray, and Rhonda McDougall, Ducks Unlimited Canada; James Bassinger and Brian Pratt, Geology Department, University of Saskatchewan; Barrie Bonsal, National Hydrology Research Centre; Jan Bednarski, Benoit Beauchamp, and Arthur Sweet, Geological Survey of Canada; Louis B. Best, Department of Natural Resource Ecology and Management, Iowa State University; Dean Biggins and Mike Lockhart, U.S. Fish and Wildlife Service; Peter Blancher, Bird Studies Canada; Don Buckle, arachnologist, Saskatoon; Bonnie Chasteen, Missouri Department of Conservation Grow Native! Program; Bob Clark and Dean Nurnberg, Canadian Wildlife Service; Meredith Cornett, Minnesota Chapter of the Nature Conservancy; Robert R. Cox, Jr., and Gary L. Krapu, U.S. Geological Survey; Sarah Davies, American Prairie Foundation; Art Davis, Cedric Gillott and Robert Randell, Department of Biology, University of Saskatchewan; Cyndi Evans and colleagues, Prairie State Park, Missouri; Gene Fortney, Nature Conservancy of Canada; Curtis Freese, World Wildlife Fund U.S.; David A. Gauthier, Canadian Plain Research Center; Rob Gardner, Society of Grassland Naturalists; Robert Gordon, Northern Plains Entomology; Robert Graf and Owen Olfert, Agriculture and Agri-Foods Canada; Grant Harper, geologist, Thornhill; John A. Harrington, Department of Geography, Kansas State University; Kirk Henderson, Iowa Native Roadside Vegetation Center; E.H. Hogg, Canadian Forest Service, Natural Resources Canada; Sam James, Department of Biology, Maharishi University of Management; Kris Kendell, Alberta Environment; Anna Leighton, Saskatchewan Native Plant Society; Steve Malins, Banff National Park; Richard Manning, author and board member of the American Prairie Foundation; Mary Ann McLean, Department of Life Sciences, Indiana State University; Sue Michalsky, range ecologist, Eastend, Saskatchewan; Russ Miller, general manager of the Turner ranches; Wendell Morrill, Department of Entomology, Montana State University; Heather Musgrove, Saskatoon; Dave Naugle and Thomas M. Power, University of Montana; Kevin Murphy, Saskatchewan Environment; Mike Phillips, Turner Endangered Species Fund; Keith Roney and Ron Tillie, Royal Saskatchewan Museum; John Sidle, U.S. National Grasslands; James C. Trager, Shaw Nature Reserve, Missouri; Elaine Wheaton, Saskatchewan Research Council; and David and Lynn Zahrt of the Country Homestead Bed and Breakfast in the Loess Hills of Iowa. I am grateful to you all.

Finally, it is a particular pleasure to acknowledge the day-in-and-day-out contribution of Keith Be... whose generosity and love of life have sustained this endeavor at every step.



WHERE IS HERE?

“You cannot take care of what you cannot see”.

DR. GEROULD WILHELM, SPEAKING AT THE NORTH AMERICAN PRAIRIE CONFERENCE, KIRKSVILLE, MISSOURI, 2002

THERE ARE PEOPLE who think of the prairie as boring, and it is hard not to pity them. We see them on the highways, trapped inside their cars, propelled by a burning desire to be somewhere else. But even as we wonder at their hurry, we have to admit that these disgruntled travelers are following in a grand old North American tradition. On both sides of the Canada–U.S. border, prairie bashing is as old as the written record. In 1803, for example, when the United States was contemplating the acquisition of the lands west of the Mississippi River from the French, through the Louisiana Purchase, the great orator Daniel Webster was moved to object. “What do we want with this vast, worthless area,” he thundered “this region of savages and wild beasts, of deserts of shifting sands and whirlwinds of dust, of cactus and prairie dogs?” And even after this supposedly howling wilderness had been annexed to the U.S., many observers remained unimpressed. The painter and naturalist John James Audubon was among them. In 1843, we find him traveling up the Missouri River on his first visit to the Great Plains. Forced onto the shore when his steamboat became grounded on a sandbar, he turned a disparaging eye toward the Dakota countryside. “The prairies around us are the most arid and dismal you can conceive of,” he wrote. “In fact these prairies (so called) look more like great deserts.”



One of the special beauties of the prairie is the cycle of four distinct seasons, each of which remakes the landscape in its own image.

Another traveler of the same era, a trader named Rufus Sage, was even more direct: “That this section of the country should ever become inhabited by civilized man except in the vicinity of large water courses, is an idea too preposterous to be entertained for a single moment.” North of the border Captain John Palliser, who crossed the Saskatchewan prairies in the late 1850s, was of much the same mind. Forget farming, he recommended. This country is just too dry.

It wasn’t until near the end of the nineteenth century that the tide of expert opinion turned and the Great Plains were opened to agricultural settlement, now touted far and wide as the new Garden of

Eden. The fact was, however, that these magnificent grasslands were neither desert nor garden but something completely new to European and Euro-American experience. So new that at first there wasn't even a name for them in either French or English. Pressed to come up with something, the early French fur traders had extended their term for a woodland meadow—*une prairie*—as a kind of metaphor for this big, wide, sparsely wooded, windswept world. But the Great Plains were far more than a meadow. What the travelers had encountered was a vast, dynamic ecosystem, a kind of tawny, slowly evolving organism that, in a climate of constant change, had sustained itself ever since the retreat of the glaciers thousands of years before. In the presence of this strangeness and grandeur, words and vision failed.

When the newcomers looked around them, all they could see was where they weren't. This was no forest or sea coast or mountains; it was nothing but light and grass, the Big Empty in the middle of the continent. A vacant space, as they saw it, in desperate need of improvement. And this failure of vision—this inability to see and appreciate the Great Plains grasslands for what they truly are—has continued to plague our perceptions right down to the present. Flat? Boring? Lifeless? Nothing could be further from the truth. It's time to drop out of the fast lane and give the prairies, our prairies, a second, loving look.

> NOTES FROM THE FIELD

The prairies have often been described as a landscape reduced to the barest essentials of land and sky—a place where the eye is lost to distant horizons and nothing much happens. But what this depiction misses is the color and excitement of the prairies seen close-up and the rewards that come with a little knowledge and observation. As evidence, here are a few brief excerpts from my notes:

Aspen Cut, November 11: “A bright blue sky, fresh snow, sparkling and mild. We are standing at the edge of a wooded draw, looking across it to choose our route down. My companion says, ‘A coyote!’ and points to the opposite slope. But it's not a coyote. It's a cougar: reddish-brown, stocky, rounded head, long heavy tail, smooth, smooth movements. It flows up the slope—pauses to look back several times—then over the ridge and out of sight. On a snow-covered log at the bottom of the draw, we find large round tracks with pin-prick claw marks above the central toes.”

Chimney Coulee, June 29: “Last night, we stood on a hillside, ankle deep in prairie wool, and heard a whispered quivering sound that seemed to come out of nowhere. And again, like a sudden sigh. Finally we saw them, high up over our heads, a pair of nighthawks that sometimes interrupted their insect-hunting maneuvers to plunge head-long down the sky and rasp the air with their wing feathers. In that moment, the whole place was shot with silver.”

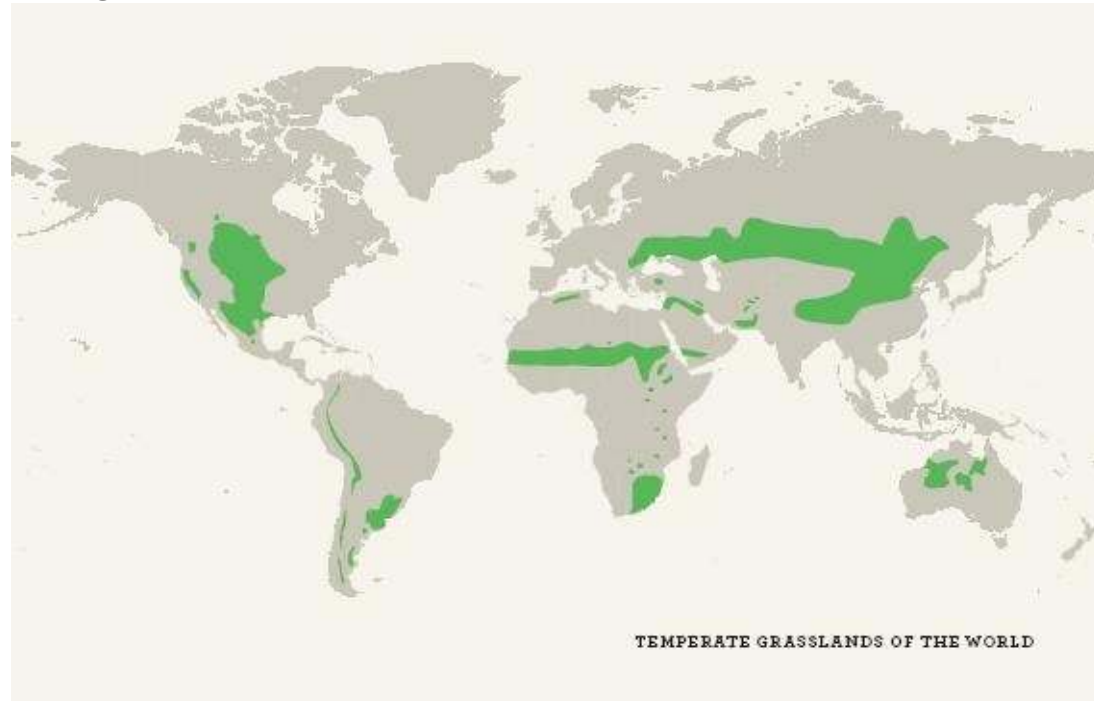
Grasslands National Park, July 9: “In just two days we have seen meadowlarks, horned larks, Sprague's pipits with their surprising pink feet, phalaropes spinning and dipping like wind-up birds in a dugout, sharp-tailed grouse, nighthawks, western and eastern kingbirds, golden eagles (nestlings and mature), jackrabbits—huge, hallucinatory—cottontails crouching in the shade of large rocks in a prairie dog colony, mule deer, white-tails, pronghorns (bucks, cows with calves), painted lady butterflies, monarchs, showy milkweed in full bloom, prickly pear cactus with waxy yellow flowers, jumping cactus stuck to our dogs, pincushions topped with electric pink blossoms, purple prairie clover, silverleaf psoralea, brown-eyed susans,

skeleton weed, blue Missouri milkvetch against bone-white clay, needle-and-thread grass, awned wheatgrass shining in the wind. The cold white glare of a full moon.”

An Empire of Grass

The key to everything that happens on the prairies lies trampled under our feet. Although grasses may look humble, they are actually versatile and tough, capable of growing under the widest possible range of conditions. Anywhere plants can grow, grasses are likely to be on the scene, whether coexisting with cactuses in a desert, poking up among lichens on the Arctic tundra, or hiding in the leafy understory of a forest. And when circumstances are especially favorable for them—for example, when the climate strikes just the right balance between precipitation and drought—grasses can assert themselves to become the dominant vegetation. (“Dominance,” in this case, refers to the plants that contribute the most living tissue, or biomass, to the ecosystem. As trees to forest, so grasses to grasslands.)

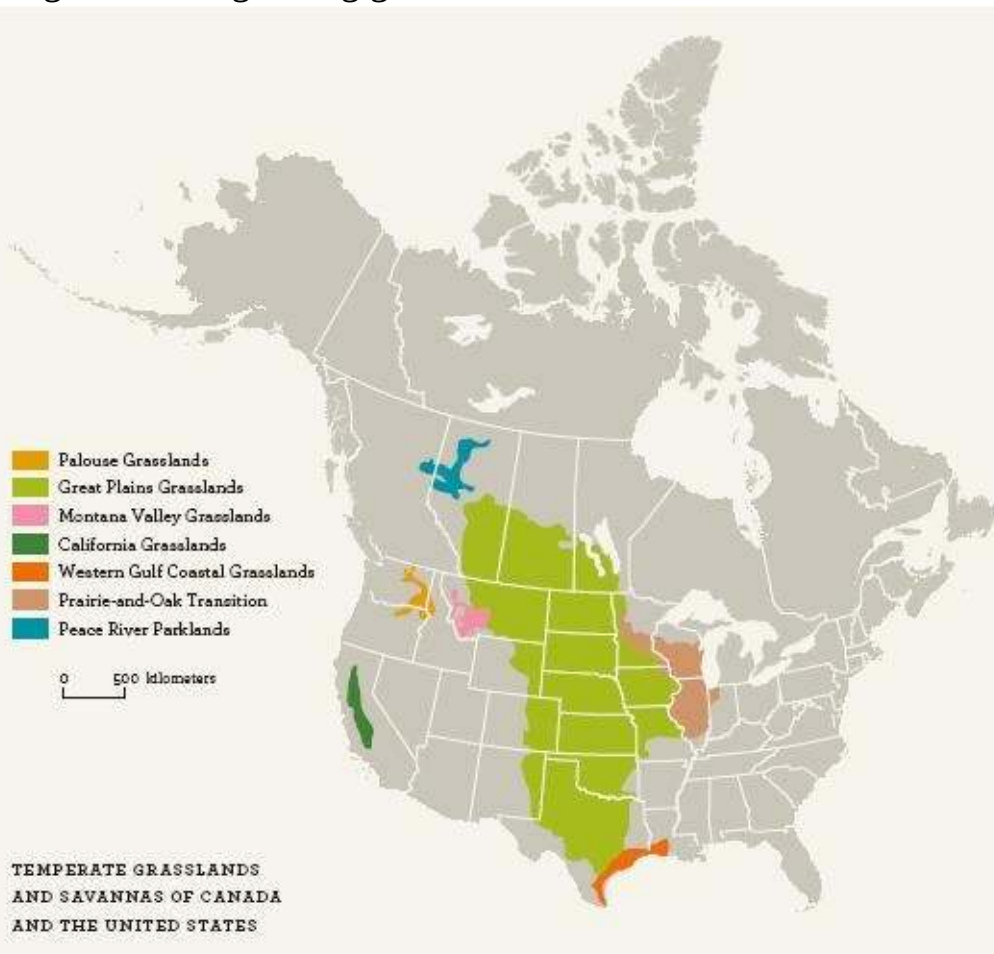
A glance at a map of the world’s major grasslands suggests that these conditions are most likely to occur on a broad, landlocked plain, far from any significant body of water, somewhere near the center of a continental land mass. It is in this semiarid environment—too wet to be a desert and too dry for forest—that grasses gain the upper hand, whether it be on the steppes of central Asia, on the pampas of Argentina, on the savannas of East Africa, or in the broad heartland of North America.



Globally, grasslands are among the largest of the Earth’s terrestrial biomes, or life zones, with a sweep that covers more than a third of the land area of the planet. (At least, that’s the area over which grasses would potentially hold sway if natural conditions were allowed to prevail.) We’re talking some 17.8 million square miles (46 million square kilometers)—almost three times the area of Russia. In North America alone, grasslands naturally extend over about 1.4 million square miles (3.5 million square kilometers), an area larger than many of the world’s major nations.

The first European known to have set foot on this great empire of grass was a soldier and sometime explorer named Francisco Vásquez de Coronado. Dispatched from Mexico City in 1540, he was supposed to investigate rumors about a kingdom called Cibola, somewhere to the north, and to plunder

its Seven Cities of Gold. When these glittering mirages turned out to be sun-baked Zuni pueblos in what is now New Mexico, he turned his attention to the uncharted Great Plains, where the fish were as big as horses, the people ate off golden plates, and the king was lulled to sleep at night by a tree full of golden bells. At least that's what people told him and what he chose to believe. And so off set Coronado, with a party of armed men, in the vague direction of present-day Kansas. In the end, the promised golden city turned out to be a village of grass-thatched huts, where the people lived by hunting bison and growing gardens, each in their season.



Yet despite this disillusionment, Coronado and his party were astonished by what they found along their route. Here lay “a wilderness in which nothing grew, except for very small plants,” but which nonetheless was teeming with million upon million of strange humpbacked cattle. “I found such a quantity of cows [bison],” Coronado reported, “that it is impossible to number them, for while I was journeying through these plains, until I returned to where I first found them, there was not a day that I lost sight of them.” Following along after these apparently endless herds were parties of nomadic hunters—ancestral Lipan Apaches, or Quechero Indians—who dressed in bison-skin clothing (sewn with bison sinew, drawn through a bison-bone awl), slept in bison-hide tipis, and subsisted on a diet of bison blood and bison muscle. Even the grass in this new world was cause for amazement, as it rebounded from the conquistadors’ steps and erased the trace of their presence. In this great round world, all that glittered was grass and an ecosystem of such richness and diversity that it could scarcely be credited.



Overlooked here by the Sweet Grass Hills of northern Montana, the sleek little Milk River takes the measure of the Great Plains, as it flows from southern Alberta into the Missouri River and onward to the Gulf of Mexico.

But think how amazed Coronado would have been if he had somehow been able to sense the true extent and variety of North America's grasslands. Little did he know that he had set foot on a vast prairie heartland—a continent of grass—that was flanked on every side by smaller islands of grasslands and prairie-to-forest transitions, or savannas. To the north, for instance, beyond his farthest imaginings, lay the Peace River Parklands, a region of rolling grass and poplars that marked the frontier between the Great Plains grasslands and the boreal forest. To the east, the Prairie-and-Oak Transition Zone—a tongue of prairie interspersed with groves of hardwoods—extended to the Great Lakes and beyond, marking the interface between the grasslands and the eastern deciduous forest. To the south, the prairies merged and melted into sultry, soupy marshlands to produce the semitropical vistas of the Western Gulf Coastal Grasslands. And to the west, in the broad valleys of the western Cordillera, lay the California Grasslands—spangled in spring by lupines and yellow-orange poppies—and the arid Palouse Grasslands of the Great Basin. Dominated by scraggly stands of sagebrush and spiky, sparse grasses, the Palouse, or bunchgrass, prairie stretched along the drainage of the Columbia and Snake rivers to intergrade with the shrubby growth of the Montana Valley Grasslands.

And in the center of everything there was the main attraction, the Great Plains Grasslands themselves, a landscape that even today invites wonderment. This truly is big sky country, with horizons that extend from the boreal forests of Alberta, Saskatchewan, and Manitoba to the deserts of the American Southwest and from the foothills of the Rockies to the Mississippi drainage. The numbers speak for themselves. Length: 1,500 miles (2,400 kilometers). Width: between 400 and 700 miles (between 600 and 1,100 kilometers). Vaguely triangular in outline, the region is broadest toward the north and narrows to its apex in the Hill Country of central Texas. Total area: 1 million square miles (2.6 million square kilometers), or roughly 14 percent of the entire land mass of Canada, Alaska, and the Lower Forty-Eight States.

> DEFINING TERMS

The word “prairie” entered the English language in the 1680s, when fur traders first began edging across the North American continent. Initially, the term was applied to the area just west of the Mississippi River, where the grasses often grew so tall that a man mounted on horseback could not see over them. Later, as the Europeans pushed farther westward, they found themselves in a country of short, spiky plants, quite different in appearance from the Mississippi grasslands. To mark this distinction, the arid grasslands of the western plains were

often referred to as “steppe,” a word the explorers borrowed from Russian. The term “prairie,” or “true prairie,” was reserved for the grasslands that the traders knew best, the tall, waving grasses of the eastern plains.

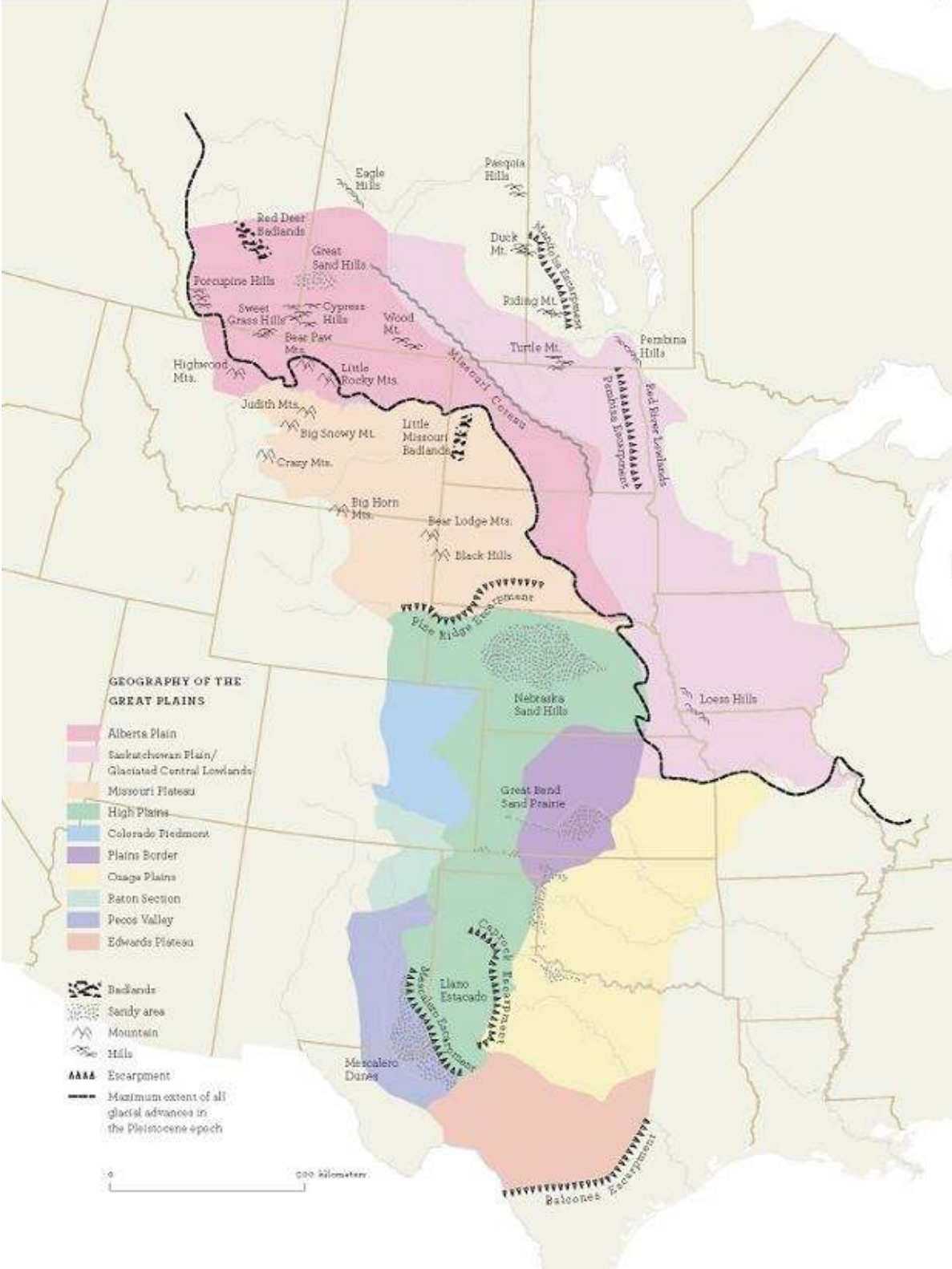
Although biologists continue to find it useful to classify grasslands by height—as short, tall, or mixed—they have dropped the old idea of true prairie. In contemporary usage, the terms “prairie” and “prairies” refer to any expanse of land that is dominated by grass and other nonwoody plants. Prairies, simply put, are grasslands. With the addition of the definite article, “the prairies” also serves as a regional designation for the great grasslands that sprawl across the interior plains of North America.

The geographical terms that are used to define the plains also require clarification. Traditionally, geographers have divided the prairie region into two components: to the west, the Great Plains and to the east, the Central Lowlands. But because there is no clear geographical feature to separate these zones, the boundary between them has never been fixed with precision. On some maps, the dividing line cuts along the 100th meridian; on others, it shifts east to follow the curves of the Missouri River. In either case, the line divides the west from the east, separating prairie from prairie. Several recent sources, however—including the online *Atlas of the Great Plains*—have erased this artificial division and redrawn the map to show the grasslands of the interior plains as a coherent unit. In this book, the term “Great Plains” refers to the grasslands at the heart of the continent, as shown by the maps.

The Grand Geographical Tour

But length and breadth are not the only descriptors of the Great Plains. The prairies also have a vertical rise and run that add a whole other dimension of interest. Formed primarily by sediments that were washed out of the Rocky Mountains millions of years ago, the landscape slopes away from west to east, stepping down from an elevation of roughly 1 mile (about 1,700 meters) above sea level at the base of the foothills to a few hundred yards (or meters) on the banks of the lower Missouri River. Often, the change happens so gently that you hardly notice it. Who would have imagined, for example, that the drive across Kansas, from west to east, following in Coronado’s path, would be downhill all the way and that you’d lose more than half a mile (one kilometer) in elevation while traversing that seemingly level state?

Overlain on this gently sloping plain are a surprising diversity of landforms. The geography of the Great Plains offers something for every taste, from fantastically sculpted badlands to craggy mountains to some of the flattest expanses of country anywhere on the planet. “I reached some plains so vast, that I did not find their limit anywhere I went,” our old friend Coronado exclaimed in a letter to the king of Spain in 1541, “with no more land marks than if we had been swallowed up by the sea. . . not a stone, nor bit of rising ground, nor a tree, nor a shrub, nor anything to go by.” The landscape which he was referring is now known to geographers as the High Plains, an elevated and sometimes spectacularly featureless tableland that extends from Nebraska and Colorado into northern Oklahoma and Texas. An erosional remnant of a high-and-wide landscape that once extended over much of the Great Plains, the region is bounded on three sides by dramatic cliffs, including the upthrusting wall of the Mescalero Escarpment in the west, the tree-clad Pine Ridge Escarpment to the north, and the amazingly convoluted and striated Caprock Escarpment in the east.





Formed by erosion sometime in the last 1 million to 2 million years, the spectacular red sandstone wall of the Caprock Escarpment forms a natural boundary between the High Plains of Texas and the rolling terrain of the Osage Plains to the east. In places, the escarpment towers as much as 1,000 feet (300 meters) above the surrounding country.

To the south of the High Plains lie the limestone hills of the Edwards Plateau, or Texas Hill Country—a world in itself—where the rolling countryside is broken by domed upwellings of rock, deeply cut by streams, and eaten away underground to form a honeycomb of sinkholes and caves. The Edwards Plateau, in turn, is bounded in the south by the terraced ridges and eroded canyons of the Balcones Escarpment, which slashes across Texas at the southern limits of the Great Plains grasslands.

To the northwest of the Edwards Plateau lies the broad Pecos Valley and a landscape of spectacularly eroded caverns, sinkholes, and steep-walled limestone cuts. And north of the Pecos are the shadowed moonscapes of the Raton Section, where mesas capped with lava compete for attention with contorted badlands and the burned-out cones of Capulin Mountain and other long-extinguished volcanoes. From there, it is on to the broad, terraced valleys of the Colorado Piedmont, literally “foothills of the mountains,” where the waters of the Arkansas and South Platte rivers have, over millions of years, stripped away layer after layer from the original High Plains surface. (This dramatic, if localized, lowering of the surface explains, for example, why the road heading east out of Denver tracks steadily upward for the first half hour or so, as it climbs out of the South Platte floodplain and onto the surrounding High Plains benches.) The effects of water erosion can also be seen on the rugged Missouri Plateau and the deeply dissected valleys of the Plains Border region.

If water has cut into these landscapes, wind has smoothed them out. For example, the southeastern edge of the Platte River valley is softened by a broad belt of curving, undulating sand dunes that were deposited by dust storms sometime during the Ice Age. Similar formations, shaped by similar forces, are also to be found strewn up and down the drier, western side of the Great Plains, from the Great Sand Hills of southwestern Saskatchewan in the north to the Mescalero Dunes of the Pecos Valley. And right in the middle of the map lies one of the prairies’ little-known natural wonders—the Nebraska Sand Hills, a region of whale-backed, grassy rises and prairie wetlands that, at an area of 24,000 square miles (62,000 square kilometers), ranks as the largest field of sand dunes in the Western Hemisphere. These sandscapes were put in place by the relentless northwest winds that have been coursing across the landscape for millions of years.

With so few barriers to stand in their way, these same winds have had the run of the entire Great Plains region. Although their influence can be seen in many parts of the country—for example, as ridges of windblown silt along both the South Saskatchewan and upper Missouri rivers—their touch is most obvious in the eastern and southern regions of the Great Plains. These include not only areas of the Colorado Piedmont and the High Plains but also the “low plains” to the east, notably the rolling hills of the Plains Border country, the Osage Plains, and the Glaciated Central Lowlands. Much of this sweep of country is blanketed in deep, contoured drifts of fine silt, or loess—pronounced “luss”—another gritty, wind-borne by-product of glaciation. The result is a gently undulating landscape of soft, rolling hills and, in places, extraordinary bluffs, like the delightfully eroded and unexpected Loess Hills of western Iowa.

The northern plains region, by contrast—north and east of the Missouri River, from Alberta to Manitoba and south through the Dakotas—is less apt to be buried in loess, but it nonetheless bears the imprint of the Ice Age. Here the terrain is an unmade bed of glacial rubble, or till, lying exactly where it dropped when the ice sheets retreated from the landscape ten thousand years ago. And protruding above this jumble of knobs and kettles is an assortment of sprawling, flat-topped uplands, including Turtle Mountain, Wood Mountain, and the Cypress Hills, which straddle the boundary between past and present. Like miniature versions of the High Plains, they are the last surviving remnants of an ancient, preglacial landscape that has otherwise been lost to erosion.

Finally, and most surprising of all, are the honest-to-goodness mountains that jut up out of the

- [download Being Cool: The Work of Elmore Leonard here](#)
- [click Girl Walks into a Bar . . . : Comedy Calamities, Dating Disasters, and a Midlife Miracle pdf, azw \(kindle\), epub](#)
- [click **Biostatistics: A Foundation for Analysis in the Health Sciences \(10th Edition\) book**](#)
- [Tribal Ways \(Rogue Angel, Book 25\) pdf](#)
- [read online Blueprint for Screenwriting: A Complete Writer's Guide to Story Structure and Character Development for free](#)
- [read The Complete Verse of NoëI Coward \(Diaries, Letters and Essays\)](#)

- <http://conexdx.com/library/On-Call-In-Hell--A-Doctor-s-Iraq-War-Story.pdf>
- <http://xn--d1aboelcb1f.xn--p1ai/lib/Julius-Winsome.pdf>
- <http://chelseaprintandpublishing.com/?freebooks/Anatomy---Physiology-for-Speech--Language--and-Hearing--4th-Edition-.pdf>
- <http://conexdx.com/library/Tribal-Ways--Rogue-Angel--Book-25-.pdf>
- <http://flog.co.id/library/Tirana-memoria.pdf>
- <http://aseasonedman.com/ebooks/Animal-Farm--A-Fairy-Story.pdf>