1 Montana: Where the Land Writes History

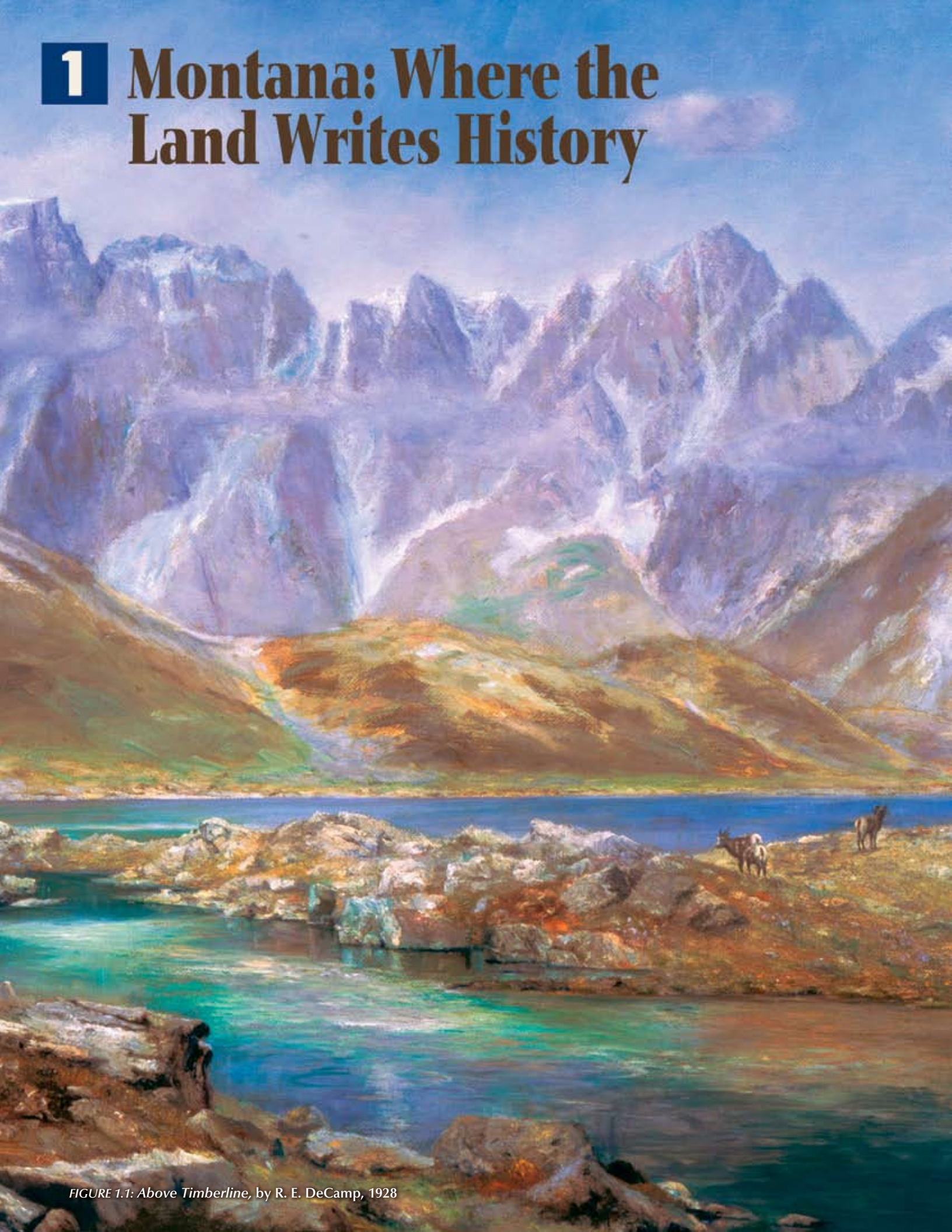


FIGURE 1.1: Above Timberline, by R. E. DeCamp, 1928

READ TO FIND OUT:

- Why all of Montana history starts with the land
- How geologic forces shaped Montana
- Ways the land is still alive and changing
- Why Montana is really three different lands

The Big Picture

The forces that created Montana—and are still changing its land—also shape the lives of Montana's people. Our story begins with the land.

If the land now called Montana could tell you the story of how it came to be, it would be a very dramatic tale. Continents collided and volcanoes erupted. Glaciers marched across the land and retreated. Seas filled and burst their banks and filled again. Winds blew dirt around, water carried dirt away, and earthquakes rearranged where the dirt was.

Some of these things happened very slowly—over millions of years. Some happened suddenly. If you could watch it, like film on fast-forward, it would be the most thrilling movie in the world.

In fact, the land does tell its story. Some of it is told through the science of **geology** (*geo* = earth; *logy* = study). Geology is the study of the earth's physical structures and the processes that change those structures. Geologists can look at a landscape of rocks and dirt and see what formed that landscape: earthquake, glacial action, volcano, or other forces. A good geologist could take you on a walk near where you live and tell you the history of the land you call home.

Montana's Deepest History

Have you ever seen a mountain that looks like a shipwreck with its bow pointing up toward the sky? Have you ever found fossils of sea creatures on the top of a mountain? Did you know that camels lived here 65 million years ago? Why are they not here now? To solve these puzzles, we must look far back in time.

Has your body always looked the way it does today? Many things have changed and shaped your body since you were born. Some of them happened very slowly. Some happened suddenly. Most geologic changes happened very slowly, too—over millions of years. Some happened in sudden, catastrophic events, such as a flood, an earthquake, or a volcano.

To really see how much you have changed, you would want to look at a picture taken on the day you were born. Scientists estimate that the earth is about 4.6 billion years old. How long is 4.6 billion years? If you stacked 1 billion pennies, they would make a tower 987 miles high. A stack of 4.6 billion pennies—one for every year of the earth's age—would stand about 3,948 miles high. If you laid that stack down on its side, it would stretch from Billings almost to Lima, Peru.

Geologic Time Intervals

To study the history of the earth, scientists have divided its age into periods called geologic time intervals. Just as your life can be divided into infancy, childhood, adolescence, and adulthood, scientists divide the earth's life into four eras: the **Precambrian** (when the oldest rocks on earth were formed), **Paleozoic** ("ancient life"), **Mesozoic** ("middle life"), and **Cenozoic** ("recent life").

FIGURE 1.2: Why do some mountains angle up toward the sky? Because crustal plates bumped into each other, pushing one layer up over the top of the other. Sights like this view of the Rocky Mountain Front near Augusta are like postcards from early days on earth.

Table: The Geologic Eras

ERA	PERIOD	EPOCH	YEARS AGO	CHARACTERISTICS
Cenozoic "Recent life"	Quaternary	Holocene	10,000 years to present	Recent
		Pleistocene	2 million	The Ice Age
	Tertiary	Pliocene	3 million	
		Miocene	24 million	
		Oligocene	37 million	Prehistoric camels, elephants, horses
		Eocene	58 million	
		Paleocene	65 million	
Mesozoic "Middle life"	Cretaceous		144 million	Continental plates move
	Jurassic		208 million	Dinosaurs
	Triassic		245 million	Seas and swamps cover Montana
Paleozoic "Ancient life"	Permian		286 million	Fish
	Pennsylvanian		320 million	
	Mississippian		360 million	
	Devonian		408 million	Clams, snails, shellfish
	Silurian		438 million	
	Ordovician		505 million	
	Cambrian		544 million	
Precambrian	Protozoic Achaean		2,500 million 4,600 million	First one-celled creatures

The Precambrian Era: Awash in Seas

The first day on the earth's calendar—at least, the first that scientists know about now—happened about 4.6 billion years ago in a time called the Precambrian era (4.6 billion years ago to 544 million years ago).

Geologic evidence shows that a great sea covered all of present-day Montana and its surrounding region. This sea was dotted with islands, which were actually the tops of ancient mountain ranges. As these mountains wore away, mud and sand settled to the bottom of the sea and became **sediment** (solid matter that settles to the bottom of fluid). Over millions of years, this sediment was heated and compressed until it formed "basement rock"—the foundation of all the other layers of earth.

Montana's basement rock contains **fossils** (remains or impressions of ancient creatures) of some of the earliest forms of life—primitive, one-celled plants and **invertebrates** (animals without backbones). Three-billion-year-old algae fossils from the Precambrian era—some of the oldest known fossils of early life—have shown up in Glacier National Park.

FIGURE 1.3: See the clams outlined in the rock? You can find fossil beds showing sea creatures from the Paleozoic and Mesozoic eras in many places in Montana, including the Big Belt, Beartooth, Pryor, and Bighorn Mountains, and in Glacier National Park.

The Paleozoic Era: Life Begins

The next period, called the Paleozoic era (544 million to 245 million years ago), saw seas wash over the region and draw back again many times. These seas piled more sediment on top of the basement rocks. Primitive fishes and hard-shelled animals like clams, snails, and shellfish developed during this era. Early plants and forests grew. Today Montana's hillsides hold fossils of worm tubes 500 million years old and snails 400 million years old—signs of life from the early Paleozoic era.

The Mesozoic Era: Plate Collisions, Volcanoes, and Dinosaurs

Then came the Mesozoic era (245 million to 65 million years ago), the age of the dinosaurs. This was an exciting time in Montana's geology. Forces beneath the surface of the earth caused the land to rise and fall dramatically. Shallow seas and swamps formed. The climate warmed up, encouraging the growth of palm and banana trees.

Most impressive of all, dinosaurs tramped the lowlands. Scientists have found many dinosaur bones from the Mesozoic era in Montana, including whole skeletons of Tyrannosaurus and Triceratops dating back 155 million years.

One of Montana's most important dinosaurs remained a secret until 1978. That year **paleontologists** (scientists who study fossils) investigating near Choteau identified a family of duck-billed dinosaurs that cared for their young. They named the new species *Maiasaurus,* which means "good mother lizard."

FIGURE 1.4: Dinosaurs of many kinds once roamed the land we call Montana. Here paleontologist Jack Horner poses with a life-sized Torosaurus sculpture at the Museum of the Rockies.

As plants and animals of the Mesozoic era died, layers and layers of sediment piled on top of them. Over time the heat and pressure of the earth transformed some of these layers into **fossil fuels** (oil, coal, and natural gas) now found in many parts of Montana.

Another exciting thing happened near the middle of the Mesozoic era. Continental plates of the earth's crust began moving around and crashing into one another. They moved slowly—a few inches per year—but produced dramatic results.

As the continental plates collided, the earth's crust buckled and fractured, forming the Rocky Mountains all along the western spine of the North American

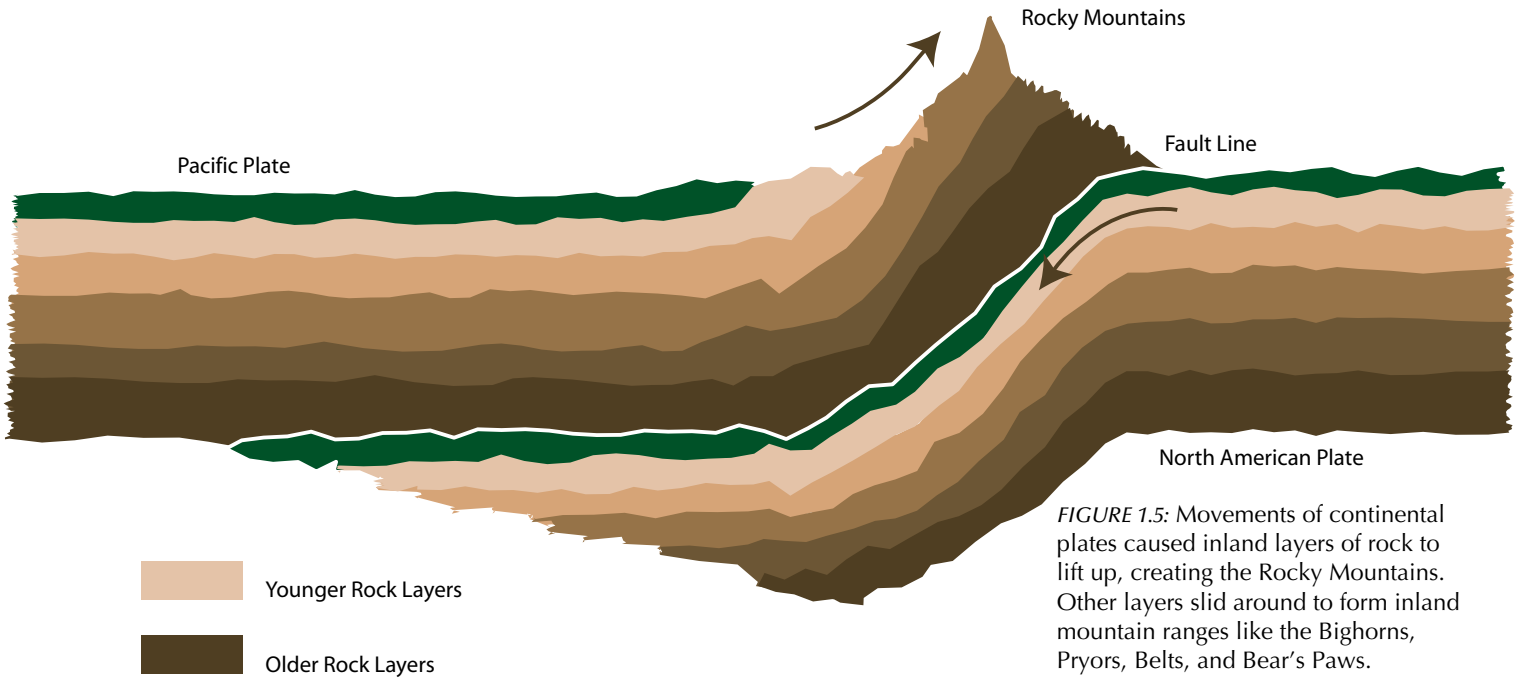


FIGURE 1.5: Movements of continental plates caused inland layers of rock to lift up, creating the Rocky Mountains. Other layers slid around to form inland mountain ranges like the Bighorns, Pryors, Belts, and Bear's Paws.

continent. In some places the sea floor thrust upward several miles into the air. This is how fossils of sea creatures got to the tops of mountains. Many of the jutting peaks of the Rockies are angled layers of sediment pointing upward toward the sky.

In some places **magma** (hot, molten material beneath the earth's crust that forms igneous rock) erupted through the surface as volcanoes. When magma reaches the surface of the earth, it becomes **lava** (molten rock). These volcanoes spewed cinder, ash, and lava out across the land, filling river valleys and changing the shape of the landscape. Many of the isolated mountain ranges of central Montana are pieces of old volcanoes.

All this geologic activity lifted whole regions—like eastern Montana—higher above sea level. It also carved new waterways across the western third of the North American continent. And it changed the makeup of the soil.

Then, toward the end of the Mesozoic era, the climate cooled. Evergreen forests sprouted up west of the Continental Divide. The lowlands east of the Rocky Mountains became high-elevation grasslands. Montana began to look a little more like it does today.

Montana's rambunctious past produced some of its greatest treasures. All this geologic activity created veins of gold, silver, copper, lead, zinc, molybdenum, platinum, and palladium. Montana's geologic processes also formed fossil fuels as well as gems like the famous Yogo sapphires. It is easy to see why Montana is nicknamed the "Treasure State" and why the state motto is *Oro y Plata:* Spanish for "gold and silver."

FIGURE 1.6: All the stones in this pin, designed by Paula Crevoshay, are sapphires, forged deep in the earth below Montana soil millions of years ago. Montana has the richest sapphire mines in North America.

The Cenozoic Era: Ice Ages

Montana's climate has always had a huge effect on life here. Never was this truer than in the Cenozoic era (65 million years ago to the present). The

Glacial Lake Missoula

Glacial Lake Missoula is probably the most dramatic example of how glaciers can change the landscape. Ice formed a dam across the Clark Fork of the Columbia River that backed up most of the streams and rivers of western Montana. These waters created a 1,000-foot-deep lake that covered 3,000 square miles. Its highest shoreline was just over 4,250 feet above sea level.

When the ice dam broke, it released a catastrophic flood. It shot 500 cubic miles of water down the Clark Fork and the Columbia River gorge, carving the scablands of eastern Washington and helping to create the scenic canyons of the Columbia Gorge. Geological evidence shows that Glacial Lake Missoula filled and emptied in such a catastrophic style at least 36 times over 1,000 years.

word "Cenozoic" means "recent life." This era introduced the first mammals and the first human beings. It was also the time of the Ice Ages.

When the Cenozoic era began, the land dried up and became more desert-like. Volcanoes still were quite active across the West.

Then, about 2 million years ago, the climate cooled and grew wetter, producing heavy rains and snowfall. Temperatures dropped by only a few degrees, but it was enough that the snow and ice accumulated faster than it melted, creating **glaciers** (masses or slow-moving rivers of ice) that advanced across the land.

Glaciers act like bulldozers. They force everything in front of them upward and out to the edges, pushing rock and earth into new shapes. In Montana, glaciers pushed around piles of rock and earth, large boulders, and even entire ridges. They formed ice dams that created huge lakes and forced rivers to find new outlets to the sea.

Imagine a wall of ice more than two miles deep, stretching along the current course of the Missouri River from the Rocky Mountains east toward North Dakota. This ice sheet weighed down the surface of the land itself.

At least four times, glaciers moved into northern Montana, pushing rocks and sediment to form U-shaped mountain valleys, and then leaving lakes and rivers behind when they receded during warmer periods. These glaciers formed much of Montana's valley geography.

FIGURE 1.7: Global warming has shrunk many of the world's glaciers. In 1850 Glacier National Park had about 150 glaciers; in 2007 there were only 37. This 1930s photo shows an ice cave in the Boulder Glacier in Glacier National Park. Today a person standing where these people stood would see only bare ground.

After the last Ice Age (which occurred between 10,000 and 13,000 years ago), the climate warmed again. The lush foliage that had supported the **megafauna** (large animals) dried up and became desert or grasslands. The world began to look more like it does today.

Most of the prehistoric mammals—including mastodons, wooly mammoths, saber-toothed tigers, and the giant beaver—either **adapted** (changed to meet the requirements of their new environment) or became extinct. The enormous wooly mammoths and mastodons became extinct. The large short-faced bear and dire wolf evolved into their smaller

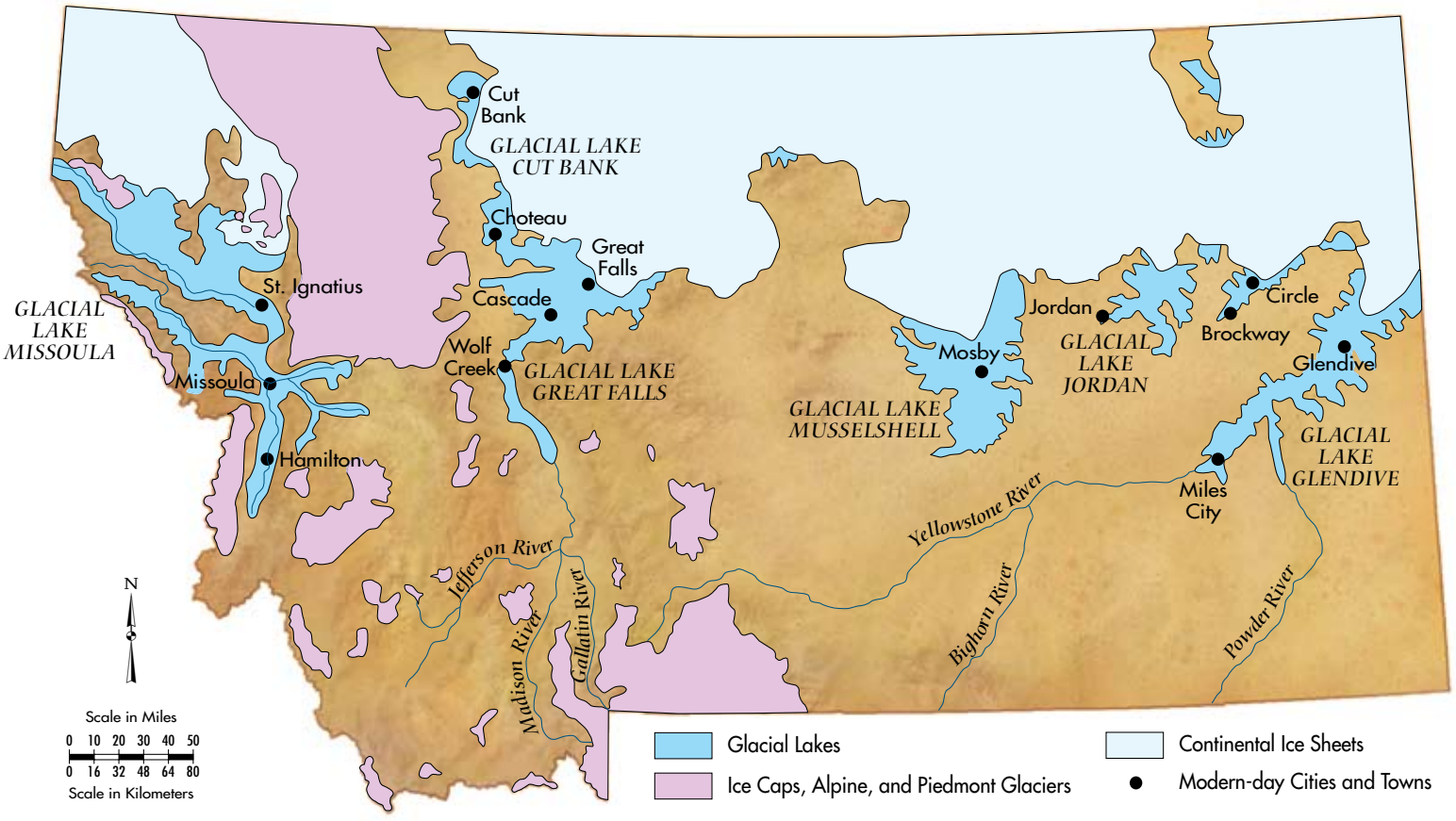
modern cousins, the grizzly and the timber wolf. Some animals, like horses and tapirs, became extinct in North America but survived elsewhere.

The new climate, with its own set of weather patterns and vegetation, encouraged the development of mammals that we know: bison, elk, deer, bears, bighorn sheep, coyotes, skunks, and rabbits. The meadowlark and bald eagle appeared. Trout and salmon moved into the rivers. Montana's weather patterns, geography, watersheds, vegetation, and animal life settled into their current pattern for a few thousand years.

The "Ice Age" may sound like a very long time ago, but many scientists believe that another Ice Age will happen in the future as the cycle continues.

FIGURE 1.8: Glaciers carved U-shaped valleys between the mountains as they pushed rock and earth ahead of them. You can tell by looking that glaciers formed this valley above Lake Josephine in Glacier National Park. Rivers carve V-shaped valleys.

FIGURE 1.9: If you live in Missoula, Great Falls, Glendive, Cut Bank, Hamilton, or Choteau, hold your breath. Where you live now was once the bottom of huge lakes formed by glaciers during the Ice Age.



Ice Age Montana

FIGURE 1.10: Geysers on the Yellowstone caldera spew steam and boiling water every day. Still, pressure is building beneath the caldera, and scientists say it will blow again one day. Will it be in your lifetime?

Geologic Forces Still Shape the Land

The geologic forces that formed the land are still actively changing it today. Every little earthquake or geyser is a reminder that the construction of the world is still going on.

Earthquakes: The Intermountain Seismic Belt

You may not be able to feel it very often, but the earth's crust is still moving and shifting. Up to ten small earthquakes occur in Montana every day, most of them detectable only by sensitive equipment. In fact, Montana ranks number eight in the nation in number of earthquakes per year.

All along the backbone of the Rocky Mountains, from Kalispell in northwest Montana south through Utah, stretches a region of active earthquake faults. It is called the Intermountain Seismic Belt. This is where earthquakes are most likely to happen as the crustal plates continue moving against each other. Two of the largest historic earthquakes in this region happened within this belt, one in 1983 near Borah Peak, Idaho (measuring 7.3 on the Richter scale), and the other in 1959 at Hebgen Lake, Montana.

Volcanoes: Is the Yellowstone Caldera Ready to Blow Again?

Yellowstone National Park, on the southern edge of Montana, gives visitors an insight into the power of the geologic activities that helped form the Rocky Mountain region. About 2.1 million years ago, molten rock exploded through the earth's crust here. It was a **cataclysmic** (violent, sudden) eruption more powerful than the world had ever seen. This explosion spewed so much magma out of the earth that it created a gigantic caldera, or crater, 50 miles long, 37 miles wide, and several hundred yards high.

The eruption spewed plumes of smoke, ash, and gas into the stratosphere, circling the earth many times. It clouded the skies enough to change the climate of North America. This ash layer is detectable in drill holes beneath the Gulf of Mexico. The volcano also sent great rivers of ash, pumice, and gas over the land, creating great lava beds throughout the West.

The top of that volcano collapsed back into the center, built up, and erupted two more times. The last eruption was about 650,000 years ago. It formed the present Yellowstone **caldera** (a large crater formed by a volcanic explosion or the collapse of a volcanic cone).

Today the Yellowstone caldera is 53 miles long and 28 miles wide and is the largest known single eruptive area in the world. **Volcanologists** (scientists who study volcanoes) calculate that in some places the ground has risen 28.5 inches in the past century. Looking at the pattern of cataclysmic volcanic action at Yellowstone, they wonder if the world is due

for another spectacular eruption sometime soon.

Erosion Gives, Erosion Takes Away

Erosion (the wearing away of soil and rock by ice, water, or wind) happens much more slowly than volcanoes or earthquakes. Yet erosion has shaped parts of Montana in many important and beautiful ways. In eastern Montana, the Missouri and Yellowstone Rivers have eroded *below* the level of the grassy **plains** (high-elevation grasslands) to create rugged buttes, bluffs, and badlands.

Erosion can benefit agricultural lands by moving rich topsoils downriver and downhill into valley bottoms, creating good farmland. Erosion also hurts Montana's agricultural land by washing **nutritive** (providing nutrition) soils farther downstream to other places.

FIGURE 1.11: People ran into the street in their nightclothes when a series of earthquakes hit Helena in October 1935. The earthquake killed four people, damaged houses and businesses, and destroyed Helena High School, shown in this picture. Aftershocks stretched out over two weeks.

The Three Ecological Regions of Montana

Have you ever driven all the way across Montana, from the mountains of the west, across the Continental Divide, over the Rocky Mountains, through the foothills, and out onto the grasslands of the east? In some ways our state is like three different countries. Within its boundaries lie three distinctly different ecologies: the western (Columbia Plateau), central (Rocky Mountain Front), and eastern (Northern Plains) regions.

Geography, climate, and resources have shaped the history and culture of each region differently.

The Western Region: Rugged Mountains, Forested Ridges, High Precipitation

Western Montana is crumpled into continuous mountains, winding rivers, and thick forests. If you live in this region,

Exactly the Right Place

"The Crow Country is good country. The Great Spirit has put it exactly in the right place; while you are in it you fare well; whenever you go out of it, whichever way you travel, you fare worse . . . The Crow Country is exactly in the right place. It has snowy mountains and sunny plains, all kinds of climate and good things for every season. When the summer heats scorch the prairies, you can draw up under the mountains where the air is sweet and cool, the grass fresh, and the bright streams come tumbling out of the snowbanks. There you can hunt the elk, the deer and the antelope when their skins are fit for dressing; there you will find plenty of white bears and mountain sheep. In the autumn when your horses are fat and strong from the mountain pastures you can go down into the plains and hunt buffalo, or trap beaver on the streams. And when winter comes on, you can take shelter in the woody bottoms along the rivers . . . The Crow Country is exactly in the right place. Everything good is to be found there. There is no country like the Crow Country." —ARAPOOISH, CROW LEADER, 1833

you probably see mountains wherever you look. The only way through the mountains is by natural passes—low saddles between the peaks.

Between the mountains lie wide, fertile valleys with rich soil that has been nourished by geologic activity and **precipitation** (rain and snow) over thousands of years. Moisture-laden clouds moving in from the Pacific Ocean hit the tall mountains and drop an average of 15 to 23 inches of precipitation per year. In some areas it snows more than 300 inches per year. As a result this region is greener and supports more vegetation than any other region of the state.

What to look for:

- Montana's western rivers feed the Columbia River, which flows west to the Pacific Ocean.
- Flathead Lake, encompassing 197 square miles of northwestern Montana, is the largest natural freshwater body of water west of the Great Lakes.
- Ash, elm, cedar, and larch trees grow only in the western region.
- The tallest pine tree in Montana is a 300-year-old ponderosa pine over 180 feet tall, growing near St. Regis.
- A grove of giant cedar trees, unlike any other trees in the state, grows near Libby.
- Most of Montana's grizzly bears live in western Montana.
- Beargrass and bitterroot (the state flower) grow mostly in the western region.

FIGURE 1.12: Lush, mountainous western Montana is tree-covered and dotted with lakes. This painting, called *The Flathead*, by Montana artist R. E. DeCamp, hangs in the Montana state capitol building.

FIGURE 1.13: Beargrass

FIGURE 1.14: Giant cedars

FIGURE 1.15: Grizzly bear

Central Region: Isolated Mountains, High Plains, Chinook Winds

Central Montana spreads east from the foothills of the Rocky Mountains. Its small, scattered mountain ranges rise above gently rolling plains. The most prominent mountain clusters in the central region are the Sweetgrass Hills, the Bear's Paws, the Little Rockies, the Highwoods, the Moccasin-Judiths, the Big Snowys, the Crazys, the Pryors, the Big and Little Belts, and the Bighorns.

Here the Rocky Mountains create a **rain shadow** (an area on the inland side of a mountain range that is dryer because it is sheltered from rain-bearing clouds). Precipitation in central Montana averages only 12 inches per year. Trees and other vegetation are more sparse than in the moist western region. Temperatures in the central region can range from –40°F to 105°F.

The central region is Montana's "Chinook Corridor." **Chinooks** are blustery, warm, dry winds that blow down the eastern slopes of the mountains and can raise temperatures as much as 50 degrees in several hours. They can melt a snowbank in an afternoon and rob the soil of moisture. Some Indians called the chinook wind the "snow eater."

Another wintertime phenomenon of the high plains east of the Rockies is the Alberta clipper, a frigid, dry wind that forms on the high plains of Alberta, Canada, and cruises southeastward like a ship sailing over the land at 40 to 60 miles per hour. Alberta clippers rarely leave more than a few inches of powdery snow, but they bring ground blizzards, subzero temperatures, and serious drifting.

FIGURE 1.16: High, fertile valleys rimmed by mountain ranges characterize central Montana, as in this photo of the Crazy Mountains, near Lennep.

FIGURE 1.17: Mule deer

FIGURE 1.18: Bald eagle

FIGURE 1.19: Silvery lupine

What to look for:

- Ponderosa pine, Douglas fir, and spruce trees cover the mountains, while bluebunch wheatgrass, timothy grass, and fescue fill the grasslands.
- Lupines, larkspur, and Indian blanketflower grow on the hillsides, and prickly pear cactus and sagebrush grow in the lowlands.
- Montana's two largest river systems, the Missouri River and the Yellowstone River, begin in central Montana.
- Mule deer and pronghorn spread throughout the lowlands, with black bear, elk, and moose in the forests and hills.
- Pheasants, sage grouse, and Hungarian partridge hide in the brush, and hawks, falcons, and eagles soar in the sky.
- Trout, sturgeon, and bass are the most important fish species.

FIGURE 1.20: The plants of eastern Montana are well suited to drought. Yucca, for example, have a thick skin or an oily coating to reduce **evaporation** (loss of moisture to the air). In an image he called *Prairie Awakening,* Montana artist Clyde Aspevig painted these yucca in bloom.

Eastern Region: Rolling Plains, Persistent Winds, the Endless Sky

Eastern Montana is almost uninterrupted grassland. Here the Missouri Breaks and the badlands in Makoshika State Park form two of the most dramatic examples of a landscape sculpted by water and wind erosion.

Eastern Montana is dry, windy, and extreme. Temperatures here are often colder in winter and hotter in summer than in the rest of the state. Arctic storms blow in blizzards and extreme cold from the north. Summer hailstorms sometimes ruin crops. Yet, with all this storm action, eastern Montana receives only an average of 11 to 14 inches of rain per year and sees many years of drought, making water extremely important in this area. Ranches and farms require more

FIGURE 1.21: Wild turkey

FIGURE 1.22: Prickly pear cactus

FIGURE 1.23: Pronghorn

irrigation (bringing in a supply of water to make farmland more productive), more space for grazing, and a little more patience than in the other regions. The towns are small and far apart.

What to look for:

- The Fort Peck Dam forms the Fort Peck Reservoir on the Missouri River—the fifth-largest human-made reservoir in the United States (134 miles long, 220 feet at its deepest, and 1,520 miles of shoreline).
- Woody shrubs like juniper thrive in the dry, elevated soils of eastern Montana, while ponderosa pine, Douglas fir, and spruce trees grow in the high elevations.
- Plants include sage, yucca, shrubby cinquefoil, prickly pear cactus, snakeweed, and rabbitbrush.
- Native grasses like needle-and-thread grass, bluestem wheatgrass, and grama grass were perfectly adapted to the bison, whose hooves agitated the topsoil just enough to spread grass seeds easily without disturbing the roots.
- Even warm-water prairie streams that seem lifeless actually teem with hundreds of fish species. The legendary paddlefish can grow to 100 pounds.
- Pronghorn, jackrabbits, weasels, and porcupines live in the hills and plains. You are likely to see wild turkeys here as well as Hungarian partridge, sage grouse, and pheasant.

FIGURE 1.24: Sculpted sandstone, brush-filled gullies, and great hiking country spread out before you in eastern Montana. This photo was taken near Jordan.

A Land of Contrast

Montana is a land of many opposites. Temperatures can get as cold as −70°F in the winter (Rogers Pass, 1954) and as hot as 117°F in the summer (Glendive, 1893, and Medicine Lake, 1937). Its lowest point

is only 1,892 feet above sea level (Kootenai River Valley), while its highest peak is 12,693 feet high (Granite Peak, near Yellowstone National Park).

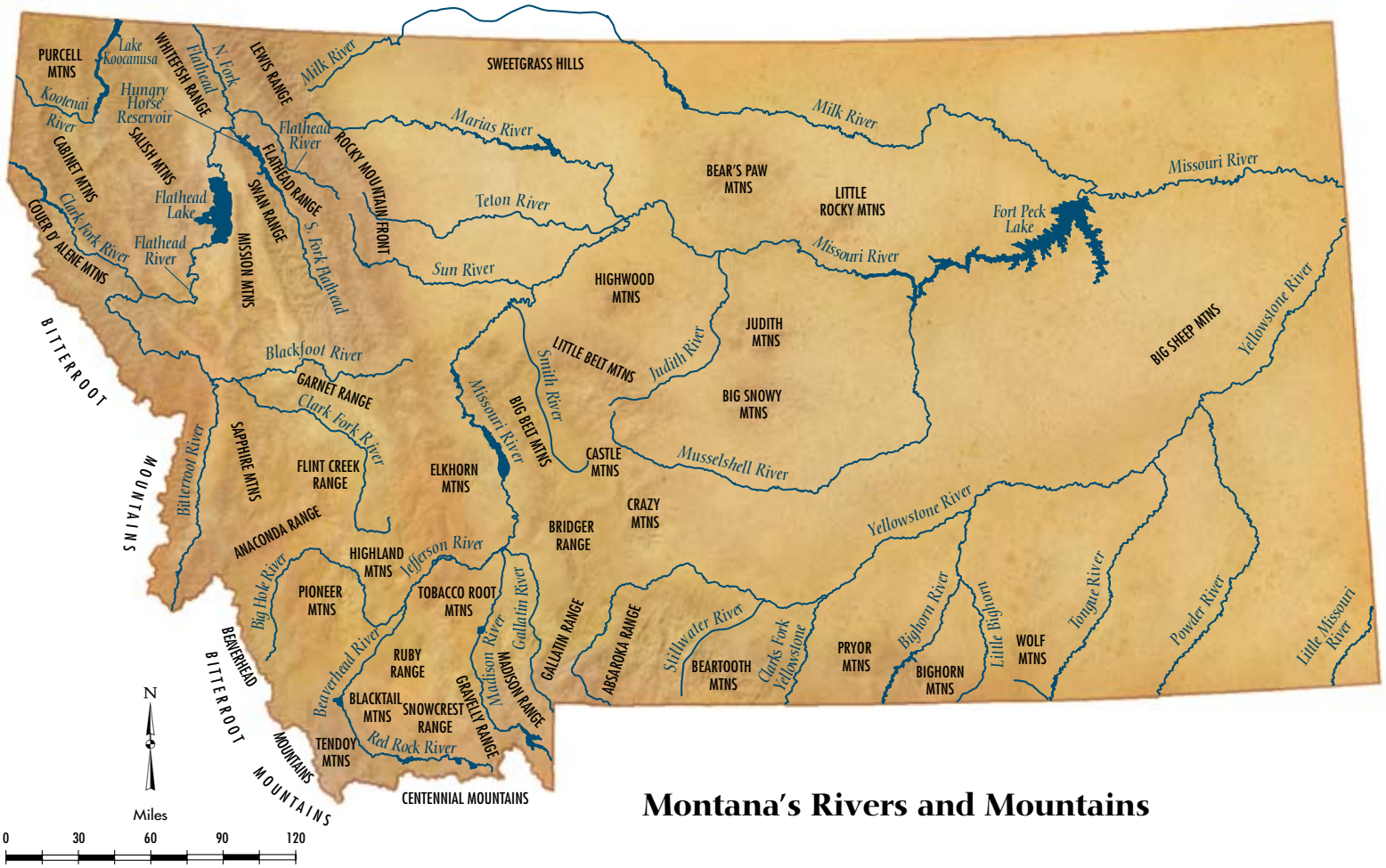
The state has many rivers and lakes—yet drought is a constant threat. The land is rich in gems, minerals, gas, oil, wildlife, grazing land, and topsoil—yet it struggles economically. Many people enjoy Montana's open land and distance from large cities, but these features make transportation one of our highest expenses.

Mountains: The Backbone of Montana

Montana's name came from the Spanish term *Montaña Relucientes,* which means "shining mountains," a Spanish translation of what the Indians called the Rocky Mountains. There are 28 important mountain ranges in Montana, and about one-third of the land is mountainous. The Continental Divide of the Rocky Mountains divides the westward-flowing rivers, which run into the Pacific, from the eastward-flowing rivers, which eventually run into the Gulf of Mexico.

Mountains, hills, buttes, bluffs, and cliffs have played an important part in Montana history. They influence climate, vegetation, and wildlife. They determine transportation routes. They contain valuable gems and metals. Sometimes they can be used as tools, as when early Indian people hunted bison at a buffalo jump.

FIGURE 1.25



Montana's Rivers and Mountains

Travel across many of these mountains would have been impossible if geologic forces had not carved passes across which people could move to hunt, trade, communicate, and ship goods.

Rivers: Three Major River Systems Feed the Land

One of the things that makes Montana **unique** (one of a kind) is its rivers. Within Montana's boundaries lie the **headwaters** (the source of a river) of three major river systems that run into three different seas. The Columbia River system flows into the Pacific Ocean; the Missouri River system flows into the Mississippi River and eventually into the Gulf of Mexico; and the Saskatchewan River system, which begins as St. Mary's River in Glacier National Park, flows northeast into Hudson's Bay and eventually into the North Atlantic Ocean. This is something no other state has. "Water is life," goes an old saying. If so, Montana gives life to the entire North American continent in a way that no other place does.

Rivers provided some of the earliest transportation corridors through the West. Rivers form natural valleys and usually follow paths of least resistance through mountain passes or across level valleys. Most highways and railroad tracks, power lines, electrical cables, petroleum pipelines, and service facilities follow alongside rivers, creating "power corridors." Throughout most of Montana's history, rivers have been basic lifelines to downstream communities, markets, and cultural influences.

FIGURES 1.26 and 1.27: Montana is a land of glaciers and desert. This penquin celebrates Cut Bank's extreme temperatures. It is often the coldest spot in the Lower 48 states. The thermometer was a tourist item from Yellowstone National Park.

People Rely on the Land

Montana's people have always been tied to the land in both obvious and hidden ways. The first people, thousands of years ago, made their living directly from the land and its plants and animals. Later, American Indians developed sophisticated ways to live on and prosper from the land and its resources. Then European and American explorers came to seek out new opportunities. Bison hunters, fur trappers, prospectors, cattle ranchers, farmers, railroaders, dam builders, hunting guides, and truckers—almost every Montanan since the very beginning has somehow been influenced by the land.

Expressions of the People

Symbols of the Treasure State

Sometimes the way people feel about the place where they live is just too big to describe in words. Symbols help us express feelings like respect for the land, pride in our communities, and a sense of place.

Like most other states, Montana has adopted many symbols that represent people's appreciation for the things that make Montana special.

FIGURE 1.28

STATE SEAL: The Montana state seal depicts Montana's history and natural beauty. At the top, a sunrise shines over snowy mountains. A pick, a shovel, and a plow—symbols of Montana's mining and farming heritage—are arranged in front of mountains, hills, trees, cliffs, waterfalls, and the Missouri River.

STATE FLAG: The Montana state flag shows the state seal on a blue rectangle with yellow edges. This flag was copied from one taken into battle during the Philippine Insurrection in 1898 by the First Montana Infantry, U.S. Volunteers. The name "MONTANA" at the top was added in 1981.

FIGURE 1.29

STATE SONGS: Montanans have written many songs about Montana, and the state has adopted three of them as official state songs. The first, called "Montana," was written by Butte newspaper editor Charles Cohan and famous songwriter Joseph E. Howard in 1910. There is also a state ballad, "Montana Melody," by LeGrande Harvey, adopted in 1983. And in 2007 the legislature officially approved "Montana Lullaby," by Ken Overcast, as the official state lullaby.

STATE GEMSTONES: Agate and Sapphire

Agates from the east and sapphires from the west share the spotlight as Montana's two state gemstones. The endless variation of agates represents the uniquely beautiful landscape of eastern Montana. The brilliant sapphires found in western Montana—especially the Yogo sapphires, found near Yogo Creek—represent the **luminous** (light-filled) beauty of western Montana. Yogo sapphires are unique because they retain their brilliance even in artificial light, which no other sapphires in the world will do.

FIGURE 1.30

STATE FLOWER: Bitterroot

Montana Indians used the dried roots of the bitterroot for food and trade. A traditional story tells how the bitterroot came to be: The sun heard a mother crying because she could not find food for her family. The sun changed her tears into the bitterroot so the mother would always have food for her children. You can find bitterroot growing near the mountains and boulders of western Montana in spring and summer.

FIGURE 1.31

STATE TREE: Ponderosa Pine

The ponderosa pine is the most common tree in Montana. The ponderosa can grow 300 feet tall and 8 feet thick. It can be seen almost everywhere along the roads of western Montana. It symbolizes the beauty and utility of Montana's resources.

STATE ANIMAL: Grizzly Bear

Most of the grizzly bears in the Lower 48 states live in Montana. Adult grizzlies can grow to eight feet long and weigh 1,500 pounds. Their back feet leave pawprints as big as magazines. They can run as fast as a horse for short distances. The size, strength, and beauty of the grizzly bear make it an important symbol of Montana and a good choice for state animal.

FIGURE 1.32

STATE FOSSIL: Maiasaura

Some of the most important fossils in the world came from Montana. Montana adopted the Maiasaura as its state fossil after an important discovery at Egg Mountain, near Choteau, revealed the first proof that some dinosaurs took care of their babies the way birds do. The Maiasaura emphasizes Montana's importance in the geologic history of the world.

FIGURE 1.33

STATE FISH: Blackspotted Cutthroat Trout

Montanans adopted the blackspotted cutthroat trout to help save the fish from decline due to overfishing and changes in the environment. The name comes from the black spots that run down its back and a pinkish red splotch on its jaw. The cutthroat trout is a favorite food for grizzly bears.

STATE BIRD: Western Meadowlark

FIGURE 1.34

The western meadowlark is known for its loud, cheerful song. It is about as big as a robin, with a bright yellow chest and throat under a black collar. You can find western meadowlarks in spring and summer along most dirt roads, sitting on fence posts singing to other meadowlarks nearby. It symbolizes optimism and wide-open spaces.

FIGURE 1.35

STATE BUTTERFLY: The Mourning Cloak

Bright blue shimmering spots along the inner edge of a yellow or beige border characterize the mourning cloak's dark brown wings. If viewed closely, the wings reflect purple highlights. The underside of the wing is dark brown with lighter brown edges. The mourning cloak symbolizes the beauty that is often overlooked in Montana.

STATE GRASS: Bluebunch Wheatgrass

FIGURE 1.36

Bluebunch is found all over the state and throughout the West. It grows mostly in flat areas and lower mountain slopes and is good grazing grass for cattle and sheep. It represents the fertile, nutritive grasslands of the Great Plains—often misunderstood and mistreated but important to the nation.

STATE NICKNAMES: "The Treasure State" and "Big Sky Country"

"The Treasure State" came naturally as a Montana motto because of the state's valuable minerals, gems, and precious metals. In the 1960s Montanans also adopted the nickname "Big Sky Country," after a novel called *The Big Sky,* by Montana author A. B. Guthrie Jr. They chose this nickname to reflect their love of the land.

CHAPTER 1 REVIEW

CHECK FOR UNDERSTANDING

1. Define: (a) geology; (b) paleontologist; (c) fossil fuels; (d) glacier; (e) caldera; (f) rain shadow
2. Identify: (a) megafauna; (b) Intermountain Seismic Belt; (c) Chinook Corridor; (d) Alberta clipper
3. Describe the four geologic time intervals.
4. What caused the formation of fossil fuels?
5. Why did evergreen forests appear west of the Continental Divide?
6. Explain how glaciers change the landscape.
7. Describe the three regions of Montana.

CRITICAL THINKING

1. Why did some mammals die during the end of the Cenozoic era while other species survived?
2. What are some of the positive and negative effects of erosion? When, and how, should people try to control erosion?
3. How do you suppose the geography and climate of Montana's three regions affects the lives of the people who live there today?

PAST TO PRESENT

1. How would you classify the geologic forces still at work shaping Montana? Do they make rapid or gradual changes to the land?

MAKE IT LOCAL

1. In what ways is the landscape changing in the region you live? Are there more human than natural forces involved in the changes? What is the difference between human and natural forces that change the landscape?
2. Think about the region of Montana in which you live. What were the primary geologic forces that created the present landscape? Can you find evidence of their work?

EXTENSION ACTIVITIES

1. Make a three-dimensional relief map of Montana.
2. Imagine that you are a travel agent. How would you describe one of the regions of Montana to attract visitors? Make a poster or brochure illustrating the region.
3. Make a poster of Montana state symbols.
4. Using a blank Montana map, locate and label the following physical features: Missouri River, Yellowstone River, Flathead Lake, Fort Peck Reservoir, Sweetgrass Hills, Bear's Paws, Little Rockies, Highwoods, Moccasin-Judiths, Big Snowys, Crazys, Pryors, and Little Belts and Big Belts.
5. Research the different ways that people use the land today in Montana.

Credits

The following abbreviations are used in the credits:

BBHC Buffalo Bill Historical Center, Cody, Wyoming
GNPA Glacier National Park Archives
LOC Library of Congress
MAC Montana Arts Council, Helena
MDEQ Montana Department of Environmental Quality, Helena
MDT Montana Department of Transportation, Helena
MFWP Montana Fish, Wildlife and Parks, Helena
MHS Montana Historical Society, Helena
MHSA Montana Historical Society Archives, Helena
MHSL Montana Historical Society Library, Helena
MHS Mus. Montana Historical Society Museum, Helena
MHS PA Montana Historical Society Photograph Archives, Helena
MSU COT Montana State University College of Technology, Billings
NMAI National Museum American Indian, Smithsonian Institution, Washington, D.C.
MSU Billings Special Collections, Montana State University Billings Library
NARA National Archives and Records Administration
NPS National Park Service
NRIS Natural Resource Information System, Montana State Library, Helena
SHPO State Historic Preservation Office, Montana Historical Society, Helena
TM Travel Montana, Helena
UM Missoula Archives & Special Collections, The University of Montana–Missoula
USDA United States Department of Agriculture
USFS United States Forest Service
WMM World Museum of Mining, Butte

Chapter 1

FIG. 1.1 *Above Timberline,* R. E. DeCamp, Capitol Art Coll., MHS Mus. photo by Don Beatty

FIG. 1.2 Rocky Mountain Front near Choteau, photo by Steve Shirley, Helena

FIG. 1.3 Fossil beds south of Choteau, photo by Donnie Sexton, TM

FIG. 1.4 Torosaurus with Jack Horner, courtesy Museum of the Rockies, Bozeman

FIG. 1.5 Diagram of crustal plate movements forming mountains, Geoffrey Wyatt, Helena

FIG. 1.6 Butterfly pin by Paula Crevoshay, photo and sapphires courtesy Robert E. Kane and Fine Gems International

FIG. 1.7 Ice cave at Boulder Glacier, photo by G. Grant, GNPA

FIG. 1.8 Lake Josephine and Grinnell Glacier, photo by T. J. Hileman, MHS PA 956-726

FIG. 1.9 Glaciers and Glacial Lakes in Montana during the Pleistocene Era, map by MHS with information from *Geologic Parent Materials of Montana Soils,* Bulletin 721 (Bozeman, 1980)

FIG. 1.10 Geysers in the Old Faithful area of Yellowstone National Park, photo by Donnie Sexton, TM

FIG. 1.11 New Helena High School after earthquake, 1935, photo by L. H. Jorud, Helena, MHS PA PAc 74-55.252

FIG. 1.12 *The Flathead,* R. E. DeCamp, Capitol Art Coll., MHS Mus., photo by Don Beatty

FIG. 1.13 Beargrass, photo by Donnie Sexton, TM

FIG. 1.14 Ross Creek Cedars, courtesy Troy Ranger Station, USFS

FIG. 1.15 Grizzly Bear, photo by Jaime and Lisa Johnson, Lincoln, MT

FIG. 1.16 Crazy Mountains as viewed above Lennep, MT, photo by Donnie Sexton, TM

FIG. 1.17 Mule Deer, photo by Jaime and Lisa Johnson, Lincoln, MT

FIG. 1.18 Bald Eagle, photo by Jaime and Lisa Johnson, Lincoln, MT

FIG. 1.19 Silvery lupine, photo by Donnie Sexton, TM

FIG. 1.20 *Prairie Awakening,* Clyde Aspevig, oil on canvas, 40 x 50 inches

FIG. 1.21 Turkey, photo by Jaime and Lisa Johnson, Lincoln, MT

FIG. 1.22 Prickly Pear, photo by Geoffrey Wyatt

FIG. 1.23 Pronghorn, courtesy FWP

FIG. 1.24 Eastern Montana landscape near Jordan, photo by Steve Shirley, Helena

FIG. 1.25 Montana's Rivers and Mountains, map by MHS, base map courtesy NRIS

FIG. 1.26 Souvenir thermometer, Haynes Foundation Coll., gift of Mrs. Isabel Haynes, MHS Mus. 1980.61.101

FIG. 1.27 Penguin, 1996, photo by Tom Ferris, Bozeman

FIG. 1.28 State Seal, courtesy Montana Secretary of State's Office

FIG. 1.29 Montana State Flag, photo by Mike Burnett, courtesy Travel Promotion

FIG. 1.30 Bitterroot, photo by Donnie Sexton, TM

FIG. 1.31 Ponderosa Pine, photo by Jaime and Lisa Johnson, Lincoln, MT

FIG. 1.32 Maiasaura, courtesy Museum of the Rockies, Bozeman

FIG. 1.33 Cutthroat Trout, courtesy US Fish and Wildlife Service

FIG. 1.34 Meadowlark, photo by Jaime and Lisa Johnson, Lincoln, MT

FIG. 1.35 Mourning Cloak Butterfly, photo by Doug O'looney, Helena

FIG. 1.36 Bluebunch Wheatgrass, courtesy USDA, NRCS Plant Materials Program, Beltsville, MD