

WHAT ARE WEST COAST
RAINFOREST CREATURES DOING
IN NORTHWESTERN MONTANA?

THE LAND THAT TIME FORGOT

STORY BY BEN LONG

PHOTOS BY DAVID HERASIMTSCHUK

BIG AMPHIBIAN Only recently discovered in Montana, the Idaho giant salamander (shown here in its larval stage) lives in the Northern Rocky Mountain Refugium, a bastion of biologically diverse coastal creatures in the Bitterroot Mountains.

The phenomenon struck me while I was watching the 2010 Olympics on TV.

The scenery around Vancouver, British Columbia, looked a lot like my family's favorite camping spot at Bull Lake, south of Troy, Montana. I could identify redcedar and hemlock cloaking the slopes where skiers were racing for gold medals. Even the pitch of the mountains looked familiar.

It turns out scientists have noticed the same thing. They've recognized that parts of western Montana and northern Idaho look like a big chunk of rainforest plucked from the Pacific Coast and plopped down 350 miles inland. And it's not just casual appearances. Scientists have identified scores of similar species living in both places, from mighty trees to lowly mayflies. For instance, the viciously thorny devil's club plant shows up in both Olympic National Park west of Seattle and Glacier National Park east of Kalispell.

How did these rainforest plants and animals survive the glaciers and glacial lakes that not so long ago covered most of northwestern Montana? Even more puzzling: How did a place that looks like Washington's Olympic Peninsula get here in the first place?

Making the Inland Rainforest

The earth's crust is assembled of plates that fit together like puzzle pieces. But they don't snap together neatly. Instead, slowly moving tectonic plates collide and buckle over and under each other, occasionally pushing skyward to form mountains. Sometime

between 90 and 65 million years ago, the Farallon Plate slid under the North American Plate, piling layers of the earth's crust upon one another to form the Rocky Mountains. At the time, northern Idaho and northwestern Montana were the continent's western coast. What are today Oregon and Washington were continental islands floating on their own tectonic plates in the Pacific Ocean.

Over the next ten million years, the con-

tinental islands drifted east and stacked up against Idaho to form Oregon and Washington and the new Pacific Coast. For several million years, moist air masses moving east from the Pacific Ocean dropped rain across the region all the way to the Rockies, creating a giant rainforest stretching for hundreds of miles. This vast mesic ecosystem was awash in warm coastal rain and lush with life. Dinosaurs had long been extinct, but salamanders slithered in the misty



MONTANA'S "OLYMPIC PENINSULA" Small high-gradient mountain streams like Deer Creek in the Northern Rocky Mountain Refugium look remarkably similar to those along the Pacific Coast, 350 miles to the west.



LUKE DURAN/MONTANA OUTDOORS

NATURE'S ARK Thousands of years ago, Glacial Lake Missoula and glaciers creeping south from Canada covered much of the inland rainforest in today's northwestern Montana. Several large areas that were too high, too low, or too far south to be covered by ice acted as refugia—places containing isolated populations of once-widespread species.

streambeds, and creeks were full of snails, slugs, aquatic insects, and water plants. Today we consider these to be coastal rainforest species, yet they existed well into the continent's interior.

Just as geological events created the giant rainforest, so did they destroy large parts of it. Roughly 17 to 15 million years ago, immense lava flows from Oregon spread east, covering large tracts of eastern and central Idaho rainforest with molten rock. Then, roughly five million years ago, the Cascade Range of today's Oregon and Washington was born. The mountains forced air masses

coming in off Puget Sound to rise, causing the moisture to cool, condense, and fall as rain. This produced a "rain shadow"—a dry region on the lee side of mountains—east of the Cascades. Much of the wet forestland there eventually turned into the dry scrubland and prairie of today's eastern Washington and Oregon.

After retaining their moisture over the low-elevation arid landscape, the air masses rose again when they reached Idaho and Montana, dropping rain. This produced enough precipitation to continue supporting thirsty plant species like hemlock and water-loving animals such as salamanders.

That was the pattern for several million years, with one rainforest thriving along the Pacific and another—separated by hundreds of miles of lava fields, grassland, canyons, scrublands, and dry pine—persisting along the western face of the Rockies. Then, about two million years ago, the climate changed again.

The Ice Ages Cometh

This was the Pleistocene Epoch, a two-million-year period of great ice ages that chilled the entire planet. Though average temperatures were only a few degrees lower than today, snow piled up so high that great slabs of ice covered Canada and the Rockies. These glaciers shaped modern Montana, pushing the Missouri River south toward the Gulf of Mexico, gouging out the footprint of Flathead Lake, and whittling down the peaks of the Rockies.

Covering much of Montana's inland rainforest were glaciers up to 1 mile thick and, during the most recent ice age, 200-mile-long Glacial Lake Missoula. But some valleys, where lower elevations created warmer temperatures, escaped glaciation. And southern reaches of the rainforest were at latitudes too warm to sustain thick ice.

These rainforest remnants are known as refugia—places containing isolated or relict populations of once-widespread animal or plant species. One of the largest, the Northern Rocky Mountain Refugium, extends from where I-90 crosses into Idaho southwest for roughly 150 miles along both sides of the Montana-Idaho border to the southern end of the Bitterroot Valley. There, rainforest species covered by glaciers elsewhere in northwestern Montana were able to survive the Pleistocene. Scientists have documented roughly 150 species of complex

Many species dispersed from this and other refugia—which acted as natural Noah's arks.

plants and vertebrate animals (and many more if insects are included) living in the Northern Rocky Mountain Refugium that have "sister taxa," or related forms, on the Pacific Coast. Among these are the 2-inch-long Coeur d'Alene salamander, the Rocky Mountain tailed frog, the newly discovered

Northwestern Montana Inland Rainforest Timeline

200 MILLION YEARS AGO

200 million years ago

North America is part of the supercontinent Pangea. Today's western Montana and northern Idaho are the west coast of the continent, with ocean waves lapping up against the Idaho Panhandle. Most of Montana is under a shallow inland sea. What is today Washington and Oregon are continental islands in the Pacific.

90 to 65 million years ago

Large tectonic plates collide, push up, and form the Rocky Mountains.

65 to 55 million years ago

The continental islands drift east and stack up against the Idaho coastline like ice floes, building today's Oregon and Washington and creating the new west coast. Moisture-bearing clouds coming in off the Pacific drop rain from the coastal shore all the way to the Rockies. This creates a giant rainforest stretching hundreds of miles.

17 to 15 million years ago

Immense lava flows from Oregon spread east, covering large tracts of what had been rainforest in central Idaho.

5 million years ago

The Cascade Range is formed. This creates a rain shadow over eastern Oregon and Washington, producing an arid landscape that further cuts off the inland rainforest from the coast. The clouds retain moisture as they move east across lower elevations, then drop rain when they hit the Rockies. This sustains what becomes an isolated rainforest ecosystem in northern Idaho, northwestern Montana, and south-central British Columbia.

2 million to 10,000 years ago

Glaciers and Glacial Lake Missoula cover much of Montana's inland rainforest with ice and water up to 1 mile deep. Some low-elevation valleys (which are warmer), mountain peaks, and areas south of the glaciers escape inundation. These are known as refugia. One of the largest, the Northern Rocky Mountain Refugium, stretches 150 miles along the Bitterroot Mountains and contains coastal plant and animal species established millions of years earlier that continue to survive.

10,000 years ago to today

After the glaciers retreat, some species from the refugia "arks" recolonize parts of the previously ice-covered rainforest, which continues to receive moisture from the Pacific. Other species survive only in the refugia, which one scientist calls "multi-taxa hotspots of genetic diversity." Biologists hope that studying the refugia and publicizing the findings will help preserve the areas and associated dispersal corridors.

90 MILLION YEARS AGO

65 MILLION YEARS AGO

17 MILLION YEARS

Holding that frog or snail will be like staring into the depths of time.

Lolo mayfly (*Caurinella idahoensis*), and dozens of other aquatic invertebrates, slugs, snails, and delicate wetland flowers.

When the last of the glaciers retreated and floodwaters subsided roughly 10,000 years ago, many plant and animal species dispersed from this and other refugia—which acted as natural Noah’s arks. Over millenia, the flora and fauna followed avenues of suitable habitat known as “dispersal corridors” and recolonized parts of northwestern Montana’s inland rainforest where they had once thrived. But many species are endemic, meaning that only the Northern Rocky Mountain Refugium and other inland rainforest refugia retained the ecological conditions they needed to survive.

The Bering Land Bridge

Colder temperatures also triggered a sweeping change that created the suite of wildlife species we enjoy today. During the ice ages, moisture remained locked up in the polar ice caps rather than evaporating into the atmosphere and falling as rain into the oceans. That caused sea levels across the globe to drop. One result was the Bering Land Bridge between Siberia and Alaska, across which bison, grizzlies, wolves, moose, elk, and other mobile species migrated from northern Asia into North America. When temperatures eventually warmed, Pacific fishes such as cutthroat trout and bull trout migrated from the ocean, swimming up river water melting from glaciers, and eventually populated inland streams.

We think of these species as Montana natives. Yet compared to northwestern Montana’s Idaho giant salamander, tailed frog, and

other refugia species, familiar mammals such as elk and mule deer are newcomers. Montana’s original natives, like those of the Northern Rocky Mountain Refugium, have dwelt here for millions of years. They and other rainforest creatures quietly carried on with their lives as ice ages came and went and even entire mountain ranges were thrust up from the ocean floor.

All this was a revelation to me. I have lived my entire life within the boundaries of the inland rainforest, an ecosystem that runs from the mountainous country of the Clearwater and St. Joe River drainages of northern Idaho, east to western Montana’s Lolo, Bitterroot, and Kootenai National Forests, and north about as far as Revelstoke, British Columbia. The lush forests and steep mountains are imprinted on my psyche as “home.” So are its wildlife. Yet until recently I was perfectly ignorant of the area’s ancient history.

Now I know that the reason Vancouver’s ski slopes resemble Montana’s scenic Bull Lake area is because both are part of what was once a contiguous mesic forest that extended from the Pacific to today’s Glacier National Park. And that it was the emergence of the Cascade Range, which five million years ago created a rain shadow between here and there, that isolated our part of the rainforest.

Now when my son and I pluck a snail off a rock at Ross Creek or ponder a tailed frog from the Yaak, I can tell him that the crea-



Ben Long is a writer in Kalispell. David Herasimtschuk is a conservation photographer in Fort Collins, Colorado.



ANCIENT CREATURES Coastal mesic forest species like this snail and tailed frog have lived in northwestern Montana for millions of years. Compared to these creatures, iconic Montana wildlife such as elk and mule deer arrived here only yesterday.

ture’s history goes back in Montana so long it makes the oldest human history seem like a click of the secondhand on Earth’s wristwatch. I’ll explain how the little mollusk or amphibian has a biological twin living hundreds of miles away on the West Coast, and how its pedigree stretches back

to a time before the Cascade Range even existed. I’ll show him how refugia are remarkable areas of biological richness, places where we can flip a rock or peer into a mountain pool and see creatures found nowhere else in Montana.

Holding that frog or snail will be like star-

ing into the depths of time, just as by looking at a distant planet he and I will stare into the depths of space.

And I will wonder what new discoveries await his generation and what secrets remain to be unlocked here and in other wild, pristine parts of Montana. 🐸