INTRODUCTION

In profile, North America is an immense plain hemmed by mountains to either side. Along the east are the old, eroded Appalachian Mountains that extend north and east from the southern Coastal Plain to the Gaspé Peninsula, the even more ancient Laurentian Mountains north of the Gulf of St. Lawrence, and the eroded, broken mountains of the Arctic Cordillera that run from northern Labrador and Québec through the Arctic Archipelago to the tip of Ellesmere Island. Along the west, there lie the great spine of the Rocky Mountains and other ranges in parallel rows—a mere section of the vast Cordillera of the Americas that runs from the Beaufort Sea to Tierra del Fuego. To the south, the trough is drained by the Mississippi River into the Gulf of Mexico. In the northeast, the Great Lakes basin drains east into the Atlantic Ocean through the St. Lawrence River, the only major waterway leading directly into the heart of the continent from the east. Further north, rivers from the west drain into the great inland sea of Hudson Bay and, more northerly still, the Mackenzie River leads north to the Arctic Ocean. The greater part of this gigantic land is occupied by just two countries, Canada and the U.S., and in them live nearly 300 species of amphibians.

NORTH AMERICAN AMPHIBIANS

Amphibians are far from being the largest of North America's wildlife. Most are small. Many are tiny. The Little Grass Frog is no more than 1.5 cm end to end and the Two-toed Amphiuma, the longest North American amphibian, may reach only slightly more than a meter in length. Yet their ecologic importance belies their size, for they are, by far, the most numerous terrestrial vertebrates on the continent. Their abundance and diversity also reflect, in a very immediate way, the climate and landscapes of the areas where they are found, and therefore mapping the distribution of amphibians in North America is also an exercise in mapping the climate and topography of the continent itself.

North America, physical.

Two of the three living orders of amphibians are to be found in Canada and the U.S. Frogs, toads and treefrogs, the Order Anura, are distributed throughout the world except for the polar regions and remote oceanic islands. Salamanders and newts, the Order Caudata, are distributed mainly in the Northern Hemisphere and the New World Tropics. Missing from Canada and the U.S. are any caecilians, Order Gymnophiona, which are strictly tropical.

More than anything else, amphibians' thin, moist, highly vascularized and water-permeable skin sets them apart from other terrestrial vertebrate animals. The skin of amphibians has no epidermal coverings such as fur, scales, or feathers and, with few exceptions, is not waterproof. Amphibians are rarely found far from moisture, as their permeable skins do not well protect them from desiccation in dry conditions. Amphibians also cannot withstand the salinity of seawater, which draws away their body water by osmosis. However, amphibians do not necessarily require standing water because they can absorb the water they need through their skin, even from the ground or from moist soil. This is the ability that allows desert amphibians to survive underground, where surface environments are intensely dry, and enables woodland salamanders to thrive far from standing water.

Amphibians also exchange respiratory gasses through their skin, in addition to their lungs. Cutaneous gas exchange enables many northern amphibians to hibernate under water in winter, as they can receive enough oxygen for respiration through their skins without having to surface for air. Plethodontid salamanders have dispensed with lungs entirely and rely only upon respiration through the skin and through the lining of the mouth. Being able to respire and draw water through the skin enables amphibians to prosper in both aquatic and terrestrial environments and to flourish in dampness.

Amphibians are notable for their skin glands. Small mucous glands distributed all over the body secrete fluid mucus that helps lubricate the skin and keep it from drying. Mucus is also secreted when the animal is stressed, helping to make it slippery and difficult for predators to capture or hold. The granular glands of amphibian skin are larger than the mucous glands and are located in discrete places on the upper surface of the body, tail, and head. They secrete toxic and noxious substances, primarily for defense. No amphibian has a poisonous bite, nor, with rare exceptions, can an amphibian inflict a poisonous wound. The granular gland secretions are released when the animal is in duress, mainly in order to render itself a less than tasty meal. Nonpoisonous species have small granular glands that release few toxic compounds, but poisonous species may secrete substantial amounts of bitter-tasting, irritating, noxious, and even highly toxic nitrogen-containing chemical compounds. The warts and parotid glands of toads and the granular bumps on the skin of newts are visible concentrations of granular skin glands.

Amphibians are ectotherms, whose body temperatures are in near-equilibrium with their surroundings. This means they are able to be active only at moderate temperatures, above freezing. By virtue of being ectotherms, though, amphibians do not metabolize their food to produce bodily heat. Consequently, they eat much less and use much more of their intake for growth and reproduction, by roughly an order of magnitude, compared to similarly sized mammals. Amphibians are environmental opportunists capable of rapid growth and considerable investment in reproduction under the right thermal conditions. Their metabolic inability to maintain internal body temperatures has not, however, prevented certain amphibians from surviving hot desert summers and or cold northern winters. The species that live in these habitats endure by escaping underground and by having adaptations that allow them to remain dormant until surface conditions are once more to their advantage.

When an amphibian is very cold, with its body temperature hovering just above freezing, its metabolic activities slow to a minimum. Oxygen demand becomes so low that enough can be obtained entirely through the skin, and though the animal is too cold and slow to feed, its nutritional requirements are so minute that it does not need to; it relies instead on stored energy reserves in the form of fat and glycogen. In this condition, amphibians can remain dormant throughout the winter, so long as they can remain in a place where they are protected. American Bullfrogs, Green Frogs, Northern Leopard Frogs and Mink Frogs hibernate underwater well below the surface ice. These frogs, when cold, can gain enough oxygen through their skins without needing to breathe air. Western Toads, American Toads and Eastern Red-backed Salamanders, among other northern species, seek refuges or bury themselves below ground to avoid frost. For them, as for most animals, freezing is deadly. But a few species, such as Wood Frogs, Spring Peepers, Boreal Chorus Frogs, and Gray Treefrogs, do not need to avoid freezing; they have antifreeze. As they cool, they flood their blood systems with glucose or glycerol; these substances enable them to tolerate substantial periodic freezing of their body water and still survive. When temperatures rise in the spring, the metabolic activity of the hibernating amphibian will also rise, and it will again become active. During mild winters on the Pacific Coast or southeast of the continent, the temperature may never get very low for very long and some species of amphibians may remain active all winter.

Amphibians may also enter into extended periods of dormancy during times of severe heat and dryness. This is called "aestivation," during which an amphibian will greatly reduce its activity and metabolic rate and remain burrowed underground, sometimes for years. Spadefoots survive in deserts owing to their ability to aestivate and dig down in sandy soils to where they can absorb soil moisture and remain cool. Sirens can survive periods of drought by aestivating in dried mud and forming a cocoon of dried skin around themselves.

In the spring, the voices of frogs fill the night air over most of North America. Vocalization is the primary means of communication for almost all frogs. Each species has its own distinct repertoire of calls, generally given only by males. Male Gray Treefrogs and Cope's Gray Treefrogs, which are otherwise virtually identical, can be readily distinguished in the wild by their calls. Among North American species, only the two species of tailed frogs make no vocalizations. The songs of male frogs are produced by the passage of air rapidly back and forth over the vocal chords between the lungs and the buccal cavity. The mouth and the nostrils are kept closed while the frog is calling, enabling some species, such as Columbia Spotted Frogs, to call while under water. Most species of frogs have expandable vocal sacs that serve to increase the volume of sound and radiate it outward. With few exceptions, salamanders are silent and identify each other by scent rather than sound.

All species of North American amphibians lay eggs. Fertilization of the eggs may be either external, as in Hellbenders and most frogs, or internal, as in the tailed frogs and most salamanders. With external fertilization, the male applies sperm to the eggs as they are being laid. When frogs mate, the male clasps the female with his forearms in an embrace called amplexus. Tailed frog and spadefoot males grasp their partners around the waist. Males of other species clasp the female behind her forearms. Among frogs, only tailed frogs employ internal fertilization, and among amphibians, only tailed frog males possess a copulatory organ. Most salamanders practice internal fertilization by means of a sperm capsule, called a "spermatophore," which the male lays and the female picks up with her cloaca. This procedure often involves an elaborate mating ritual that enables salamanders of the same species to recognize each other, and position themselves so that successful sperm transfer can occur.

Amphibian eggs do not have hard protective shells, and the embryos do not grow fluid-holding external membranes. They are surrounded only by a transparent jelly coat and must either be laid in the water or be hidden in moist places on land to protect them from drying. Most North American amphibians lay aquatic eggs and hatch as tiny, gilled, tadpoles or larvae. Many species of frogs will lay thousands of eggs at a time. The larval stage may last from several weeks to several years, depending on the species, before the animal metamorphoses

North America and Hawaii, political, showing U.S. states and Canadian provinces.

into its adult form. Some species of salamanders, though, retain their larval appearance their entire life and will reach sexual maturity while still in larval form. This condition is called "neoteny" and is characteristic of sirens, Mudpuppies and many cave-dwelling species. In some populations of Northwestern Salamanders, tiger salamanders, and giant salamanders, individuals are also frequently neotenic. On the other hand, many terrestrial plethodontid salamanders, such as Ensatinas slender salamanders, and slimy salamanders, and many tropical and subtropical frogs, including the chirping frogs and robber frogs, bypass the free-living larval stage by going through direct development to the adult form while within the egg. The young of these species hatch as tiny replicas of their parents. Parental care is commonplace among these direct-developing species, which all lay their eggs in moist places on land. Either the female or the male parent tends to the eggs, keeps them moist with its own body, and eliminates dead or diseased eggs by eating them. If a tending adult is removed from a clutch of terrestrial amphibian eggs, the eggs have a much-reduced chance of survival.

Amphibians play an important role in the energy flow of ecosystems as small, abundant predators and aquatic herbivores and detritivores. The tadpoles of frogs consume aquatic plants, detritus, and carrion, but when they grow and transform into adults they become carnivores. Salamanders and their larvae are strictly carnivorous throughout life. Amphibians consume large numbers of insects, worms, or other invertebrates and, in turn, serve as a food source for snakes, raccoons, birds, or other larger predators. The great abundance of amphibians thus forms an important link in the food chain.

No amphibian is directly harmful or dangerous to humans, but humans, directly and indirectly, are having an enormous impact on amphibians. Recent indications of widespread amphibian population declines have raised great concern about North American amphibians and greater awareness of the difficulties they may face in a world where the human footprint is increasingly heavy. Habitat loss due to land clearing for urban development, agriculture, logging, and other reasons, is a major threat to amphibians. Water development and drainage projects such as dams or canals can destroy habitat by scouring stream banks, inundating habitats, eliminating ponds and marshes, and causing drought during critical periods of amphibian development. Other problems for amphibians result from introduced animals, including stocked fish, which may be brought in for commercial or recreational purposes without regard to their ability to outcompete native animals, feed on them, or transmit diseases. Human disturbance of streams and ponds can lead to increased siltation that can smother eggs and larvae. Increasing automobile traffic and roads result in an increased incidence of road kills and fragmentation of habitats. Amphibians are also disappearing from near-pristine areas where there is no visible disturbance. Chemical contamination from acid rain and contaminated snowmelt runoff, heavy metals leaching from mining operations, fertilizers and pesticides, and chemicals used in road maintenance and construction may harm amphibians directly or cause a host of sublethal effects on the animals' health. No cause is more insidious in the demise of populations of some North American frogs than an emerging disease caused by a recently recognized chytrid fungus. Though declines and extinctions occur naturally in all animal populations, in recent years there have been both declines in amphibian abundance and losses of amphibian populations altogether.

THE NORTH AMERICAN CONTINENT

The geologic formation of North America dates back nearly 2 billion years, when the ancient, stable crust of the Canadian Shield coalesced from four disparate continental fragments, or cratons, and fused with the equally ancient Precambrian crust that underlies the present-day northern Great Plains. These vast, flat expanses of ancient rock are exposed in the northeast, where they were scraped clean by the comparatively recent continental ice sheets of the Pleistocene, beginning a mere 2.5 million years ago, but toward the south they are overlaid with layer upon layer of sedimentary rocks dating back over 600 million years.

Between 600 million and 250 million years ago, this early North America was located close to the equator, and much of it was submerged. In these shallow seas, ancient corals grew and their remains resulted in thick accumulations of limestone. Because limestone will slowly dissolve in water, over time such limestone, or karst, regions become riddled with subterranean passages, caves and water-filled aquifers. This is the origin of the underground waters and springs of the southeastern U.S., in which many species of cave-dwelling and wholly subterranean salamanders now live.

The mountains that surround the central plain of the continent first began to rise 400 million to 300 million years ago, when North America collided with other continents to form the ancient supercontinent of Pangaea. Where the northeast-facing margin collided with northwestern Europe, the Arctic Cordillera took shape. Where the south-facing margin collided with South America, there formed the Ouachita and Ozark Mountains. And where the southeast-facing margin collided with northwestern Africa, ridge after ridge of the Appalachians rose, including the Blue Ridge Mountains to the southeast, the Cumberland, Allegheny, and Adirondack Mountains to the northwest, and the Appalachian Valley and Ridge region in between. All of these ancient mountain ranges have been well worn down by now and the various ridgetops of the Ozarks, Ouachitas and Appalachians today are rich in species of amphibians, particularly salamanders.

The mountain ranges that formed along the western margin of the continent are much younger, and higher, than the Ozarks, Ouachitas, and Appalachians. About 180 million years ago, North America began to drift westward over the floor of the Pacific Ocean. As it went, it sheared rocks off the Pacific Plate, which accreted in successive ridges onto its western edge. The process also resulted in chains of volcanoes just inland of the western margin of the continent. This process continues today, resulting in the great chain of upthrust sedimentary rocks known as the Rocky Mountains and the arc of coastal volcanoes stretching from the Aleutian Islands through the British Columbia Coast Mountains and the Cascades Range to the Sierra Nevada of California. In between these two long mountain chains lies a region of stretched and crumpled continental crust know as the Basin and Range Province. These comparatively new, dry, and rugged regions are home to only a small number of species of amphibians.

The westward drift of North America that created the Rocky Mountains and coastal ranges also created the Atlantic Ocean and the Gulf of Mexico as Pangaea split apart. This has given the continent its low-lying Atlantic and Gulf Coastal Plains, interrupted by the Mississippi River. Many species of amphibians, especially frogs, have overlapping ranges along these coastal plains such that more species can be found living in the same place than in any other region of the continent.

GLACIATION

The primeval origins of North America's plains, mountains, waterways, and valleys set the stage for the animals and plants living here today. But the current distributions of amphibians in North America are profoundly related to geologic events much more recent than the accretion of cratons, the drift of the continent, and the rise of its mountains. Beginning about 2.5 million years ago, northern North America entered a cycle of periodic episodes of glaciations, when colossal ice sheets covered half the continent. The most recent glacial maximum was about 18,000 years ago. At that time, ice sheets as much as 4 kilometers thick spread from the Laurentian Mountains and the Canadian Cordillera to cover virtually all of present-day Canada and the Great Lakes basin. So much of the earth's water was frozen into continental ice sheets that the global mean sea level was 120 meters lower than

Pleistocene North America during the most recent Wisconsinan glacial maximum, 12,000 to 15,000 yrs ago. Image copyright Ron Blakey, Colorado Plateau Geosystems, used with permission.

it is today. The recession of this blanket of ice took place from about 13,000 to 6,000 years ago, leaving behind easily visible signs of the immense power of the ice sheets. The movement of the ice scoured the Canadian Shield to leave smooth, bare bedrock surfaces and ice-cut rock basins that are now filled by innumerable lakes. The debris carried off by the glaciers was deposited to the south, most visibly as a great terminal moraine, a line of hills marking the furthest extent of the ice. Once the tremendous weight of the ice had been lifted from the crust, the land began to rise, and it is still rising to this day. Sand hills on the coastal plain were once beaches by the sea; they are now stranded inland as the plain slowly rose over thousands of years. Meltwaters of the receding ice formed immense, but ephemeral, proglacial lakes. Surrounding each of the modern remnants of these lakes—Lake Winnipeg, Lake Athabasca, Lake Champlain, and many others—are similar lines of sand hills that mark their ancient beaches. Salt flats throughout today's western deserts are the dried remains of Pleistocene lakes.

No amphibian could possibly survive where there was such ice. Consequently, all amphibian populations currently living in previously glaciated North America arrived there within the past 6,000 years or so and all are descended from populations that had survived south of the ice. However, they did not necessarily need to find refuge very far south of the ice.

Though the climate was undeniably cooler during a glacial episode than it is during today's interglacial period, it need not have been profoundly cold. All that was necessary for the ice sheets to form was for the climate to be cold enough at their centers of origin for winter snows to remain unmelted during summer. Each succeeding winter, more and more snow could then accumulate. The compressed snow became ice, and the thick ice began to flow. The kilometers-thick ice sheets of the Pleistocene flowed far to the south from their centers of origin, but the cool climate that made them remained in the north. During the time of the glacial maximum, it is probable that many northerly distributed species of amphibian—such as Wood Frogs, Spotted Salamanders, and Western Toads—survived just kilometers away from the ice.

To the south of these ice sheets, the ranges of widespread amphibians were more restricted than they are today, and many glacial-era refuges were located on either side of mountain ranges, particularly the Appalachians and Pacific Coast Ranges. The repeated range restrictions caused by the advance and retreat of the ice sheets are the origins of different genetic lineages observed within many species today, including divisions between closely related species. This has resulted, for instance, in the differentiation of Coastal Tailed Frogs, Coastal Giant Salamanders, and Van Dyke's Salamanders, located in the Cascades Range and Coast Mountains, from their close relatives, Rocky Mountain Tailed Frogs, Idaho Giant Salamanders, and Coeur d'Alene Salamanders, found in the Rocky Mountains. The northern shift of ranges following the retreat of the ice also left behind isolated populations of amphibians in shrinking patches of suitable habitat. These glacial relicts include Wyoming Toads, Houston Toads, Vegas Valley Leopard Frogs, various species of slender salamanders, and others.

Despite their intolerance of seawater, amphibians today inhabit many offshore islands. The presence of toads, frogs, and salamanders on Vancouver Island, the California Channel Islands, the Barrier Islands of North Carolina, Long Island, and Martha's Vineyard indicates that overland connections to the mainland existed during the time of Pleistocene glaciation. No amphibians are native to the Island of Newfoundland or Anticosti Island, though, as these islands became separated from the mainland before amphibians could reach them following the retreat of the ice.

CLIMATE AND AMPHIBIAN DISTRIBUTION

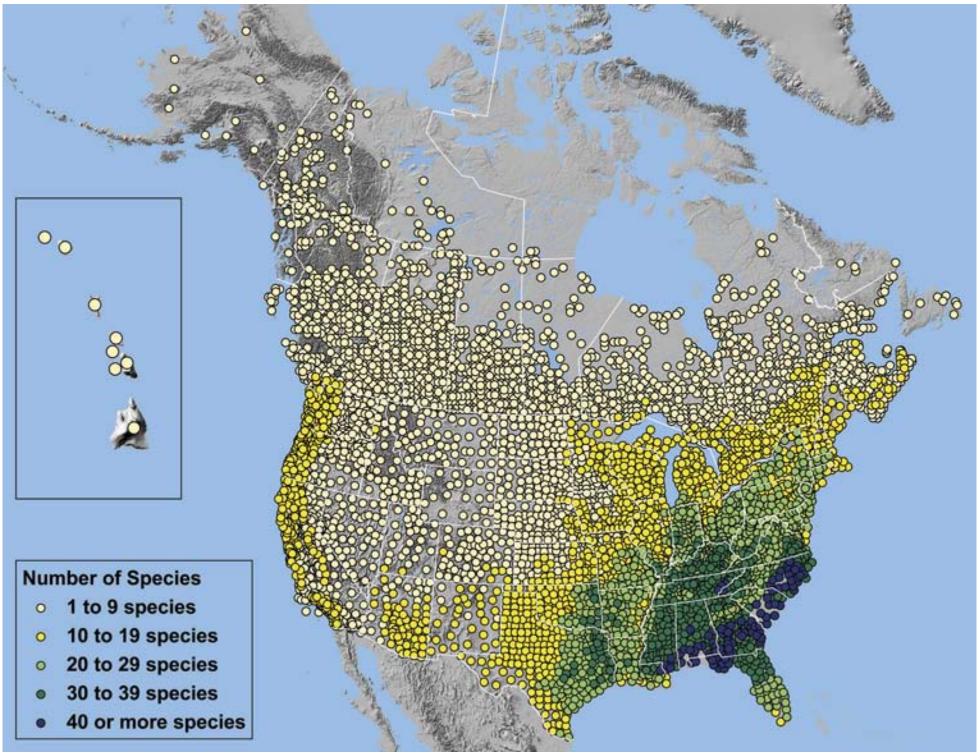
Amphibians, attuned as they are to temperature and moisture, are profoundly influenced by climate. North America is enormously wide and is located at latitudes where most weather systems move from west to east, propelled by the upper jet stream that snakes across the continent. In general, North American weather systems reach the West Coast laden with moisture picked up from the Pacific Ocean. As these wet air masses rise over the Coast Ranges along the Pacific Coast, they cool and lose their moisture as precipitation. This results in the warm, wet weather and moderate climate of the maritime west coast forests, which are dominated by the largest trees in North America. The gigantic redwoods and western red cedars that grow in these forests along the north coast of California are replaced by Douglas firs and western hemlocks in Oregon, Washington, and British Columbia that are almost as large. Rough-skinned Newts, the torrent salamanders, Northern Red-legged Frogs, and Coastal Tailed Frogs flourish in this environment. To the south, in coastal southern California, the ameliorating effects of the wet westerly winds are confined largely to wintertime. The summers are hot and arid, under the influence of dry air masses that expand out from the desert inland. This is a Mediterranean climate that fosters an open scrub forest of chaparral, evergreen oaks, yellow pine, and sagebrush. In this region live the slender salamanders, Arboreal Salamanders, Western Spadefoots, and Arroyo Toads.

As the westerly winds crest the mountains and descend into the western intermontane basins and valleys, they have been wrung free of most of their moisture. In this shadow of the mountains, from the Okanagan Valley of south-central British Columbia through the Great Basin to the arid lands of Arizona and New Mexico, there is desert. Drought-tolerant plants as sagebrush and bunchgrasses cover the high deserts toward the north, whereas the low-lying southerly deserts feature heat-tolerant yucca, saltbush, mesquite, and cacti of many varieties. This is a harsh environment for amphibians, but Great Basin Spadefoots, Arizona Toads, and Canyon Treefrogs make their homes here.

The high inland mountains in the northwest also force the weather systems further upward, resulting in an interior wet belt in more northerly latitudes. These northwestern mountain forests are made up of cedar and Douglas fir on the wet western slopes, lodgepole pine and white spruce on the dry eastern slopes, and Sitka and Engelmann spruce at higher elevations up to the tree line. In these forests, there are Western Toads, Columbia Spotted Frogs, Coeur d'Alene Salamanders, and Long-toed Salamanders.

Once across the Rockies, the westerly air masses descend again over the Great Plains and prairies of the continent's central and southern interior. These vast grasslands fill the midsection of the continent from the Canadian prairie provinces of Alberta, Saskatchewan, and Manitoba south to Texas, separating North America's western mountains from its eastern forests. The dry, western Great Plains are covered by short grass prairie vegetation consisting mainly of bunchgrasses and sagebrush, but in the river valleys and coulees cut by smaller streams, more luxurious vegetation and trees can grow. The eastern plains are more humid, and its rich soil supports a dense tall grass prairie of bluestem grasses, indiangrass, and switchgrass, along with a profusion of wildflowers and berry bushes. The Great Plains are inhospitable for most amphibians. Plains Spadefoots, Great Plains Toads, Canadian Toads, and Plains Leopard Frogs are found associated with coulees and prairie pothole ponds but, except for the blind, cavern-dwelling salamanders of the Edwards Aquifer in west-central Texas, the only salamander of the plains is the Western Tiger Salamander.

In the southeast of the continent, to the east of the Great Plains, the westerly winds once again bring moisture as warm, humid air moves up from the south in spring and summer from off the Gulf of Mexico. This combination brings rains and a moderated climate to the Appalachian Mountains and their surrounding interior and coastal plains, and fosters the growth of the great eastern temperate forests. These mixed forests contain both



Amphibian species density in North America and Hawaii.

hardwood deciduous trees, such as maples, beeches, oaks, hickories, poplars and birches, and softwood coniferous trees, such as pines and hemlocks. Toward the south, the forests increasingly contain more subtropical trees, such as pawpaws, myrtles, magnolias, laburnums, mimosas, live oaks, and gum trees. Regions of dry, sandy soils that are a legacy of glacial-era drainage patterns are covered by pines. The rich, humid conditions of the eastern forests are ideal for amphibians, and it is in these regions where most of North America's amphibian species are found. The lowlands support a profusion of mole salamanders, amphiumas, waterdogs, treefrogs, gopher frogs, chorus frogs, and cricket frogs. On the Atlantic and Gulf Coastal Plains, more amphibian species can be found in any one place than anywhere else on the continent. The eastern, forested mountains, though, are the empire of salamanders. On virtually every ridge and mountain crest there will be at least one species of small woodland salamander such as a Northern Zigzag Salamander, a large woodland salamander like Jordan's Salamander, a brook salamander such as the Southern Two-lined Salamander, a species of slimy salamander, and several species of dusky salamanders of varying sizes, along with an assortment of frogs, toads, treefrogs, mole salamanders, and newts.

The only truly tropical wet forests in North America are the hardwood hammocks of southern Florida. These small patches of tropical vegetation, featuring strangler figs, mahogany trees, palms, gumbo limbo trees, bromeliads, and orchids, are scattered throughout the marshland of the Everglades like islands of rainforest in a sea of sawgrass. Despite their lushness, these hammocks have few amphibians, mainly treefrogs. Various aquatic amphibians, such as dwarf sirens, Eastern Newts, and Pig Frogs live in the surrounding marshes.

In the north of the continent, the influence of the westerly winds is weak. Instead, the major climatic force is the cold, dry air of the Arctic, which descends south in winter, particularly through the flat, central interior of the continent. In the plains of the far north and northeast, where the arctic air supplies only a light coat of winter snow and a meager fall of summer rain, there is tundra. The intense cold of the winter and shortness of the summer in these regions keeps surface water from easily draining over the flat land. The result is a marshy plain, underlaid with permafrost, where trees cannot grow. Amphibians, too, are stymied by the tundra, except for Wood Frogs, which are able to venture out onto its southern rim. Just south of the tundra, though, and crossing the continent in a great, unbroken swath from the Bering Sea to the Atlantic Coast of Canada, is the boreal forest of North America. This is a forest of conifers, including spruce and balsam fir, jack pine, and tamarack, and all of it is on previously glaciated terrain. Like the forest, amphibians such as Spring Peepers, American Toads, Mink Frogs, Wood Frogs, and Blue-spotted Salamanders that inhabit North America's boreal region are new arrivals following the retreat of the Pleistocene ice sheets.

Humans are the most recent influence on the distribution of North American amphibians. Many species have been introduced to localities outside their native range, sometimes deliberately. American Toads and Northern Leopard Frogs were introduced into Newfoundland. Pacific Treefrogs were brought to the Queen Charlotte Islands from the adjacent mainland by someone who liked to hear them sing. American Bullfrogs and Green Frogs were introduced in many parts of western North America in the early 20th century as stock for frog farms. The frog farms failed, but the frogs remain and have since become well-established invasive species. Wandering Salamanders may have come to Vancouver Island in the late 19th century as stowaways on oak-bark shipments from northern California. Seal Salamanders, Shovel-nosed Salamanders, and Black-bellied Salamanders, marketed as "spring lizards" and sold as fish bait, now occur in many localities outside their natural ranges. Cane Toads, Coquís, Green and Black Dart-Poison Frogs, and Greenhouse Frogs were introduced on many of the Hawaiian Islands and in southern Florida, where they are well established and even considered to be pests.