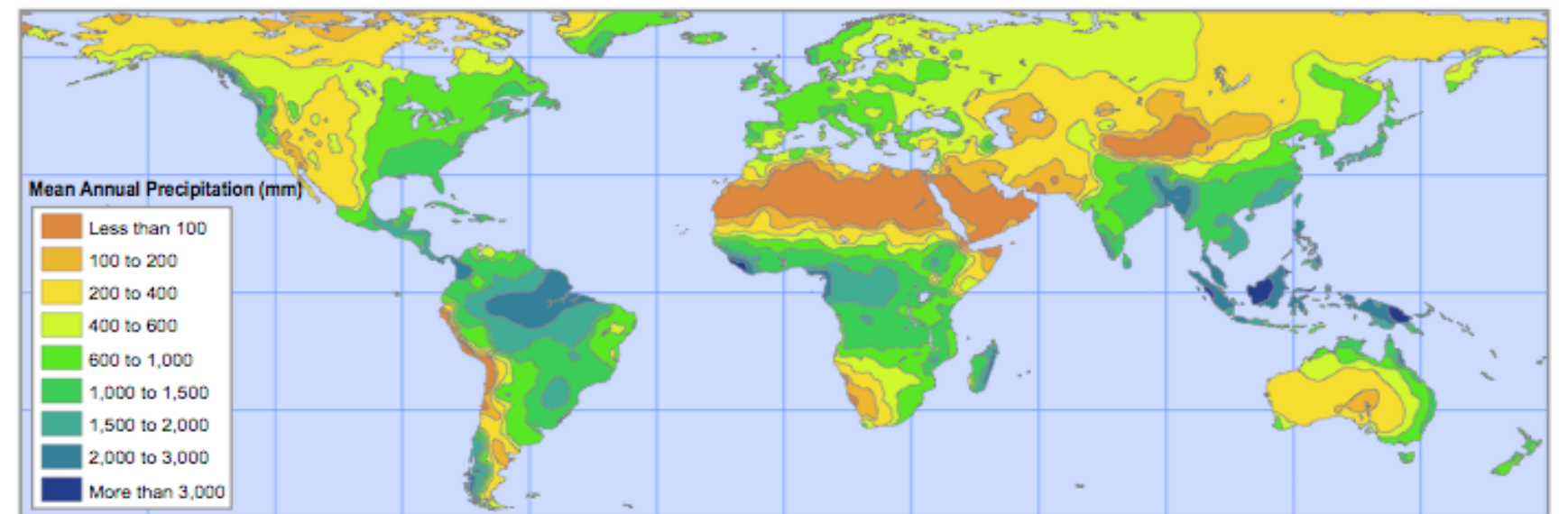
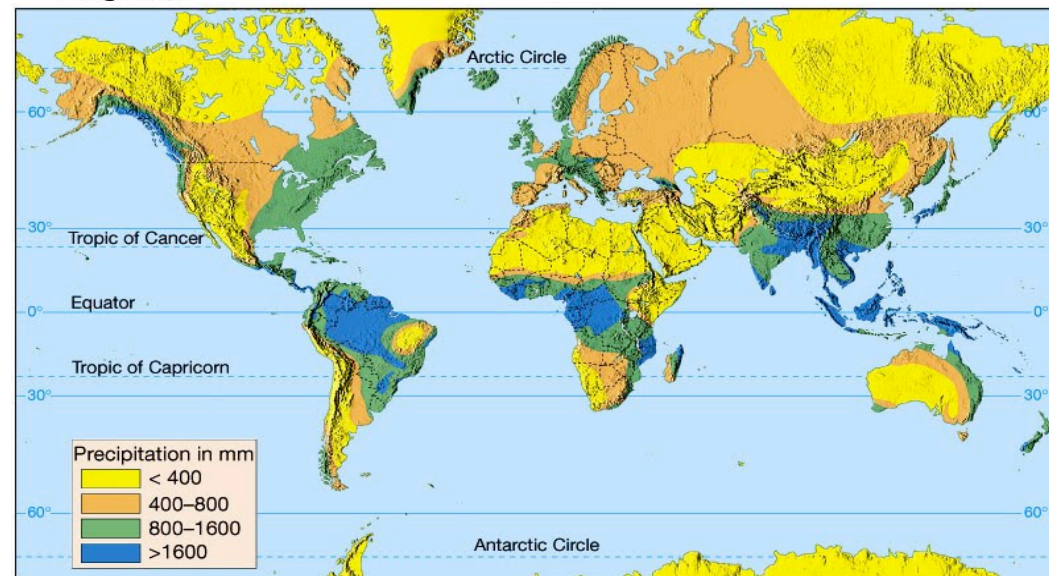
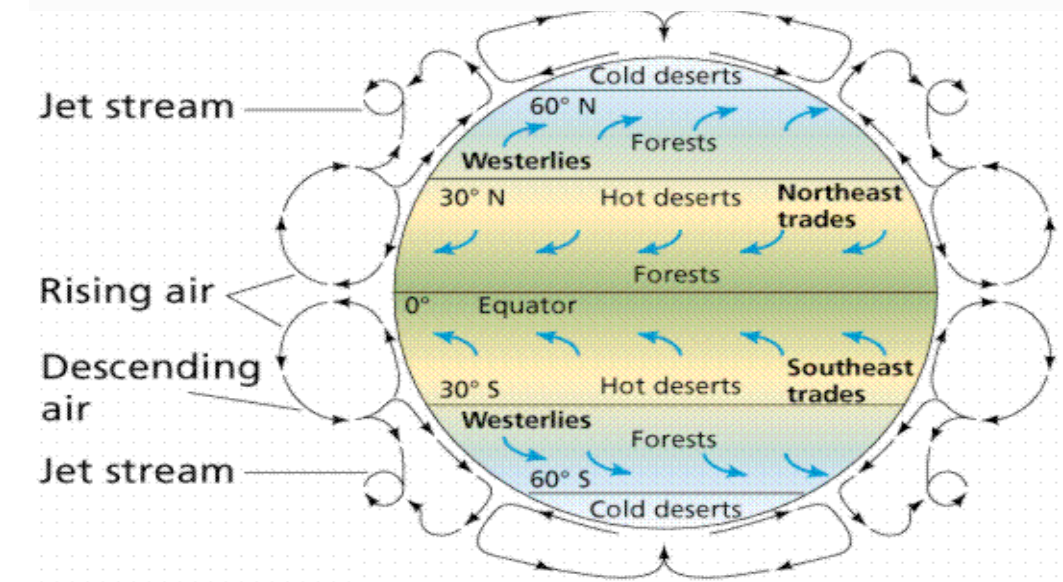
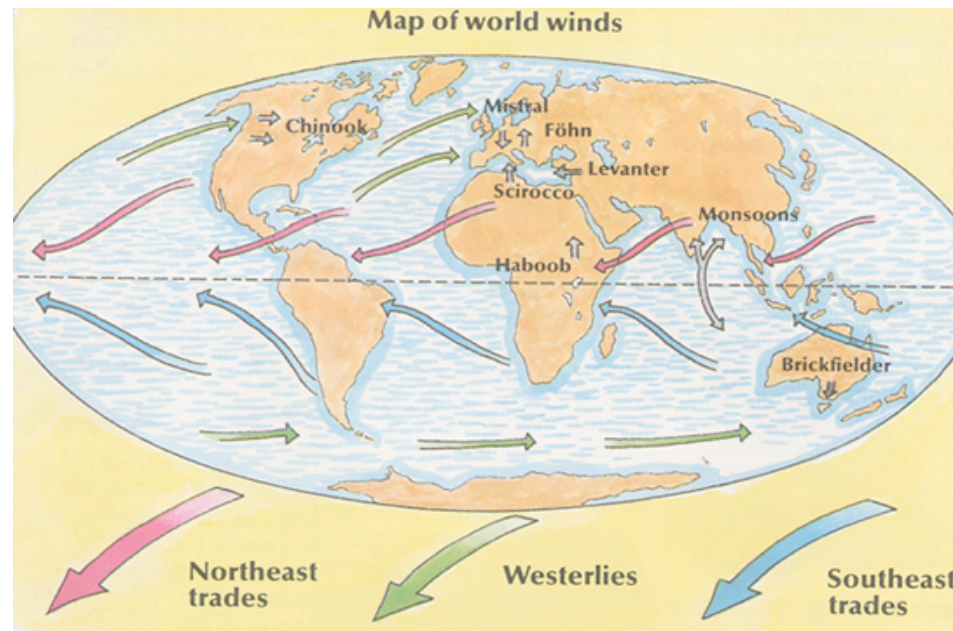
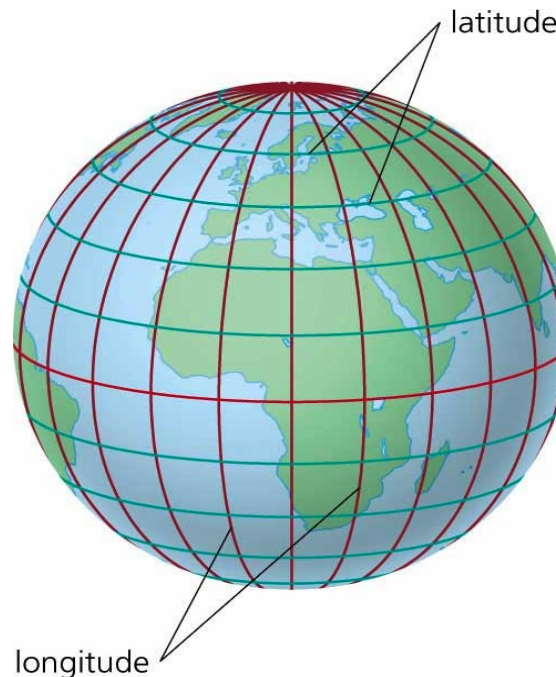
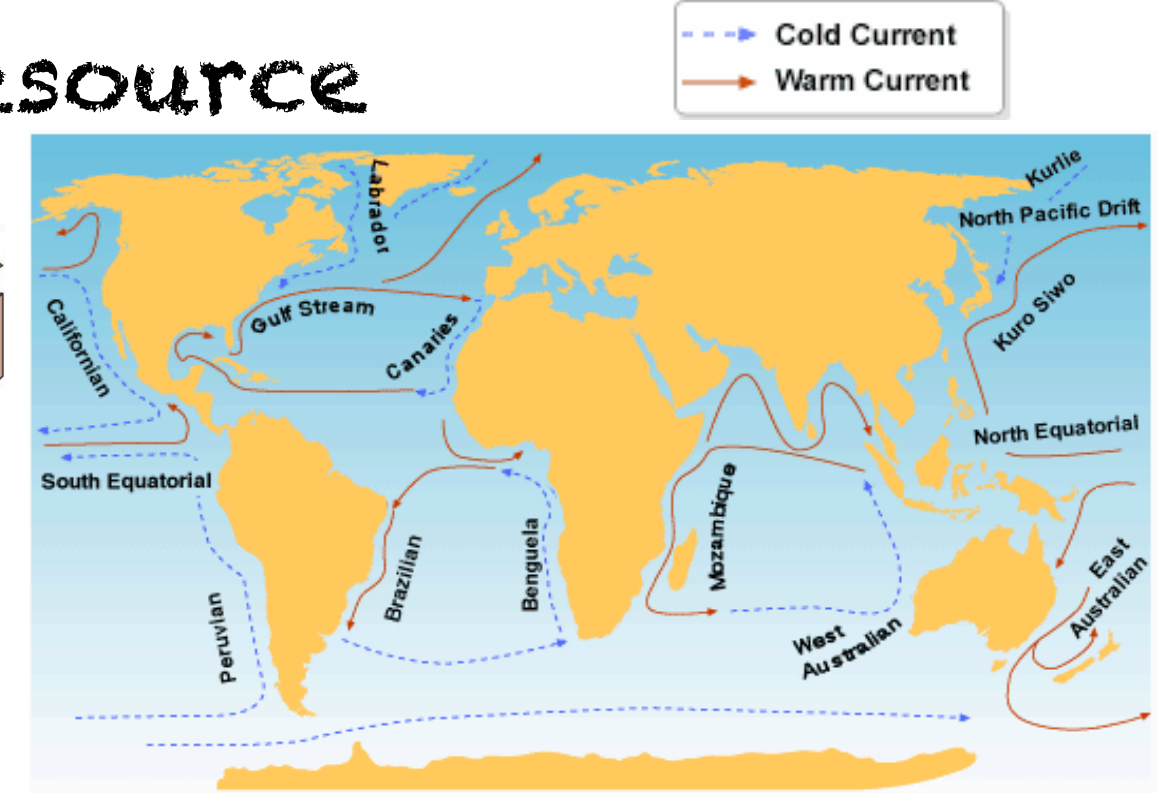
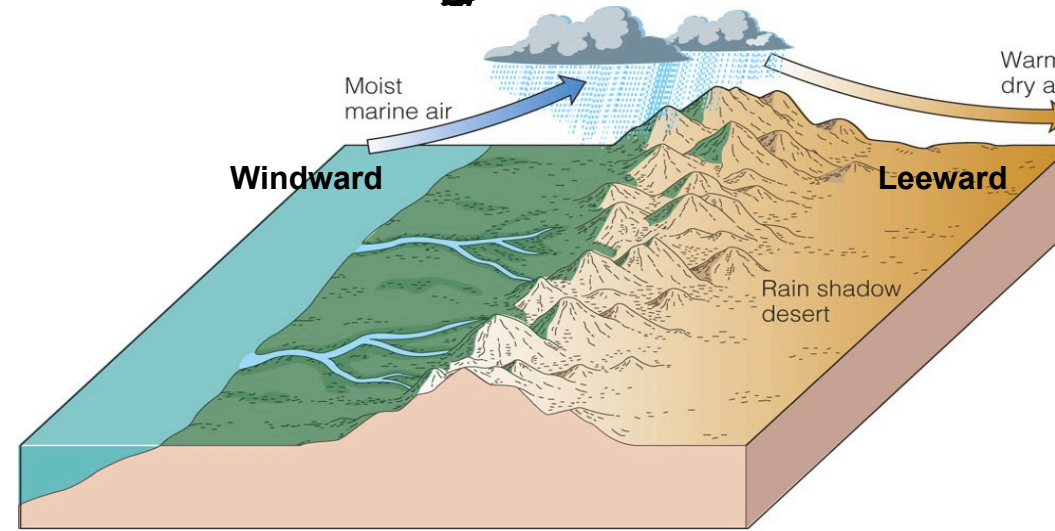
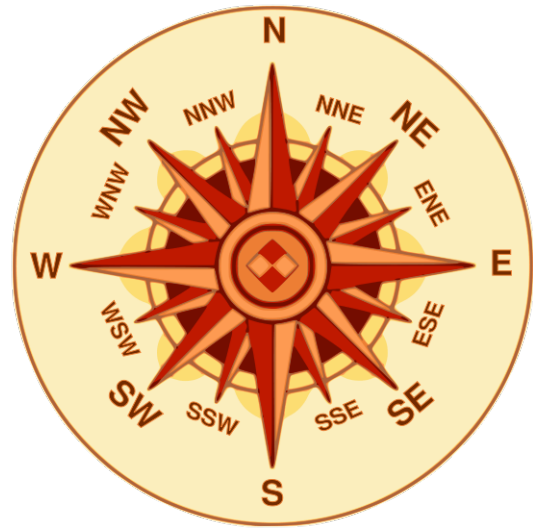
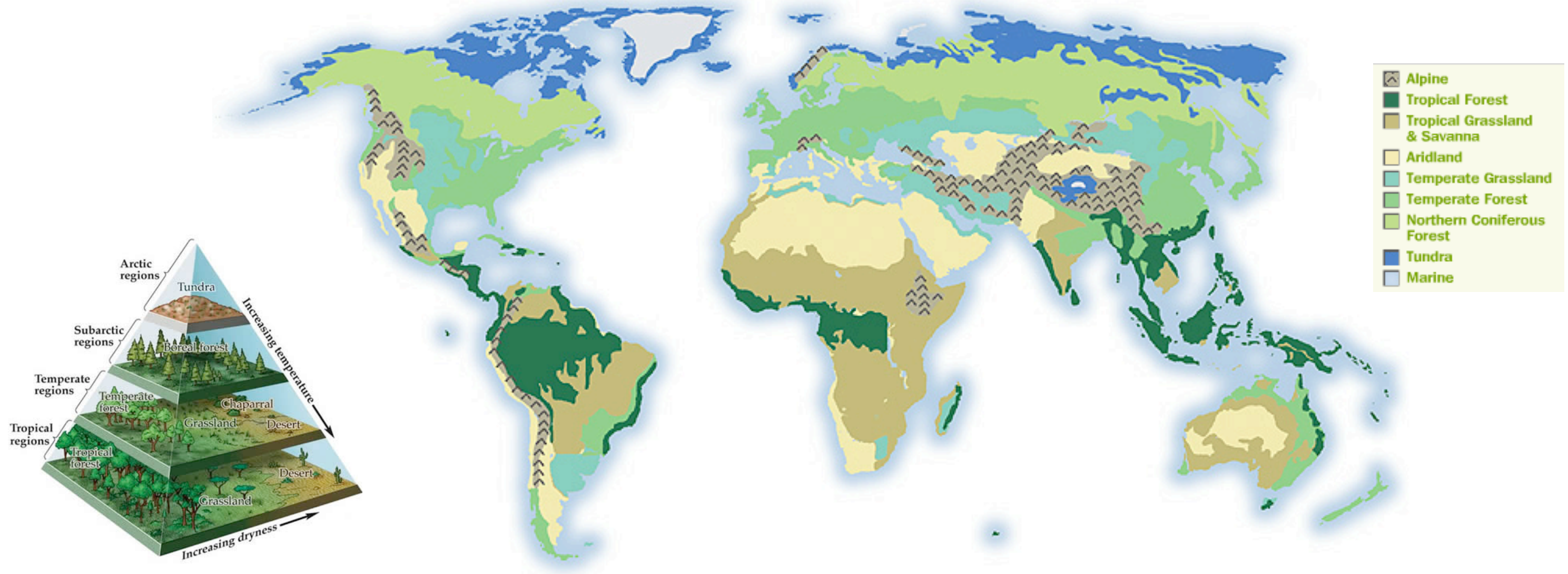



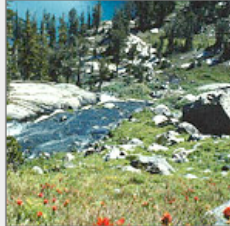







# Imaginary Island Resource

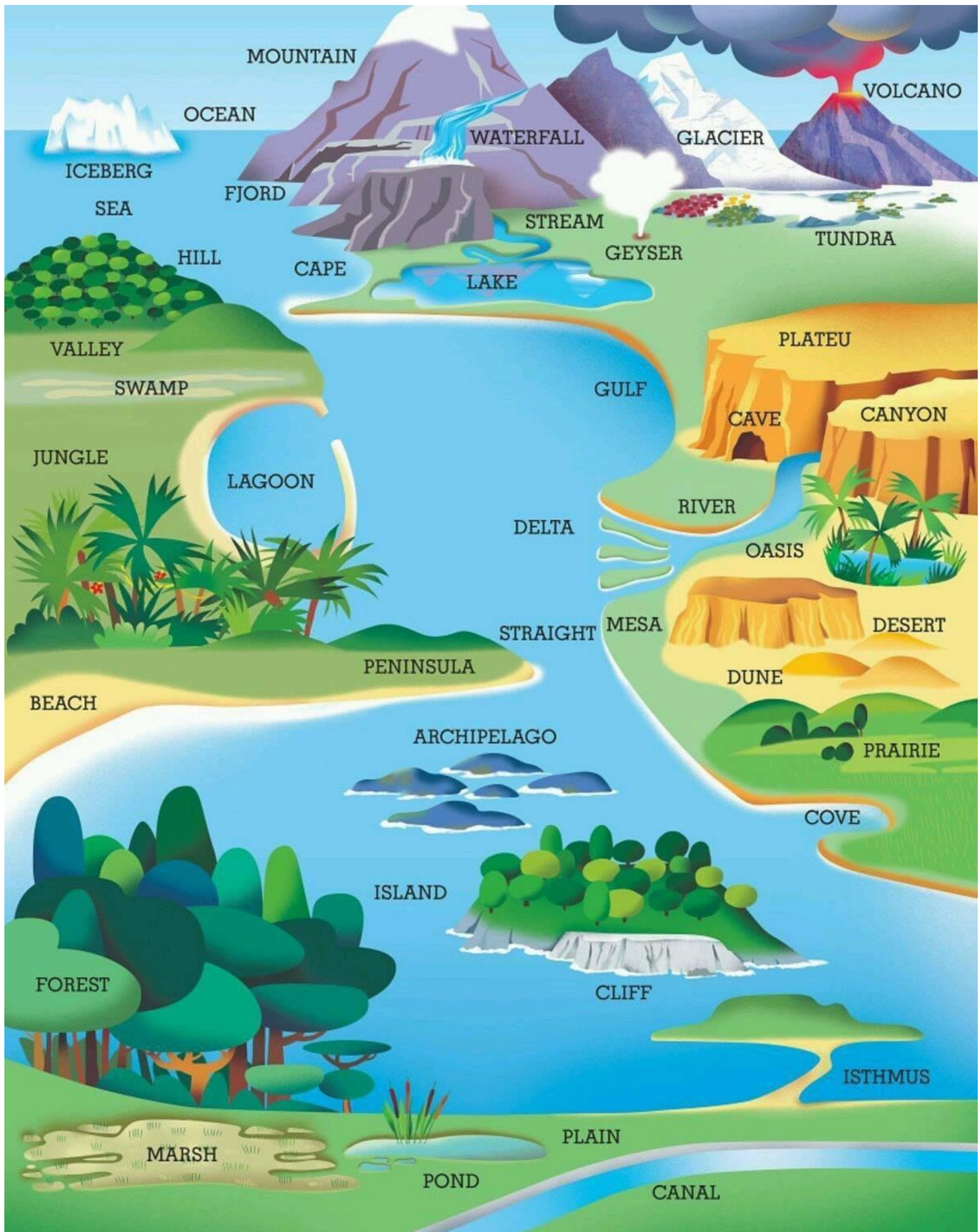







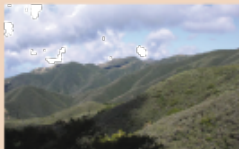

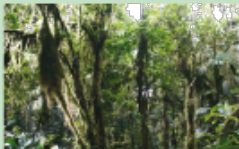

# Imaginary Island Resource



## BIOMES OF THE WORLD

Tropical Rainforest	Mountain/Alpine	Tropical Grassland	Temperate Grassland	Temperate Forest	Coniferous Forest	Tundra/Taiga	Marine/Ocean	Desert/Aridland
								
Equatorial rain forests and tropical seasonal semi-evergreen forests both receive considerable amounts of rainfall. Only the seasonal forests, however, also experience significant dry seasons.	The climate of this high-altitude biome varies according to the elevation. Location determines the altitudes at which the tundra conditions occur.	In spite of a wide range of rainfall accumulation, soil types and drainage play a major role in supporting similar types of vegetation throughout the various regions of this biome.	Warm, even temperatures coupled with low rainfall favor the dominance of grasses over trees and shrubs in these large, predominantly flat areas.	Even rainfall and a long growing season characterize this temperate biome, which supports deciduous and mixed forests.	Drier than temperate forest, the taiga, or boreal forest, is known for a short, cool growing season and long, harsh winter.	Short winter days and strong uninterrupted winds characterize this biome's severe climate.	The great heat capacity of the oceans ensures relative uniformity in temperature, except near land. Surface waters, however, are often divided biogeographically by high, middle, and tropical latitudes.	This biome is made up of desert, chaparral, and tropical scrub forest. Low levels of rainfall, uninterrupted winds, drainage, and soil quality all contribute to this biome's sparse vegetation.
Mean annual rainfall: 24 to 93 inches (61 to 237 cm) Mean annual temperature: 77°F (25°C)	Mean annual rainfall: 9 inches (23 cm) Mean annual temperature: 24°F (-4°C)	Mean annual rainfall: 29 to 68 inches (74 to 172 cm) Mean annual temperature: 66°F (19°C)	Mean annual rainfall: 10 to 30 inches (25 to 75cm) Mean annual temperature: 50°F (10°C)	Mean annual rainfall: 29 inches (74 cm) Mean annual temperature: 48°F (9°C)	Mean annual rainfall: 18 inches (47 cm) Mean annual temperature: 33°F (0.5°C)	Mean annual rainfall: 7 inches (17 cm) Mean annual temperature: 19°F (-7°C)		Mean annual rainfall: 2 to 9 inches (4 to 23 cm) Mean annual temperature: 64°F (18°C)



Biome: Other Name(s)	Type of Climate, Growing Season, Soil Quality	Biodiversity, Common Plants, Common Animals
<p><b>Tundra:</b></p> <p>Arctic tundra (high latitudes)</p> <p>Alpine tundra (high altitudes)</p>	<p><i>Type of climate:</i> arctic, arid</p> <p><i>Growing season:</i> very short</p> <p><i>Soil quality:</i> Very poor</p>	 <p>Alpine tundra in the Alps Mountains of Switzerland in Europe</p>  <p>Arctic tundra on the northern coast of Alaska in the United States</p> <p><i>Biodiversity:</i> very low</p> <p><i>Plants:</i> mosses, grasses, and lichens; few herbaceous plants; no trees</p> <p><i>Animals:</i> insects; birds (summer only); no amphibians or reptiles; mammals such as rodents, arctic hares, arctic foxes, polar bears; caribou (summer only); mountain goats and chinchillas (alpine tundra only)</p>
<p><b>Boreal Forest:</b></p> <p>Taiga</p> <p>Northern conifer forest</p>	<p><i>Climate:</i> subarctic, semi-arid</p> <p><i>Growing season:</i> short</p> <p><i>Soil quality:</i> Poor</p>	<p><i>Biodiversity:</i> low</p> <p><i>Plants:</i> conifers such as cedar, spruce, pine, and fir; mosses and lichens</p> <p><i>Animals:</i> insects; birds (mainly in summer); no amphibians or reptiles; mammals such as rodents, rabbits, minks, raccoons, bears, and moose; caribou (winter only)</p>  <p>Boreal forest in central (inland) Alaska, United States</p>
<p><b>Temperate Deciduous Forest:</b></p> <p>Temperate hardwood forest</p> <p>Temperate broadleaf forest</p>	<p><i>Climate:</i> temperate, semi-humid</p> <p><i>Growing season:</i> medium</p> <p><i>Soil quality:</i> good</p> <p><i>Climate:</i> temperate, semi-arid</p> <p><i>Growing season:</i> medium</p> <p><i>Soil quality:</i> excellent</p>	<p><i>Biodiversity:</i> high</p> <p><i>Plants:</i> broadleaf deciduous trees such as beech, maple, oak, and hickory; ferns, mosses, and shrubs; many herbaceous plants</p> <p><i>Animals:</i> insects, amphibians, reptiles, and birds; mammals such as mice, chipmunks, squirrels, raccoons, foxes, deer, black bears, bobcats, and wolves</p>  <p>Temperate deciduous forest in Pennsylvania, eastern United States</p> <p><i>Biodiversity:</i> medium–high</p> <p><i>Plants:</i> grasses; other herbaceous plants; no trees</p> <p><i>Animals:</i> invertebrates such as worms and insects; amphibians, reptiles, and birds; mammals such as mice, prairie dogs, rabbits, foxes, wolves, coyotes, bison, and antelope; kangaroo (only in Australia)</p>  <p>Temperate grassland in Nebraska, midwestern United States</p>
<p><b>Chaparral</b></p> <p>Mediterranean scrub forest</p>	<p><i>Climate:</i> temperate, semi-arid</p> <p><i>Growing season:</i> medium</p> <p><i>Soil quality:</i> poor</p>	<p><i>Biodiversity:</i> low–medium</p> <p><i>Plants:</i> shrubs and small trees such as scrub oak and scrub pine</p> <p><i>Animals:</i> insects, reptiles, and birds; mammals such as rodents and deer</p>  <p>Chaparral in southern California, United States</p>
<p><b>Desert</b></p>	<p><i>Climate:</i> temperate or tropical, arid</p> <p><i>Growing season:</i> varies</p> <p><i>Soil quality:</i> very poor</p>	<p><i>Biodiversity:</i> none–low</p> <p><i>Plants:</i> plants adapted to dryness, such as cacti, sagebrush, and mesquite; virtually no plants if extremely arid</p> <p><i>Animals:</i> insects, reptiles, and birds; mammals such as rodents and coyotes</p>  <p>Desert in southern California, United States</p>
<p><b>Tropical Rainforest</b></p>	<p><i>Climate:</i> tropical, humid</p> <p><i>Growing season:</i> year-round</p> <p><i>Soil quality:</i> excellent</p>	<p><i>Biodiversity:</i> very high</p> <p><i>Plants:</i> tall flowering, broadleaf evergreen trees; vines and epiphytes; few plants on forest floor</p> <p><i>Animals:</i> insects, amphibians, reptiles, and birds; mammals such as monkeys, sloths, leopards, jaguars, pigs, and tigers</p>  <p>Tropical rainforest in Ecuador, South America</p>
<p><b>Tropical Grassland</b></p> <p>Savanna</p>	<p><i>Climate:</i> tropical, semi-arid</p> <p><i>Growing season:</i> year-round</p> <p><i>Soil quality:</i> poor</p>	<p><i>Biodiversity:</i> low–medium</p> <p><i>Plants:</i> grasses; scattered clumps of trees</p> <p><i>Animals:</i> insects, reptiles, and birds; mammals such as zebras, giraffes, antelopes, lions, cheetahs, and hyenas</p>  <p>Elephant browsing on the leaves of an acacia tree in savanna in Kenya, eastern Africa</p>

# Imaginary Island Resource

## MOUNTAIN/ALPINE BIOME

Climbing a mountain is like traveling northward: For each 650-foot (200-m) -rise in elevation, the average temperature drops about two degrees Fahrenheit (1°C). This is because the atmosphere becomes thinner the farther away it is from Earth's surface and thinner air is able to hold less heat. As well, cold air holds less moisture than warm air, so as air rises and cools, it gets drier, causing biomes to gradually change with elevation, in some cases paralleling the shift in biomes — from rain forest to temperate deciduous forest to coniferous forest to tundra — that occurs as one travels from the equator to the north pole.

Another factor that contributes to the change in climate is the effect of mountains on trade winds. When trade winds carrying clouds are forced upward by mountains, they release rainfall at higher levels. In the tropics and subtropics, when the mountains intercept warm, moist air from the sea, a "cloud forest," or montane rain forest, may be created, typically at sixty-five hundred to ten thousand feet (2,000 to 3,000 m). Unlike the vegetation of a tropical rain forest, which is characterized by a tall canopy, the vegetation of a cloud forest is dominated by short, crooked trees, mosses, masses of epiphytes, and a rich ferny understory.

Above this moist belt of vegetation lies the alpine tundra. The point where this line begins varies greatly according to the climate of the region. For instance, on certain mountains in Scandinavia, the tundra line occurs at altitudes of two thousand feet (600 m), while on mountains in Venezuela near the equator, the tundra line occurs at about thirteen thousand feet (4,000 m). At these heights, strong, uninterrupted winds create chill factors of devastating proportions. The miniature juniper forests of the Colorado Rockies are good examples of trees on the "front lines" of the alpine tundra. Twisted and bent by wind and ice, the junipers actually shift position, loosening and regaining their grip on rock.

The mammals that inhabit the higher altitudes deal with cold in a variety of ways. The larger ones, such as the mountain sheep (*Ovis canadensis*) and its predator the mountain lion (*Felis concolor*), descend to warmer pastures in the autumn, while many smaller mammals hibernate or take shelter. For instance, the meadow vole (*Microtus pennsylvanicus*) is active year-round, inhabiting a labyrinth of burrows under the snow. For these mammals, survival in low temperatures means maintaining a very high metabolic rate.

Large size is a more economical way to combat the cold. A greater overall mass in relation to surface area means valuable heat is more effectively retained. Size combined with thick fur insulation enables alpine species such as the mountain goat (*Oreamnos americanus*) to inhabit regions above the tree line year-round. Specialized hooves aid such mountain ungulates in coping with rocky terrain and steep cliffs. Those of the mountain goat are almost pincerlike. They open and close, serving as brakes during a descent or as a grip on a rocky ridge. A textured, cushioned foot pad provides the hoof with secure, suction-cuplike traction.

Finally, as any climber knows, the rarified oxygen content of thin mountain air poses breathing challenges. In response to this, the Andean vicuña (*Vicugna vicugna*) has developed a form of hemoglobin with an enhanced affinity for oxygen. This trait, coupled with its remarkably thick fur, makes the vicuña one of the highest-living mammals, inhabiting lofty alpine summits more than sixteen thousand feet (5,000 m) up.

**Some Mammals:** Alpine Marmot, American Pika, Dall Sheep, Hoary Marmot, Ibex, Mountain Goat, Snow Leopard, Yak

## TROPICAL FOREST BIOME

Tropical forests include both evergreen rain forests, such as the ancient forests of the Amazon basin, and seasonal deciduous forests, such as the dry eucalyptus forests of western Australia and Tasmania. Although many species are found in tropical deciduous forests, the greatest diversity of life exists in the true rain forest.

Different mammals thrive at different vertical levels in a tropical forest. Those of the canopy include insectivorous and fruit-eating bats, as well as primates, squirrels, and other climbing rodents. Their predators are likely to be snakes and raptors such as hawks and eagles.

Especially adapted to life in the trees are the monkeys, all of which can grasp and hold branches while in rapid motion. New World monkeys such as the spider monkey have the additional help of a prehensile tail — a tail that is also possessed by two rain-forest carnivores, the binturong and the kinkajou.

At ground level, anteaters, peccaries, capybaras, and the semi-aquatic tapir forage in the rich undergrowth, keeping an eye out for their felid predators — jaguars, clouded leopards, tigers, and ocelots.

**Some Mammals:** Bald Uakari, Brown-Throated Three-Toed Sloth, Cotton-Top Tamarin, Goodfellow's Tree Kangaroo, Jaguar, Kinkajou, Mandrill, Okapi, Red River Hog, Spotted Cuscus, Tasmanian Devil, Vested Anteater, White-Handed Gibbon

## TROPICAL GRASSLAND & SAVANNA BIOME

During dry winter months, tropical grasslands grow parched and their streams and pools dry up. With summer, however, comes rain, and the land is transformed by flourishing grasses and flowers.

Surprisingly, tropical grasslands are often found in regions with enough rainfall to support luxuriant tropical rain forests year-round. But extensive tree growth in these areas is discouraged by strong winds that blow across the flat land and by the fast-draining grassland soils. Where trees such as baobabs and acacias do grow, they tend to be scattered about; such grassland is called a savanna. Africa is renowned for savannas where giraffes browse on trees almost twenty feet (6 m) high. Another browser, the African elephant, munches on trees as well as bushes and grass. Scientists believe that the elephants may coordinate their eating patterns by signaling to each other in ultra-low pitches. At night during the dry season, these sounds can travel as far as twelve miles (20 km).

Other grassland wildlife includes zebras and blackbucks, ungulates that feed on grass and must cover vast distances in search of fresh green patches. Preying on these large herds of herbivores are carnivorous such as cheetahs, lions, hyenas, and hunting dogs.

The specialized feeding habits and preferences of most ungulates may reduce competition among species. For example, although herds of gnus consume about 80 percent of the grass growing in their path across the Serengeti plain during their annual migration, by the time the herds of Thomson's gazelles pass over the land a couple of months later, the grazed-over grass reveals fresh shoots — their preferred food.

**Some Mammals:** African Elephant, Blackbuck, Blue Gnu, Cheetah, Zebra, Baboon, Giraffe, Lion, Red Kangaroo, Hyrax, Gazelle, White Rhinoceros

## DESERT/ARIDLAND BIOME

Extreme temperatures and low rainfall typify the aridlands of the world. These regions range from the semi-arid scrub forests of the Middle East, which receive an annual rainfall of ten to twelve inches (25 to 30 cm), to the Asian Gobi Desert, where the driest areas receive less than three inches (8 cm) of rain per year. In between lie regions known as Mediterranean, where summer drought places heavy demands on the plant and animal species that live there.

Survival for most aridland plant life depends on an array of structures that gather and retain moisture, including extensive root systems, shiny succulent leaves that hold moisture, and even, in the case of the welwitschia of the Namib Desert, leaves with the ability to absorb humidity from nighttime mist.

Mammals, too, are ingeniously adapted to withstand the difficult conditions. The camel, for example, uses its hump to store fat, which, during prolonged dry periods, is metabolized to produce water. The body temperature of the camel and another large aridland mammal, the gemsbok, fluctuates rapidly in response to external temperature changes, allowing them to expend less energy staying warm when temperatures drop at night. Equally important, water is not wasted in cooling the body during the scorching heat of day.

Many small aridland mammals are nocturnal, responding to the heat by spending the day burrowed in soil or sand. Some, such as the lesser Egyptian jerboa, the African jird, and the Ord's kangaroo rat, have developed common physical traits to cope, showing convergent evolution at work. These rodents all have enlarged hindlegs and long tails to help them hop on shifting sands.

**Some Mammals:** Aoudad, Asian Wild Donkey, Porcupine, Desert Warthog, Edmi, Fennec Fox, Gemsbok, Greater Bilby, Guanaco, Kirk's Dikdik, Kit Fox, Meerkat, Short-Nosed Echidna

## TEMPERATE GRASSLAND BIOME

Today about a quarter of the Earth's surface that supports vegetation is made up of temperate grassland. While a large portion of this land was once forest and has been degraded to grass by human development, many original temperate grasslands still exist.

Perhaps the harshest of all grassland biomes are those of the Eurasian steppes and northwestern North America. Even so, despite the low winter temperatures, a rich summer growth of vegetation supports a variety of mammal species here, including ungulates — such as the saiga antelope and the pronghorn — that share a common ancestry with the antelopes and gazelles of Africa.

Many rodent species on the grasslands survive winter by tunneling into the soft, dry soil, where they hibernate and store food. Susliks and marmots in Eurasia and prairie dogs in North America make up a large percentage of these species and, in turn, support predators, including the coyote, which is widely distributed in North America, and the gray wolf, which is also distributed in Eurasia.

Mammals of the pampas grasslands of South America show some striking similarities to those found in grasslands of the northern hemisphere. The niches of the prairie dogs and coyotes, for instance, are here represented by the viscacha (*Lagostomus maximus*), another burrowing rodent, and the maned wolf (*Chrysocyon brachyurus*). Only distantly related to true wolves, this South American canid has unusually long legs, permitting it to bound above tall grass in search of prey.

**Some Mammals:** American Bison, Black-Footed Ferret, Black-Tailed Prairie Dog, Coyote, Pronghorn, Przewalski's Horse, Vicuña, Wild Boar

## TEMPERATE FOREST BIOME

There are far fewer species of trees in temperate forests than in tropical forests. Broad-leafed trees, such as oak, birch, chestnut, and maple, make up most of the trees in the southerly reaches. Farther north, colder temperatures encourage the growth of coniferous trees, such as pine, redwood, hemlock, and cedar.

Seasonal contrasts mark this biome; summers are generally warm, and winters are cold, often below freezing, forcing some mammals to hibernate or migrate. Rainfall is often more evenly distributed throughout the year, and in some regions, such as northeastern North America and southeastern Australia, the amount is high enough for temperate rain forests to grow.

Although temperate forests are home to a variety of ground-dwelling mammals, including red foxes, musk deer, rabbits, and wild boars, some forest dwellers have adopted an arboreal lifestyle. Gray squirrels, for instance, are physically well suited to scampering along branches, gripping the bark with their sharp claws, and jumping from tree to tree, using their tail as a counterbalance. Unlike most tree-climbing mammals, such as bears, which climb down back-end first, these squirrels descend head-first.

North American porcupines, which live in both the temperate and northern coniferous forests of North America, are also tree climbers, with rough, nonskid pads on the soles of their feet and a tail equipped with modified spines on the underside. Conifers, such as the eastern hemlock, are their food of choice and their passage is often noted by the appearance of shiny rings girdling the trunk high up, where they have eaten the bark away. Other inveterate climbers include the gray fox (*Urocyon cinereoargenteus*), which relies on the extended rotatory ability of its fore legs to help it shimmy up trees, while pushing with its hind feet like an arboreal bear. An omnivore, the gray fox generally climbs trees to reach fruit or to escape.

**Some Mammals:** American Beaver, Black Bear, Eastern Gray Squirrel, European Rabbit, Giant Panda, Japanese Serow, Raccoon, Red Fox, Southern Pudu, Wapiti

## **NORTHERN CONIFEROUS FOREST BIOME**

One of the largest concentrations of trees on Earth, the northern, or boreal, forest extends across North America and northern Eurasia. The ecology of this vast landscape of pine, spruce, fir, and larch rarely attains a climax or stable state because of the biome's long winter, short growing season, and frequent natural forest fires.

Some mammal species that inhabit boreal forests also live farther south, but in the north, these species tend to be larger. Their greater size helps them conserve energy, especially in winter, a significant adaptation that outweighs the disadvantage of requiring more food to sustain a larger bulk.

The threat of food shortages dominates the life of most mammals living in the north. The moose and the caribou, for instance, rarely stop foraging in the winter, looking for alternate food sources — aquatic plants in the case of the moose, tundra lichen for the caribou — that are covered by ice and snow. Heavy grazing and digging of forest lichen and new shoots and saplings puts pressure on a forest's ecology. This, coupled with fire damage, sometimes results in serious food shortages and a subsequent decline in the region's moose and caribou populations.

Survival strategies of smaller boreal mammals include hibernation or, as with many rodents, wintertime burrowing under the thick blanket of snow, where mosses, herbs, and shrubs remain available. Predators such as the marten and the mink (*Mustela vison*) face the winter with pelages of thick underfur and long, stiff guard hairs.

**Some Mammals:** Fisher, Gray Wolf, Moose, North American Porcupine, Northern Red-Backed Vole, Pine Marten, Red Squirrel

## **TUNDRA/TAIGA BIOME**

Finnish for "barren land," tundra is a band of sparsely covered land bordered by boreal forests to the south, permanent ice to the north. Bitterly cold, dark winters and minimal precipitation make life difficult here. Summers are brief, but the long hours of daylight nourish a mantle of plants that help support wildlife.

Within the tundra, there are three distinct vegetation divisions. The southern tundra, also called the low arctic, sustains woody plants, including scrubby willow and birch, and poorly drained soil creates extensive bogs. In the middle arctic, dwarfed woody plants grow close to the ground to avoid strong winds. In the high arctic, moss and lichen, as well as some hardy herbs, cling to bare rock. Few mammals live this far north, and those that do, such as the polar bear have had to make significant adaptations to survive the cold.

The mammals of the tundra include both migrants and residents. Among the migrants, the caribou stand out. Large herds still make the journey of several hundred miles from their winter habitat in the coniferous forests farther south to spring and summer grazing grounds on the tundra.

Resident mammals rarely hibernate because the summer isn't long enough to accumulate sufficient fat reserves. Instead, burrowing under the snow has been perfected, particularly by the collared lemming. The lemming is also the only rodent with a pelage that changes to an all-white winter coat. Other tundra residents that change color with the snow include the arctic fox and the arctic hare.

**Some Mammals:** Arctic Fox, Arctic Hare, Caribou, Muskox, Polar Bear

## **MARINE/OCEAN BIOME**

The oceans cover more than two-thirds of the globe, providing a home for at least 118 species of mammals. To make their living there, these mammals have to be able to suspend their breathing for lengthy periods. The capacity of seals and cetaceans for carrying oxygen is higher than land mammals because their blood contains twice the number of red blood cells. This, along with a circulatory system that diverts blood from other parts of the body to the heart and brain, permits them to carry out protracted dives. Cetaceans can also slow down their heart rate during long dives; some whales may remain submerged for almost two hours. To survive in the coldest regions of the ocean, fur-covered marine mammals such as the harp seal make use of air trapped in the fur as an added layer of insulation. Small mammals also employ vasoconstriction, reducing blood flow to the limbs to keep the body core and vital organs at a constant temperature. Large cetaceans such as the sperm whale keep warm with an enormous shell of insulating blubber. When they need to cool down, they draw in ocean water through the blow hole and circulate it through nasal passages, cooling the capillaries in the adjacent spermaceti organ of the head, effectively cooling the whale's whole body. The heated water is then expelled from the blowhole.

**Some Mammals:** Blue Whale, Great Sperm Whale, Harp Seal, Leopard Seal, Northern Right Whale, Striped Dolphin, Walrus, West Indian Manatee

## Industry Ideas

technology/software  
petroleum  
steel  
motor vehicles/automobiles  
plastics  
aerospace/ space vehicles  
telecommunications  
chemicals  
electronics  
food processing  
lumber  
mining  
textiles/apparel/clothing  
iron ore  
steel  
aircraft  
motor vehicle parts  
aluminum and other metals  
coal  
oil  
toys  
rail cars and locomotives  
shipbuilding  
satellites  
defense industries  
tractors  
construction equipment  
electric power generating and transmitting equipment  
medical and scientific instruments  
consumer durables  
tourism  
green energy

## Agriculture Ideas

wheat  
corn  
grains  
fruits  
vegetables  
cotton  
beef  
pork  
chicken  
turkey  
dairy products  
fish  
forest/wood products  
coffee  
soybeans  
rice  
sugarcane  
cocoa  
citrus  
potatoes  
peanuts  
tea  
barley  
apples  
sugar beets  
sunflower seeds  
cereals  
grapes  
soybeans  
eggs  
sheep  
goats