



Science Unit: *Resource Extraction and the Environment*

Lesson 1: *Biomes of the World (and Canada)*

School year: 2008/2009

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Grade level: Presented to grades 4 - 5; appropriate for grades 2 – 7 with age appropriate modifications.

Duration of lesson: 1 hour and 20 minutes

Notes: All biome and organism pictures are included in this lesson; however, cutting pictures of organisms is required.

Objectives

1. Learn about the characteristics of the biomes of the World (grade 4) / Canada (grade 5)
2. Learn about the animals and plants that live in each of these environments
3. Learn that organisms are dependent on each other in each of these environments

Background Information

The slight tilt of Earth's axis provided the planet with distinct ecological regions. Each of these regions is called a biome. A biome is defined by its climate, topography and ecosystem. There are 5 main biomes in the world: Tundra, Taiga (also called Boreal Forests), Grassland, Desert, and Rainforest.

Animals and plants that live in each of the biomes are well adapted to the climate, topography and the specific ecosystems. The organisms that inhabit each biome have co-evolved to eat one another and withstand the climate whether it is a dry like deserts, cold like the tundra, or wet like rainforests.

Vocabulary

<u>Word:</u>	<u>Brief definition.</u>
Biome	A region of the world defined by its climate, topography and ecosystem
Tundra	A biome characterized by its complete absence of trees and
Boreal Forest / Taiga	A biome characterized by its forest of evergreen trees
Deciduous forest	A biome characterized by its forest of deciduous trees
Grassland / Savannah	A biome characterized by its flat topography and having mostly grass as vegetation
Rainforest	A biome characterized by having lots of rainfall and tall, lush trees.
Desert	A biome characterized by the little amount of rainfall and little vegetation
Food chain	The way organisms interact by feeding on one another
Producers	Plants – the only organisms that can produce food from sun light and air
Consumers	Animals that eat plants (Herbivore) or other animals (Carnivore) or both (Omnivore)
Decomposers	Organisms (Bacteria and fungi) that eat dead animals and plants. These organisms help the producers grow.



SCIENTIST IN RESIDENCE PROGRAM

Ecosystem A system formed by the interaction of a community of organisms and their environment

Materials

- Pictures of each biome
- Biome information sheet/ card (you can cut the sheet to make cards)
- Scotch tape or sticky dough or magnets
- Pictures of animals and plants from a given food chain from each biome (one per student)

In the Classroom

Introductory Discussion

Ask the students to suggest two wild animals and pick a third one – write it on the board

(when picking the third one choose something as different as possible from the first 2)

eg. Tiger, Elephant and Polar bear

Ask the students to think of a place on Earth where all three animals could live together without the help of humans (no zoos!)

- They should arrive at the conclusion that it will not be possible!

Ask why.

- These animals have very different needs because they are adapted to living in different environments of the Earth. They also need these environments because the animals/ plants they eat are also specific to their environment.

Introduce the idea of Biomes and define the word

Science Activity: Populate the Biome!

1. Take the pictures of each biome and place it on the board or a wall

NOTE:

In this lesson we did 5 biomes:

Tundra, Taiga, Savanna, Desert and Tropical Rainforest (grade 4) and

Tundra, Boreal forest, Deciduous forest, Grassland, Temperate Rainforest (grade 5)

The resource file contains the picture of 4 organisms per biome and 2 pictures of general decomposers. If you have more children in your class just add more animals or plants. Extra descriptions are present in the biome information sheets and in the biome food chain sorted by trophic level.

2. Pass around a basket with pictures of animals, plants, bacteria and fungi
3. Ask the students to place their picture in the biome they believe it belongs to.
4. As you go through each biome ask why that organism was placed there, explain about that biome and correct any misplaced organisms



Science Activity: Build a biome-specific food chain

Inform the students that they are about to become a food chain!

- Ask if anyone knows what a food chain is
 - A food chain is part of the reason why some organisms can only live in certain habitats: their food lives there!
- Define the participants of a food chain and write it on the
 - Producers
 - Herbivores
 - Carnivores
 - Omnivores
 - Decomposers
- Divide the students into groups (same as the number of biomes)
- Give each group a bundle of information cards and the name of their biome.
- Leave enough time for each group to decide who eats who
- Ask each group to present to the class their biome food chain – starting with the producer
- As each group presents pose the question:
 - **What would happen if I took this plant/ animal away?**
Students will realize that in nature everything is in balance
 - If you extinguish the plants, herbivores die, causing carnivores to die
 - If you extinguish a herbivore, plant will grow too much creating competition and wiping out other plants and carnivores die

Closure Discussion

1. Why can't different animals like the (*animals they picked during the intro*) live in the same place on Earth?
2. How does a food chain influence an organism's habitat?
3. How do you think humans influence these organisms and their biomes?
 - a. Introduce resource extraction and ask them to think how it would affect a biome

Post-Lesson - In class activity

Explain this activity.

Each group will construct a biome diorama using whatever materials are available. (we used lids from large styrofoam boxes or boxes of blank printing paper). Allow them to use their imagination: play dough, paint, real vegetation, sand, soil, paper animal cutouts on toothpicks...anything goes!

This biome will be used after the last lesson of the unit. Throughout this unit the students will learn about resource extraction and its impact on ecosystems. After they have learned about it their job will be to modify this diorama to include the extraction of a given resource: wood, minerals, water, farming, etc...



References

Information on Biomes of Canada and the World

1. <<http://canadianbiodiversity.mcgill.ca/english/ecozones/ecozones.htm>> The Canadian Biodiversity website. Hosted by The RedPath Museum, McGill University. [excellent information on the biodiversity of Canada.] Accessed on May 10, 2009.
2. < http://www.blueplanetbiomes.org/world_biomes.htm> Blue Planet Biomes. Website hosted by Brynn Schaffner and Kenneth Robinson. Last updated on Nov 7, 2006. Created by students at the West Tisbury Elementary School. [great pictures and descriptions of world biomes.] Accessed on May 10, 2009.

Extension of Lesson Plan

1. Make your own ecosystem in a pop bottle using snails, sand, plants and water to identify organisms in a food chain
2. Go on a field trip to identify features of the biome you live in
3. Research different biomes and publish your findings on a website

Ten Information Sheets for Lesson 1, Biomes of The World (and Canada)

1. African Savanna Information Sheet

African Elephant - Their tusks are teeth used for digging for roots and stripping the bark off trees for food, for fighting each other during mating season, and for defending themselves against predators. The African elephant's size makes them hard for predators to eat, such as leopards, lions, or jaguars. They keep the savannas clear by eating shrubs and trees which helps the grass grow. This allows the many grazers on the savanna to survive.

African Wild Dog - is a carnivorous mammal found only in Africa, especially in scrub savanna. The African wild dog's main prey varies among populations, but always centers around medium-sized ungulates such as the Impala. Some packs will also hunt large prey such as zebras and wildebeests.

Caracal - also called Persian Lynx or African Lynx, is a fiercely territorial medium-sized cat. It hunts at night (but in colder seasons also in the daytime) for rodents and hares; rarely it may even attack a gazelle, or a small antelope.

Impala – it is a medium-sized African antelope. They graze when the grass is green and growing and browse at other times. It enjoys the fruit of the Jackalberry tree. They will browse on shoots, seedpods and foliage. Leopards, cheetah, Nile crocodiles, lions, spotted hyenas and wild dogs prey on impala.

Egyptian mongoose - All mongooses are known for being talented snake killers. Egyptian mongooses are mostly carnivorous. They also eat fruit if it is available where they are living. Their typical diet consists of rodents, fish, birds, reptiles, amphibians, insects and insect larvae. They are preyed on by birds of prey and large carnivores on the savanna, such as the leopard, caracal and raptors.

Black Mamba – contrary to its name, the Black Mamba is a white snake. It's a poisonous snake that eats lizards, rodents and other small mammals, such as monkeys and bats. It is preyed on by the mongoose.

Zebra - Plains zebra herds will mix and migrate together along with other species such as wildebeests. Wildebeests and zebras generally coexist peacefully and will alert each other to predators. The zebra does not require short grass to graze on. It eats a wide range of different grasses and also browses on leaves and shoots from time to time. The Plains zebra's main predators are lions and spotted hyenas. Nile crocodiles are also great threats during river crossings. Wild dogs and leopards also prey on zebras

Lion - Their prey consists mainly of large mammals, with a preference for wildebeest, impalas, zebras, buffalo, and warthogs.

Leopard - Leopards are opportunistic hunters. Their diet consists mostly of ungulates and monkeys. In Africa, mid-sized antelopes provide a majority of the leopard's prey, especially impala and Thomson's gazelles.

Giraffe – Giraffes can inhabit savannas, grasslands, or open woodlands. They prefer areas enriched with acacia growth. The giraffe browses on the twigs of trees. Lions and Nile Crocodiles are some of its predators.

Nigriceps Ant - The tree of choice for the nigriceps ant and its competitors is the whistling thorn acacia. It is eaten by the mongoose.

Nile Crocodile - The Nile crocodile is an opportunistic predator capable of taking almost any animal that is within attacking range. They start life very small however, therefore the diet of hatchlings consists of smaller prey. Hatchlings eat insects and small aquatic invertebrates, and quickly graduate to amphibians, reptiles, and birds. The most frequently recorded mammalian prey taken by Nile crocodiles are wildebeest, zebra, warthog, goats, sheep and cattle. Larger herbivores such as giraffes are also preyed upon.

Dung beetle – will only eat animal dung. Preyed on by animals that eat insects.

Termite - Termites mostly feed on dead plant material, generally in the form of wood, leaf litter, soil, or animal dung.

Whistling thorn acacia - is a swollen-thorn acacia native to East Africa. Whistling Thorns have leaves that taste bitter and prevent herbivores from eating them. These trees have a special relationship with ants, the ants defend the tree from other herbivores and the tree feeds nectar to the ants.

2. Alaska Tundra Information Sheet

Tundra Biome – Alaskan Food Web

Arctic Willow - The Arctic willow likes cold climates, which makes the tundra a perfect place for it because the average temperatures range from -70 degrees F to 20 degrees F. It is typically a low shrub growing to only 1–15 cm (0.39–5.9 in) in height. The Arctic Willow is a food source for several Arctic animals. Muskox, caribou, Arctic Hare and lemmings all feed on the bark and twigs.

Purple Saxifrage – is a plant that grows in a low, tight clump that look like a cushion. The purple star-shaped flowers are about 1 cm wide. Caribou, Arctic hares and lemmings feed on this plant.

Caribou Moss - Caribou moss grows in arctic and northern regions around the world. It grows on the ground and on rocks. It looks like a foamy, gray-green spongy mass, and grows to be 1 to 4 inches high. Although it is called a moss, it is actually a lichen. Animals such as Reindeer and Caribou feed on these lichens.

Arctic hare - The Arctic hare is a small, fur-covered mammal that lives in a cold environment. Their main food is the Arctic willow, but they also eat the flowers of purple saxifrage in late spring and early summer.

Ermine - Ermines like to inhabit marshes, open spaces or rocky areas next to woodlands. The coat of the ermine changes with the seasons and camouflages it from predators. In winter the ermine's coat is white blending in with the snowy environment. In warmer seasons the fur turns brown again matching the colour of the landscape. The ermine is a carnivore and eats rabbits, small insects and rodents.

Lemmings - are small rodents that do not hibernate during winter. Lemmings eat twigs in the winter and berries and leaves in the summer. The lemming's predators are hawks, owls, weasels, foxes and basically all Arctic animals.

Snowy Owl – This powerful bird relies primarily on lemmings and other rodents for food, but it also hunts larger mammals such as hares. Though Snowy Owls have few predators, the adults are very watchful and well equipped to defend against any kind of threats towards them or their offspring. During the nesting season the owls face Arctic foxes.

Arctic Fox - Arctic foxes are found throughout the northern barren lands of the world. Their food preference is arctic hares, but they will also eat lemmings and other rodents. Arctic wolves occasionally eat them.

Arctic Wolf – They are one of the few species of mammals that can tolerate the harsh conditions of the tundra. They are carnivores that will eat Musk Oxen, Caribou, Arctic foxes, lemmings, and Arctic hares. Their only predators are polar bears.

Caribou – They spend much or all of the year on the tundra from Alaska to Baffin Island. The caribou are herbivores; they rely on plants as the food that sustains them. Their favourite food source is lichens. They have to watch out for hungry carnivores such as the arctic wolf and polar bears

Polar Bear – during the winter these bears live on ice-covered ocean, where they eat mostly seals. During the summer they can either live off their fat reserves or hunt terrestrial animals such as Muskoxen and Caribou.

Muskox – is an herbivore animal that grazes on cotton-grasse and any other plants. Besides wolves, the only natural predators of muskoxen are Brown, Grizzly and Polar bears.

Cotton-grass - are found particularly abundant in Arctic tundra regions. Its seed heads are covered in a fluffy mass of cotton and are eaten by most herbivores of the tundra.

Tundra Fungi and Bacteria – little is known about these organisms; however, we know that without them, plants could not grow.

3. Manitoba Taiga Information Sheet

Red Squirrel - are preyed upon by Canada Lynx, coyote, great horned owl, northern goshawk, red-tailed hawk, American Marten, coloured fox, wolf and weasel. These animals are granivores, which means they mostly eat seeds. Their favourites are white spruce seeds, but they will also eat willow leaves, poplar buds and berries.

Beaver - They subsist chiefly on bark and twigs or the roots of water plants. They have been known to eat grasses on the banks of rivers and streams. Beavers also gnaw the bark of birch, poplar, and willow trees; but during the summer they also eat berries. Two of their successful predators are wolves and humans. Other predators include bears, lynxes, wolverines, red foxes, and dogs.

Snowshoe hare – Snowshoe hares feed on a variety of deciduous trees and shrubs, (birch, willow, maple), some conifers (white pine, balsam fir), grasses and wild plants (raspberry and fireweed). Common predators include the lynx, colored fox, coyote, great horned owl and goshawk.

Jackpine – is a North American pine with its native range in Canada east of the Rocky Mountains. Jackpine are conifers and its leaves are needle-like, twisted and slightly yellowish-green.

Black grouse – These birds feed mainly on vegetation, but also on insects, especially when feeding young. Several of the forest-living species are notable for eating large quantities of conifer needles. The black grouse is prey for numerous predators, including Golden eagles and hen harriers. Pine martens, foxes, crows, and stoats eat the birds as well as their eggs.

Woodland caribou -Caribou are herbivores. Their main food source is lichens, which gives caribou an advantage in the more harsh northern areas of its range where vegetation is scarce. The common "caribou moss" is actually a type of lichen (*Cladonia rangiferina*), which is a major food for caribou. Caribou also eat vegetation such as grasses, sedges, birch and willow leaves, and mosses. The wolf is the greatest natural predator of the caribou.

Vole – Depending on the species, the vole's diet consists of seeds, tubers, conifer needles. Some species will die, however, if deprived from their main meal, Douglas Fir Needles, for too long. Many carnivores such as martens, owls, foxes and the red tailed hawk eat voles. A common predator of voles is the short-eared owl.

Lynx – Lynx will have their dens in crevices or under ledges. They feed on large ungulates like the caribou, and smaller, more usual prey: birds, and small mammals, like snowshoe hares, fish, sheep, and goats.

Coloured fox – Common vertebrate prey includes voles and rabbits. Beyond coyotes, badgers and lynxes, foxes are known to be preyed on by large eagles and wolves.

Wolf – Wolves feed primarily on medium to large sized ungulates, including deer, antelope and caribou. They also prey on rodents like beavers.

Short-eared owl – Its food consists mainly of rodents, especially voles, but it will eat other small mammals and some large insects. Natural enemies include many diurnal raptors such as the Bald Eagle and the Red-tailed Hawk. Because they nest on the ground, they are vulnerable to mammalian predators such as skunks, dogs, foxes, and coyotes.

Red-tailed Hawk - The Red-tailed Hawk is carnivorous, and an opportunistic feeder. Its diet is mainly small mammals, but it also includes birds and reptiles.

Marten – Pine martens spend a lot of time searching the forest floor for rodents. Martens prefer to eat Red-backed voles. Fisher hunts marten, as they have the ability to catch a marten on the ground or in trees. Large owls also prey on marten occasionally.

Fisher - Their primary prey includes hares and martens. Fishers are also known to eat ground-nesting birds such as grouse.

Black bear - The black bear eats a wide variety of foods, mainly herbs, nuts and berries. They also kill and eat small mammals such as rodents (beavers and voles) and ungulates, such as deer and caribou, mostly the young.

4. Southern Ontario Temperate Deciduous Forest Information Sheet

Cattail – usually grows in wetlands and is typically a tall grass. This plant is food for many herbivores in deciduous forest.

Opossum - As omnivores they eat insects, snails, rodents, berries, fruit, grasses, leaves, carrion, snakes, bird and waterfowl eggs, corn and all other vegetables. Their natural enemies are foxes, Canadian dogs, dogs, bobcats, and owls.

Raccoon – raccoons eat active or large prey such as birds and mammals only occasionally, since they prefer prey which is easier to catch. Its diet in spring and early summer consists mostly of insects, worms and other animals already available early in the year, it prefers fruits and nuts, such as acorns, that emerge in late summer and autumn. The most important natural predators of the raccoon are bobcats, Canadian dogs, and great horned owls which mainly prey on the young.

Muskrat - In the summer the muskrat will feed upon emergent vegetation such as cattails and sedges, but in the winter the diet is limited to submerged vegetation such as pond weeds. Their chief predator is the mink, but while on land they also fall prey to foxes, Canadian dogs and lynxes as well as some of the larger avian predators.

Mink - Mink prey on fish and other aquatic life, small mammals (rabbits especially), and birds, particularly water fowl. Long-eared owls, bobcat and fox are the natural predators of Mink.

Moose - A full-grown moose has few enemies, but a pack of Canadian dogs can still pose a threat, especially to females with calves. These animals are herbivores and will graze on grasses and flowering plants.

Long-eared owl - The long-eared owl hunts in open spaces at night for voles and other small animals. Raccoons prey upon eggs and nestlings.

Canadian dog – these animals are at the top of the food chain. They are carnivores and will eat any smaller mammals or birds.

Bobcat - Though the Bobcat prefers rabbits and hares, it will hunt anything from insects and small rodents to deer. It is a top predator.

White-tail deer – Whitetail deer eat large varieties of food, commonly eating legumes and foraging on other plants, including shoots, leaves, cactus, and grasses. They also eat acorns, fruit, and field corn or any kind of corn. There are several natural predators of white-tailed deer. Canadian dogs and cougars are their main predator. Bobcats are most likely to take adult deer during winter.

5. Saskatchewan Prairies Information Sheet

Prairie sage – is a tall grass with leaves on both sides of the stem and soft white hairs. When crushed, they smell like sagebrush. As a grass, it is eaten by most herbivores of the prairies.

Thirteen-lined ground Squirrel - This ground squirrel prefers grasslands, particularly near shrubby areas or aspen trees. Its burrow lacks the tell-tale dirt mounds of other ground squirrels. Primary diet includes grass and weed seeds, caterpillars, and grasshoppers, but may also eat bird flesh and even mice and shrews. This squirrel sometimes damages gardens by digging burrows and eating vegetables, but also devours weed seeds and harmful insects. Their only predators are hawks, weasels and badgers.

White-tail deer – Whitetail deer eat large varieties of food, commonly eating legumes and foraging on other plants, including shoots, leaves, cactus, and grasses. They also eat acorns, fruit, and field corn or any kind of corn. There are several natural predators of white-tailed deer. Gray Wolves, cougars are their main predator. Lynxes, Prairie Wolves and bobcats are most likely to take adult deer during winter.

White-tailed jackrabbit – White-tailed jackrabbits are strict herbivores. They feed on grasses, forbs, and shrubs in varying amounts. They are a favorite prey item of animals such as red fox, grey fox, Prairie Wolf, bobcat, cougar, badger, snakes, owls, eagles, and many species of hawks.

Prairie Wolf – these animals are versatile carnivores with a 90% mammalian diet, depending on the season. They will eat deer, owls, badgers and generally any small mammal. In the prairies, these animals are at the top of the food chain.

Badger – The badger is adapted to catch small burrowing mammals, such as the black-footed ferret. The badger has few natural predators, cougars or Prairie Wolves will sometimes tackle a badger.

Great Horned Owl– Predominantly small to medium-sized rodents, such as the black-footed ferret. It's even a natural predator of porcupines and skunks. Great Horned Owl eggs, nestlings and fledgings may be preyed on by foxes, Prairie Wolves, or wild or feral cats.

Black-footed ferret - The black-footed ferret eats mostly prairie dogs. If it can't find prairie dogs, it eats other small mammals like mice gophers and ground squirrels. Great-horned owls, golden eagles, prairie falcons, badgers, bobcats and foxes all prey on ferrets.

Black-tailed Prairie dog - prairie dogs are small, burrowing rodents native to the grasslands of North America. They are an important prey species, being the primary diet in prairie species such as the black-footed ferret. The seeds stems, roots and leaves of forbs (flowering plants), grasses and weeds make up most of the prairie dog's diet.

6. Siberian Taiga Information Sheet

Capercaillie Grouse - found in all the taiga forests of northern and northeastern Eurasia. The Capercaillie is a highly specialized herbivore, which feeds almost exclusively on blueberry leaves and berries along with some grass seeds and fresh shoots of sedges in summertime. It is preyed on by the Red Fox, Wolf and Brown Bear; however, the most serious threats to the species are habitat degradation.

Siberian Spike Grass – Siberian spike grass is a perennial. It is palatable to all classes of livestock and wildlife. It is a preferred feed for cattle, sheep, horses, hares and elk in spring and also in the fall, if additional growth occurs from late growing season rainfall.

Great Grey Owl – these birds rely almost fully upon small rodents, with voles being their most important food source. They also eat hares, moles, shrews, weasels and grouse. Young owls are prey to bears, and fishers; while adults are preyed by lynxes.

Elk – they inhabit forest and forest-edges, feeding on grasses, plants, leaves, and bark. Major predators in Asia include the wolf, brown bear and Siberian tiger. Eurasian lynx will sometimes prey on Asian elk calves.

Siberian Tiger - the Siberian tiger is a carnivorous predator. It preys primarily on red deer, but also roe deer and musk deer.

Siberian Musk Deer - They are solitary animals, and maintain well-defined territories. Like true deer, they eat mainly leaves, flowers, and grasses, with some mosses and lichens. Musk deer also eat young shoots, coniferous needles, leaves, buds, and bark of mountain ash, aspens, maple, willow, bird cherry, and honeysuckle. The main predators of the musk deer (other than man), are the lynx, wolverine, and the yellow-throated marten.

Siberian Roe Deer – It feeds mainly on grass, leaves, berries and young shoots. It particularly likes very young, tender grass with high moisture content, such as grass that has received rain the day before. Wolves and other large carnivores of the Taiga will prey on the Siberian Roe Deer.

Reindeer – Golden Eagles, wolverines, brown bears prey on reindeer calves. Gray Wolf is the most effective natural predator of adult reindeer, especially during the winter. Reindeer are ruminants. They mainly eat lichens in winter, especially reindeer moss. However, they also eat the leaves of willows and birches, as well as sedges and grasses.

Boreal Owl - This owl feeds on small mammals, birds, and insects, and can detect its prey under debris or snow by using its acute hearing. Boreal Owls sit and wait on a perch for prey and then swoop down upon it. Adults are preyed by the Great Horned Owl, whereas their young are most likely preyed by the Marten.

Brown hare – It is strictly herbivorous. It eats grasses and herbs during the summer months but changes to feeding on twigs, bark, and the buds of young trees in winter, making it a pest to orchard farmers. Its natural predators include the Golden Eagle and carnivorous mammals like the Red Fox and Wolf.

Eurasian Lynx – It is native to European and Siberian forests, where it is one of the predators. The Eurasian lynx is the biggest of the lynxes and preys on hares, rodents, foxes, roe deer and reindeer. As with other cats, trying on larger prey presents a risk to the animal. The main method of hunting is stalking, sneaking and jumping on prey.

Grey wolf – Wolves feed primarily on medium to large sized ungulates, including all deers. In areas where wolves brown bears and tigers share ranges, such as the Russian Far

East, these species typically display a great deal of dietary overlap, resulting in intense competition.

Red Fox - Red Foxes are largely carnivorous; however, they also eat some plant material. Common vertebrate prey includes voles and rabbits. In Scandinavia, predation by Red Fox is the most important mortality cause for young Roe deer. Red Foxes are hunted by Eurasian Lynxes. It is uncommon but occurs during winter and spring. Beyond coyotes, badgers and lynxes, red foxes are known to be preyed on by large Golden Eagle, gray wolves and brown bears.

Brown bear -The largest populations are in Russia, with 120,000, where they inhabit mostly dense forests. They are omnivores and feed on a variety of plant products, including berries, roots, and sprouts, fungi as well as meat products such as fish, insects, and small mammals. Brown bears also occasionally prey on deer, elk, and reindeer.

7. Sonoran Desert Information Sheet

Banded Gila Monster - Gila monsters are one of only two venomous lizards known to occur in the world. Gila monsters prey on newborn rodents, rabbits, and hares, though ground nesting birds and lizards, as well as eggs from birds, lizards, snakes and tortoises are also eaten. It will eventually fall prey to larger predators, but it does not have a specific predator.

Bobcat - Though the Bobcat prefers rabbits and hares, it will hunt anything from insects and small rodents to deer. Prey selection depends on location and habitat, season, and abundance. Predators of the bobcat include mountain lions, coyotes, foxes, owls, wolves, and humans

Cactus Wren - It mainly eats insects, though it will occasionally take seeds or fruits. It rarely drinks water, getting its moisture from its food. It is a bird of arid regions, and is often found around yucca, mesquite, cholla or saguaro. Cactus Wren eggs and the young wrens are vulnerable to smaller predators such as Blue Jays and snakes. Adult birds can be food for coyotes, hawks, fox, bobcats or domestic cats.

Coyote - Coyotes are versatile carnivores with a 90% mammalian diet, depending on the season. They primarily eat small mammals, such as rodents, though they will eat birds, snakes, lizards, deer, javelina, and livestock as well as large insects and other large invertebrates.

Gray Fox - Gray fox are considered omnivores, therefore they eat a wide variety of foods. Small mammals, eggs, fruit, birds, insects, nuts, berries, and lizards are some of their food choices. The gray foxy falls prey to cougars, eagles, owls, bobcats, hawks, coyotes, and humans who kill them for their fur.

Bark Scorpion - Scorpions are predators. They consume all types of insects, spiders, centipedes, and even other scorpions. Scorpions are preyed upon by large centipedes, tarantulas, lizards, birds (especially owls), and mammals such as bats, shrews, and grasshopper mice.

Kangaroo Rat - There are many creatures out there who would like to make a tasty meal out of this small creature. Owls, snakes, bobcats, foxes, badgers, coyotes, ringtail, and your cat or dog are just a few. Kangaroo rats eat seeds from a variety of desert grasses as well as mesquite beans. On occasion, some kangaroo rats will eat green vegetation and some insects.

Jackrabbit - These hares are herbivores, feeding on grasses, leaves, clover, alfalfa, twigs, seeds, beans, twigs and cacti. Jackrabbits are an important food source for many animals. These can include coyotes, Red-tailed Hawks, Ferruginous Hawks, eagles, foxes, bobcats, and humans.

Elf Owl - They feed primarily on invertebrates such as moths, crickets, scorpions, centipedes and beetles. Elf owl predators can include other owls, snakes, coyotes, bobcats and ringtail. Most predators find it difficult to access the owls nest high up in a saguaro.

Diamondback rattlesnake - rodents, rabbits and other small animals make up the diet of this snake. Eagles, hawks, roadrunners, kingsnakes, coyote, bobcats or fox are predators that look at these snakes as a source of food.

Javelina - Javelina are classified as herbivores. They eat a variety of native plant foods such as agave, mesquite beans, and prickly pear, as well as roots, tubers, and other green

vegetation. The main predators of Javelina are mountain lions, humans, coyotes, bobcats and jaguars.

Beetle grub - The grubs will eat the woody tissue of the tree roots. Adult beetles may take nectar and feed on fruit. Predators of adult beetles include roadrunners, owls, coyotes and bobcats.

White-throated woodrat - In the wild, packrats eat large amounts of prickly pear cactus, as well as seeds, leaves, and fruit of other plants. The packrat is prey for many different animals. Snakes, owls, coyotes, foxes, are all typical predators.

Velvet Mesquites - are one of the most abundant trees in the Sonoran desert. Like many of the desert trees here, Mesquites are in the Pea Family. Velvet Mesquites produce edible seed pods (mesquite beans).

Puma - Deer are at the top of the menu for the almost completely carnivorous pumas. Also included are elk, wild hogs (in Florida), rabbits, rodents, birds, livestock, and once in a while, a peccary or another pumas.

Proghorn Antelope - They eat a wide variety of plant foods, often including plants that are unpalatable or toxic to sheep and cattle. A study showed that they eat cacti, grass and shrubs. Cougars, Wolves, coyotes and bobcats are the major predators.

Desert Bighorn - Bighorn rely on their keen eyesight to detect potential predators such as puma, coyotes, and bobcats, and they use their climbing ability to escape. The typical diet of a desert bighorn sheep is mainly grasses, sedges and forbs.

8. Sumatran Tropical Rainforest Information Sheet

Bengal Tiger - Bengal tigers hunt small-sized and large-sized animals, such as rhinoceros and foxes, and they also feed on fish and other animals. They sometimes prey on smaller animals such as hares, monkeys, langurs or peacocks.

Leopard - leopards are nocturnal creatures and are hard to spot. They are good swimmers and live in small groups of 3 or 4 maximum. They eat almost every animal, from monkeys to fish. Despite being a top predator, therefore having very few predators, it is sometimes hunted by Bengal tigers.

Durian - Widely known and revered in southeast Asia as the "king of fruits", the durian is distinctive for its large size, unique odour, and formidable thorn-covered husk. This fruit is a favourite food of mammals, such as monkeys and bats.

Musang - They are expert climbers and spend most of their lives in trees. They eat small vertebrates, insects, ripe fruits and seeds. They are very fond of palm sap, therefore their common name.

Proboscis Monkey - Their diet consists mainly of seeds, leaves, mangrove shoots and unripe fruit. The false gavia, a crocodile-like reptile, is a major predator of proboscis monkeys. Another predator is the clouded leopard which has also been seen attacking the monkeys. Monitor lizards and snakes are potential predators, as well as estuarine crocodiles, and crested serpent eagles.

False gavia – it has an elongated snout specialised for catching fish, but is actually a more generalist predator. Stomach content analysis from animals in Malaysia show evidence of fish, insects, crustaceans and mammals. It has been reported in the past to take animals as large as monkeys.

Lesser dawn bat - They are likely to be vulnerable to predation by climbing snakes and nocturnal birds of prey, such as owls. Diet consists primarily of the nectar and pollen of night flowering plant species. Two studies state that stomach and tongue contents contained pollen exclusively.

Red-Shanked Langour - The Douc Langour eat mainly leaves, fruits, seeds, and flowers. They eat 50 different plant species and they do not prey on animals. Langours are pot-bellied because their digestive system is adapted to eat large quantities of leaves.

9. Vancouver Island Temperate Rainforest Information Sheet

Grizzly bear – Although grizzlies are of the order Carnivora and have the digestive system of a carnivore, they are actually omnivores since their diet consists of both plants and animals. They have been known to prey on large mammals such as moose, deer, sheep, bison, caribou and even black bears.

Red Huckleberry - In the Pacific Northwest of North America, the huckleberry plant can be found in mid-alpine regions, often on the lower slopes of mountains. The berries are small and round and range in color according to species from bright red, through dark purple, and into the blues. Huckleberries are a favorite of many mammals such as bears and humans.

Vancouver marmot - The predators of the Vancouver Island Marmot include the Golden Eagle, coyotes, badgers, foxes and humans. The marmot signals danger by shrill calls. Vancouver Island marmots are herbivores and require a good variety of plants to eat.

Red fox – Common vertebrate prey includes voles and rabbits. Beyond coyotes, badgers and lynxes, red foxes are known to be preyed on by large eagles and wolves.

Marten – Pine martens spend a lot of time searching the forest floor for rodents. Martens prefer to eat Red-backed voles. Fisher hunts marten, as they have the ability to catch a marten on the ground or in trees. Large owls also prey on marten occasionally.

Woodland caribou -Caribou are herbivores. Their main food source is lichens, which gives caribou an advantage in the more harsh northern areas of its range where vegetation is scarce. The common "caribou moss" is actually a type of lichen (*Cladonia rangiferina*), which is a major food for caribou. Caribou also eat vegetation such as grasses, sedges, birch and willow leaves, and mosses. The wolf is the greatest natural predator of the caribou.

Moose - A full-grown moose has few enemies, but a pack of canadian dogs can still pose a threat, especially to females with calves. These animals are herbivores and will graze on grasses and flowering plants.

Raccoon – raccoons eat active or large prey such as birds and mammals only occasionally, since they prefer prey which is easier to catch. its diet in spring and early summer consists mostly of insects, worms and other animals already available early in the year, it prefers fruits and nuts, such as acorns, that emerge in late summer and autumn. The most important natural predators of the raccoon are bobcats, canadian dogs, and great horned owls which mainly prey on the young.

Wolf – these animals are at the top of the food chain. They are carnivores and will eat any smaller mammals or birds.

Snowshoe hare – Snowshoe hares feed on a variety of deciduous trees and shrubs, (birch, willow, maple), some conifers (white pine, balsam fir), grasses and wild plants (raspberry and fireweed). Common predators include the lynx, red fox, wolf, great horned owl and goshawk.

Beaver - They subsist chiefly on bark and twigs or the roots of water plants. They have been known to eat grasses on the banks of rivers and streams. Beavers also gnaw the bark of birch, poplar, and willow trees; but during the summer they also eat berries. Two of their successful predators are wolves and humans. Other predators include bears, lynxes, wolverines, red foxes, and dogs.

Mountain lion - Deer are at the top of the menu for the almost completely carnivorous mountain lions. Also included are elk, wild hogs (in Florida), rabbits, rodents, birds, livestock, and once in a while, a peccary or another mountain lion.

10. Tundra Biome – Northern Quebec Food Web

Arctic Willow - The Arctic willow likes cold climates, which makes the tundra a perfect place for it because the average temperatures range from -70 degrees F to 20 degrees F. It is typically a low shrub growing to only 1–15 cm (0.39–5.9 in) in height. The Arctic Willow is a food source for several Arctic animals. Muskox, caribou, Arctic Hare and lemmings all feed on the bark and twigs.

Purple Saxifrage – is a plant that grows in a low, tight clump that look like a cushion. The purple star-shaped flowers are about 1 cm wide. Caribou, Arctic hares and lemmings feed on this plant.

Caribou Moss - Caribou moss grows in arctic and northern regions around the world. It grows on the ground and on rocks. It looks like a foamy, gray-green spongy mass, and grows to be 1 to 4 inches high. Although it is called a moss, it is actually a lichen. Animals such as Reindeer and Caribou feed on these lichens.

Arctic hare - The Arctic hare is a small, fur-covered mammal that lives in a cold environment. Their main food is the Arctic willow, but they also eat the flowers of purple saxifrage in late spring and early summer.

Ermine - Ermines like to inhabit marshes, open spaces or rocky areas next to woodlands. The coat of the ermine changes with the seasons and camouflages it from predators. In winter the ermine's coat is white blending in with the snowy environment. In warmer seasons the fur turns brown again matching the colour of the landscape. The ermine is a carnivore and eats rabbits, small insects and rodents.

Lemmings - are small rodents that do not hibernate during winter. Lemmings eat twigs in the winter and berries and leaves in the summer. The lemming's predators are hawks, owls, weasels, foxes and basically all Arctic animals.

Snowy Owl – This powerful bird relies primarily on lemmings and other rodents for food, but it also hunts larger mammals such as hares. Though Snowy Owls have few predators, the adults are very watchful and well equipped to defend against any kind of threats towards them or their offspring. During the nesting season the owls face Arctic foxes.

Arctic Fox - Arctic foxes are found throughout the northern barren lands of the world. Their food preference is arctic hares, but they will also eat lemmings and other rodents. Arctic wolves occasionally eat them.

Arctic Wolf – They are one of the few species of mammals that can tolerate the harsh conditions of the tundra. They are carnivores that will eat Musk Oxen, Caribou, Arctic foxes, lemmings, and Arctic hares. Their only predators are polar bears.

Caribou – They spend much or all of the year on the tundra from Alaska to Baffin Island. The caribou are herbivores; they rely on plants as the food that sustains them. Their favourite food source is lichens. They have to watch out for hungry carnivores such as the arctic wolf and polar bears

Polar Bear – during the winter these bears live on ice-covered ocean, where they eat mostly seals. During the summer they can either live off their fat reserves or hunt terrestrial animals such as Muskoxen and Caribou.

Muskox – is an herbivore animal that grazes on cotton-grasse and any other plants. Besides wolves, the only natural predators of muskoxen are Brown, Grizzly and Polar bears.

Cotton-grass - are found particularly abundant in Arctic tundra regions. Its seed heads are covered in a fluffy mass of cotton and are eaten by most herbivores of the tundra.

Tundra Fungi and Bacteria – little is known about these organisms; however, we know that without them plants could not grow.

Tundra Biome - Northern Quebec Food Web

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Canadian Biomes Food Chains –Sorted by Trophic Level

Northern Quebec Tundra

Producer <u>Arctic Willow</u> Bearberry Caribou Moss Diamond-leaf Willow Labrador Tea Pasque Flower Purple Saxifrage	1ary Consumer Caribou Musk Ox <u>Arctic hare</u>	2ary Consumer <u>Snowy Owl</u> Ermine	3ary Consumer Grizzly Bear <u>Arctic Fox</u> Polar Bear	Decomposers Tundra bacteria Fungi
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Manitoba Boreal Forest

Producer Blueberry Crowberry Paper birch Aspen White Spruce <u>Jackpine</u> Larch Lichen	1ary Consumer Snowshoe hare Beaver <u>Black Grouse</u> Woodland caribou Vole	2ary Consumer Short-eared owl <u>Coloured fox</u> Martens	3ary Consumer Wolf Red-tailed Hawk <u>Lynx</u> Black bear Fisher	Decomposers Earthworms Bacteria Fungi Lichen
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Prairies grassland

Producer	1ary Consumer	2ary Consumer	3ary Consumer	Decomposers
Wheat Grass Cattails Willows Canada Goldenrod Western Snowberry Blue Grama Grass <u>Prairie Sage</u> Prairie Rose Sedges Spear Grass	<u>Whitetail jackrabbit</u> Thirteen-lined Ground Squirrel Prairie dog	Black-footed ferret <u>Badger</u> Great Horned Owl	<u>Prairie wolf</u>	Fungi Bacteria

Southern Ontario Temperate Deciduous Forest

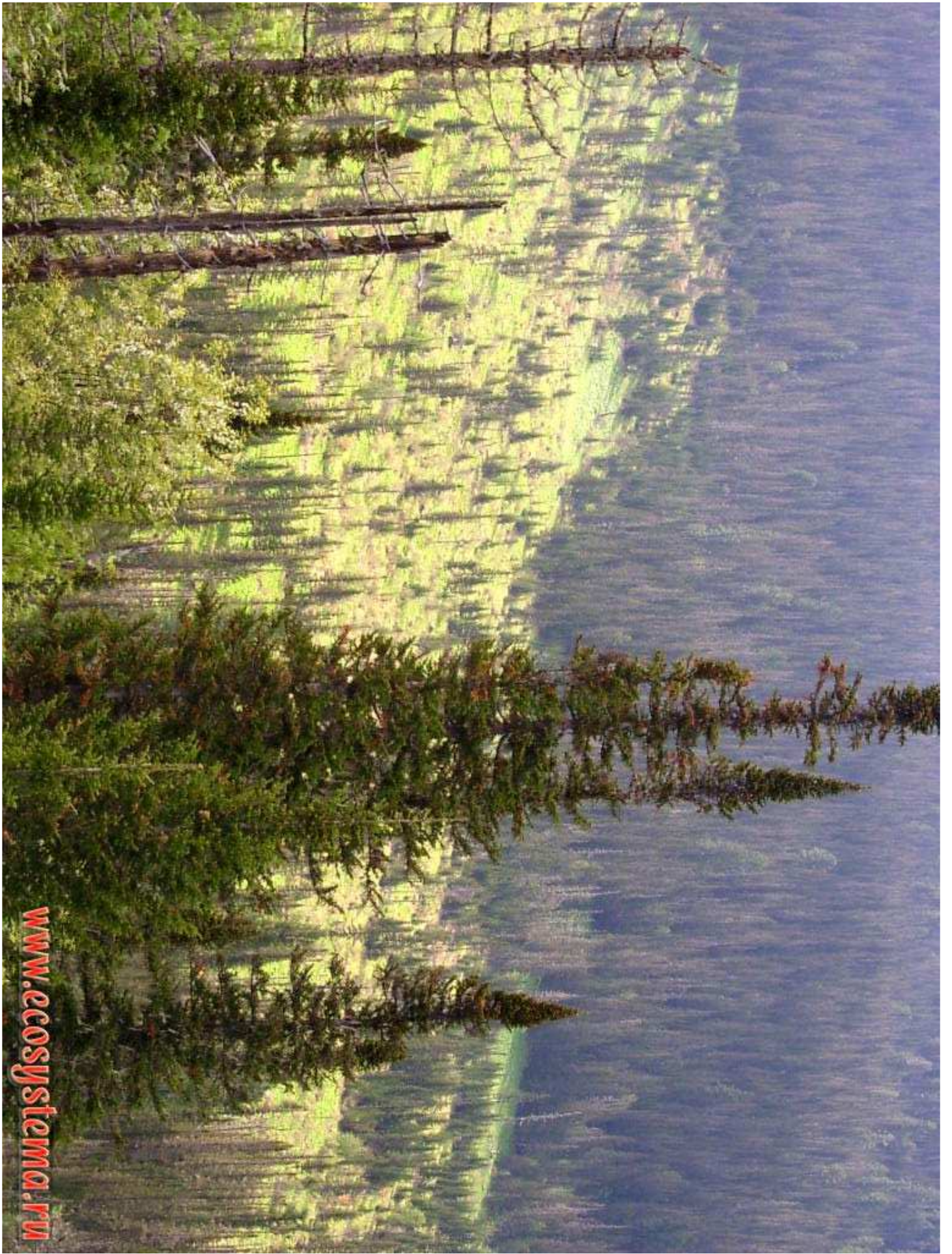
Producer	1ary Consumer	2ary Consumer	3ary Consumer	Decomposers
Pine Oak Sugar maple White elm Balsam poplar Gooseberry Mayflower <u>Cattail</u> Fern Moss	Moose White-tailed deer Opossum <u>Muskrat</u>	Raccoon <u>Mink</u>	Canadian dog Bobcat <u>Long-eared owl</u>	Fungi bacteria

Tofino Temperate Rainforest

Producer	1ary Consumer	2ary Consumer	3ary Consumer	Decomposers
Salmonberry Arbutus <u>Red huckleberry</u> Western hemlock Devil's club Bracket fungus Red alder Pacific dogwood Red cedar	Moose Caribou Beaver Snowshoe hare <u>Vancouver marmot</u>	Marten Raccoon <u>Red fox</u>	Grizzly bear <u>Wolf</u> Cougar	Fungi bacteria

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- Slide 4 – Grassland (Canada - Saskatchewan)
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- Slide 6 – Boreal Forest (Canada – N. Manitoba)
- Slide 7 – Temperate Rainforest (Canada - Tofino)
- Slide 8 – Tropical Rainforest (world - Sumatra)
- Slide 9 – Tundra (Canada and World – N. Quebec)

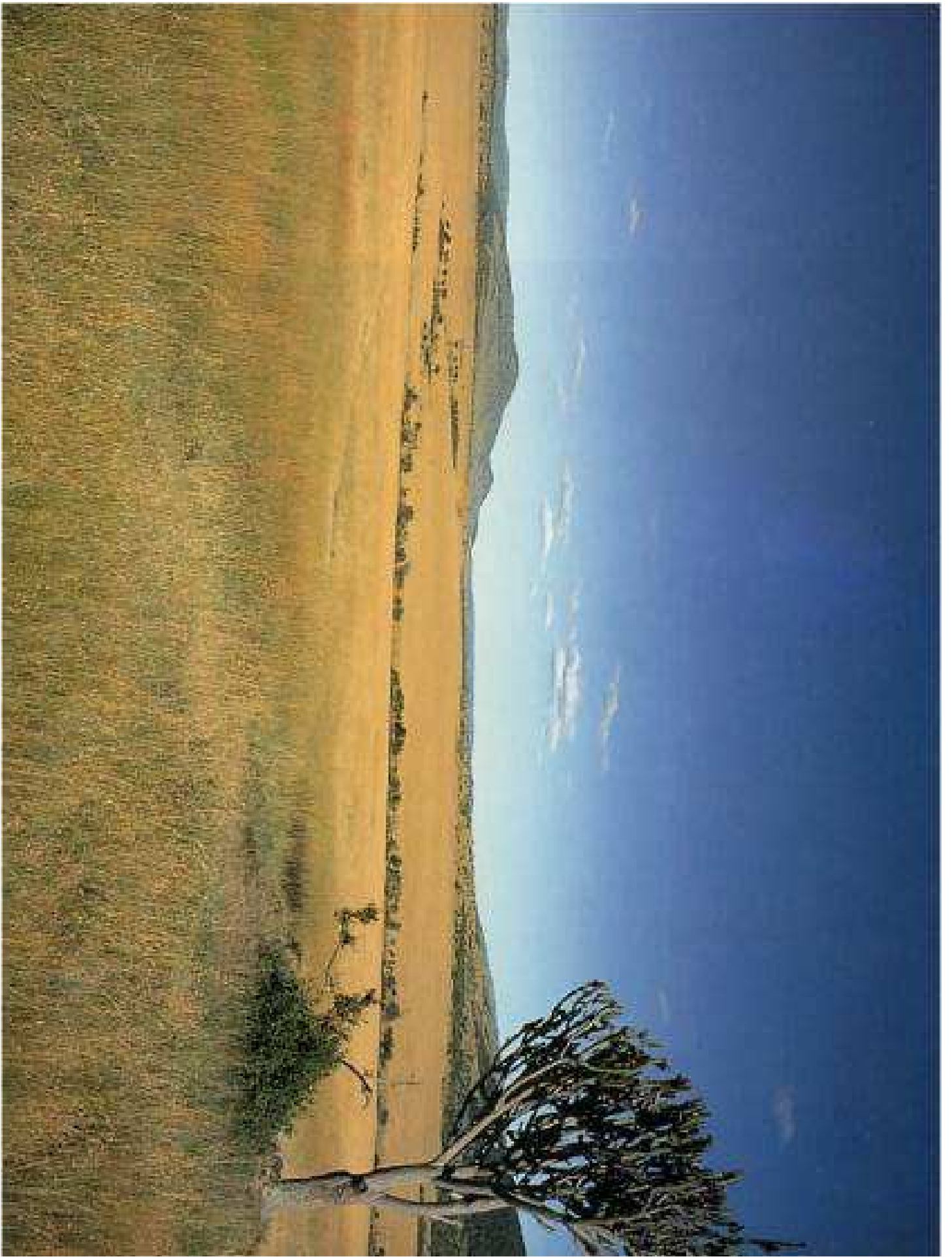


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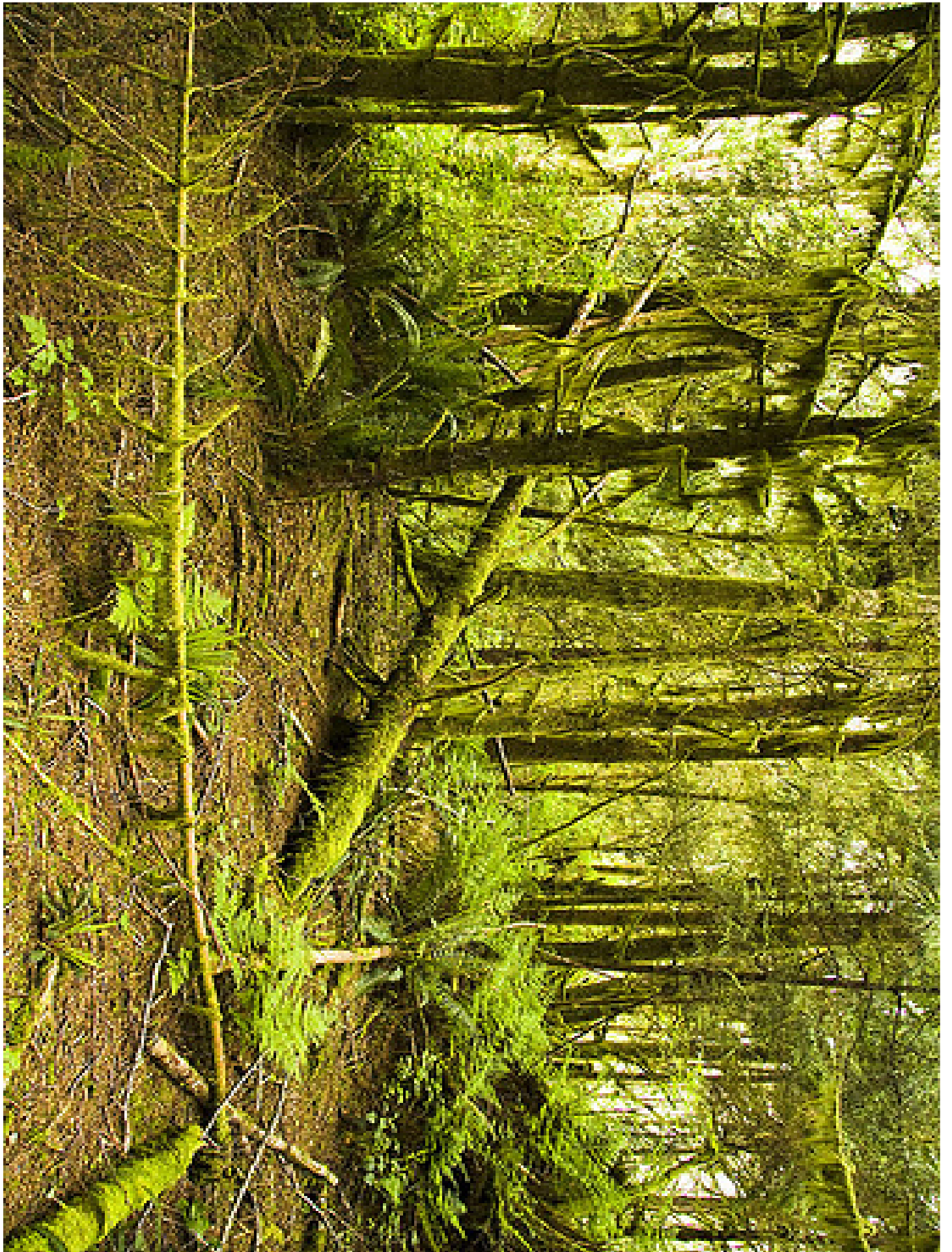


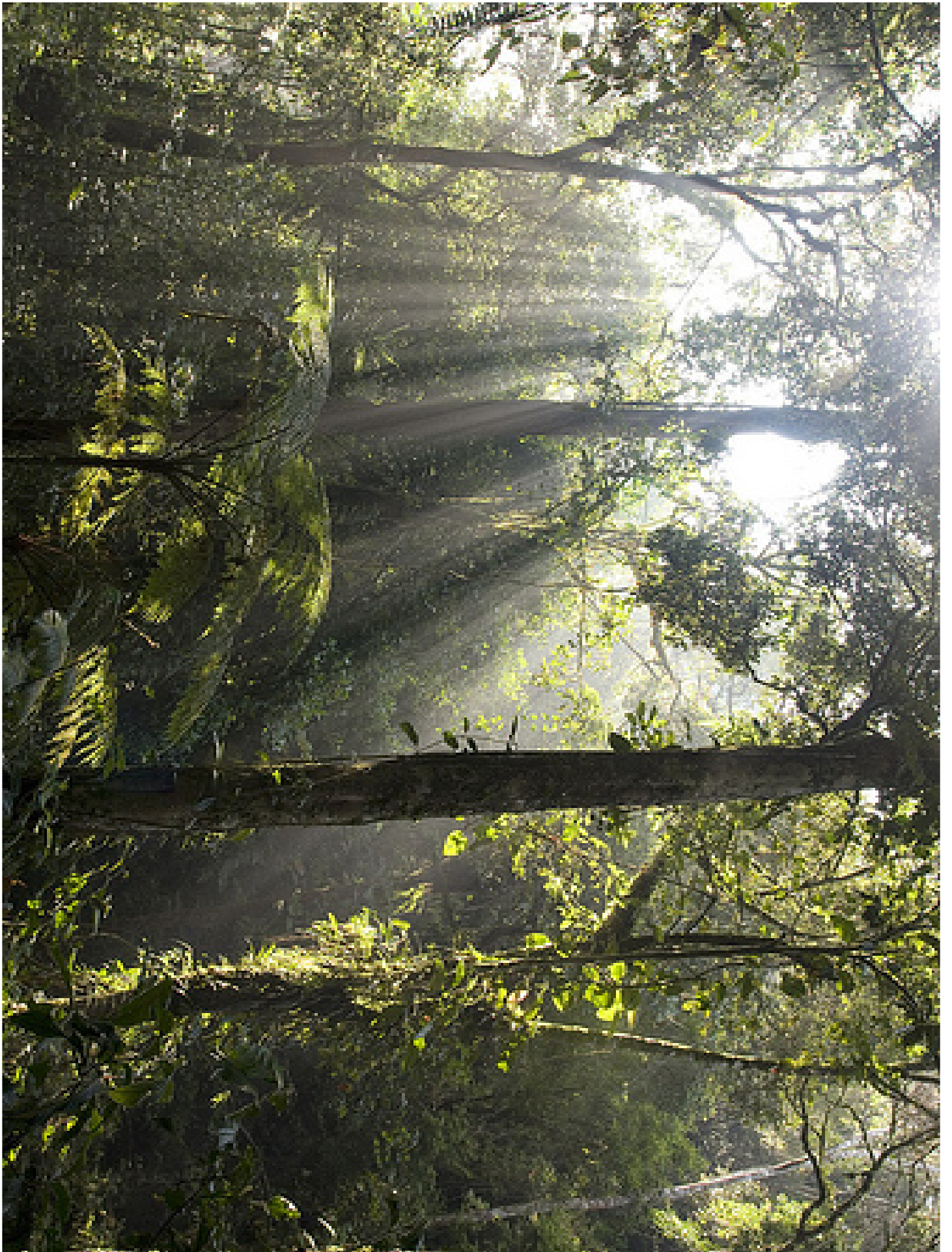


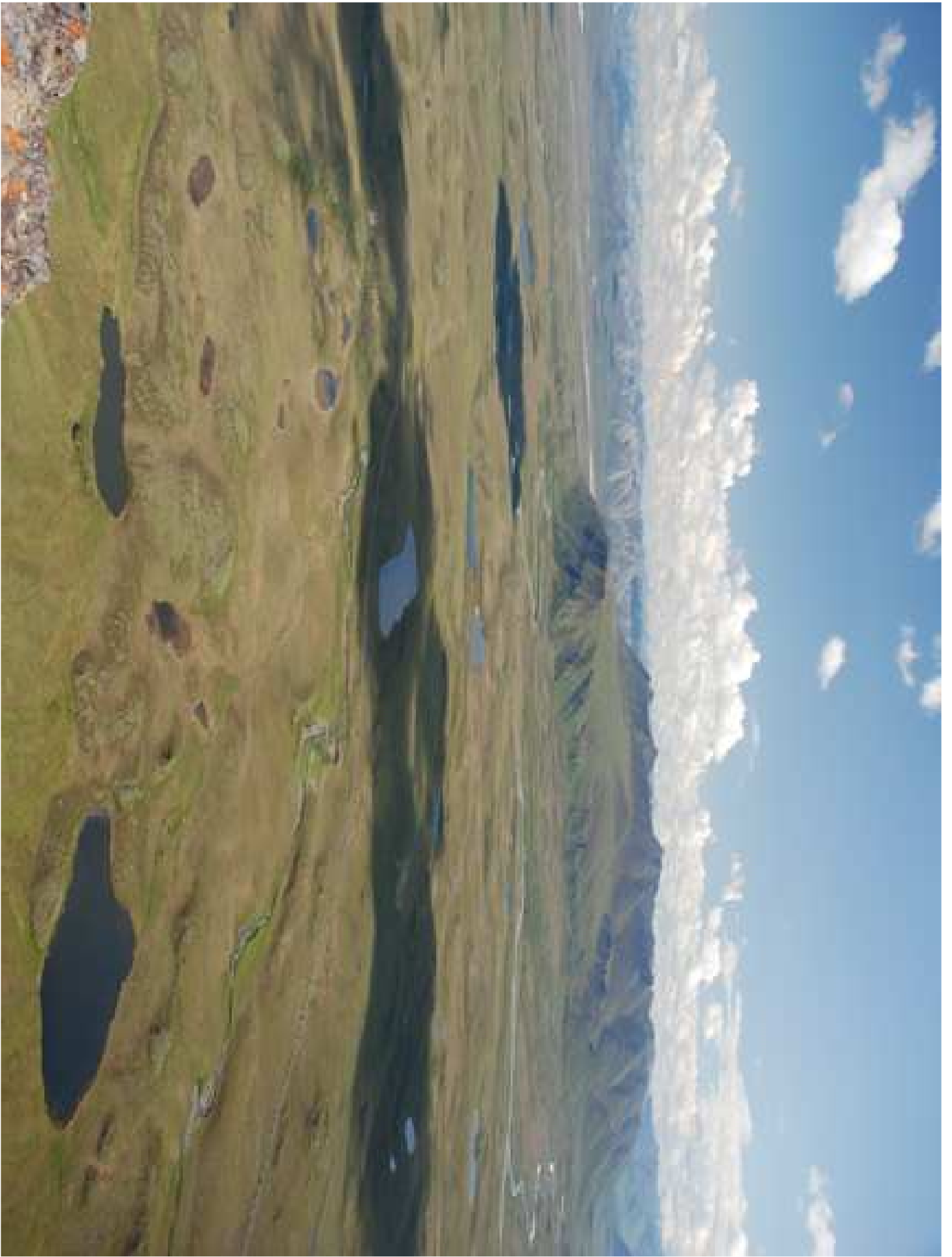








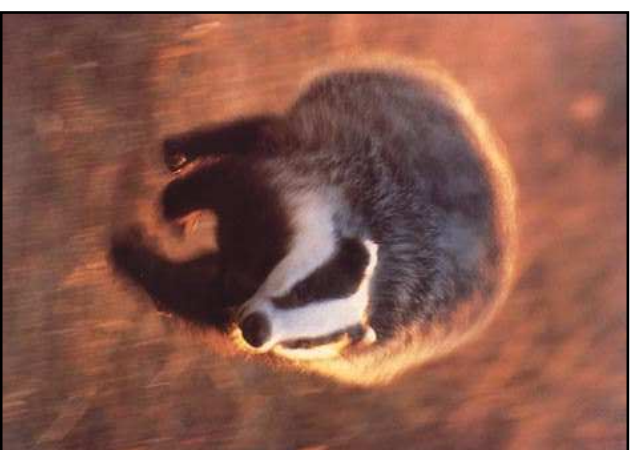




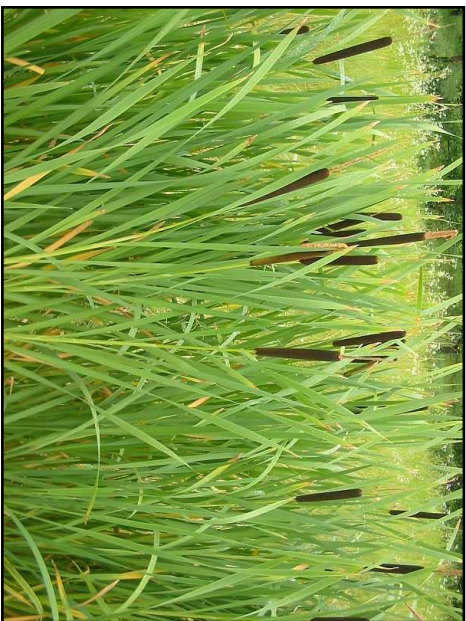
Manitoba Boreal Forest



Saskatchewan Prairie Grassland



Southern Ontario Deciduous Forest



Tofino Temperate Rainforest



Tundra

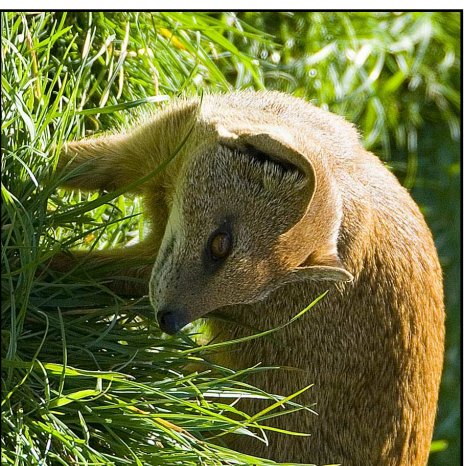
(Northern Quebec and Alaska)



Siberian Taiga Food Chain



African Savannah



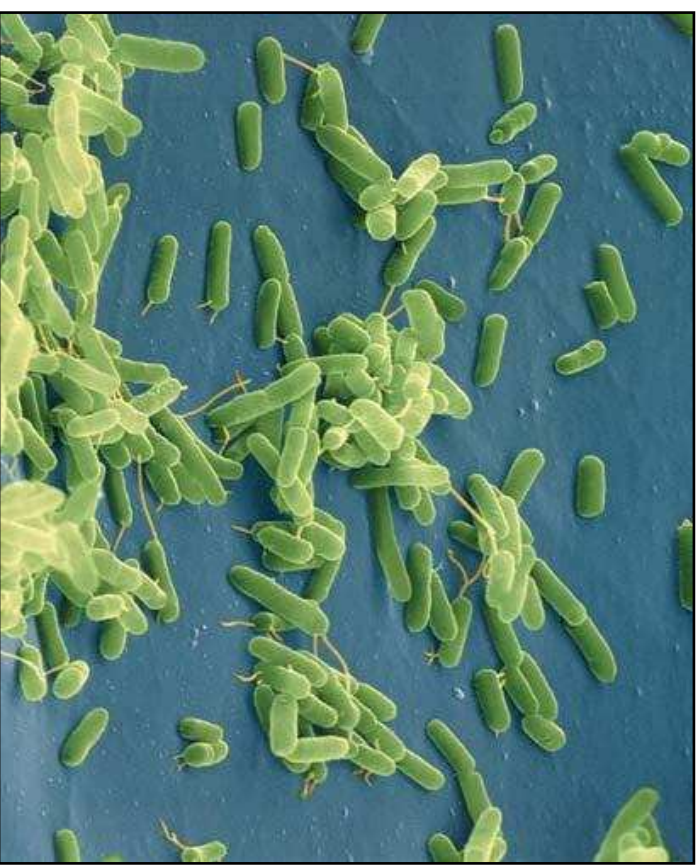
Sonoran Desert



Sumatran Tropical Rainforest



Decomposers



References

- Brown bear <http://farm4.static.flickr.com/3261/2818830812_5026d707c9_o.jpg> Obtained at Flickr profile Podgey, uploaded on September 1, 2008.
- Jackpine <http://en.wikipedia.org/wiki/File:Pinus_banksiana.jpg> Wikipedia – Jack Pine. Last modified on April 28, 2009.
- Arctic willow <<http://www.forestryimages.org/browse/detail.cfm?imgnum=1353225>> Forestry Images. Image created by Mary Ellen (Mel) Harte, Bugwood.org. Last updated on January 05, 2005.
- Arctic hare <<http://www.wildlifenorthamerica.com/Mammal/Arctic-Hare/Lepus/arcticus.html>> Wildlife of North America. Photographed by Steve Sayles.
- Snowy Owl <http://en.wikipedia.org/wiki/File:Snowy_Owl_Barrow_Alaska.jpg> Wikipedia – Snowy Owl. Photographed by Floyd Davidson.
- Arctic fox <http://farm3.static.flickr.com/2001/2263747461_e976b0080c.jpg> Obtained at Flickr profile tobibritsch, Uploaded on February 13, 2008. Taken at the Detroit Zoo, Michigan.
- Black Grouse <<http://en.wikipedia.org/wiki/File:Teeri.jpg>> Wikipedia – Black Grouse. Last modified on May 10, 2009.
- Red Fox <<http://www.nwtwildlife.com/NWTwildlife/foxes/redfox/redfoxtop.htm>> NWT Wildlife and Fisheries. Last updated on February 12, 2009.
- Canadian Lynx <http://en.wikipedia.org/wiki/File:Canadian_Lynx.jpg> Obtained at Flickr profile digitalART2, uploaded on November 12, 2007.
- Prairie sage <<http://commons.wikimedia.org/wiki/File:SKSummersAge.JPG>> Wikimedia Commons, SKSummersAge. Uploaded and photographed by SriMesh.
- WhiteTailJackrabbit <<http://www.chuckngalerobbins.com/photogallery.htm>> ChuckGaleRobbins.com.
- Badger <<http://www.hedweb.com/animimag/badger.htm>> The Hedonistic Imperative. BLTC Research. David Pearce.
- Prairie wolf <<http://www.animalwebguide.com/Coyote.htm>> The Animal Web Guide@ 2004-2007, Chuck Ayoub
- Cattail <http://en.wikipedia.org/wiki/File:Typha_latifolia_02_bgiu.jpg> Wikipedia – Typha. Photographed on July 3, 2005.
- Muskkrat <<http://eliot.needham.k12.ma.us/technology/lessons/animals/muskkrat.htm>> Needham Community Animals. John Eliot School
- Mink <<http://www.kdwp.state.ks.us/news/layout/set/print/Hunting/Furharvesting/Furbearer-Gallery/Mink-Mustela-vison>> Kansas Department of Wildlife and Parks.

References

- Long-eared owl
http://ec.europa.eu/enlargement/archives/enlargement_process/past_enlargements/eu10/pictures/hungary_en.htm
Enlargement Archives. Pictures from Hungary. EPA Photo / Peter Lehoczky
- Siberian Taiga Landscape <http://www.ecosystema.ru/08nature/world/sai/06e.htm> Western Sayan Mountains (East Siberia) natural landscapes and nature objects. Photographed by Alexander Bogolyubov, June 2006.
- Manitoban Boreal Forest Landscape http://www.manitobaliberals.ca/uploaded_images/lc30-722683.jpg Jon Gerrard's Blog. Wekusko Falls. Posted by Jon Gerrard Sept 10, 2006.
- Deciduous Forest Landscape <http://iloveforest.blogspot.com/2008/02/autumn-forest.html> I love forest: autumn forest. Uploaded originally in Flickr by veloopity.
- Desert Landscape <http://sherhorosko.wordpress.com/?ref=Guzels.TV> Sher Horosko's weblog. Sonoran_desert_matt
- Savannah Landscape http://www.wilton.k12.ct.us/whs/lib/student_work/Final%20Folder/Fossil%20Locations.htm Fossil Locations. The Australopithecus Discovery. Created by Arielle, Evan and Amanda.
- Grassland Landscape <http://picasaweb.google.com/h/photo/JUu17pLHVmdwKOT65JmKUG> Picasa WebAlbums. Jarod's Gallery. The Saskatchewan Prairie Landscape. Photo taken by Jarod on June 13, 2007.
- Temperate Rainforest Landscape <http://www.flickr.com/photos/laszlopodor/25339532299/> Temperate Rainforest – Pacific Rim National Park, Tofino, BC. Obtained from Flickr Website profile laszlofromhalifax. Photo uploaded on May 31, 2008.
- Tropical Rainforest Landscape http://budak.blogs.com/the_annotated_budak/2008/09/missing-in-action-megafauna-and-seed-dispersal-in-asia-s-empty-forests.html The annotated budak: Missing in Action: Megafauna and seed dispersal in Asia's empty forests. Budak.
- Tundra Landscape <http://www.terrapodcast.com/media/samples/graphics/tundra%20landscape.jpg> TerraPod List of Stock Photography.
- Beaver http://en.wikipedia.org/wiki/File:American_Beaver.jpg Wikipedia - American Beaver. Author: Steve, Washington, DC USA. Uploaded on July 04, 2007.
- Red Huckleberry <http://humanhabitatrestoration.com/drive-byforestpark1.htm> Human Habitat Restoration
- Vancouver Island Marmot <http://allaboveus.files.wordpress.com/2008/06/3.jpg> All Above US, June 2008. Blog.
- Wolf <http://www.gvzoo.com/node/118> Wolf ~ Vancouver Island | Greater Vancouver Zoo.
- Red Fox (BC) <http://cruisingbc.blogspot.com/> Cruising the Pacific Northwest in the San Juan Islands, Alaska and BC, Canada. Mary and Lou Aubert Blog.

References

- Fungus http://www.mdidea.com/products/new/black_fungus.jpg MDIdea Exporting division.
- Bacteria <http://sustainabledesignupdate.com/?p=409> Sustainable Design Update. Blog Archive. Hydrogen from grass munching bacteria
- Brown Hare <http://isleeswildlifeimages.blogspot.com/> JSlees Wildlife Images Blog. Posted by James Lees
- Red Fox <http://isleeswildlifeimages.blogspot.com/> JSlees Wildlife Images Blog. Posted by James Lees
- Eurasian Lynx <http://creative-commons-photo.com/image/68-bobcat> Bobcat Creative Commons Photo.com
- Siberian Spike grass <http://www.ext.nodak.edu/county/cass/horticulture/grass/grasses.htm> Big Blue Stem to Switch grass. Todd Weinman. Last updated February 2003.
- Whistling thorn acacia <http://www.travelpod.com/travel-photo/nate-n-amy/tanzania-2007/1185559200/whistling-thorn-acacia.jpg/tpod.html> Whistling Thorn Acacia, Serengeti National Park, Tanzania. Nathan and Amy's Travel Blog.
- Nigriceps Ant http://www.geocities.com/brisbane_ants/SugarAnt.htm Black Headed Sugar Ant. Last update September 30, 2006.
- Mongoose <https://secure.mlqpro.com/forum/showthread.php?t=232739&page=2> Major League gaming forum. Posted by WhiteBread.
- Caracal <http://lastrow.wordpress.com/2008/08/04/kids-dont-know-their-animals-anymore/> Kids don't know their animals anymore – Last Row Blog.
- Durian http://thailand.ipm-info.org/crops/durian/crop_development.htm Durian crop development.
- Proboscis Monkey http://www.cuti.com.my/Sub/Sabah/guide_kinabatangan.htm Cuti Malaysia original website. Image obtained from Wikipedia - Proboscis Monkey.
- Bengal Tiger and Leopard <http://www.iloveindia.com/wildlife/indian-wild-animals> Indian Wild Animals. I love India Website.
- Velvet Mesquite beans <http://fireflyforest.net/firefly/2006/01/05/velvet-mesquite-beans-and-recipes/> The Firefly Forest. Discovering and enjoying nature. T. Beth Kinsey.
- Coyote, Kangaroo rat, gray fox <http://www.desertmuseum.org/kids/oz/long-fact-sheets/> Sonoran Desert facts. Arizona Sonora Desert Museum.

World Biomes Food Chains – Sorted by Trophic level

Alaskan Tundra

Producer	1ary Consumer	2ary Consumer	3ary Consumer	Decomposers
<u>Arctic Willow</u> Bearberry Caribou Moss Diamond-leaf Willow Labrador Tea Pasque Flower Purple Saxifrage	Caribou Ermine Musk Ox <u>Arctic hare</u>	<u>Arctic Fox</u> Ermine	Polar Bear <u>Snowy Owl</u>	Tundra bacteria Fungi

Siberian Taiga

Producer	1ary Consumer	2ary Consumer	3ary Consumer	Decomposers
Siberian Larch Siberian Pine Siberian Spruce Aspen Paper birch Black Spruce Mosses <u>Siberian spike grass</u>	Siberian Musk Deer Elk Siberian Roe Deer Reindeer Capercaillie Grouse <u>Brown hare</u>	Boreal owl Great grey owl <u>Red Fox</u>	Siberian Tiger Grey wolf Wolverine Brown bear <u>Eurasian Lynx</u>	Bacteria Fungi

Savannah – Central African Republic

Producer	1ary Consumer	2ary Consumer	3ary Consumer	Decomposers
Acacia Senegal Bermuda Grass Elephant Grass Jackalberry Tree Manketti Tree River Bushwillow Umbrella Thorn Whistling thorn acacia	Impala African Elephant Zebra Wildebeest Giraffe Nigriceps Ant	Mongoose Black Mamba	African Wild Dog Lion Caracal Leopard Nile Crocodile	Dung beetle Termite Bacteria Fungus

Sumatran Rainforest

Producer	1ary Consumer	2ary Consumer	3ary Consumer	Decomposers
Bengal Bamboo Durian Jambu Rafflesia Kapok Tree Mangrove Forests Strangler Figs Tualang	Proboscis Monkey Lesser dawn bat Musang Red-Shanked Langour Sumatran Rhinoceros	False Gavial Leopard	Bengal Tiger	Saprophytes fungus Earthworms Bacteria

Sonoran Desert - <http://www.desertmuseum.org/kids/oz/long-fact-sheets/White-throated%20woodrat.php>

Producer	1ary Consumer	2ary Consumer	3ary Consumer	Decomposers
Barrel Cactus	Desert Bighorn	Grey fox	Puma	Dung beetle
Brittle Bush	Sonoran Proghorn	Bobcat	Coyote	Termite
Desert Ironwood	Antelope	Bark scorpion		
Chain Fruit Cholla	Kangaroo rat	Elf Owl		
Creosote Bush	Jackrabbit	Diamondback rattlesnake		
Crimson Hedgehog	Javelina			
Cactus	Beetle grub			
Ocotillo	White-throated Woodrat			
Palo Verde				
Saguaro Cactus				
Soaptree Yucca				
Teddybear or Jumping Cholla				
Triangle-leaf Bursage				
Velvet Mesquite				