Toronto District Christian High School

CONNECTIONS IN ALGONQUIN

The effect of the atmosphere, hydrosphere, biosphere, lithosphere and humans on Algonquin Park

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Introduction

The earth is like a body. There are many parts, and all these parts together form the whole body. When one part of the body is damaged even slightly, functions of the body can be compromised. Likewise, slight, seemingly harmless changes to earth can severely alter earth's balance and damage it. These "parts" that make up the earth are referred to as spheres - the atmosphere (air), hydrosphere (water), biosphere (living things), and the lithosphere (land). These will be explained more in depth shortly. Everything that is a part of this earth can fit into one of these four spheres. They are each seen as a layer that completely surrounds the earth, and each sphere will often have their own set of cycles and layers within themselves. Each layer works together to form each sphere, and each sphere works together to form the Earth and environments that humans are so familiar with. These spheres are all connected, interacting and affecting each other in a variety of ways.

Connections between these spheres can be observed in Algonquin Park with its rolling hills, many lakes, and lush forests teeming with life. They interact with each other to have a huge impact on the climate, ecosystems of the park, and why certain organisms live where they do in the park. From bogs poor in nutrients, to the outwash plains dominated by coniferous trees, to the west side of the park dominated by deciduous trees, it is all because of factors that have changed one or multiple spheres in some way. However, not all factors are natural, or are a part of the natural state of the park. For instance, humans have made a huge impact on the park, such as logging and forest fires and acid rain, the park has not been left untouched by humanity. Humans have greatly affected the spheres that make up the Earth, and as a result, have greatly affected the park. This paper will explore these connections between the spheres, as well as the impacts humans have made and are making on the park, and how this has affected the park's ecosystems and the communities of organisms that live here today.

Image 1
(Courtesy of Nicholas Tran)

What are the Spheres?

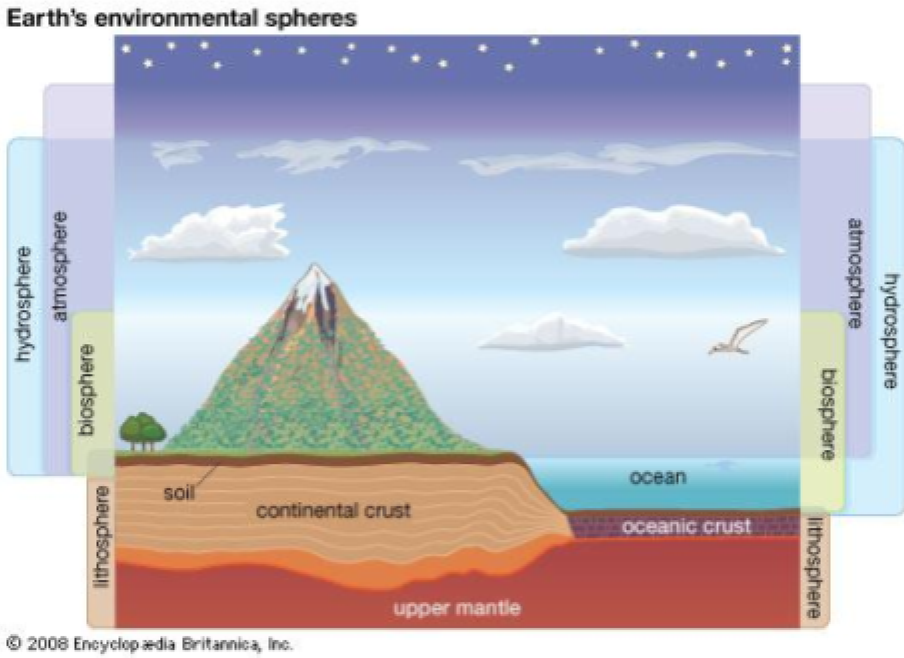

Image 2
The Earth's Four Spheres
(Courtesy of Encyclopedia Britannica)

The Earth is made up of four different spheres, and these spheres interact with each other to create not just Algonquin, but the whole world. These four spheres are the atmosphere, hydrosphere, biosphere, and the lithosphere. They each represent a unique part of the environment, and different regions of the world will have different factors that have affected the spheres, impacting the local ecosystems.

The Atmosphere

The atmosphere is the first layer of the Earth, and it is the layer of gasses that envelops the earth, held in place by the Earth's gravitational pull. It consists of mainly nitrogen (78%), oxygen (21%), and various other gases, which are vital to life as oxygen is needed for organisms to breathe, and nitrogen is an essential nutrient for growth (Sharp). The atmosphere is split into five layers, (starting from the surface of Earth and working towards space): the troposphere, stratosphere, mesosphere, thermosphere, and the exosphere (NASA). These layers within the atmosphere all work together in order to let the perfect amount of sun energy in, deflect harmful radiation, keep away meteors, and play a crucial part in making Earth suitable to live on.

Image 3
The dark clouds and overcast sky gives a hint to what the weather will be
(Courtesy of Mr. D. Robinson)

The troposphere is the first layer of the atmosphere that extends from the surface of the Earth, and is also the densest part of our atmosphere. Almost all of Earth's clouds and weather occurs in the troposphere (Sharp). The stratosphere is the second layer directly above the troposphere. Here the ozone layer is found, which is extremely important because it absorbs and protects organisms from harmful ultraviolet radiation from the sun by converting it into heat (ibid). In addition, most commercial airplanes will fly in the lower stratosphere, or in the upper troposphere to avoid turbulence and weather interference (Ali 1). Flying high in the troposphere or into the stratosphere means airplanes can avoid much of the weather that occurs in the troposphere (ibid). On top of that, air in the stratosphere is much thinner at higher altitudes in the troposphere and stratosphere, translating into less drag, and therefore a more efficient flight, saving fuel and money for airline companies (Ali 2). The third layer is the mesosphere. It is the coldest part of the atmosphere, with temperatures averaging around -90°C (Sharp). Not much is known about the mesosphere, but it is known that most meteors will burn up in this layer, and will leave behind metals and minerals (ibid). The fourth layer is the thermosphere, which is part of the atmosphere, but is often seen as outer space as air density is so low (ibid). This layer is where satellites orbit Earth (ibid). Finally, the layer that is least dense and farthest from the surface of the Earth, the exosphere. This layer is the outer shell of our atmosphere, where our atmosphere transitions into outer space (ibid). These five layers form our atmosphere, providing oxygen, keeping organisms safe, and forming the world's climate and weather patterns.

The Hydrosphere

The hydrosphere is water in all forms, everything from rain to oceans to glaciers to rivers. It includes water that is liquid, frozen, gaseous, or groundwater that is contained within soil or rock (Mackenzie). This sphere is vital to life, as without water, nothing would be alive. The hydrosphere is also always in motion, moving from place to place ("What is the Hydrosphere?"). The motion of rivers or waves is obvious, but motion across the entire world is a lot harder to point out. Currents caused by salinity, density differences, temperature, and wind sweep across the globe, moving heat, oxygen, and nutrients, but most importantly, are a part of a "global conveyer belt" (Fairclough; National Ocean Service). This conveyer belt is a vital part of ocean carbon dioxide and nutrient cycles, as well as global climate, making the hydrosphere extremely important for all life on Earth (ibid). It also deeply connects with all other spheres as it is constantly eroding rocks, supporting life, and interacting with the atmosphere to form waves or to create weather and climate.

Image 4
The hydrosphere in Algonquin is prevalent, as water can be found everywhere
(Courtesy of Genevieve Huyer)

The Biosphere

The biosphere is the sphere that contains all living things, and overlaps all spheres as life can be found in the atmosphere, hydrosphere and lithosphere. From bacteria to a whale shark, all living organisms are a part of the biosphere (Thompson, et al). It is a global ecosystem between organisms as well as the abiotic factors that affect

Image 5
(Courtesy of Nicholas Tran)

them (ibid). The biosphere measures around 20 kilometers thick, however, the majority of life on Earth is found between 500 meters below the ocean's surface to 6 kilometers above sea level (National Geographic Society "Biosphere"). Though it is seemingly huge, the biosphere is quite thin. For instance, if the Earth were the size of an apple, the biosphere would be one thousand times thinner than the skin of the apple (Ahern 31). The biosphere relies heavily on the other three spheres, as without one of the spheres, all life on Earth would cease to exist, making it very vulnerable when changes to the biosphere or any other spheres occur.

The Lithosphere

Image 6
A large glacial erratic- a remnant of the last ice age
(Courtesy of Nicholas Tran)

The lithosphere is the rocky outer crust of the Earth (National Geographic Society "Lithosphere"). Everything on the Earth rests on the lithosphere, as it is the plates that make up seabeds as well as the land that everything rests on. It consists of the pedosphere (soil), the crust and the uppermost mantle. There are two types of crust within the lithosphere, oceanic crust and continental crust (ibid). Oceanic crust is found at the bottom of seas and oceans, and it is much younger, thinner, and denser than its continental counterpart (Luyendyk). Continental crust is what makes up landmasses, and it is much thicker and older than oceanic crust. These two types of crust along with the upper mantle and pedosphere form the lithosphere of Earth, however, the lithosphere is broken in places. These breaks form tectonic plates, making the surface of the Earth like a giant puzzle (Gardiner). These plates move slightly every year, riding on top of the viscous, putty-like asthenosphere below them (National Geographic Society "Lithosphere"). In addition, tectonic plates will interact with each other, colliding, sliding, separating, destroying and creating new crust (ibid). This shapes the very lithosphere itself, by creating mountains with the collision of continental crust, or by forcing oceanic crust to the mantle at subduction zones.

How do the Spheres Affect Algonquin?

The four spheres that were covered in depth above are what shape the Earth to what it is today. In different regions, the spheres are affected by different factors, and as a result, create completely different environments and ecosystems. The same can be said for local regions, like Algonquin park. On the 22nd of September to the 26th, the Grade 11 Earth and Space Science Class went on a trip into Algonquin park to observe and study these relationships between the spheres. From acid rain to glacial outwash, or erosion from the hydrosphere, all of the spheres have made Algonquin park how it is today, and have made it possible to support the unique variety of wildlife that make their home in the park.

The Atmosphere

Around the world, the atmosphere closely interacts with the other spheres to have numerous effects on each other and the world. Weather and climate showcase the interaction between the atmosphere and the hydrosphere, which have a huge effect on the biosphere and lithosphere as well. Climate and weather patterns are one the biggest ways that the atmosphere affects the biosphere, defining where certain plants and animals will live depending on temperature, precipitation, as well as humidity (Ahern 24). Climate has divided the Earth into biomes, based off of the vegetation and characteristics in that area as a result of climate (ibid). In Algonquin park, the story is no different, as the atmosphere often closely interacts with other spheres to have numerous effects on the the park. The gases in the atmosphere are vital to all life on Earth, and everything in the biosphere relies especially on the oxygen and the nitrogen found in it. The atmosphere is vital to life, and is deeply connected to the other spheres to sustain life within the park. However, the atmosphere and climate have been also affected by human impact, and this will be explored as well.

Climate

Climate plays a big part in why the world is the way it is. However, what is the difference between climate and weather? Isn’t weather what happens every day, such as rainfall or the temperature? Yes, however, climate is the long-term patterns of weather in a particular region

(Dunbar). That means looking at the average of weather patterns, including precipitation, temperature, humidity, sunshine, wind velocity, and other measures of weather over a longer period of time than just a day or week (ibid). Climate is important to Algonquin as it is the reason why the the park is home to certain species of plants and animals.

Image 7
Climate in part has determined what vegetation grows inside the park and what organisms will follow
(Courtesy of Algonquin Provincial Park)

Algonquin park rests in a Boreal-Temperate transition biome, and this is a direct result of the climate that affects the land (Ahern 24). A boreal-temperate transition biome means that it sits sandwiched between two different biome: a boreal forest biome and a temperate mixed forest biome (ibid). To the north of Algonquin, the boreal forest biome rests, characterized by the large stands of coniferous trees that dominate the landscape, whereas the temperate mixed forest biome is characterized by its mix of broadleaf deciduous trees, such as maples, oaks, and beeches, and some coniferous trees, such as pines, spruces, and firs. This in-between situation that Algonquin is in means that depending on the region and climate that affects that region, the park will have a more boreal nature, ruled by the stands of coniferous trees, or it may have a more temperate mixed forest feel, dominated by maples (ibid). But why is Algonquin like this, and how does climate affect what trees grow?

In the park, prevailing winds come from the west or northwest, and thus, carries moisture from the west / northwest across the park towards the east/ southeast. This is important, along with the fact that the park is shaped like a dome. These two factors play a big role in the climate of the park. As wind and moisture sweep across the park, they are forced upwards due to the elevation increase caused by the domed shape of the park (Ahern 24). This rising air cools and condenses, forcing it to drop its precipitation as it moves overtop of the dome (ibid). As a result the west side of the park is cooler and wetter due to its higher elevation, and the east side of the park is warmer and drier due to its lower elevation. This temperature and moisture difference alone separates Algonquin distinctly into two environments: an environment suited towards the growth of deciduous trees such as maples, or an environment that lends itself towards the growth of pine trees. The pedosphere also plays a big part in what vegetation grows, and this will be explored later. However, in terms of climate, the wetter, cooler, west side of the park is dominated by maples and other broadleaf trees that prefer the moister soil (ibid) On the other hand, the drier, warmer east side is better suited towards the growth of spruce and pine trees (ibid). In addition, because of the different vegetation, each side of the park is home to different organisms. These two completely different types of vegetation support two different ecosystems, all because of the differing climate in the two regions. This variety of organisms is one of the many reasons why Algonquin is so special and unique, and climate has to do with it.

Nitrogen, Oxygen, and Carbon Dioxide Cycles

The atmosphere is deeply tied to the biosphere, as the nitrogen, oxygen, and carbon found in the atmosphere is needed for all life on Earth. Nitrogen is an essential part of building proteins and DNA because it is essential to make the building blocks of life (The Editors of Encyclopedia Britannica "Nitrogen Cycle"). Oxygen is needed by everything living in the process of respiration in order to breathe and live. Finally, carbon is what makes up most living organisms on Earth, and it is needed in order to grow and live as well. These three essential components each have their own cycle, and these cycles interact with all spheres of the Earth. They are all extremely important and deeply intertwined.

Nitrogen is everywhere in the atmosphere. In fact, it is the most abundant element in our atmosphere, making up around 78% of it (Sharp). However, nitrogen in the atmosphere is in a gaseous form, and is unusable to most organisms (The Editors of Encyclopedia Britannica "Nitrogen Cycle"). The process of turning this nitrogen into a useable form is called "Nitrogen fixation", and it is performed by nitrogen fixing bacteria and certain algae (ibid). The result of nitrogen fixation produces ammonium, which is then taken by nitrifying bacteria, producing nitrates, a form of nitrogen that is useable by other organisms (Harrison "The Nitrogen Cycle"). From there it is absorbed by plants and other vegetation through the soil, and used to make proteins and other nitrogen-based compounds (ibid). If these plants get eaten by other organisms, it passes on that nitrogen, fueling the food chain. Finally, when a plant or animal dies, it decomposes, turning back into ammonium in the soil, which can be turned into nitrates, which can then be used by plants once again. However, denitrifying bacteria can also take those nitrates and turn it back into the gaseous atmospheric nitrogen, releasing it back into the atmosphere, completing the nitrogen cycle (The Editors of Encyclopedia Britannica "Nitrogen Cycle").

However, there is one exception to nitrogen fixing bacteria. Instead of releasing the fixed nitrogen into the soil, they will sometimes live symbiotically with plants, and will provide fixed nitrogen directly to that plant ("Bat Lake Trail" Post 12). Algonquin park has one of these plants, the speckled alder, or *Alnus incana* (ibid). All other trees in the park must get their nitrogen from the soil, a rather slow process, but not the alder (ibid). They have nodules on their roots that are home to these nitrogen-fixing bacteria, directly making the fixed nitrogen available to the alder (ibid). This allows the alder to grow extremely well even in relatively nutrient poor conditions. However, this is not the only impact that it has. Because of the nitrogen-fixing bacteria hosted by the alder, its leaves are as a result, four times richer in nitrogen than the leaves of other plants ("Bat Lake Trail" Post 12). These leaves will fall by the millions at fall into the waterways of Algonquin, and power the aquatic food chain in lakes, rivers, streams, and ponds. The nitrogen rich leaves are food to insect larvae, which in turn feed the insects and minnows that feed on them, and the insects and minnows are food for fish, birds, and other organisms (ibid). An entire ecosystem is supported by the speckled alder, and the nitrogen-fixing bacteria that it houses. In addition, when the leaves of the alder fall on soil, the result is similar. The nitrogen rich leaves help to fertilize the soil, and as a result, improve plant growth, which in turn supports more animal growth (ibid). This cycle of nitrogen in the atmosphere is extremely important and it supports all live on Earth, and the unique relationship between the nitrogen-fixing bacteria and the speckled alder is crucial to support a number of ecosystems as well.

Oxygen is the second most abundant element in our atmosphere, and is vital as well to life on Earth (Sharp). Oxygen is needed by cells to produce energy, and as a result, every living thing on this Earth needs oxygen, even plants, though it may not seem like it. The oxygen and carbon dioxide cycles are so deeply intertwined that they both will be covered here together.

Carbon dioxide and oxygen both are present in the atmosphere. Oxygen is taken by all living organisms in the process called respiration, where organisms will take in oxygen for the production of energy and release carbon dioxide ("Respiration"). All organisms will perform respiration. Simply put, humans and animals breathe in oxygen from the atmosphere which is used for energy in cells, and carbon dioxide is released back into the atmosphere. Plants will take in oxygen to create energy and food, and carbon dioxide is released ("Photosynthesis and Respiration"). Respiration is how carbon dioxide gets into the atmosphere: organisms intake oxygen, output carbon dioxide. But then how does oxygen get replenished into the atmosphere?

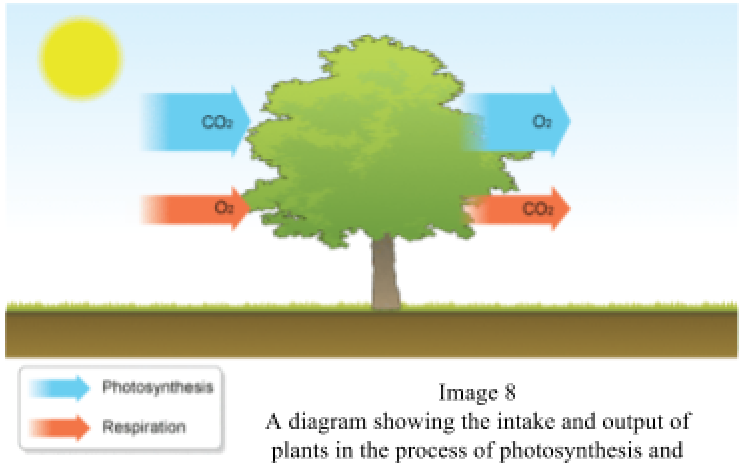

Image 8
A diagram showing the intake and output of plants in the process of photosynthesis and respiration
(Courtesy of BBC Bitesize)

Plants create their food through the process of photosynthesis, where they will take the carbon dioxide in the atmosphere along with sunlight and water to create glucose, a sugar that is used by plants for growth ("Photosynthesis and Respiration"). In this process, oxygen is released as a waste product, which is how oxygen in the atmosphere is replenished, ready to use again by organisms (ibid). In addition, plants will get eaten by other organisms, transferring carbon to those organisms, and those plants and organisms will eventually die or produce waste, and that will transfer the carbon into the ground, often fertilizing the ground (Johnson). This relationship between the atmosphere, biosphere and lithosphere is vital for life all on earth, supporting organisms and giving them the oxygen they need to survive.

Humans and the Atmosphere

A new threat is upon not just Algonquin, but the world. Global climate change and global warming are a reality that is affecting and will affect the park (Ahern 46). Algonquin is warming, and as a result, its ecosystems are changing (ibid). As it warms, northern species may move out of the park, and southern species may head up into the park (ibid). On top of that, fish species in the lakes of algonquin can be affected. For example, trout like cold water, and they will often stay deep in lakes and rivers and only come up briefly into the warm water to feed (Ahern 40). However, with rising temperatures, lakes and rivers are warming up, meaning that suitable places for them to live in are becoming scarcer, plus warming water temperatures will put the stress on the fish.

In conclusion, the atmosphere is extremely important, not only does it provide the elements such as nitrogen and oxygen that is needed for life on Earth, it plays a big part of controlling where organisms live through climate, a feature of Algonquin that contributes to its beauty and wonder.

The Hydrosphere

In Algonquin park, the hydrosphere is everywhere. The park is littered with lakes, rivers, ponds, and streams. According to The Friends of Algonquin Park, Algonquin has over 1,500 lakes and 1,200 kilometers of stream ("Fishing in Algonquin Park"). The hydrosphere in Algonquin is so deeply intertwined with all the other spheres. It is home to many organisms, from plants to salamanders, fish, and beavers. It provides refuge and safety for some, while also being a place to hunt and be hunted for others. Dimictic lakes rely on the atmosphere and winds for oxygen, plants and animals rely on the water cycle and the hydrosphere for shelter and moisture. Beavers will create beaver ponds and make a completely different habitat for organisms (although this will be explored in the "beavers" section in the biosphere), and rocks will play a part in the number of animals supported by a lake. Even the actions of a glacier over 10 000 years ago has played a huge part in why Algonquin is the way it is today by shaping the lithosphere and pedosphere. The hydrosphere is everywhere, and can be linked to everything.

River Ecosystems

Rivers in Algonquin support many different organisms, as they are rich in food (). From leaves that have fallen into the river to algae that covers, logs and debris in rivers, rivers have a variety of food, and as a result support a variety of different organisms. The river that will be focused on here is the Oxtongue River, but the principals can be applied to other rivers in Algonquin.

There are three types of plant food that fuel these river ecosystems: dead plant matter, bacteria and algae floating downstream, plant debris that have fallen to the bottom of the river, and the "slimy" coating of algae on rocks, logs, and other debris. One food that is especially important are the fallen leaves, of the speckled alder, mentioned in the section "Nitrogen, Oxygen, and Carbon Dioxide Cycles", that are extremely important ("Whiskey Rapids Trail" Post 2). Their leaves contain four times the nitrogen of other leaves, making it especially nutritious for the river (ibid). These three types of plant food fuel the aquatic food chain of Algonquin (ibid).

Image 9
Rivers support a large number of organisms, from insect larvae to belted kingfishers
(Courtesy of Genevieve Huyer)

Algonquin rivers are home to hundreds of species of insect larvae such as the blackfly, mayfly, and stonefly ("Whiskey Rapids Trail" Post 5). These larvae will feed on the plant food mentioned above, and in turn be food for other organisms. For example, insect larvae will feed on plant food mentioned above, and they will feed bottom feeding fish, minnows and other organisms (ibid). From there, fish are food for even bigger animals such as the otter, even bigger fish, and the belted kingfisher. Algonquin rivers are teeming with life, and it's these relationships between the spheres that make it all possible.

Dimictic Lakes

All living organisms need oxygen to live, so how do fish and underwater organisms get that oxygen? Seems like a simple answer- doesn't it just dissolve into the water? Yes, but extremely slowly ("Peck Lake Trail" Post 3). Fortunately, there are two other ways for oxygen to get into water, by plants that live in the water and aeration caused by winds and currents. The latter way forces oxygen to dissolve into the water at a much faster rate than it would normally occur at. This interaction is vital, as without the wind to power the currents and waves that aerate the waterways, there would be a lot less oxygen in Algonquin's lakes. However, lakes in Algonquin have another obstacle to get over. Most lakes in Algonquin are dimictic lakes, meaning that they only mix surface to the bottom twice a year (Lane). But why does this happen, and what effect does this have?

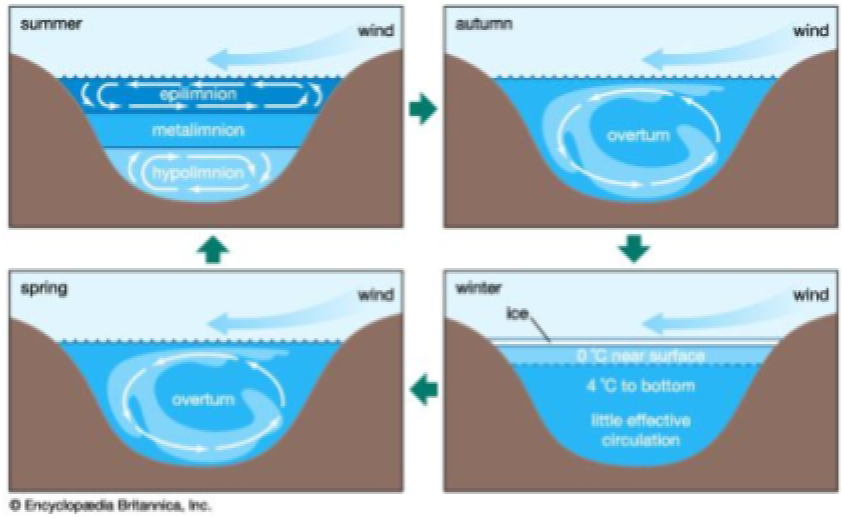

Image 10
Diagram of a dimictic lake, showing the different temperatures of the lake (Courtesy of Encyclopedia Britannica)

Dimictic lakes are caused by temperature differences in the water, resulting in different densities and therefore different resistances to currents ("Peck Lake Trail' Post 2). This section will discuss Peck lake in specific but the same principles can be applied to other lakes inside and outside of Algonquin. In spring, Peck lake is uniformly one temperature (around 4°C). This means that the water in the lake is the same density, and has the same resistance to currents, allowing the currents caused by winds at the surface of the lake to flow and circulate from the surface to the bottom (ibid). This mixes the lake's water (and therefore nutrients) evenly throughout the lake. This is called the spring turnover. However, as the months go on, the surface of the lake heats up faster than the currents can mix the warmer surface water with the colder water below (ibid). This causes the surface water to continue to get warmer and lighter than the colder, denser water below, making it harder and harder to mix the two the more the lake heats up (ibid). This creates an effect where the top half of the lake will continue to get warmer and warmer, circulating that warmer water only in the top couple meters of the lake, leaving the lower sections of the lake colder, and without a fresh supply of nutrients (ibid). As a result, this creates "two lakes", one on top of the water- the first being a warm upper lake that continues to circulate warm water, oxygen and nutrients, and a second, deeper, colder lake that is cut off from the circulating nutrients and oxygen (ibid). This means that the colder, lower lake must get enough oxygen from the spring turnover to last the summer, as the temperature differences in the summer between the two lakes cuts off oxygen to the lower lake (ibid). This continues through the summer until fall, where the surface of the lake cools down and the lake is one uniform temperature again, allowing the wind and currents to mix the water and nutrients throughout the lake- the fall turnover. The fall turnover ends in winter, when ice covers the surface of the lake, sealing the entire lake away from any air and wind (ibid). These dimictic lakes rely on the two turnovers to sustain life, making those two turnovers all the more important. On the rare occasion that the lake has not taken in enough oxygen for the winter, or its supply of dissolved oxygen is used up by the organisms or processes within the lake, dead fish can be found floating at the top of the lake once the ice melts ("Peck Lake Trail" Post 3). This interaction between the atmosphere and hydrosphere are extremely to the lakes of algonquin, and the organisms living in them, and it allows for the lakes of Algonquin to support much more life that they would otherwise could not.

Glaciers

Glaciers have influenced Algonquin park massively, from the types of soil to where that soil is, and that affects what kind of vegetation flourishes in the area. Around 13, 000 years ago the most recent ice age was coming to an end, and the massive glacier that covered Algonquin was retreating north (Ahern 20). In its retreat it scoured the lithosphere, creating depressions in the ground that eventually turned into many of the lakes that are in the park today. Then, as the glacier melted, massive torrents of water flowed out from the glacier. These torrents of water carved out huge river valleys, eroded much of the land, and deposited the soil that covers the park (Ahern 22). However, there were two type of soil left behind as the glacier retreated, and this is an important part of Algonquin's environment.

Due to the lower elevation in the east of the park, much of the glacial meltwater tended to drain out to the east of the park. As a result, much of the glacial till, or left behind rocks, sand, and silt from the glacier, was drained/ filtered by the meltwater ("Bat Lake Trail" Post 2). Big boulders or rocks did not get carried very far, and the silt and clay particles in the rivers were too small and light to be dropped, and they were carried away (ibid). However, sand particles were light enough to be carried by the huge torrents of water, but when these rivers widened and slowed, they were dropped (ibid). However, in the southern and western part of the park, glacial till was dumped here and left unaffected by the meltwater. As a result, the lowlands of northern and eastern Algonquin are covered in sandy soil, and the highlands of southern and western Algonquin are covered in unsorted glacial till, consisting of rocks, pebbles, sand, silt and clay particles (Ahern 29). Because of these two soil types that differ between two sides of the park the vegetation in these two sides of the park are distinctly different from each other (ibid). Also, because of the differing vegetation, these two sides of the park will be home to some very different animal species.The effect that the different soil has will be explored more in depth in "Pedosphere and the Park" in the Lithosphere section.

Glaciers and their meltwater carved out and eroded many river valleys. These massive river valleys once carried huge of water, but now the river that flows through the valleys are a fraction of the size of what they used to be. One example of this is the Barron canyon ("Barron Canyon Trail" Post 1). The Barron canyon started as a break in the Earth's crust, but was eroded over millions of years by rain, the Barron river, frost action, and glacial meltwater (ibid). At one point, glacial meltwater from the Fossilmill drainage flowed into the Barron canyon, and at its peak, carried around as much water as one thousand Niagara Falls ("Barron Canyon Trail" Post 3). Today, the days of the raging torrents of water are long gone, however, its effects can still be felt today.

The steep canyon walls provide nesting areas for ravens and red-tailed hawks, and at the bottom cliffs close to the water, they provide nesting sites for swallows and the eastern phoebes ("Barron Canyon Trail" Post 6). Even though glaciers happened thousands of years ago, they have greatly affected the park, from the types of soil to the lakes and rivers inside the park

Acid lakes

Inside Algonquin park, there are 15 lakes that are known to be acidic ("Bat Lake Trail" Post 10). This section will focus on Bat Lake, but the same ideas can be applied to other lakes. But why are lakes acidic? It could be from acid rain, and this is often the reason humans point at to why lakes are acidic, but it is not always entirely true (ibid). Certain species of algae are tied to certain pH levels, and it could be possible the Bat Lake has always been acidic due to the presence of that algae (ibid). In addition to the algae, Bat Lake and many other lakes in Algonquin have little to no way of neutralizing the acid due to the type of rocks that make up bedrock and lake bottoms (ibid). The sound of an acidic lake with no way of helping itself sounds grim, and is often seen as a lifeless or sterile space, but acidic lakes actually support a unique ecosystem that is not found anywhere else.

Image 11
Acidic lakes can be bad but, they are not always human caused, and they support completely different organisms (Courtesy of Algonquin Provincial Park)

When most people think of life in lakes, it is normally fish. However, Bat Lake is devoid of fish, but it is still teeming with life. Tiny crustaceans will feed on the algae mentioned above, and millions of phantom midge larvae will feed on those crustaceans, in turn feeding thousands of other predatory insects, which are food for buffleheads, a type of duck, that will migrate past the park ("Bat Lake Trail" Post 11). Finally, acidic lakes are great for salamanders, as it provides a place for them to lay their eggs in the spring and let their tadpoles mature without the threat of being eaten by fish (ibid).

Humans and the Hydrosphere

Humans have greatly affected the hydrosphere as well. Acid rain/precipitation is a big threat to lakes, especially to lakes that are sensitive to acidity and not naturally acidic. Acid precipitation is caused by the release of millions of chemicals into the atmosphere in the process of burning oil, or smelting ores ("Acid Rain in Algonquin Provincial Park" 1). These chemicals, particularly sulphur dioxide and nitrogen oxides react with the rain droplets and form acid rain (ibid). Most lakes are able to "buffer", or neutralize the acid in small doses, but the repeated attack of acid on lakes will use up that "buffer space" (ibid). Algonquin lakes face the threat of being acidified even more than other lakes, because they lack the minerals and nutrients needed to counteract the acid (ibid). Limestone is great at neutralizing acid, and as a result, Gilmore

Lake is insensitive to acidification ("Acid Rain in Algonquin Provincial Park" 2). However, most lakes are not so lucky, and lack the calcium carbonate or limestone needed to counteract the acid can prove to be a problem. Acidification is a threat, although it is a slow process, organisms living in those lakes eventually could be put under a lot of stress, and die, even if the lake is not permanently acidified (ibid). For example, if a lake trout were to have its spawning bed covered by acid precipitation, that could mean that the whole year's worth of fry were be wiped out (ibid). Not only that, increased acidity can deform growth in eggs, or damage a fish's' inner organs, as well as skeletal strength (Ophardt). A lake acidifying can be disastrous, and it is not just a problem for fish, but all organisms that interact with the hydrosphere, directly, or indirectly.

The Biosphere

The biosphere in algonquin is extremely diverse, from the plants and animals that make their home here permanently, to the animals that will migrate to and from Algonquin. Algonquin is teeming with life, big and small, and every piece of the biosphere here in Algonquin is important. Food chains and the complex relationships between organisms in the park will be explored here, as well as the importance of certain animals in the park. For example, caterpillars, which are often seen as tiny, insignificant bugs, are the most important animal in Algonquin in terms of total weight ("Bat Lake Trail" Post 6). Beavers also have had huge impacts on the environment, changing it to suit their own needs. The biosphere relies on all other spheres to be able to support life. However, humans have impacted the biosphere in Algonquin, and have had major effects that can still be observed today. All of these will be explored in this section.

Food Chains

All living things need food of some sort in order to survive. Whether that is insect larvae or microscopic algae in the water to wolves at the top of the food chain, they all need nutrients to survive. Food chains are used to group together organisms that depend on certain food to survive. Plants are always at the base of food chains, and are called primary producers, because they produce the energy that will eventually make its way up to the top of the food chain. Plants will take minerals and nutrients from soil, and sunlight to create energy. When these plants are eaten by herbivores, or primary consumers, that energy is then transferred to those organisms (Ahern 35). In Algonquin these primary consumers are caterpillars, deer, moose, mice, and other plant-eating organisms (ibid). From there, that energy is passed to secondary consumers, or omnivores, such as bears, fish, some types of birds (ibid). Finally the energy from omnivores and herbivores are transferred to tertiary consumers, or carnivores, that rule the top of the food chain. This can include wolves, falcons, predatory birds, etc (ibid). It seems pretty simple, except for the fact that food chains are extremely inefficient (ibid). About only 10 percent of the energy consumed by organisms is actually used, meaning that a huge number of organisms and plants are needed at the bottom of the food chain to support the few organisms that are on the top of the food chain (ibid). These food chains are often a delicate balancing act, and influxes at the bottom will affect the rest of the food chain, and as a result, affect the whole park. This means that the organisms closest to the bottom of the food chain are the most important ones.

Fire! That's Bad... Right?

Fire is the one word that is almost always seen as bad thing for forests, but it may not be the case. Forest fires do sometimes occur naturally, and are a part of the natural cycle of nature ("Two Rivers Trail" Post 4). For instance, every year there are about 15 fires that are started in the park due to lightning strikes (ibid). Nowadays, they are put out pretty quickly, but fires are actually extremely beneficial to the park's vegetation and wildlife ("Two Rivers Trail" Post 7). Not only are fires beneficial to the park, disturbances in general can benefit the wildlife as well as the vegetation. These disturbances could be outbreaks of certain organisms, forest fires, logging, or even tornados. In fact, many of the plants and forests that are present in Algonquin would not be around if it were for a disturbance of some kind ("Big Pines Trail" Post 3).

Forest fires not only benefit vegetation, but also the animals. But how? Well certain types of plants, particularly pines, birches, and trembling aspen, need specific conditions in order to grow that only come from disturbances such as forest fires. When a forest fire occurs, it will burn away the "duff" layer of dead leaves, or decomposing plant matter, leaving an exposed mineral soil that is needed for trees such as red and white pines ("Berm Lake Trail" Post 4; "Big Pines Trail" Post 3). Not only that, it kills many of the surrounding trees and shrubs, meaning that there is no plants to shade out the seedlings of these trees, which is needed for them to grow, especially for trembling aspens and white birch trees ("Two Rivers Trail" Post 5). This means that a forest fire will often create and promote stands of new, younger growth, where it would not be possible otherwise. As a result, this younger growth supports much different life than the mature forests of the park.

Image 13
Red Squirrels are a common sight in pine forests, as pine seeds are their main source of food
(Courtesy of Genevieve Huyer)

Deer, moose, and bears feed heavily on aspen leaves, as well as beavers and porcupines, who feed on the bark of aspens, which are only found in relatively young growth, ("Two Rivers Trail" Post 6). These stands of aspen trees support a variety of life, and so do the forests of red and white pine. Red squirrels and red crossbills eat the seeds of white pines, at least 44 kinds of insects feed on white pine twigs and needles, and birds such as the pine warbler feed on those insects. Because of forest fires these ecosystems that pines and aspens support were created. Forest fires are generally regarded as a threat to forests, but they have always been a part of the natural history and succession of the park, and are vital to support new growth and a variety of organisms.

Beavers

Beavers are incredibly influential to the park, as they will change the environment to suit their needs, instead of adapting to the environment ("Beaver Pond Trail" Post 2). The start of a beaver pond begins with a forest with a small stream running through it (ibid). Beavers will cut down trees and make a dam, flooding the area, and killing all the trees in the surrounding area. This creates the shallow pond that the beavers live in. It is a safe haven for them, protecting them from predators and threats (ibid). Not only that, but it creates a safe area for other animals to feed and live in as well. Water lilies grow in beaver ponds, and support not just the beavers that eat them, but also frogs and dragonflies. It pond provides food and habitat for great blue herons, mosquitos, and hundreds of other of organisms ("Beaver Pond Trail" Post 6). Not only that, the mosquito larvae the live here feed moose, as well as ring-necked ducks that feed on aquatic insects and seeds of aquatic plants (ibid; “Ring-necked Duck”). However, eventually the beavers will leave the area because they eat the available food faster than it is replenished (“Beaver Pond Trail” Post 3). Over time, the unattended dam breaks, and water levels go down, exposing the mud that was used to create the dam (ibid). Grasses and sedges colonize the mud, and a meadow is formed (ibid). This supports other forms of life, such as the meadow jumping mouse, as well as frogs and snakes (“Beaver Ponds”; “Mizzy Lake Trail” Post 11). The meadow, free of any trees also provides a clear view for broad-winged hawks, making it a perfect hunting ground (“Mizzy Lake Trail” Post 11). In theory, the meadow could be taken back by trees and turned back into a forest, but eventually, the trembling aspen that beavers feed on will regrow, attracting them back to the area, restarting the process (ibid). Beavers are extremely influential and unique, creating habitats that are not otherwise found, and those habitats continue to have lasting effects even long after beavers have left the area.


Image 14
Beaver meadows are beneficial to a number of organisms, and they are the remainder of what once was a beaver pond
(Courtesy of Genevieve Huyer)

Humans and the Biosphere

Humans, have had huge impacts on the biosphere, directly and indirectly. From logging to invasive species, not all of the effects were deliberate, but they all have made their mark on the park nonetheless. Logging was and still is a huge part of Algonquin. Back in the 1830’s the first loggers entered the east side of the park (“Whiskey Rapids Trail” Post 9). They felled hundreds of thousands of trees, and in fact, by the 1880’s, very little of the original forests of eastern North America remained (Ahern 43). The mass amounts of logging (pines in particular) left behind stumps of hundreds of thousands of cut down trees (“Two Rivers Trail” Post 1). Fires ignited on the woody debris left behind by the loggers, greatly affecting the park’s ecosystems by providing a place for new growth, which impacted the kinds of animals that made their home there as observed earlier (ibid). However, today forest fires in the park are almost always put out right away, and that is not such a good thing. Forest fires have been part of the natural way of life in the park, but the unnaturally high number of forest fires back in the 1800's and the unnaturally low number of forest fires today cause by humans are both equally unnatural to the environment ("Two Rivers Trail" Post 4). As the park is now protected from forest fires and clear-cut logging, it will be a long time before a big disturbance allows the park to undergo a period of new growth (Ahern 32). Trembling aspen may become rarer and rarer, because it relies on disturbances in order to grow, which in turn may cause a decline in the number of beavers in the park.

Another human interaction with the biosphere, and the waterways of Algonquin is smallmouth bass. They were introduced by man in 1899, and outcompete local brook and lake trout for food and other resources (Ahern 40). They were introduced as a trophy fish, but their introduction caused populations of trout in the park to decline. Smallmouth bass can tolerate the warmer water higher in the lake, and will stay higher up while trout stay deeper in the water. They will feed in these warmers, leaving much less food for trout when they come up to eat.

Image 15
Brook Trout have been greatly impacted by the introduction of Smallmouth Bass into Algonquin waterways
(Courtesy of Algonquin Provincial Park)

The biosphere is extremely sensitive, and has so many different connections that it is impossible to explore all of them. However, its intricacy and complex relationships make it all the more beautiful and mysterious. Algonquin park is home to many different organisms, all who affect each other and their surroundings to create the unique environment that is Algonquin park.

The Lithosphere

The lithosphere is the Earth's crust, and can be described simply as rock. Often, it is seen as nothing more than just the ground that everything rests on. This is true, but it affects the world much deeper than that. The type of soil in the park along with climate affects what type of vegetation is in the park and where it is. Even the shape of the land affects climate, this is observed in the section "Climate" in the atmosphere. This interaction results in the west side of the park being wetter and cooler, supporting a different ecosystem of life than the east side. Why this is will be explored shortly in "Pedosphere of the park". Rocks and minerals in lakes can affect prosperity and life in lakes as well. The lithosphere has a huge impact, and had a big role in shaping the park to what it is today.

Formation of Algonquin

Formation of Algonquin park started almost 1500 million years, with the movement between tectonic plates (Ahern 14). The continent called Nena makes up the core of what is modern North America, and this continent was heading towards another continent called Atlantica (ibid). In between these two continents rested the Grenville Ocean, which was closing up, forced into the asthenosphere at subduction zones as it was sandwiched between these two plates (ibid). Eventually, at around 1200 million years ago, Atlantica and Nena collided (ibid). Atlantica pushed up and over Nena, and large amounts of crust formed into big mountains, called the Grenville Mountains (ibid). Algonquin park would have been 25 to 30 kilometers buried underneath the highest peaks of these mountains (ibid). At such a depth, the rocks underneath these mountains were under immense amounts of pressure and heat, and that caused them to change their structures (ibid). They metamorphosed into gneiss, an extremely hard rock that makes up the bedrock of Algonquin (ibid). Eventually mountain building stopped, and the two continents were stuck together, forming the first supercontinent, Rodinia (ibid). The Grenville Mountains began to erode, at a pace less than a millimeter of rock per decade (Ahern 15). Slowly, Algonquin was exposed (ibid). However, it was soon flooded by the Iapetus ocean, and formed a shallow sea as Rodinia broke in two, at around 600 million years ago (ibid). Sediments piled onto the ancient rocks, forming sedimentary rocks hundreds of meters thick on top (ibid). From there, over the next 450 million years other geological and historic events happened: Brent meteor smashed into Algonquin, plate movement was responsible for the formation of Pangea, the most recent supercontinent, as well as the splitting of Pangea to form modern day North and South America, and dinosaurs roamed the earth and were wiped out (ibid). Erosion continued its course, and eventually exposed the hard bedrock of Algonquin made of gneiss. The next major event in shaping algonquin were the various ice ages that covered this region of the world by a giant glacier and lasted from about 2.5 million years ago, to the most recent one, ending around 10, 000 years ago (ibid). The retreating glacier scoured the land, creating many of the lakes that are in the park, and it left behind the soils that make up Algonquin. The retreating of the glacier also signaled the end of major events that have shaped Algonquin park to the way it is today. From the roots of an ancient mountain chain to the most recent ice age, the process of forming Algonquin park has been a long one, but each other these factors affect the park to this day, directly or indirectly. However, Algonquin park is still changing, and the process of erosion is still present. Frost action, lichen, and weathering all still erode the lithosphere today, though erosion still occurs at an incredibly slow pace ("Lookout Trail" Post 4).

Pedosphere of the Park

The pedosphere of Algonquin park is a part of what makes the park so special. Because of the two types of soil deposited by the glacier, there are two distinct vegetation "zones" of the park. When the glacier retreated around 13, 000 years ago, it dumped glacial till, an unsorted, jumble of rock particles, everything from boulders to silt particles across the entire park. However, the silt particles in the till in the east was washed away, leaving behind the sand particles that makes up the soil of the

Image 16
The pedosphere and atmosphere, determine largely what vegetation grows where
(Courtesy of Genevieve Huyer)

east side of the park ("Berm Lake Trail" Post 2). Because the base of the soil in the east is composed entirely of sand particles, there are gaps between each grain, allowing water to drain quickly from this soil. ("Bat Lake Trail" Post 2). Compared to the unsorted, jumble of rock particles that make up the soil of the west side of the park, which contains silt. Silt particles fill in gaps and holes between particles, trapping water in the soil, meaning that the soil in the west side of the park retains moisture much better ("Bat Lake Trail" Post 3). This difference in the soils on each sides of the park means that each side of the park supports different vegetation and as a result, different organisms.

To the west, maple trees and broadleaf deciduous trees dominate the western highlands. Maples need soils that are always moist ("Berm Lake Trail" Post 1). This combination of soil that retains moisture and the fact that the west side of the park is wetter and cooler, allowing it to keep that moisture longer, means that sugar maples and other deciduous trees picky with their soil dominate the western landscape of the park (Ahern 29). On the other hand, pines are more dry tolerant than maples, meaning that they can survive in the sandy soils, and they take advantage of that by ruling over the sandy soil of the east (ibid). Because of this, the west side of the park is a deciduous forest, dominated by sugar maples and sprinkled with american beech, yellow birch, eastern hemlock, and even a couple white pine that have gotten the chance to grow due to a disturbance ("Deciduous Forest"). In contrast, the east side of the park is pine dominated, but the sandy soil also promotes the growth of plants such as red oak trees and blueberry plants ("Bern Lake Trail" Post 10). These vegetation differences support different life inside the park.

On the west side of the park, animals such as the white-tailed deer, moose, black bears, and pileated woodpeckers can be found ("Deciduous Forest"). To the east, red squirrels, pine warblers, and red crossbills make their home in the pine forests, getting food from the seeds of the

Image 12
Pileated Woodpeckers hunt for insects by pecking into the bark of a tree
(Courtesy of Genevieve Huyer)

pine trees or eating the organisms that eat the trees. Black bears and moose are also found on the east side, but black bears are more common here than they are on the west side ("Berm Lake Trail" Post 10). Why is that? This is because black bears need to store enough food energy to able to hibernate the entire winter (ibid). An important source of this energy are acorns from red oak trees that can be found on the east side of the park. Also, in the summer black bears feed on blueberries, which are common to the east side as well (ibid). Pines that dominate this landscape also provide a safe haven and escape route, as their bark is soft and easily climbed (ibid). Bears as well will sometimes even dig up the hidden caches of red squirrels. All of these factors, from the blueberries to pine trees and red oaks are all here because of the drier climate and sandy soil that is found on the park's east side (ibid). Furthermore, the drier climate and sandy soils are due to the elevation differences between the east and west, where the west side of the park creates a rain shadow overtop of the east side, and the sandy soils are because of the actions of a glacier over 10, 000 years ago, with its meltwater that drained out the east of the park, sorting and carrying away any silt particles (ibid). The park is deeply connected, and the deep relationships between the spheres have shaped the park the way it is today.

Nutrient Poor Lakes

Lakes in Algonquin have another problem. They can never support as much life as the lakes found in southern Ontario. But why? The reason is that lakes in southern Ontario lie on limestone, and lakes in Algonquin lie on granite and gneiss ("Mizzy Lake Trail" Post 9). Because limestone is relatively soft, and nutrient rich in calcium, phosphorus, and potassium, (nutrients vital for growth), plant growth in these Southern Ontario lakes flourish, and that allows large amounts of small animals and fish to thrive, which will then support a large group of predatory fish that prey on them ("Peck Lake Trail" Post 4). On the other hand, the granite and gneiss that lakes of Algonquin rest on are hard, and poor in nutrients (ibid). As a result, the low nutrient levels put a limit on plant growth, which in turn limits the amount of small animals and fish, which then puts a limit on the amount of larger, predatory fish that can be supported by lakes (ibid). However, being nutrient poor does not only limit the number of fish that it can support, it also limits the amount of acid precipitation lakes can neutralize.

Acid precipitation and the acidification of lakes is a serious concern to not just Algonquin, but other lakes and areas as well ("Acid Rain in Algonquin Provincial Park" 1). In other lakes, most fish and organisms are generally safe because the water is full of dissolved minerals that can help to neutralize the acid (ibid). However, in Algonquin and similar areas resting on granitic bedrock, lakes have extremely low levels of these dissolved minerals, meaning that they have little ability to buffer, or counteract the acid (ibid). This can prove to be lethal and dangerous for many organisms in lakes, from deformation, to being unable to support fish, and generally putting stress on the ecosystem ("Acid Rain in Algonquin Provincial Park" 2). The process of acidification is slow, but it is a real threat.

From the formation of Algonquin park to the climate and soil today of the park, the lithosphere is extremely important to why Algonquin is the way it is today. The actions of tectonic plates, ancient mountain chains, and glaciers have greatly impacted the lithosphere, which has impacted the parks local ecosystems and climate. Dry-intolerant maples dominate the glacial-till highlands of the west, while pine trees dominate the sandy glacial outwash plains of the east. The actions of these factors over thousands of years ago are still affecting the park today, and make it such a unique place.

Weathering and Erosion

According to Steve Tomecek, "Erosion is the the process by which the surface of the Earth is worn down" (Tomecek). Erosion can be compared to building a sand castle, in time it will turned weathered down or turned into mush by the water and wind eroding at the sand particles. Erosion can be caused by the atmosphere, hydrosphere, and even the biosphere as wind, water, or living organisms make up the main ways erosion can occur. Although erosion may not be extremely evident, the effects of erosion are still present, as over hundreds of millions of years erosion weathered away at the Grenville Mountains at an extremely slow pace, and exposing the land formation of Algonquin park. Algonquin park is the way it is today because of erosion, and erosion still happens today. What causes erosion and what it does to the lithosphere will be explored here.

There are a couple main ways of eroding the lithosphere: wind erosion, water erosion, temperature, glaciers, and lichen. First, as wind sweeps across a landscape, it picks up particles.

These particles brush up against rocks or other parts of the lithosphere, and as a result, cause more particles to break away (National Geographic "Erosion and Weathering"). Second, water erosion is similar to wind, as rain or the movement of water such as rivers, rain, or waves, will gradually weather away particles and carry them to another location. Also, water that gets into cracks of rocks and freezes will expand, and is able split rocks (ibid). Third, temperature erosion, caused by heating and cooling of rocks can weaken rocks and cause them to expand and shrink, cracking them (ibid). With temperature erosion, rocks will sometimes "exfoliate", meaning that thin pieces or sheets or rock will separate and fall off due to temperature erosion (The Editors of Encyclopedia Britannica "Exfoliation"). Glaciers also erode the lithosphere through abrasion, scraping and scouring at the Earth's surface, much of which is done by the debris that is stuck underneath the glacier (The Editors of Encyclopedia Britannica "Erosion") They can also erode through their meltwater, rushing torrents of water that carry away massive amounts of particles. These causes of erosion are generally well understood, but there is another cause that is not as well known- Lichen.


Image 17
Fruticose lichen (Pictured here) help to erode rocks and create soil
(Courtesy of Genevieve Huyer)

Lichen is an organism that consist of a symbiotic relationship between algae (usually green) or cyanobacteria (blue-green algae), and fungi (The Editors of Encyclopedia Britannica "Lichen"). The algae/cyanobacteria creates the food and nutrients in this relationship while the fungi anchors the plant to a surface (Texas Parks & Wildlife "Lichens") There are three main types of lichen, grouped according to the general shape of their thallus, or body: crustose, foliose, and fruticose (Deacon). Crustose lichen are hard, and form a crust on the surface they are attached to, foliose lichen are flat, and have a leaf-like structure, and fruticose lichen are normally erect, bushy, and branching (ibid). They all are slightly different, and are all attached to surfaces slightly different, but they all function fairly the same. They can survive incredibly harsh conditions and are a part of soil creation through erosion ("Lookout Trail" Post 4). In fact, lichen are one of the first organisms to colonize the bare rock that the Algonquin landscape was once it was released from glacial ice (Ahern 26). But how do they do this? Lichen create a weak acid that slowly dissolves the minerals in rocks, forming tiny cracks on the rocks, that slowly expand over a long period of time (Texas Parks & Wildlife "Lichens"). Eventually dead lichen and rock particles will accumulate in these cracks and crevices until there is enough soil for various mosses to take root ("Lookout Trail" Post 4). This cycle usually will repeat itself, creating more and more soil until there is enough to allow trees to take root, but because of winds in Algonquin that have the potential to scatter soil, it makes it very hard for the lichen to create enough soil to allow for trees to grow (ibid). However, lichen play a vital part in Algonquin and all over the world in the process of breaking down rocks, and shaping the lithosphere, along with wind, water, temperatures, and glaciers. These factors have all helped create algonquin to what it is today

Conclusion

In conclusion, Algonquin is complicated and complex. Relationships between the spheres and organisms and humans have shaped Algonquin to how it is today. From the movement of plates and glacier, to beavers building dams today, they all have an effect. Each of these connections in the park are all little puzzle pieces that all fit together to make the big picture of Algonquin complete. Without one of them, Algonquin would not be the same. These puzzle pieces are always changing, affecting each other and changing the park. Even today, Algonquin is changing. The world is not static and the park is not in an isolated bubble. Actions outside of the park such as global warming, acid precipitation, and invasive species threaten the park. However, none of the beautiful scenery that millions of people enjoy every year through camping, hiking, or canoeing would not be here if it were not for the creation of the park in 1893. The creation of Algonquin park allowed for the unique variety of flora and fauna that reside in the park to flourish, and provides a safe place from some of human intervention. These deep and intricate connections between all four spheres create the beautiful and unique place that is Algonquin Park.

Resources

Images

1: Nicholas Tran

2: https://www.britannica.com/science/hydrosphere

3: Mr. D. Robinson

4: Genevieve Huyer

5: Nicholas Tran

6: Nicholas Tran

7: https://twitter.com/Algonquin_PP?ref_src=twsrc%5Etfw

8: http://www.bbc.co.uk/schools/gcsebitesize/science/add_ocr_gateway/green_world/photosynthesisrev1.shtml

9: Genevieve Huyer

10: https://www.britannica.com/science/dimictic-lake

11: https://twitter.com/Algonquin_PP?ref_src=twsrc%5Etfw

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