Climate and Ecosystem Dynamics

CD3 - Examine biodiversity through the analysis of interactions among populations within communities. (DM, SI)
Pun of the Day

Have you heard about the deer population?

It's staggering.
Ecosystems

- An ecosystem is the living (biotic) and nonliving (abiotic) factors that work together and interact in an area.

- What are the factors (both biotic and abiotic) that affect our pond ecosystem?
<table>
<thead>
<tr>
<th>Biotic</th>
<th>Abiotic</th>
</tr>
</thead>
<tbody>
<tr>
<td>- Fish</td>
<td>- Rocks</td>
</tr>
<tr>
<td>- Eggs</td>
<td>- Water</td>
</tr>
<tr>
<td>- Algae</td>
<td>- Soil</td>
</tr>
<tr>
<td>- Daphnia</td>
<td></td>
</tr>
<tr>
<td>- Snail</td>
<td></td>
</tr>
<tr>
<td>- Dead material</td>
<td></td>
</tr>
</tbody>
</table>
First Nations and Metis peoples acknowledge the interconnectedness of relationships and natural systems. They see everything on Earth that has life as having energy and a spirit. It is understood that all of nature is connected to a living energy called the cycle of life.
# FNMI Perspective - Animate vs. Inanimate

<table>
<thead>
<tr>
<th>English</th>
<th>Cree</th>
<th>Scientific Classification</th>
<th>Cree Classification</th>
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<tbody>
<tr>
<td>Man</td>
<td>nāpēw</td>
<td>biotic</td>
<td>animate</td>
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<tr>
<td>Tree</td>
<td>mitos</td>
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</tr>
<tr>
<td>Bead</td>
<td>mīkis</td>
<td>abiotic</td>
<td>inanimate</td>
</tr>
</tbody>
</table>
Levels of Organization

Ecosystems can be broken down into levels.
Levels of Organization

- Individual - One member of a population.
- Population - The total number of one type of organism (a species) in a certain area.
- Community - All of the populations that interact in an area.
- Ecosystem - All of the communities and nonliving factors in an area.
- Biome - A region that can include a number of ecosystems.
- Biosphere - All of the ecosystems on Earth combined.
Populations and Population Dynamics

- Population dynamics is a study of how populations change in size (total number of individuals), age distribution (the proportion of individuals of each age in a population), and density (number of individuals in a certain area), in response to changes in environmental conditions.
1. Change in Population Size

- Population size increases through natality and immigration and decreases through mortality and emigration.

Population Growth = (Births + Immigration) - (Deaths + Emigration)
Open and Closed Populations

- Ecologists classify populations as either open or closed.
- In an open population, all four factors are acting on the population of each organism.
- In a closed population, only natality and mortality affect the population size.
- Is the Canadian human population an open or closed population?
- Is the global human population an open or closed population?
What Limits Population Growth? - Limiting Factors

- The number of organisms in a population depends on the amount of resources available. Because resources limit the population, they are called limiting factors.
- Organisms compete for these resources and depend on them for survival.

WATER          SUNLIGHT          FOOD          LIVING SPACE
The carrying capacity is the largest number of organisms an ecosystem can support. The carrying capacity of an ecosystem is determined by limiting factors and the number of other organisms living in the ecosystem.
Biotic Potential

Without limiting factors, how quickly would a population grow?

- The biotic potential is the highest rate of reproduction possible by a species in ideal living conditions.
- Which species has a higher biotic potential: humans or dogs? Why?
- Which species has a higher biotic potential: dogs or bacteria? Why?
Exponential vs. Logistic Population Growth
2. Change in Age Distribution

- A population pyramid is a pyramid-shaped diagram that illustrates the age distribution of a population.
- The number of people in young, middle, and older age groups determines how fast populations grow or decline.
- The number of people under age 15 is the major factor determining a country’s future population growth.
We will go over these worksheets tomorrow at the beginning of class!
Let us prey.
3. Change in Population Density

- Population density is the number of individuals in a certain area.
- A population’s density may or may not affect how rapidly it can grow.
- There are density-independent populations controls, and density-dependent population controls.
Density-Independent Population Controls

- Density-independent population controls affect a population’s size regardless of its density.
- Such controls include floods, hurricanes, fire, habitat destruction, pesticides, and pollution.
Density-Dependent Population Controls

- Some factors that limit population growth have a greater effect as a population’s density increases, therefore they are density-dependent.
- Such controls include competition for resources, predation, parasitism, and disease.
Competition

- Many organisms compete for the same resources, such as food, water, and space.
- One species will always out-compete the other.
- There are two types of competition: intraspecific competition and interspecific competition.
Competition

Intraspecific Competition

Interspecific Competition
Predation

In predation, members of one species (the predator) feed directly on all or part of a living organism of another species (the prey).

In this interaction, the predators benefit while the prey are harmed.
Predation

- Predator and prey populations tend to cycle together.

- The classic examples of this are the hare and the lynx: as the hare population increases, the lynx has more to eat and so the lynx population can increase. The increased lynx population results in more predatory pressure on the hare population, which then declines. The drop in food availability in turn causes a drop in the predator population.
Parasitism

Parasitism occurs when one species (the parasite) lives on or in another species (the host).

In this relationship, the parasite benefits, while the host is harmed.
Parasitism and Disease

- Parasites and diseases are spread quickly through densely packed populations due to how close organisms are to one another.
- Populations that rarely come into contact with one another are less likely to share bacteria and viruses.
Competition / Predation Activity

I will give you a card - Do not tell anyone what it says!

Complete the directions on the card.

No running!

Plant  Water  Meat  Shelter  Parasite
Population Density Techniques

Population density is the number of individuals in a certain area.

Population density can be used to estimate the size of a population. Some techniques used to estimate population size are:

- Mark and Recapture
- Sampling with quadrats
ATTEMPTED MURDER
Mark and Recapture Lab

Use the mark and recapture method to estimate the size of a bean population.
The Mark and Recapture Method

The mark and recapture method involves marking a number of individuals in a natural population, returning them to that population, and recapturing some of them as a basis for estimating the size of the population at the time of marking and release.
The Mark and Recapture Method

\[ N = \frac{M \times C}{R} \]

\( N \) = estimated population size

\( M \) = number of individuals marked in the first sample

\( C \) = total number of individuals captured in the second sample

\( R \) = number of individuals in the second sample that are marked
The Mark and Recapture Method

A pest control technician captures and applies ear tags to 23 brown rats, which he then releases. A week later he traps 29 brown rats, 11 of which have ear tags. What is the estimate of the total population of brown rats?
Ethical Perspectives - Cost vs. Benefit

Tracking snakes using electric transponders:

What are some ethical implications of population density techniques, particularly the Mark and Recapture method?
Ethical Perspectives - Cost vs. Benefit

- Physical discomfort
- Psychological distress
- Loss of fitness
- Incidental mortality
Ethical Perspectives - Cost vs. Benefit

What are the benefits of population density techniques, particularly the Mark and Recapture method?
The Sampling Method

Animals can be difficult to count. To get around this problem, ecologists take data from just a small portion of the population, called a sample.

They take several samples and then use the average size of those samples to calculate an estimate of the entire population size.
Sampling Lab

Use the sampling technique to estimate a “grasshopper” population.
Mark and Recapture vs. Sampling

Compare the Mark and Recapture method to the Sampling method.

Which method gave you the best estimate?

Why do you think this is?
Don’t worry. There are always more fish in the sea.

Cartoon of the Day
Assignment

Page 23 # 2, 3, 4
Page 76 # 1, 3, 4
Page 80 # 1

Due Thursday at the beginning of class!
Biodiversity

Why is biodiversity so important?

Answer the questions as you watch the video.
# Biodiversity Jigsaw

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<td></td>
<td></td>
<td>Austin</td>
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</tbody>
</table>
Biodiversity Jigsaw

Group One - Ecotones

Group Two - Ecosystem Diversity

Group Three - Genetic Diversity

Group Four - Species Diversity

Group Five - Species Richness and Species Evenness - Simpson’s Index
Biodiversity Lab

Measure the species diversity of two different sites.

Can you apply the terms ‘species richness’ and ‘species evenness’ to the sites?

If you could only save one site, which site would you save?
Cartoon of the Day
Effects on Biodiversity

News Stories

Invasive Species - Zebra Mussels

Habitat Loss - ‘Blu’ Macaw

Climate Change - Arctic Sea Ice
# News Story Stations

<table>
<thead>
<tr>
<th>Group One</th>
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<th>Group Five</th>
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<td>Tyson M.</td>
</tr>
</tbody>
</table>
As an invasive species with an endless appetite, they can decimate ecosystems and send species extinct...

Asian carp??

Aquatic Times

Humans.
Assignment

Page 19 # 1, 3
Page 23 # 5
Page 44 # 2, 3
Page 46 # 3, 4

Due Wednesday at the beginning of class!
Links in the Chain
Links in the Chain

What is the primary source of energy in an ecosystem?

Which organisms convert the solar energy into chemical energy?

Which organisms are the foundation upon which all other organisms in the system depend on?

What is a primary consumer? A secondary consumer? A tertiary consumer?

How much energy is stored at each trophic level? What is most of the energy lost used for?
Energy Movement Through Ecosystems

- The source of all energy in ecosystems is the sun.

- Sunlight provides the energy used by plants to make the compounds that maintain their lives and serve as food for all other organisms.

- We can begin to understand how energy flows by categorizing living things by their trophic level in their ecosystem, according to how they obtain energy.
Trophic Levels

Primary Producers - Organisms that make their own food from basic nutrients and sunlight.

Primary Consumers - Organisms that obtain their energy by feeding on the primary producers.

Secondary Consumers - Organisms that obtain their energy by feeding on the primary consumers.

Tertiary Consumers - Organisms that obtain their energy by feeding on the secondary consumers.

Quaternary Consumers - Organisms that obtain their energy by feeding on the tertiary consumers.
Food Chains

Food chains are a way of showing a step-by-step sequence of who eats whom in an ecosystem.
Food Webs

Food webs are systems of interlocking and interdependent food chains. Food webs allow us to see how energy moves through an ecosystem.
Toxin Movement Through Ecosystems

- There is no better way to understand the flow of matter through an ecosystem than to study food webs.
- This is true of both natural organic matter and toxins introduced by humans.
- Food webs also allow us to see how these harmful toxins move through an ecosystem.
Pests and Pesticides

- Pesticides are chemical toxins designed to kill pests.
- A pest is an organism that people consider harmful or inconvenient.
- What are some examples of pests?
- In many situations, pesticides are used to protect species that are beneficial to humans from a competitor or predator that is less useful.
- What pest did we learn about on Friday?
Bioaccumulation

- DDT stands for dichlorodiphenyltrichloroethane, an insecticide.
- Chemicals that contain chlorine, such as DDT, are soluble in fat, but not in water.
- As a result, these toxins cannot be released in urine or sweat, so they accumulate in the fatty tissues of animals. This is called bioaccumulation.
Biomagnification

- When there is a small amount of the pesticide in the environment, it will enter the bodies of animals that are low in the food chain, particularly primary producers or consumers.
- Even though there is a small amount of the toxin in each of the prey animals that a secondary consumer eats, the amount of the toxin in its body will be large because each predator eats many prey.
- As a result, as you move up the food chain, the concentration of the toxin increases. This is called biomagnification.
DDT Concentration - Aquatic vs. Terrestrial

- Concentrations of DDT tend to be higher in aquatic ecosystems because of runoff from land ecosystems.
- Therefore, land organisms tend to be exposed to less DDT over time, while aquatic organisms tend to be exposed to more DDT over time.
Biomagnification Game

I will give you a name tag - you are either a macroinvertebrate, a fish, or a bear.

You will have time to collect as many food items as you can and put them in your “stomach”.

No yelling, no running!

Let’s play!
Food Web Activity

These questions are due tomorrow!
Puns of the Day

I have the necessary
Your Koalafications are
Koalafications
Don't listen to him

It's making my voice horse
Completely irrelephant
This arguing is becoming

Ouch
Hawkward

He's lion
Unbearable!

Indeed
Don't worry, owl wait

I'm out of here!
You all are giraffing me crazy

Alpaca
Your things

Let minnow
When you get there
Biomes

- A biome is a group of similar ecosystems that cover a broad area.
- Each biome has a distinct community of plants and animals.
- The rainforest and the desert are two completely different biomes.
- These two biomes have different communities of plants and animals.
Abiotic Factors

- The types of plants and animals in a biome depends on the abiotic factors that act upon that biome.
- Factors such as climate (including precipitation and temperature), insolation, latitude, and altitude affect the types of plants and animals that live in a certain biome.
Climate

- Climate is the average weather in an area over a long period of time.
- Climate is generally described in terms of precipitation and temperature.
Climate - Precipitation

- Precipitation is any form of water that falls to the Earth’s surface.

- What effect might precipitation have on the plants and animals in a specific biome?
Climate - Temperature

- Temperature is the measured amount of heat of an object or place.
- What effect might temperature have on the plants and animals in a specific biome?
- The climate of a particular location depends on its insolation, latitude, and altitude.
Insolation

- Insolation is exposure to the sun’s rays.
- Areas of earth that are perpendicular to the sun’s rays receive more energy than other parts where the sun’s rays hit the earth at a slanted angle.
Latitude

- Latitude measures how far a biome is from the equator.
- Latitude is measured in degrees.
Latitude

- Temperature zones are based on latitude.
- The three temperature zones include tropical, temperate, and arctic zones.
Altitude

- Altitude measures the vertical elevation of land above sea level.
- Altitude is measured in meters or feet.
What and Who Lives Where?

Match your species (plant or animal) to the correct biome.

- What adaptation does each species need to survive in its biome-habitat?

- What are some other animals that you think may live in each biome?

- Why is it important to protect biodiversity in each biome?
Virtual Biome

Explore a desert biome, a rainforest biome, and a temperate forest biome.

List 2 plant species and 2 animal species present in each biome.
Biome Research Project

You are a travel agent hired to design a travel brochure featuring one of the major biomes.

These brochures are due Friday, September 28 at the beginning of class!
Climate and Ecosystem Dynamics

CD4 - Investigate the role of feedback mechanisms in biogeochemical cycles and in maintaining stability in ecosystems. (CP, DM, SI)
Pun of the Day

MAKING PUNS, HUH?

TOUCAN PLAY THAT GAME
Reminders

Biome brochures are due on Friday, September 28!

We will have another work period on Wednesday!

The computer labs are open on Thursday and Friday at lunch if you think you will need some more time to work on them.
Feedback Systems

- A system is a network of relationships among a group of parts, elements, or components that interact with and influence one another through the exchange of energy, matter, or information.
- A system is said to be in equilibrium when opposing forces or influences in that system are balanced.
- There are four types of equilibrium.
Equilibrium

- Dynamic equilibrium - When processes in a system move in opposite directions at the same rate so their effects balance out.
- Static equilibrium - Equilibrium of a system whose parts are relatively at rest.
- Stable equilibrium - A state in which a body tends to return to its original position after being disturbed.
- Unstable equilibrium - A state in which a body tends to move further away from its original position after being disturbed.
Feedback Loops
Feedback Systems

- Negative feedback mechanisms push a system back to its original equilibrium position.
- Positive feedback mechanisms push a system to a new state of equilibrium.
Biogeochemical Cycles

- Nutrients are elements and compounds that organisms consume and require for survival.
- Nutrients stimulate the production of plants, and the lack of nutrients can limit production.
- Nutrients move through ecosystems in biogeochemical cycles.
Nutrients

- There are five chemical elements or nutrients that limit the amount of life possible in an ecosystem:
  1. Carbon
  2. Hydrogen
  3. Oxygen
  4. Nitrogen
  5. Phosphorus
Reservoirs

- Nutrients are accumulated for short or long periods of time in Earth’s atmosphere, oceans, and land masses.
- These accumulations are called reservoirs or stores.
- A residence time is the average amount of time that something spends in a reservoir.
- Different processes move nutrients from one reservoir to another.
The Carbon Cycle Game

You are a carbon atom travelling through the carbon cycle.

Roll the dice to find out your next destination!

Stamp your passport before you leave!
The Carbon Cycle Game

Look at your carbon passport.

- Which reservoir did you start at?
- Where did you go next?
- Trace your whole journey (all 16 locations) on your carbon cycle map by drawing arrows from one reservoir to the next.
Joke of the Day

THE FOREST MANAGER

STAFF’S BEEN CUT, SO WE NEED YOU TO ABSORB THE CO₂ OF THE REST OF THE DEPARTMENT.

Rhymes with Orange

Earth Day

RhymesWithOrange.com

By: Hazy & Price 4.22
- What are the 10 carbon reservoirs represented in this game?
- What major carbon reservoir is not represented in this game? Think of something we use every single day!
- What processes are responsible for cycling carbon from one reservoir to the other?
- Which carbon reservoirs have the longest residence times? How do we know this?
- Look at your carbon cycle map. Is the carbon cycle a cyclical process? What does it actually look like?
- In what ways might human activities affect the carbon cycle?
- What kind of equilibrium would be represented by the carbon cycle if it was untouched by human activities?
- Is the carbon cycle, when affected by human activities, still in dynamic equilibrium? Why or why not?
Carbon’s Role in Photosynthesis

Tomorrow, you will do an experiment to examine carbon’s role in photosynthesis.

Let’s pre-lab!
Pun of the Day

Are you hungry?

I could use a light snack.
Carbon’s Role in Photosynthesis

Let’s do an experiment to examine carbon’s role in photosynthesis!

Form a group of 3!
Pun of the Day

snapfox:
  rneerkat:
    what happens to nitrogen when the sun rises
    it becomes daytrogen
    I’m going to bed.
    good nitrogen
    sleep tightrogen
    don’t let the bed bugs bitrogen
The Nitrogen Cycle

You are a nitrogen atom travelling through the nitrogen cycle.

Roll the dice to find out your next destination!

Stamp your passport before you leave!
The Nitrogen and Phosphorus Cycles

- What are the major nitrogen and phosphorus reservoirs?
- What processes move nitrogen and phosphorus from one reservoir to the other?
Pun of the Day

RIP
BOILED WATER
You will be mist.
Assignment

Page 65 # 1, 2, 3, 4, 6 (a)

Page 69 # 1, 2, 3, 4, 6, 7

Due Tuesday at the beginning of class!
The Water Cycle

- What are the major water reservoirs?
- What processes move water from one reservoir to the other?
## The Water Cycle Jigsaw

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</table>
The Water Cycle Jigsaw

Group One - Evaporation

Group Two - Condensation

Group Three - Precipitation

Group Four - Transpiration

Group Five - Runoff, Infiltration, and Percolation
Pun of the Day

I’m sorry mom... but I couldn’t hold it in any longer!
\
The Water Cycle Model

Your task is to create a model of the water cycle using a plastic box, water, ice, a petri dish, a lamp, and some clay.

You must include the processes of evaporation, condensation, and precipitation!

GO!
The Water Cycle Model

- Which part of the activity simulated evaporation?
- Which part simulated condensation?
- Which part simulated precipitation?
- What is the energy source and what does it represent?
- What elements of the water cycle are not represented?
- How could we demonstrate transpiration in this activity?
- How could we demonstrate runoff, infiltration, and percolation in this activity?
- Would condensation occur in the box without the ice? Why or why not?
- After observing this activity, explain why water is considered a renewable resource.
Climate and Ecosystem Dynamics

CD2 - Investigate factors that influence Earth’s climate system, including the role of the natural greenhouse effect. (DM, SI)
Looks like the weather today will be incredibly nice.

Good day, gentlemen.

Oh my! You look radiant today.

Your rays are simply stunning.
Weather vs. Climate

How would you define weather?

How would you define climate?

What is the major difference between the two?
Weather vs. Climate

Meteorology is the study of the atmosphere and weather forecasting. A meteorologist is a person who studies weather forecasting.

Climatology is the study of global weather systems over a long period of time. A climatologist analyzes climate patterns to provide an understanding of the conditions of a particular area.
# Meteorology vs. Climatology

<table>
<thead>
<tr>
<th>Meteorology</th>
<th>Climatology</th>
</tr>
</thead>
<tbody>
<tr>
<td>What the weather is doing now</td>
<td>What you expect to see</td>
</tr>
<tr>
<td>Short-term effects and results</td>
<td>Long-term consequences</td>
</tr>
<tr>
<td>Concerns small areas</td>
<td>Concerns much larger areas, or global results</td>
</tr>
</tbody>
</table>
The First Nations knowledge of weather is an example of our weather heritage, which consists of a great variety of words, sayings, and ideas that people have used over the years.

Other examples of weather heritage involve legends and sayings that help people forecast weather by remembering what conditions cause changes and observing the variables associated with weather.

These variables include atmospheric and cloud conditions, temperature, winds, and the reactions of plants and animals.
Some of the cultural heritage related to weather is based on legends or myths.

Cultures all over the world attribute the control of the Sun, Moon, winds, rain, snow, and other weather features to the action of spirits and gods.

A legend to explain “Indian summer”, a time of higher-than-average temperatures in the fall after first frost, tells of a god having one last smoke on his pipe before falling asleep for winter.
Impacts on Daily Life

What impact does weather have on daily life?

What decisions did you make today that were impacted by the weather?
Weather, the Atmosphere and the Hydrosphere

- **Weather dynamics** - The study of how the motion of water and air causes weather patterns.

- Three main parts of the Earth influence global weather:

  1. Atmosphere - Air
  2. Hydrosphere - Water
  3. Lithosphere - Land
Atmosphere

The atmosphere is the blanket of air and moisture that surrounds Earth.

- Its density is higher at sea level, where molecules are pressed together by the weight of the air above.
- As the height above sea level increases, the density of the air decreases.

What is density?
Atmosphere

Life as we know it would not be able to exist without the atmosphere.

- Plays a role in the water cycle. What role does it play?
- Gases such as $\text{H}_2\text{O}$ and $\text{CO}_2$ trap energy in the form of heat radiated from the ground and therefore keep the temperature within life-supporting range.
Hydrosphere

The hydrosphere is formed by all of Earth’s water, both freshwater and saltwater.

- Our weather systems depend greatly on water in its three states: solid, liquid, and gas.
- How does the water cycle work?
Clouds and Fog

Clouds are obvious indicators of weather and weather systems.

- Most condensed droplets of water in a cloud are very small and easily carried by air molecules.
- Once thousands of these tiny droplets join together to form a raindrop, gravity will pull it toward the ground.
- Clear skies allow solar energy to pass through the atmosphere and strike the surface. How will this affect evaporation?
Clouds and Fog

Clouds build up.

- Clouds have a high albedo. What does this mean?
- They reflect much of the solar energy back to space, reducing the amount reaching the surface.
- Clouds absorb infrared radiation from the sun and emitted from Earth's surface.
Heat Capacity

Land has a low heat capacity.

- Heats up and cools down much more quickly than water.
- This influences cloud formation and local weather effects.
- High heat capacity: Takes a long time to change temperature, but holds that temperature well.
- Low heat capacity: Changes temperature easily, but loses that temperature easily.
Weather Forecasting - How Predictable!

You are a meteorologist studying weather forecasting. You will be responsible for keeping track of forecasted and actual weather conditions over a seven day period by watching the weather report on a local news channel. You will also be responsible for creating a weather report. You will be “presenting” the television weather report for the evening news.
Pun of the Day

YOU'RE LIKE REALLY HOT

HOW ARE YOU SINGLE?

I HURT ANYONE WHO GETS TOO CLOSE
Earth’s Energy Balance

Almost all the energy used on Earth to sustain life and cause our changing weather systems comes from the sun.

Just the right amount of energy is returned to space from Earth to keep the average surface temperature about 15°C.

Energy can be transferred by three different methods in order to help maintain Earth’s energy balance.
Radiation

Radiation is the transfer of energy by means of waves or particles.

- The electromagnetic spectrum consists of several types of radiation waves listed in order of increasing energy.
Conduction

Conduction is the transfer of energy through the collision of particles.

- It occurs most easily in metals, but it also occurs in substances on Earth’s surface, including rock, sand, and soil.
Convection

Convection is the transfer of energy by movement of particles in a liquid or gas (a fluid).

- Convection is often applied in order to understand changing weather systems.
- The motion of molecules in liquid water or water vapor transfers heat through convection, causing the formation of clouds.
Radiation
Conduction
Convection
Reflection and Absorption of Energy

The energy reflected by the Earth back into space depends on the Earth’s albedo

- High albedo - reflects a lot of energy, absorbs little
- Low albedo - reflects little energy, absorbs a lot
- Heat sink - object or material that absorbs energy and becomes warmer (ex. water)
- Heat capacity - how much energy it takes to increase a substance’s temperature
Heat Transfer Lab

You must design an experiment to test how heat is transferred through air and water.

Use the resources on the blog to design your experiment.

Once you have designed a procedure, it must be okayed by me.
Heat Transfer Lab Groups

**Group One** - Brioni, Holly, Alex, Tyler

**Group Two** - Caleb, Tristin, Tyson K., Emma

**Group Three** - Carter, Thomas, Bradley, Tyson M.

**Group Four** - Zak, Chase, Evan, C.J., Jaden

**Group Five** - Emmit, Liam, Sydney, Avery, Chloe

**Group Six** - Rylan, Austin, Jackson, Lannah
Pun of the Day

I’m hotter

I’m cooler
Heat Transfer Lab

SAFETY

Gather your materials and GO!

Make sure to be writing down any observations.

Fill in your data tables.
It was a terrible summer for Humpty Dumpty, but he had a great fall.
- Thursday, October 25
- You will receive a review sheet on Wednesday
- You will have a review period the day before the exam
- We will play Review Jeopardy and Heads Up
Weather vs. Climate Review

**FACT:**

WEATHER IS NOT CLIMATE.

WEATHER is what we see over a short period of time in a given location.

CLIMATE is the average weather patterns we see over decades.
Global Position and Effect on Climate

You will graph data to examine the relationship between latitude, longitude, altitude and average temperature.

- First, calculate the average temperatures for each Canadian city.
- Next, look up the latitude, longitude, and altitude for each city using Map Coordinates.
- Lastly, graph the relationships between global position and average temperature.
Climate and Ecosystem Dynamics

CD1 - Assess the implications of human actions on the local and global climate and the sustainability of ecosystems. (CP, DM)
Good news! At the current rate of global warming we should be able to just swim over there and eat him in under five years...!
WHAT IS CLIMATE?
The Key Indicators of Climate Change

- There are 5 key indicators of climate change:

1. Carbon Dioxide Levels
2. Global Temperature
3. Arctic Sea Ice
4. Ice Sheets
5. Sea Level
Global Climate Change - Vital Signs of the Planet

NASA - Global Climate Change
Before the Flood - Netflix Documentary
Pun of the Day

If Icebergs Dated

YOU'RE BREAKING UP WITH ME?!

SORRY, BABE. GLOBAL WARMING.
Continue *Before the Flood*
Pun of the Day

RENEWABLE ENERGY?

I'M A BIG FAN
Stewardship and Sustainable Development

Environmental stewardship refers to responsible use and protection of the natural environment through conservation and sustainable practices.

Sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs.

Sustainable societies consume resources without impacting future resources.
Sustainable Development

Why do you think sustainable development must consider the environment, the economy, and society together?
Sustainable Development

The environment, the economy, and social well-being depend on one another – a change in one area will disturb the other.

What example from Before the Flood could we use to explain this?
Sustainable Development

Finding sustainable solutions can be difficult, because there needs to be a balance between the economy, the environment, and social well-being.

What sustainable energy alternatives to fossil fuels were discussed in the movie?

What energy alternative was not mentioned in the movie?
Nuclear Power Fishbowl - Environmental Solutions Challenge

Today, you will be looking at the use of nuclear power as an alternative energy source to fossil fuels.

Should a nuclear power plant be built on Serena Lake?

You must use qualitative and quantitative data to support your arguments.

You will debate on Monday!
You must be a mountain because I can't get over you.
Take the quiz to find out which force of nature you are! Then watch the corresponding video. Scroll down to see more information.
Dear Future Generations...