

# Environmental Science 3205



## Chapter 1

### An Introduction to Environmental Science

# Biosphere:

- A complex system of *living things* that interact with each other and extend into the geosphere, atmosphere, and hydrosphere.

## Need to know ...

- **Geosphere:** all of the rocks, minerals and ground that are found on and in Earth.
- **Atmosphere:** the layer of gases that surround the Earth.
- **Hydrosphere:** all the water on Earth.
- **Biosphere:** all the living organisms on Earth.

## Earth as a spaceship.

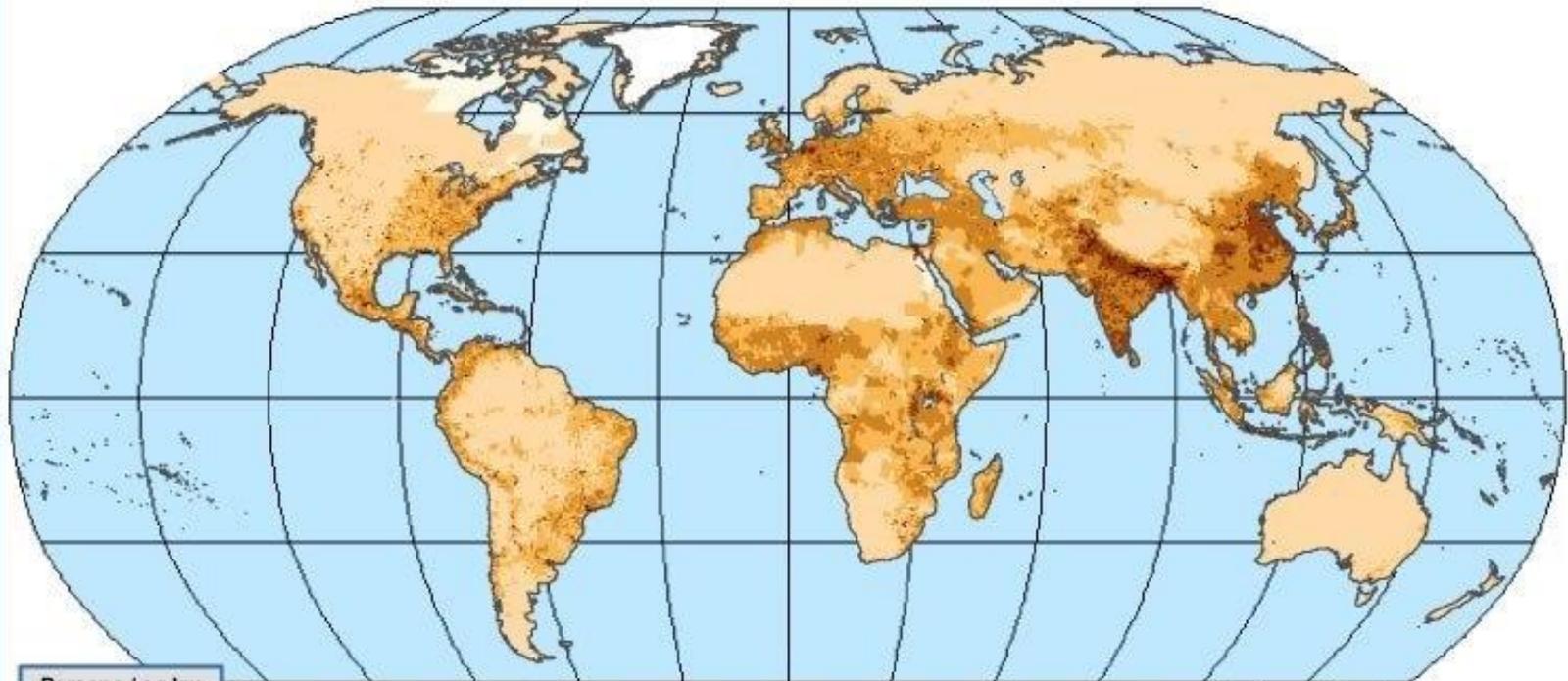
- **Earth is like a spaceship with limited amounts of food, water, oxygen, set amount of space.**
- **Earth is unlike a spaceship (e.g. Spaceship is much smaller, has fewer occupants).**

# How Much of Planet Earth is Habitable?

- Urban areas cover 3% of the Earth's land surface.
- Farms and agricultural areas cover 40% of the Earth's land surface.
- Only 29% of the Earth is land.

## Global Population Density Estimates, 2015

GPW [v3]



Robinson Projection

Persons / sq km





- Activity “100 Square Earth”



# Impacts of Human Civilization

- **Humans are one part of a complex system of living things that can have a great impact on the other systems**
- **“Impact” does not always mean “negative impact”.**
- **Even though humans are only one part of the system of living things, they often have the greatest impact on other living things.**
- **This impact is often because of our use of *technology*.**

# Aboriginal People, European Settlers and Today

- **Aboriginal or first nations cultures saw themselves as only one part of the “environmental system”. They had the first concepts of *sustainability*, which included respect for the environment, understanding of interconnectedness, and “take only what you need and always give back”.**

# Aboriginal People, European Settlers and Today

- **Early European settlers' in North America at that time, considered their environment: “wild” and as such settlers wanted to “tame” and shape their environment.**

# Aboriginal People, European Settlers and Today

- **Early settlers saw the environment as a source of unlimited resources to sustain life. This differed from the aboriginal view and led to substantial exploitation of resources.**

# Paradigm Shift

- **Paradigm**: a way of looking at or thinking about something.
- **Paradigm shift**: an important change that happens when the usual way of thinking about or doing something is replaced by a new and different way.

# Environmental Science and Decision Making

- **Environmental science draws from a variety of areas including: science, social studies, law, math, fine arts, and health.**
- **Scientific knowledge is only one component of environmental decision-making.**

# Environmental Science and Decision Making

- **Government policies, societal needs, societal wants, etc, all play a part.**
- **In this context “governments involved” refers to the policymaking, legislation and decision-making that occurs at all levels of government agencies.**

## Environmental Science and Decision Making

**Find two (2) examples of decision making in page 8 of your textbook:**

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**What groups may have been involved in making these decisions?**

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# Common Misconceptions about Science:

- (i) science can solve all problems**
- (ii) scientific knowledge is fact**
- (iii) science is done for noble causes**
- (iv) there is one scientific method**
- (v) science is not influenced by society**

# Some Applications of Environmental Science:

## **(i) environmental impact assessment (EIA)**

**a process of evaluating the likely environmental impacts of a proposed project or development, taking into account inter-related socio-economic, cultural and human-health impacts, both beneficial and adverse.**

## **(ii) environmental monitoring**

## **(iii) risk assessment**

## **(iv) decision making and policy development**

## Activity:

Check out Department of Environment and Conservation for examples of EIA's

[http://www.env.gov.ni.ca/env/env\\_assessment/index.html](http://www.env.gov.ni.ca/env/env_assessment/index.html)

# Our Attitudes

- **Anthropocentric attitudes have contributed to many of today's environmental issues**
- **Anthropocentric: The idea that humans are the most important beings in the universe.**

# Our Attitudes

- **Human-centered attitudes have influenced environmental values, attitudes and decision making: For example, ideas such as “it’s there for your use” or “humans are the top of the food chain”**

# Our Attitudes

- **There are different belief systems and that our view is not the **only one or even necessarily correct view.****
- **Belief systems impact how people **manage/interact** with their environment.**

# Human Population

**Identify the relationship between**

- (1) human population growth,**
- (2) demand for resources, and**
- (3) increased consumerism.**

- **Our resource demands go well beyond our life-sustaining need for food, water, and space.**

# Renewable and Non-Renewable Resources

- **Renewable Resources:** are replenished naturally and over relatively short periods of time. (eg. fish, crops, cattle)
- **Non-Renewable Resources:** are available in limited supplies. This is usually due to the long time it takes for them to be replenished. (eg. coal, oil, natural gas)

## Human Demand:

- **transportation** such as cars, motorcycles, snowmobiles, ATV's, etc.
- **recreation** such as videogames, computers, movies, books, etc., which utilize resources
- the use of **energy** resources such as fossil fuels, electrical, and nuclear power

## *Human Demand:*

- **What are some of the resources we use in our province?**

## *Human Demand:*

- **What types of things demand energy in our lives?**

## Human Demand:

- **We must understand that our resource demands are driven by population growth and consumerism both on a collective level and an individual level.**
- **North American and European lifestyles have been developing (and continue to develop) an increasing need for energy and resources.**

## *Human Demand:*

- **Lifestyle trends in Asia (the most populated areas of the world) are shifting towards a more western lifestyle. This shift will have an enormous impact on the demand for resources and energy.**

- **What are ways in which humans could reduce the impact of their resource demands and consumption of energy?**

# Sustainability

- **This is a human practice to maintain ecosystem stability.**
- **Ecosystems naturally establish a balance. For example, populations stop growing when they reach their carrying capacity and run out of space, food, and water.**

# Sustainability

- **When humans interact with the ecosystem such as by hunting animals or cutting down trees, they shift the natural balance.**
- 
- **Sustainable practices are human attempts to minimize their impacts and to help ensure the ecosystem will continue to exist and thus continue to provide the things humans want.**

# Ecological Concepts

- **What is ecology? (p.9)**
  - Ecology is the study of the way organisms interact with each other and with their nonliving surroundings. These interactions involve energy and matter. Living things require a constant flow of energy and matter to ensure their survival.

# Ecological Concepts

- **What is an ecosystem? (glossary)**
  - **An ecosystem is a collection of living things as well as the environment in which they live; e.g. a prairie ecosystem including coyotes, the rabbits on which the coyotes feed on, and the grasses on which the rabbits feed on.**

# Ecological Concepts

- **What is meant by abiotic and biotic factors? (glossary)**
- **Abiotic Factors: parts of the biosphere that are nonliving; e.g. sunlight, temperature, minerals, air, water.**
- **Biotic Factors: parts of the biosphere that are living; e.g. plants, animals, bacteria.**

## How balance is maintained in ecosystems:

- (i) energy transfer (food chains/webs, pyramids)**
  - (ii) nutrient cycling**
- There is a finite amount of resources on earth and in order to maintain life, resources must be recycled when their use comes to an end. For example, nitrogen, carbon, and oxygen from once living things are returned back into a form that can be used by other living things.**

- **Identify example organisms within each of the three ecosystems:**

**(i) freshwater:**

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**(ii) terrestrial:**

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**(iii) marine areas:**

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# What is a food chain? (glossary)

- **Food Chain:** a simple step-by-step sequence of who eats whom in an ecosystem.

Draw the example of a food chain from your textbook on p. 11.



Black Spruce  
Cones



Red  
Squirrel



Newfoundland  
Marten



Peregrine  
Falcon



Decomposers

# What is the difference between a food chain and a food web? (glossary)

- **Food Web:** a network of food chains that are interdependent; each organism may have several food sources.

## (a) producers

- **Plants** are called producers. This is because **they produce their own food**. They do this by using light energy from the Sun, carbon dioxide from the air and water from the soil to produce food - in the form of sugar. The process is called **photosynthesis**.

## (b) consumers

- **Animals** are called consumers. This is because they cannot make their own food, so **they need to consume (eat) plants and/or animals.**

## (c) decomposers

- **Bacteria and fungi** are decomposers. They eat **decaying matter** - dead plants and animals and in the process they break them down and decompose them. When that happens, they release **nutrients and minerals** back into the soil which will then be used by plants.

## (d) herbivores

- Herbivores are animals that eat plants.

## (e) carnivores

- A carnivore is an animal or plant that eat **other animals**.

## (f) omnivores

- An omnivore is a kind of animal that eats **either other animals or plants.**

## (g) scavengers

- Scavenger definition, an animal or other organism that feeds on **dead organic matter**.

# Environmental Science

## 3205

unit one  
ch2

# Environmental Conservation

The concept of **sustainability** does not just mean **saving resources** to use later. It also involves the **maintenance of untouched environments**.

# What is stewardship in relation to sustainability?

Stewardship is defined in terms of **shared responsibility** that aims to achieve sustainability.

It includes activities that preserve the environment at three levels: **self, local, and global.**

For example

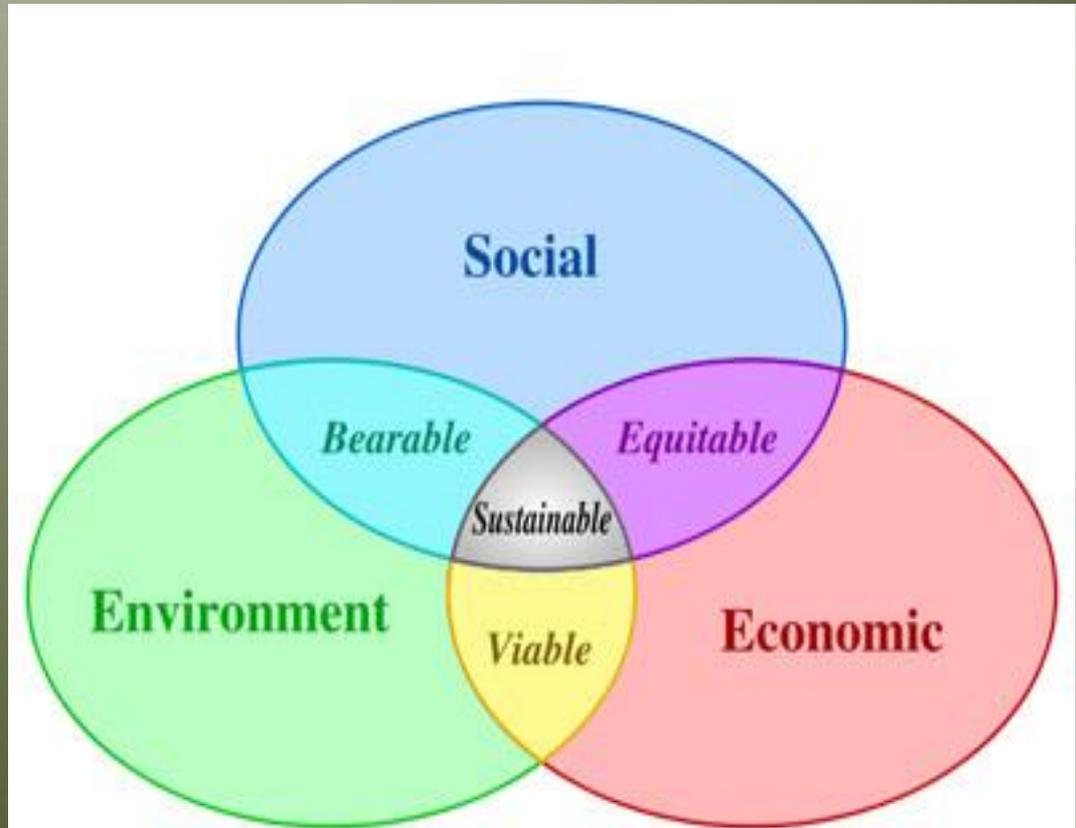
recycling \_\_\_\_\_

wetland protection \_\_\_\_\_

Kyoto Accord \_\_\_\_\_

# Factors that influence sustainability

- (i) ecological
- (ii) social
- (iii) economic



# Ecological factors

- The environment can be divided up into **biotic** (living) factors and **abiotic** (nonliving) factors.

# Social Factors

- Culture (attitudes, values, and beliefs) affects decisions that make concerning sustainability.
  - Ex. There are people who value money more than the fate of future cod stocks; poaching, etc.

# Economic Factors

- Economics impacts decisions related to sustainability.
  - Ex. Sustaining caribou populations may involve setting **lower quotas** for hunting. What economic impact would this have on outfitter operations?

# Case Study p 31

"Population Growth of an Introduced Species".

# Precautionary Principle

A duty to prevent harm, when it is within our power to do so, even when all the evidence is not in.

# Consider the role of legislation in guiding stewardship and sustainability:

- Example:
  - limiting the size of mesh in fishing nets
  
- Example:
  - the establishment of various hunting and fishing seasons
    - The recreational cod fishing season happens usually for one or two weeks in late summer.
    - This provides opportunities for recreational fisherpersons to catch codfish while securing the total amount caught.

Environmental monitoring is an essential component of sustainability

Ex. record the amount of packaging that your family discards over a week.

Other aspects that could be **monitored** are:

- amount of meat products eaten,
- amount of water used daily,
- amount of recycling in the household,
- kilometers traveled in a week.

There are a number of widely-held misconceptions related to sustainability:

- (i) environment damage is permanent
- (ii) forest fires are bad
- (iii) one person cannot make a difference
- (iv) science can solve all of our problems
- (v) practicing the four R's is difficult
- (vi) all human activity in nature is bad

# The 4 R's

4 R's refer to *Reduce, Reuse, Recycle, Recover* and are an important component of sustainability.

## Clean and Green

**REDUCE**

**REUSE**

**RECYCLE**



**RECOVER**

# Environmental responsibility

Consider the role of:

(i) individuals

(ii) community

(iii) industry

(iv) government

# Individuals

The area of land and water ecosystems required to produce resources, which the population consumes, and to assimilate the wastes, which the population produces, is called the **ecological footprint**.

Calculate your individual ecological footprint using the web site

<http://www.footprintnetwork.org/en/index.php/GFN/page/calculators/>

# Community

## Describe your community's impact on the environment

Living in particular areas such as our community, we impact our local environment.

- What is our present use/abuse of the local environment?
- What are types of commercial and domestic activities?

# Describe your community's impact on the environment

- How do we use the environment for recreation?
- What are some waste management strategies?

# Industry

- Compliance with environmental regulations
- Being a corporate citizen
  - giving back to the community
  - hiring and buying locally
  - supporting "green" community projects
  - meeting international standards for industry (ie ISO)

# Government

- Passing and enforcing legislation pertaining to the environment
- Financially supporting community based projects and NGO's (nongovernmental organizations)
- Signing and implementing international agreements

# What is Eco-citizenship?

Eco-citizenship arises from the need for each person to choose a **morality** based on universal values and a **code of conduct** to behave as a **responsible consumer**.

The formation of healthy environmental attitudes is based on **sound knowledge** and that practice is the outward expression of being an **eco-citizen**.

- (i) knowledge
- (ii) attitude
- (iii) practice

# Knowledge:

Environmental science courses provide a knowledge base from which to make **informed decisions** concerning local, regional, national and global environment issues.

# Attitude:

The formation of healthy environmental attitudes is based on **sound knowledge**.

## Practice:

Practice is the **outward expression** of being an eco-citizen

Ex. Practicing the 4Rs

# Eco-citizenship

MMSB

HHW

Waste Reduction

Composting

# Ecocitizenship



- In **2001**, the Provincial Waste Management Strategy was developed. It included the following:
  - **Multi Materials Stewardship Board**
    - Responsible for developing, implementing and managing **waste diversion** programs
    - Recycling has increased to **68%**

# Household Hazardous Waste



- **Corrosive**: can eat away at surfaces
- **Flammable**: can easily catch on fire
- **Explosive**: can react violently when mixed or exposed to heat or pressure
- **Poison**: can damage living organisms



Corrosive



Flammable



Explosive



Poison

# Dangers of Improper Disposal



- Pouring HHW down drains or storm sewers **poses dangers** to sanitation workers, children, and wildlife as these chemicals are toxic and eventually will end up in **urban streams** and **ground water**

# Used Motor Oil Collection

- Since 2003 disposal of used motor oil has been regulated by the province
- Non-renewable therefore MUST be recycled
- One oil change can ruin 3,700,000 litres of water

## Used Motor Oil Collection

➤ 454,000,000 litres still disposed of incorrectly!!!

1. Remove: Do not **spill** any oil on the ground.
2. Contain: Put your used oil in a **clean plastic** container with a tight lid. **Never** use a container that once contained household chemicals, food, or beverages. Do not **mix** the oil with anything else, such as paint, gasoline, solvents, cleaners, or antifreeze.

3. **Recycle**: During posted business hours, take used motor oil to a **service station, lube center, or automotive store** that collects used motor oil for recycling.

# Waste Reduction and Composting

- **FACT**: Newfoundlanders and Labradorians generate approximately **2 kg** of waste per person per day. That's the equivalent of over **400,000** tonnes per year.
- Waste Reduction Strategies worksheet (p51-54)

# Conflict may exist between eco-citizenship and economic realities

Living “green” requires **commitment** and in some cases an additional **expense** (ie hybrid cars, heat pumps, purchasing organically grown foods, etc).

The need for **employment** and regional **economic growth** often takes precedent over environmental concerns.

# **Environmental Science**

## **3205**

unit one

### **Chapter 3**

# Ecosystems:

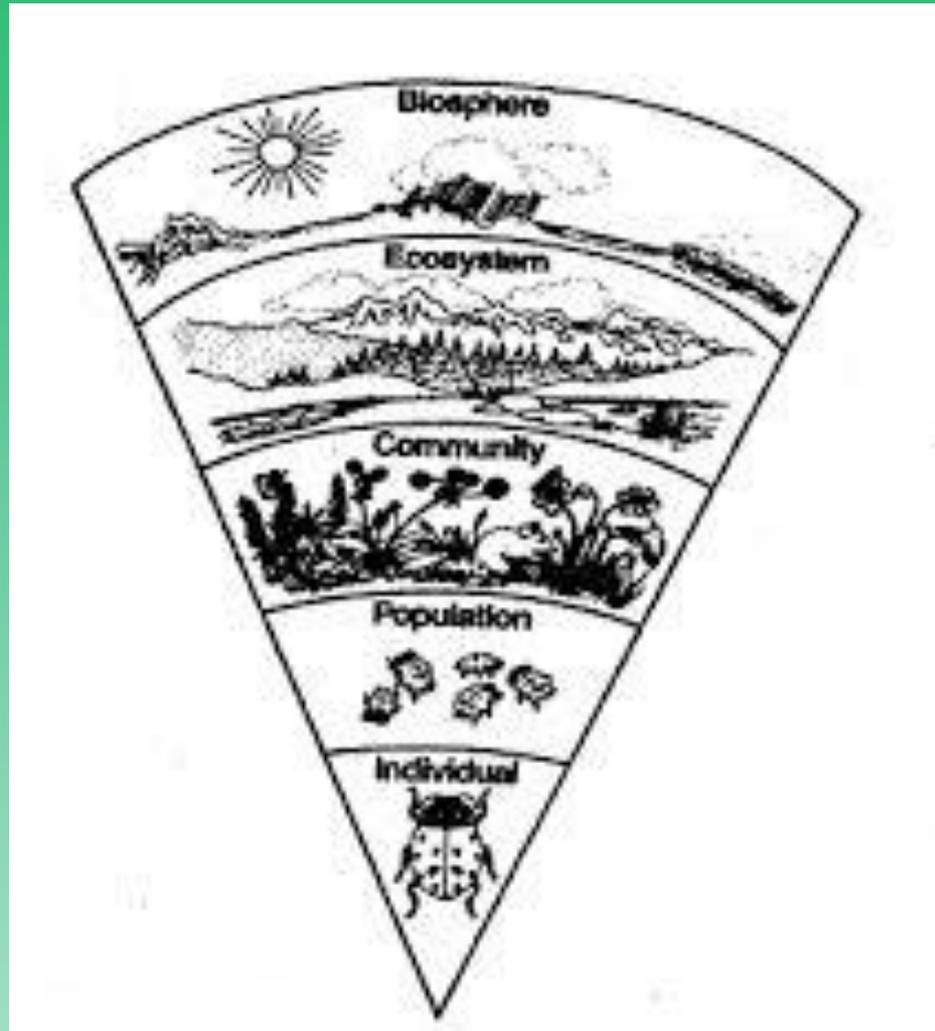
We have seen how food webs along with their cycles of energy and nutrients make up an ecosystem

Organisms can exist within set of physical conditions: **range of tolerance**. Organisms prefer their **optimum range**

# Remember...

- A **population** is all of the members of a species living in the same ecosystem or habitat.
- A **community** is all organisms living together in a common habitat.

# Remember...



# Communities

- Example: Terra Nova National Park is a community of populations of black bears, moose, coyotes, ravens, ravens, ospreys, salmon, many plants, etc.

# Diversity of Ecosystems

- The diversity or variety of ecosystems NL is spectacular
- For example, we have oceans, rugged coastlines, maritime barrens, boreal forests, lakes, mountains (alpine), and sub arctic tundra.

- A diverse ecosystem includes many organisms at each trophic level.
- If we remove one species from one trophic level, other trophic levels can be affected (domino effect).



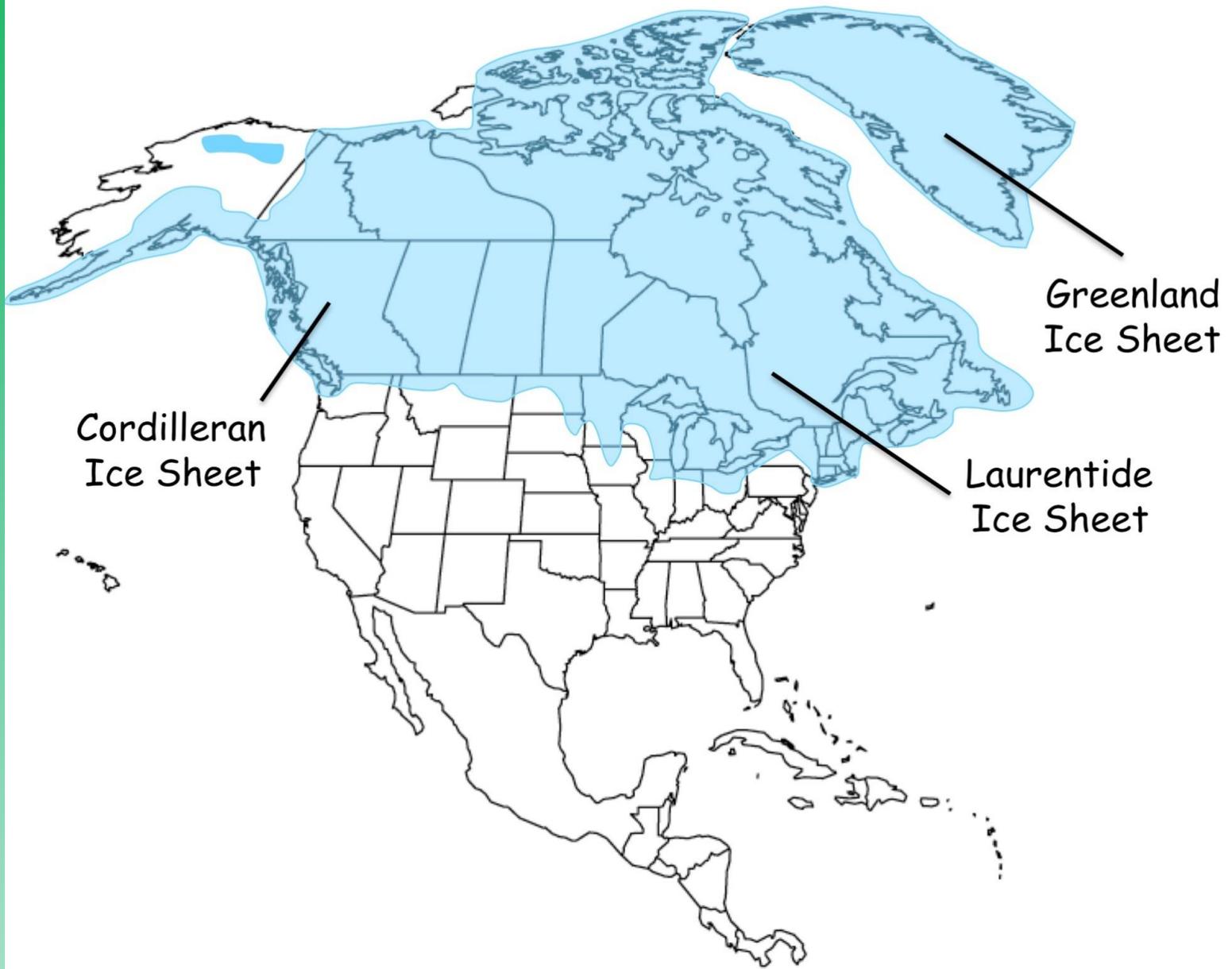
What does being an island mean to our diversity?

What was the effect of the ice age on our ecosystems and their diversity ?

***These are related questions!***

After the last ice age our island was mostly stripped of life, and our island was pretty much scraped to the bedrock!

Thus our plant life is limited to what could travel across the gulf on the westerly winds and our animals are those that could come across the frozen ocean in winter



Also, no animals that hibernate in winter made it across the gulf (Except for black bears).

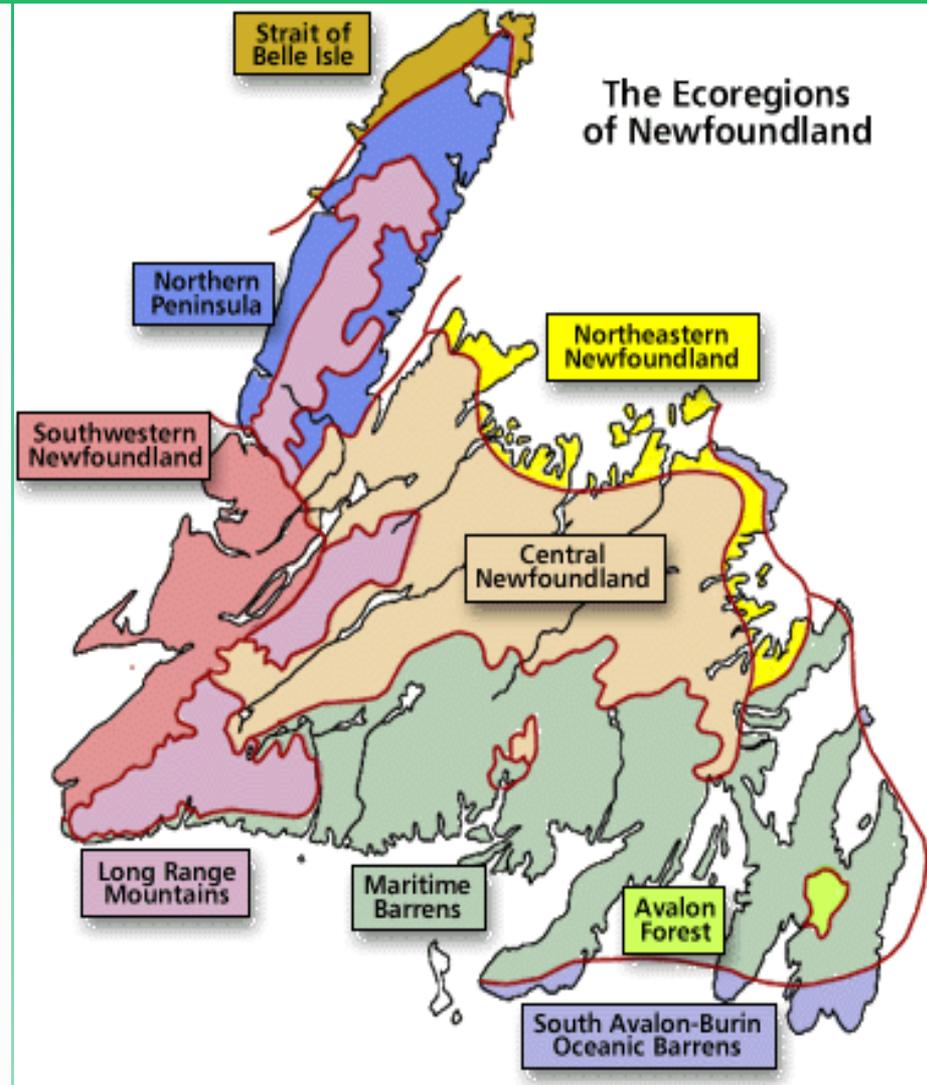
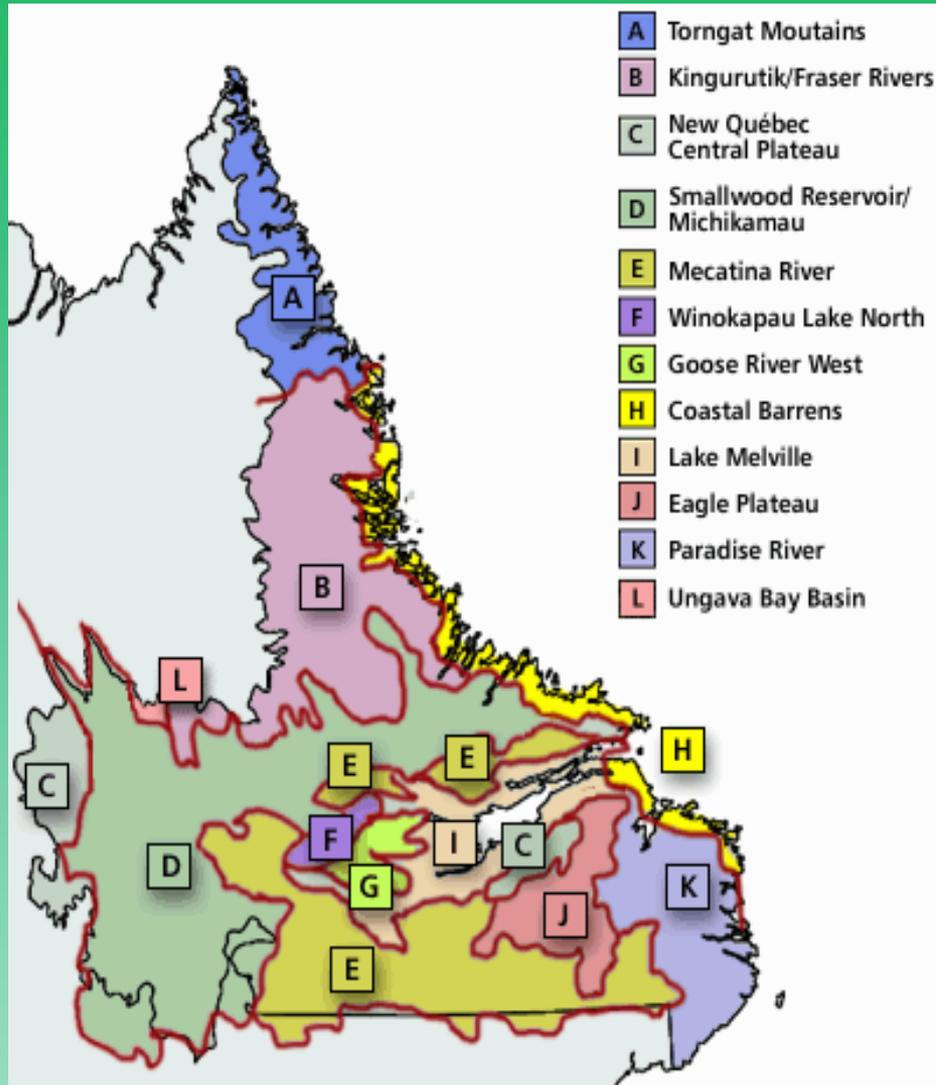
It makes sense then that there are only **14 species of mammal on the island** and there are **39 species in Labrador.**

# Ecoregions

Pg. 58-70

Newfoundland and Labrador has a variety of ecoregions and ecosystems. These are areas of general similarity in ecosystems.

The **island** of NL has **9 ecoregions**. **Labrador** has **12 ecoregions**. They differ from one another in climate, soil, geology, flora (plants) and fauna (animals).



# Biodiversity

Biodiversity is the **variation of life forms** within a given ecosystem, biome, or for the entire Earth.

Biodiversity is often used as a **measure of the health of biological systems** in that the greater the biodiversity the healthier the biological systems will be.

# Three Tiers of Biodiversity

1. Species Biodiversity refers to the **number of species** of plants, animals and other organisms in a **specific area**.

# Three Tiers of Biodiversity

2. Genetic Biodiversity describes the range of **variation within a species**. For example the Newfoundland Marten is genetically different from the American Marten.

# Three Tiers of Biodiversity

3. Community or Ecological Biodiversity refers to the **various communities of interdependent** plant and animal life as the big picture of biodiversity

- Different biomes have varying amounts of **species diversity** (the number of different kinds of species).
- For example, the **tundra** has a **low number** of different kinds, with each species specialized or adapted to live in, what is largely, a very cold dry environment;
- However, the **Boreal Forest** has **greater species diversity**, as there are many different ecosystems that can be inhabited.





# Northern Boreal Forest (Taiga)

balsam  
fir



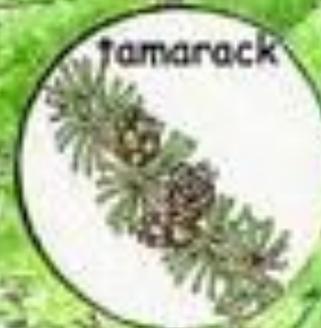
jack pine



paper birch



tamarack



spruce



quaking  
aspen





Within each species there also exists genetic diversity.

That is, slight **differences** of characteristics within the **same species**.

For example, some people can see better, or run better than others. The same is true for other species, eg. Lynx.



These differences enable a species to adapt and survive when there is environmental change.

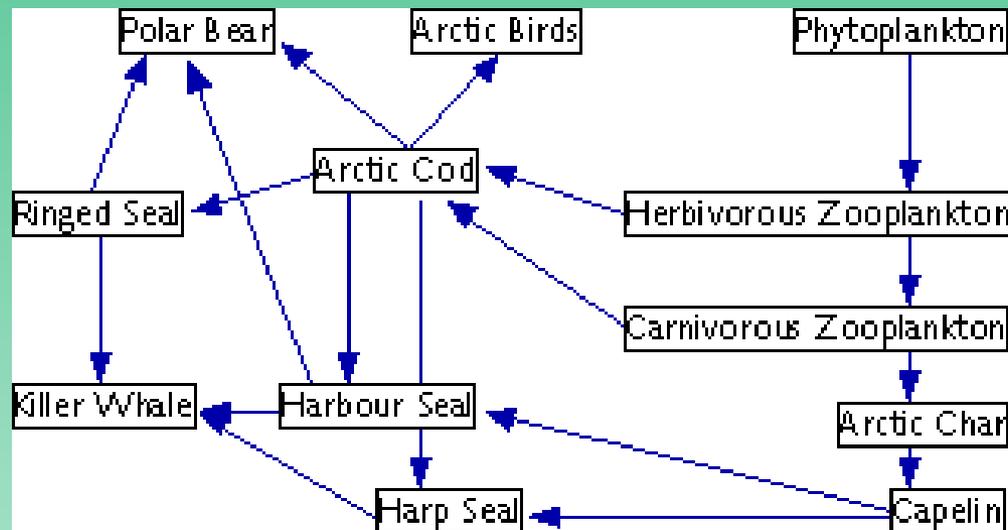
If a species are all identical, it reduces their chances that some would survive change.

All species are important, either directly or indirectly. Eg. Insects are important in pollination.

Both **species and genetic diversity** are important to a **healthy ecosystem**.

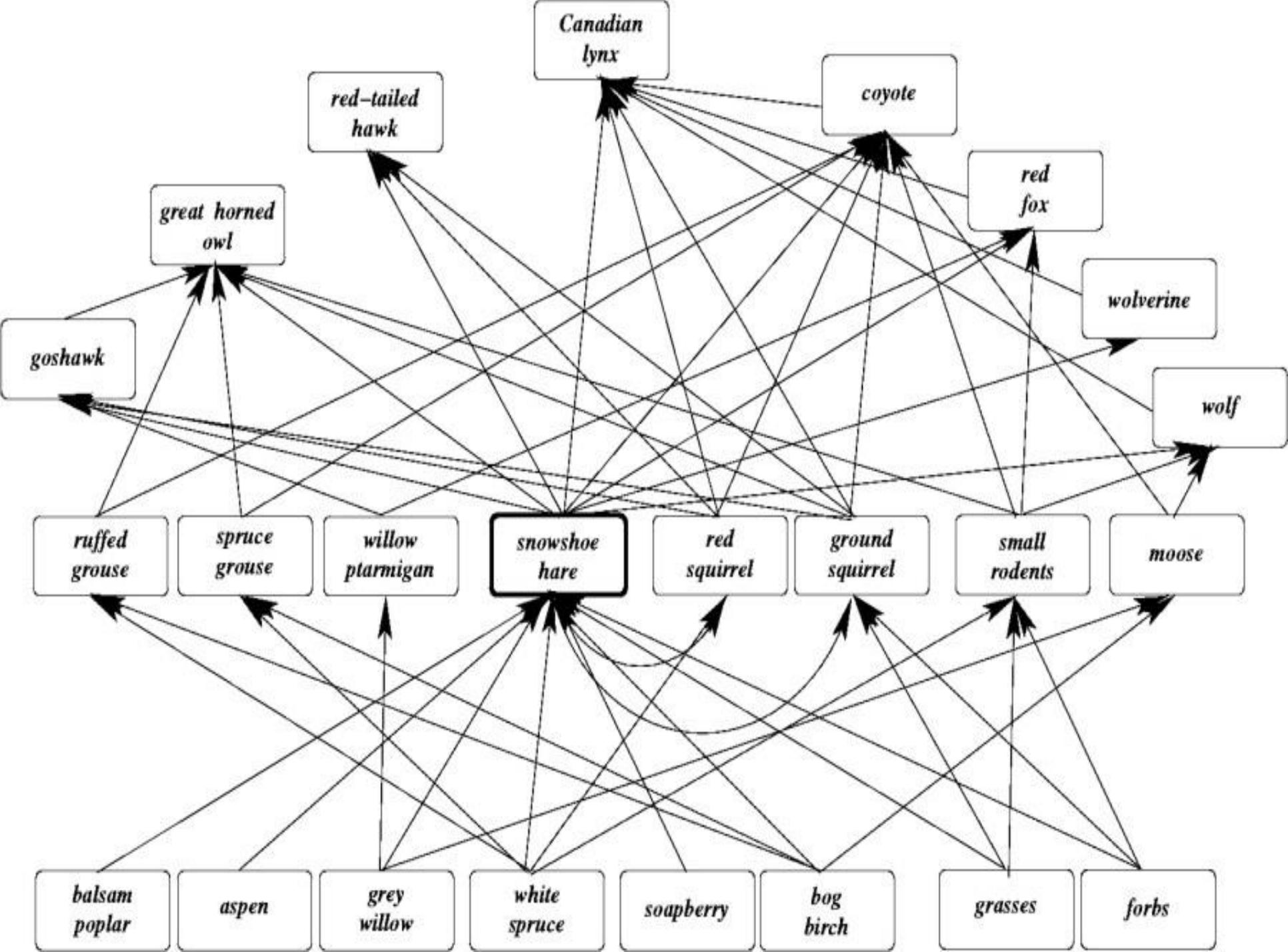
What is the relationship  
between genetic diversity and  
species diversity in the overall  
biodiversity of an ecosystem?

For example, in an Arctic ecosystem the biodiversity is low because the number and types of species are all highly specialized for surviving in this ecosystem, which has limited places to exploit.



In the Boreal forest, there is a greater biodiversity because there are a greater number of species present.

This is related to the greater number of available ecosystems for them to exploit.



# Mini Lab Activity

“What Ecoregion do I live in?”

# Species Preservation

In terms of preserving species, **biodiversity is essential** for maintaining healthy ecosystems since **organisms** within an ecosystem are **dependent on one another** (e.g. food webs).

Therefore removal of one species directly and indirectly affects those that remain.

CORE Lab:

“Biodiversity - Why is it important?”

# Genetic Diversity and Environmental Change

- Genetic diversity equips organisms with the **necessary adaptations for survival** when environments change.
- This in turn will increase species survival in a changing environment.

When genetic diversity is reduced (i.e. when all members of a species are identical) the possibility of having the variability to adapt to changes in the environment is reduced.

# Environmental Science 3205

## Chapter Four Protecting Species

(unit one)

**Why is it important to  
protect species?**

**First: Distinguish  
between natural  
extinctions and  
anthropogenic  
extinctions (caused by  
humans)**

Extinctions have been occurring since life began and that these extinctions represent a natural process.

For example, the extinction of dinosaurs occurred millions of years before humans were on the planet

*Natural* extinctions result from  
catastrophic events (such as  
volcanic eruptions, tidal waves,  
earthquakes), climate change,  
and changing environmental  
factors (competition, predation,  
disease, etc.)

*Anthropogenic* extinctions  
(caused by man) are brought  
on by habitat loss, over-  
hunting, over-fishing, pollution,  
etc.

Recent human activities have been directly linked to species extinctions.

Species extinctions, in general, are now occurring at a faster rate than any other time in history (not including catastrophic events).

Understanding of why species go extinct is very important.

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Species extinctions, in general, are now occurring at a faster rate than any other time in history (not including catastrophic events).

Understanding of why species go extinct is very important!





- Scientists, recognize that humans are not separate from ecological interactions like food chains and food webs and our interactions in the environment are in fact natural.
- As a result, some scientists argue that there is little or no distinction between natural extinctions and anthropogenic extinctions.

Read the Enviro-Focus  
“Overexploitation of the Great  
Auk”, as well as the Enviro focus  
on the Woodland Caribou and  
Wolffish

# Why are species at risk?

The major reason is habitat degradation and loss, resulting from unsustainable development, such as:

- urban and agricultural development (sprawl)
- (Read about the Leatherback turtle)

# Leatherback turtle

- Largest range of any reptile
- Seen in NL waters in the summers
- Species in decline due to habitat degradation of marine environment (entangled in fishing gear, swallowing garbage which can block gastro-intestinal system)

# Leatherback turtle

- Destruction of nesting sites  
(mechanical raking of beaches and off road vehicles)
- Protection of nesting beaches in Central America should increase hatchling mortality

- **Leatherback Sea Turtle Research in Costa Rica**

- <http://www.youtube.com/watch?v=tM8Wuo36FDM>

- **More on Leatherback**

- <http://www.youtube.com/watch?v=5Fqbel4IMnc>

# More...Why are species at risk?

The primary human associated factors contributing to extinction are:

1. Habitat loss and degradation
2. Introduced species
3. Overexploitation
4. Pollution

# Examples of Factors Contributing to Extinction

- inadequate waste disposal  
(poisons leaching in landfills or  
sewage emptying in water  
ways)
- resource extraction (mining,  
forestry eg clear-cut logging)



# Species at risk

- Damming rivers for hydro-electric projects drowns river, forest and marshland ecosystems
- Ghost Nets, bottom dragging, lobster and crab gear entangling whales

- **Silting: erosion of soil into rivers clogs them with mud, changing the fish habitat**
- **Silt can also clog the gills of fish**
- **Pollution: read pp 89-90 (Boreal Lichen)**

# Pollution

A pollutant is any substance that, when introduced in the environment negatively affects a resource or the health of humans or any organism

Eg: sewage, garbage, chemicals, pesticides etc.

# Bioaccumulation & Biomagnification

Bioaccumulation is the accumulation of toxins in an organism's body

As pollutants are passed from prey to predator the resulting increase in concentration is known as biomagnification.

When garbage is not properly disposed of or recycled it can impact various species.

Some animals will swallow plastics for example which can cause illness or death.

# Climate change and species at risk

- Evidence is growing that human activities are directly changing the Earth's climate
- Globally temperatures are rising
- Consequences will be drought floods and rapidly changing ecosystems

- Temperatures in the arctic are rising at twice the rate of the rest of the world
- The polar bear lives all over the arctic usually needs ice to hunt its favorite prey: the seal

- They usually live off stored fat in the summers when it is difficult to hunt seal
- Global warming will lengthen arctic summers and cause the Polar Bear hardship and make it unlikely they will reproduce effectively

# Polar Bear: Feeling the Heat with Jeff Corwin

<http://www.youtube.com/watch?v=c5DmSxPc6ws&feature=related>

**Read the Enviro-Focus  
“Invasive Alien Species: Fungal  
Diseases of Newfoundland Red  
and White Pine”**

**Invasive Species**

**[http://www.youtube.com/watch  
?v=-V5513w1XSk](http://www.youtube.com/watch?v=-V5513w1XSk)**

# Species at risk

- disease
- invasive species (eg. Colt's foot, replacing Balsam fir, European Green Crab,)

*What are the effects of accidental or unplanned introductions.*

For example, coyotes and rats.

Sometimes introduced species out compete indigenous species and may result in their extinction or extirpation.

A species can be intentionally or accidentally brought into an ecosystem that is outside its normal distribution.

Such a species is called an alien species.

When an alien species spreads aggressively and out-competes local native (indigenous) species, it is called an invasive species.

Over 35 percent of plant species in Newfoundland and Labrador are aliens. *Of these plants, a few have taken over natural habitats, reducing biodiversity by changing species composition.*

- Deer Mouse
- Eastern Chipmunk
- Green Frog
- House Mouse
- House Sparrow
- Lake Whitefish
- Masked Shrew
- Mink
- Mink Frog
- Moose
- Red Squirrel
- Muskox
- Norway Rat
- Northern Bank Vole
- Rock Dove
- Ruffed Grouse
- Southern Red-Backed Vole
- Spruce Grouse
- Wood Frog
- American Toad
- Snowshoe Hare

- Birch Leaf-Mining Sawfly
- Cabbage White Butterfly
- Centipedes
- European Earwig
- European Skipper
- Fir Coneworm
- Long Horned Beetles
- Multicolored Asian Lady Beetle
- Water Scavenger

Black Knapweed  
Canada Thistle  
Goutweed  
Purple Loosestrife  
Japanese Knotweed  
St. John's Wort  
Wild Chervil  
Colts Foot  
Yellow Iris  
Sea Buckthorn

These invasive species can threaten the environment, the economy and even human life.

They do this by threatening local wildlife populations, reducing populations of economically important species, and by carrying diseases harmful to humans. (eg West Nile Virus)

# The process of classifying an organism as a species at risk.

- (i) species assessment
- (ii) COSEWIC's recommendation
- (iii) government action/ inaction

# COSEWIC

COSEWIC listings that categorize species at risk.

- (i) not at risk
- (ii) data deficient
- (iii) special concern
- (iv) threatened
- (v) endangered
- (vi) extirpated
- (vii) extinct

# COSEWIC

*Not at risk*: A wildlife species that has been evaluated and found to be not at risk of extinction.

# COSEWIC

*Data deficient*: A wildlife species for which there is not enough information to make a proper assessment of its risk of extinction. A temporary designation that is used until more data is collected and assessed.

# COSEWIC

*Special concern:* A wildlife species that may become a threatened or an endangered species because of a combination of biological characteristics and identified threats. Refers to species that are considered vulnerable in provincial legislation.

# COSEWIC

*Threatened:* A wildlife species likely to become endangered if limiting factors are not reversed.

*Endangered:* A wildlife species facing imminent extirpation or extinction.

# COSEWIC

Extirpation: A wildlife species no longer existing in the wild in Canada, but occurring elsewhere.

Extinct: A wildlife species that no longer exists.

# Recovery process of a species at risk

- (i) research
- (ii) monitoring
- (iii) stewardship
- (iv) education
- (vi) socio-economic
- (vii) recovery teams

# Recovery process of a species at risk

Note that when species are designated as special concern a separate management plan is developed for each species (One Step).

# Recovery process of a species at risk

When species are designated as threatened or endangered, recovery becomes a two-step process.

First, a recovery strategy is written for each species. This document identifies the steps required to recover the species whereby it is no longer considered At Risk.

# Recovery process of a species at risk

Second, *action plans* are developed which identifies the specific actions that are required to carry out the steps identified in the recovery strategy.

# Recovery process of a species at risk

Assessment process includes:

1. Selection of species that require assessment
2. Compiling of data, knowledge and information into the COSEWIC Status Report
3. Assessment of the species' risk.

# Who is COSEWIC

*Committee on the Status of  
Endangered Wildlife in Canada.*

They are the group that assesses the “At Risk” status of native wildlife species in Canada.

# Who is COSEWIC

They are a non-government body that started in 1977. Members are university academics, independent specialists, Aboriginal people, and/or government, museum or independent biologists.

# Who is COSEWIC

They select a species that requires assessment. They then compile data, knowledge, and information into the COSEWIC Status Report, which is viewed largely as a recommendation

# Who is COSEWIC

Government action results in listing the species under the SARA (Species at Risk Act) legislation. The course of action that follows depends on the nature of the listing.

# **Read over Habitat Stewardship Program**

# Environmental Science

## 3205

# Chapter Five

## Protecting Species

unit one

# Protected Areas

Natural spaces that are legally protected from harmful human use in order to retain their biological diversity

# Types of Protected Areas in NL

## Federal Protected Areas p117-118

- National Parks of Canada
- National Historic Sites
- Migratory Bird Sanctuaries
- National Marine Conservation Areas



There are three national parks in this province: Terra Nova National Park, Gros Morne National Park, and Torngat Mountains National Park Reserve. As of 2008, a potential fourth, in the Mealy Mountains of Labrador, is under discussion.



Parks Canada policies also allow for valued natural ecosystems to be protected in national historic sites.

In this province, there are two with significant habitat for rare plants: Port au Choix National Historic Site and L'Anse-aux-Meadows National Historic Site.

<http://www.youtube.com/watch?v=QHNFsN7rqSY>

<http://www.youtube.com/watch?v=B2oENraZknY&list=PLA2234EA1AF3B9CB4&index=8>

# Types of Protected Areas in NL

## Provincial Protected Areas p118-119

- Wilderness Reserves
- Ecological reserves
- Provincial Parks
- Wildlife Reserves
- Wildlife Parks
- Crown / Public reserves

**ECOLOGICAL RESERVES** can be divided into four types, each of which serves a different purpose. They are created to protect:

1. Portions of the province's ecoregions such as the three subregions in the Little Grand Lake Provisional Ecological Reserve.
2. Rare species, such as the jack pine stands in the Redfir Lake-Kapitagas Channel Ecological Reserve.

## ECOLOGICAL RESERVES cont'd

3. Unusual biological richness such as the seabird colonies in Witless Bay Ecological Reserve.

4. Unusual natural features such as the important fossils at Mistaken Point Ecological Reserve.

# WILDLIFE PARKS

Salmonier Nature Park on the Avalon Peninsula is the province's only wildlife park.

Established for educational purposes, and administered by the Wildlife Division, it has evolved to become a tourist destination.

## WILDLIFE PARKS

The park has also expanded its role in wildlife rehabilitation, research and in environmental monitoring.

Its boundaries include the headwaters of the Salmonier River. Activities permitted within its borders are similar to those in a wildlife reserve.

# Benefits of Protected Areas p122

Biodiversity protection

Enjoyment

Education

Economic benefits

Natural experiences

Places for Scientific Research

# Why is it important to protect biodiversity?

- As an environmental benefit, protected areas help preserve biodiversity in an ecosystem.

- Each species is inherently valuable

# Why is it important to protect biodiversity?

- Economic value may come from organisms in ways yet undiscovered
- Unknown complexity of interdependence

# Protected Areas and Biodiversity

The biggest threat facing most species is habitat loss, although over-fishing is thought to be the greatest threat to marine species

Biodiversity loss is happening at an alarming rate ... "half of all mammal and bird species will be extinct by 2100"

# Canada's Biodiversity Strategy

Five goals:

1. Conserve biodiversity
2. Improve our understanding of ecosystems
3. Promote understanding
4. Maintain or develop incentives and laws that support conservation
5. Work with other countries to conserve biodiversity,

# 1. Habitat protection.

Regulations prohibit harmful activities from taking place in some protected areas. This allows natural habitats, plants, and wildlife to enjoy relatively undisturbed conditions in which to survive and evolve.

## 2. Scientific benchmarks.

When healthy ecosystems exist, we have standards against which to measure the health of all our natural systems.

We can use protected areas as living laboratories to help us assess and improve methods for managing similar areas outside their borders.

### 3. Insurance against disaster.

Ecological disasters may cause species loss.

Unaffected protected areas can provide places where these threatened species may survive.

## 4. Ecological stability.

Intact ecosystems with healthy plants and animals are better able to survive and evolve naturally inside protected areas.

This, in turn, provides direct environmental benefits to areas outside their borders.

# How Protected Areas are Created

- identify the need for a protected area
- scientific study of the area
- knowledge of wildlife patterns of behavior
- habitat needs
- how ecosystems function
- public consultation and support
- legislation

## Legislation examples:

- Canada National Parks Act
- Marine Protected areas under the Oceans Act

## Creating protected areas is a slow complex process

- Gathering public and expert support
- Doing research
- Identifying proposed water and land boundaries
- Acquiring land
- Negotiating with partners and stakeholders
- Resolving land use or water use rights

# Benefits of Protected Areas

The Eco Spotlight feature “Burnt Cape: The Making of an Ecological Reserve” provides an example of a successful community initiative to protect an ecologically sensitive area in this province.

Read pp133

# "Burnt Cape: The Making of an Ecological Reserve"

This cold and windswept area has just the right conditions for plants that otherwise grow only in the Arctic.

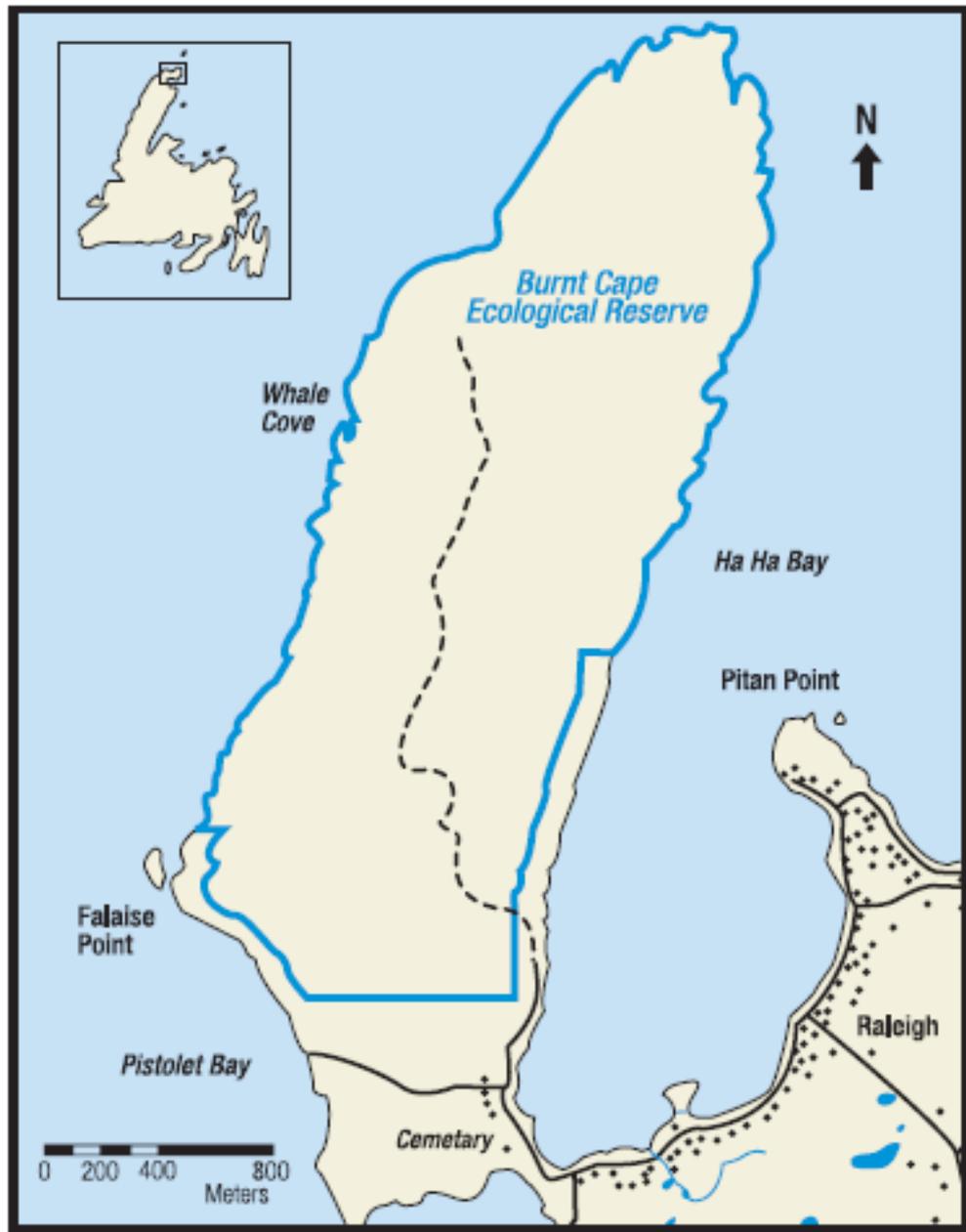
- northwest tip of the Great Northern Peninsula, rocky limestone

- 3.6 km<sup>2</sup>

- 300 species
- first site in the world for Burnt Cape Cinquefoil
- Only non arctic site for Dwarf Hawk's Beard
- Credit to the people of Raleigh
- M L Fernald 1920s (famous botanist)

<http://www.youtube.com/watch?v=mpvIG5xtssc>

[http://www.env.gov.nl.ca/env/parks/wer/r\\_bce/index.html](http://www.env.gov.nl.ca/env/parks/wer/r_bce/index.html)



**Frost Polygons**, are loose stone surface ridges around an open space

These occur in areas of exposed ground that are subject to intense freeze and thaw cycles

Over thousands of years, repeated freezing and thawing of groundwater in loose gravel and mud slowly pushes the larger rocks away from the pressure centre of finer grained material where the water is retained.



Sea caves are also found in the reserve. The predominately limestone coast, exposed to westerly prevailing winds and wave action, displays any spectacular caves.



Dungeon Provincial Park Sea Caves  
Bonavista, Newfoundland.

# "Eight Key indicators of Ecological Integrity in National Parks

1. **Native Species** - Are they being conserved?
2. **Focal species** - Are any species losing their role?
3. **Herbivores/predators** - Are any food chains being lost?
4. **Productivity /decomposition** - Is there a change in the rate of growth or decay?

5. **Community age /spacing** - How do they compare in plant and animal communities

6. **Nutrient Cycling** - Is this occurring at expected rates

7. **Physical processes** - Are landform and water bodies changing at expected rates?

8. **Stressors** - What is the net effect of human impact on a park?

# Environmental Stressors at Home

These specific concerns need to be addressed in and near Newfoundland and Labrador's terrestrial protected areas:

- Modification of natural habitat caused by industrial or logging practices.
- Habitat fragmentation caused by new roads, power lines, and bridges.

# Environmental Stressors at Home

- Changes in streams and waterways from pollution, dumping, and culverts that disrupt natural patterns.
- Vehicle use (ATVs, snowmobiles) which can destroy habitat and take humans into areas that cannot sustain the destruction caused by significant human presence.

# Environmental Stressors at Home

- New species, introduced on purpose or by accident, that can upset natural ecosystem processes.
- Expanding development that follows the construction of new access roads.
- Harmful human activity such as oil spills, poaching, dumping, and polluting.

# Tools used in the Management of Protected Areas.

- (i) research
- (ii) monitoring
- (iii) education
- (iv) stewardship
- (v) protection and enforcement
- (vi) human resources

# The Management of a Protected Area

This involves a multifaceted approach which includes constant monitoring, ongoing research, public education, utilizing both employees and volunteers for protection and enforcement, coordination and cooperation between various levels of government and volunteer groups, etc.

# Enviro-Focus

"Balancing Act - How Many Hikers are too Many?"

[http://www.ed.gov.nl.ca/edu/k12/curriculum/documents/science/highschool/ES3205\\_student\\_text\\_chapter\\_5.pdf](http://www.ed.gov.nl.ca/edu/k12/curriculum/documents/science/highschool/ES3205_student_text_chapter_5.pdf)



# What Monitoring Reveals

5% of people using the trail go off route

When 60 people walk through an area the compaction and trampling is noticeable

70 people can cause a decline in vegetation

90 people can cause measurable damage

90 people taking a new route for two seasons can create a new trail (braiding)

Read p 138 "Community Involvements helps  
Salmon Stocks Recover"

<http://www.pc.gc.ca/docs/v-g/ie-ei/at-ag/sec7/page3.aspx>



How do “acting responsibly” and “protected areas” fit?

Stick to the trail

Respect wild behaviour

“A fed animal is a dead animal”

Avoid restricted areas

Do interpretive activities

Encourage responsible development

Become more informed

# Stewardship

involves taking care of things that are valued by all

Environmental stewardship occurs when individuals, groups, and governments come together to take the lead in conservation initiatives such as supporting protected areas.

# Stewardship

Read pp 141-142

Main River and Mistaken Point

[http://www.ed.gov.nl.ca/edu/k12/curriculum/documents/science/highschool/ES3205\\_student\\_text\\_chapter\\_5.pdf](http://www.ed.gov.nl.ca/edu/k12/curriculum/documents/science/highschool/ES3205_student_text_chapter_5.pdf)

<http://www.youtube.com/watch?v=ENhdyOtpxR8>

<http://www.cbc.ca/landandsea/2011/07/mistaken-mystique.html>

<http://www.youtube.com/watch?v=RxJzF3Yk0uc>

# Identify career opportunities related to the study of environmental issues

- Ecologist
- Environmental Engineer
- Game Warden / Wildlife Officer
- Park Naturalists
- Soil Conservationists
- Forestry/ Silviculture workers
- Fisheries Scientist
- Wildlife Biologist