

Declining Populations



- S2-1-07 Describe potential consequences of introducing new species and species extinction on an ecosystem.
- S2-1-08 Observe and document a range of organisms that illustrates the biodiversity within a local or regional ecosystem.
- S2-1-09 Explain how the biodiversity of an ecosystem contributes to its sustainability.

Biodiversity

- The VARIETY of ORGANISMS found within an ECOSYSTEM is known as its BIODIVERSITY.
- The BIODIVERSITY of an ecosystem is an INDICATOR of its STABILITY and HEALTH.
- STABLE and HEALTHY ecosystems will have a LARGE NUMBER and VARIETY of SPECIES present.



Sustainability

- **STABLE** and **HEALTHY** ecosystems are **SUSTAINABLE**
 - they are **RENEWABLE** and can **CONTINUE** without the addition of **NEW MATERIALS**.
- They **RELY** on:
 - the **UNDISTURBED CYCLING OF NUTRIENTS**, and
 - the natural **BIODIVERSITY** of the area to maintain **PREDATOR-PREY** relationships.
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- A **BIODIVERSE** ecosystem is **SUSTAINABLE** because it will be able to withstand **DISASTER** or **CATASTROPHE**.

At-Risk Species

- We have seen that the population of a given species tends to **FLUCTUATE NATURALLY** but remain at a fairly **CONSTANT** value determined by the **CARRYING CAPACITY** of the ecosystem.
- If the ecosystem changes, for example, by having favorable weather for an extended period of time, the carrying capacity will increase and the population of a given species will increase.
- However, if the **CARRYING CAPACITY** of the ecosystem **DECREASES**, then the **POPULATION** of a given species will **DECREASE** as well. The decline in population can lead to that species **DISAPPEARING ENTIRELY**. The species are classified as **AT-RISK SPECIES**.

At-Risk Species

These at-risk species can be divided into four different categories...

1. EXTIRPATED.

- A species that NO LONGER EXISTS in ONE AREA, BUT EXISTS in OTHER AREAS

Example: Grizzly Bears

- Are the state animal of California, which doesn't have any!



- The last grizzly bear in California was seen in 1922.



Figure 1. Current and Historic Grizzly Bear Distribution in North America

At-Risk Species

2. THREATENED

- A species that is LIKELY to become ENDANGERED if factors that make it vulnerable are NOT REVERSED



Example: Woodland Caribou

- Threats include HABITAT DESTRUCTION from forest fires, roads, trails, transmission lines, logging and other industrial operations.
- By declaring them threatened, the government has the ability to PROTECT their CURRENT HABITATS.



At-Risk Species

3. ENDANGERED.

- this refers to a species that is CLOSE to EXTINCTION in ALL PARTS of CANADA or in a significantly LARGE REGION

Example: Peregrine Falcon

- Used to be a rare, but naturally occurring species in Manitoba until the 1950's
- Numbers have declined seriously due to DDT and other chemicals causing their EGGSHELLS to THIN.



At-Risk Species

4. EXTINCT.

- this is a species that is NO LONGER FOUND anywhere on EARTH

Examples:



Dinosaurs

Lived for about 180
million years

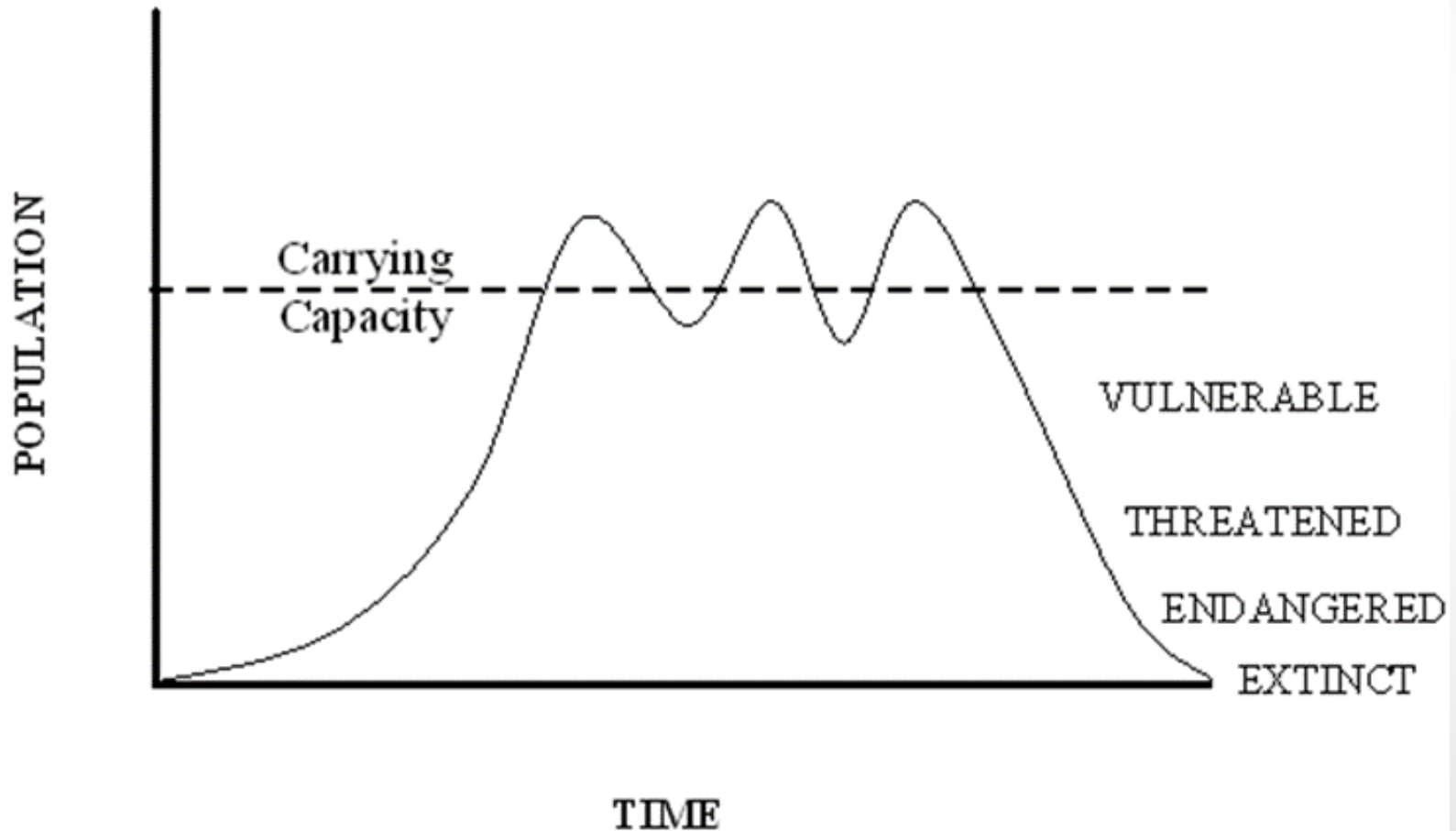


Dodo Bird

Extinct since about 1662

At-Risk Species

POPULATION GROWTH CURVE LEADING TO EXTINCTION



At-Risk Species

Example: Polar Bears near Churchill Manitoba

- There is a large concentration of polar bears in northern Manitoba
- They live on the ice in Hudson's Bay from mid November to Late July, filling up on fish and SEALS.
- When the ice melts they move to the land and survive on stored FAT.
- Our CHANGING CLIMATE has caused the ice to melt much sooner, resulting in a SHORTER hunting season.
- This has lead to polar bears becoming a THREATENED species.



Introduction of New Species

The introduction of new species can also cause changes in ecosystems and the populations of species:

- The SUSTAINABILITY of the ecosystem can be INCREASED or DECREASED,
- FOOD CHAINS can become ENHANCED or DISRUPTED
- RESOURCES can be INCREASED or DEPLETED.

Sometimes new species are introduced to IMPROVE BIODIVERSITY, or to help CONTROL populations.

Other times, new species are introduced by ACCIDENT, and they INVADE the ecosystem → INVASIVE SPECIES

Examples include: ZEBRA MUSSELS, RUSTY CRAYFISH, PURPLE LOOSTRIFE, etc.

Introduction of New Species

Purple Loosestrife:

- A plant that was introduced in the 1800's through livestock **SHIPMENTS** from Europe and its use in **MEDICINE** and **GARDENS**.
- Purple loosestrife spreads into natural areas and **COMPETES** for resources with native vegetation.



Effects of Extinction

Organisms are linked together in **COMPLEX FOOD WEBS**. Should one species in an ecosystem go **EXTINCT**, the entire food web may be **JEOPARDIZED**. Extinction **DISTURBS PREDATOR-PREY** relationships.

- How would the removal of algae affect the Lake Winnipeg ecosystem?
- It is an important food source for **PRIMARY CONSUMERS** such as **INSECTS**.
- A lack of algae could result in a shortage of food for these **PRIMARY CONSUMERS**.
- The **INSECT** populations will begin to **DECLINE**.
- Thus populations of **SECONDARY CONSUMERS** that **PREY** also decline.
- The number of minnows and catfish would be **REDUCED**.
- The number of **TERTIARY CONSUMER** populations, the whitefish and northern pike, would begin to **FALL** as well.
- Finally, the **TOP CONSUMERS**, the eagles would dwindle in number.

You can see how the removal of one species can have a large impact on an ecosystem. It can lead to a **DOMINO EFFECT** – one event can cause a large **CHAIN REACTION**.