

Biodiversity Concepts

WHAT IS BIODIVERSITY?

- ✓ Biodiversity is the variety of life on Earth.
- ✓ For any kind of animal or plant – each individual is not exactly the same as any other; nor are species or ecosystems.
- ✓ Biodiversity is generally described at three levels: genetic diversity, species diversity and ecosystem diversity.
- ✓ **All life forms that make up biodiversity, including humans, are ultimately connected to all other life forms, and to their physical environment.¹**
 - No one living element of any ecosystem can survive independent of the others.
 - Connections among living and non-living elements keep the environment functioning and healthy.
 - Because biodiversity represents the interconnectedness of all things, the effects of some causes can be surprising.
 - Human impact on the environment, therefore, directly or indirectly affects the function of other living things, and, by extension, ourselves.

BIODIVERSITY HAS LIMITS

- ✓ Physical environments, even healthy ones, can support just so many of any species, including people, indefinitely.
- ✓ This maximum number is termed the *carrying capacity* for that environment (e.g. # of individuals/ha or km²).
- ✓ The carrying capacity for any species changes as the numbers and actions of other life forms, and environmental conditions, change.
- ✓ Species can cause changes in environmental conditions, and *vice versa*, leading to changes in carrying capacity for themselves and for other species.

¹ Concepts in bold are considered overarching.

- ✓ Another way to express limits and carrying capacity is through the term *ecological footprint*.
- ✓ An ecological footprint is the amount of productive land and water required to maintain the current lifestyle of a particular individual, and is almost always applied to humans (e.g. # of ha/individual).
- ✓ Over the short term, these limits can be exceeded by a population or species, including people, a condition often termed *overshoot*.
- ✓ Overshoot, in the short term, often degrades the associated environment; in the long term, it causes a sharp, considerable decline in a population or species, or even its elimination from that environment.

BIODIVERSITY HAS VALUE

- ✓ **Biodiversity has evolutionary, ecological, economic, social, cultural, and intrinsic values.**
 - Biodiversity is nature's insurance policy – the more variety there is now, the more there can be in the future, and the greater the chances of adapting to major changes in environmental conditions.
 - Biologically diverse ecosystems offer a variety of natural products, including medical ingredients that enhance human health and standard of living.
 - Biodiversity provides ecosystem services: water purification; clean air, fertile soil, climate regulation, flood control, as well as pest regulation and disease resistance, essentially for the cost of letting natural systems function.
 - Sustaining biodiversity has economic benefits: world *ecosystem services* reliant on biodiversity are valued at 33 trillion dollars per annum while the total of all economic goods and services are valued at 18 trillion per annum.
 - Biological diversity is key to long term ecosystem sustainability (e.g. 75% of cash crops rely on a variety of insects and other organisms for pollination; a biologically diverse agricultural ecosystem provides stability, nutrients to the soil and natural pest resistance).
 - Biodiversity is key in sustaining the natural beauty of National and Provincial Parks and green spaces for recreational use and heritage preservation.

- Biologically diverse ecosystems maintain a stable environment capable of providing a high quality of life.
- Healthy, stable, diverse environments are able to respond to change more efficiently than degraded or simple systems.

BIODIVERSITY IS IN TROUBLE

- ✓ There is growing scientific concern about the major, rapid decline in biodiversity around the world. The extinction of each additional species and the loss of variation within species brings the irreversible loss of unique genetic diversity.
- ✓ the scientific community has linked human activity to the accelerated rate of recent and current extinctions.
- ✓ Biodiversity is declining because of:
 - Habitat loss
 - Invasive species
 - Pollution
 - Population Growth
 - Over-consumption (Unsustainable use)
 - Climate change
- ✓ Signs of biodiversity loss in Ontario:
 - more than 70 of Ontario's wild species are endangered
 - more than 70% of southern Ontario's wetlands are gone; the loss of wetlands is seen as eroding the protection of our drinking water and leading to further species losses.
 - climate change is significantly affecting some northern Ontario species.
 - Increase of at risk species.
- ✓ Human cultural diversity and biodiversity are linked. Intact indigenous cultures living traditional lifestyles require an intact, functioning ecosystem, and are threatened by the loss of biodiversity and attendant ecosystem goods and services.
- ✓ Human impacts on biodiversity have been accelerating as population growth and consumption rates have increased.
- ✓ If the dominant public demand is less expense and more convenience, that is what industry will supply -- often to the detriment of environmental

interests. In short, it is the average consumer that dictates industrial actions that may lead to loss of biodiversity.

- ✓ The same principle discussed above for industry applies also to agriculture. The consumer wants cheap fresh food. The farmer delivers.
- ✓ Loss of species may mean loss of important but as yet unknown resources for humans.

CLIMATE CHANGE AND BIODIVERSITY

- ✓ Loss of habitat due to climate change is the leading threat to global biodiversity.
- ✓ Ecosystems fluctuate around a state of equilibrium. In the long run, however, ecosystems and their components always change when climate changes.
- ✓ Climate change and Biodiversity represent a reciprocal issue:
 - Climate change degrades biodiversity.
 - Stable, biodiverse environments are more capable of adapting to climatic shifts.
 - Stable, biodiverse environments are more capable of mitigating the production of GHG's (e.g. carbon sequestration by forests, bogs) and thus climate change.
 - Reduction in sources of climate change (excessive fossil fuel use, etc.) will help conserve biodiversity.
 - Enhancement/conservation of biodiversity (forest conservation, reduced chemical pollution and other factors not directly related to climate change) will minimize impacts of climate change.
 - We may have to help some species adapt to changes in climate.
- ✓ Climate change resulting from, among other things, unsustainable use of fossil fuels results in loss of biodiversity:
 - Temperature increase makes certain environments uninhabitable to previously indigenous species.
 - Loss of indigenous species allows introduced species to flourish, thus increasing the loss of other indigenous species.

- Changing composition of environments and loss of species directly effects ecosystem services.

SOCIETY'S ROLE IN SUPPORTING BIODIVERSITY

“We do not inherit the Earth from our ancestors; we borrow it from our children.”

“Conserving biodiversity is not necessarily about preserving everything currently in existence. It is more a question of walking lightly on the Earth.”

- ✓ **All Canadians depend on biodiversity and have a responsibility to contribute to biodiversity conservation and to use biological resources in a sustainable manner.**
 - Government, non governmental organizations, community groups, academic institutions and individuals use a variety of means to protect plants and animals.
 - Preservation of local natural areas (woods, old fields, wetlands, etc) allows the plants and animals that depend on these areas to continue to live.
 - Restoration of habitat that has been lost (school yard naturalization, naturalized gardening, and removal of invasive species) can increase the number of different species found in an area.
 - Development and institution of recovery plans for species at risk.
 - Zoos and botanical gardens and other facilities can participate in captive breeding with the intent of re-introducing the species when habitat problems have been solved through processes such as ecological restoration.
 - Individual and community contributions to biodiversity conservation and steps towards sustainable living *do* make a difference: ie) informed consumer choices.
- ✓ Canadians must claim *ownership* of their choices and the resultant environmental effects. Identifying a personal connection to biodiversity and what its loss means on a personal level is more likely to motivate behaviour change than not doing so.