

## STEWARDSHIP OF ECOSYSTEMS: FACILITATED LESSONS AT BRIGHTWATER

Understanding the changes in the scientific worldview (paradigm shift) of sustainability and human's responsibility to protect ecosystems. Demonstrating how society's needs and functions, as well as the global economy, affect one's community. Students will have a better understanding of and connection to local native prairie and forest ecosystems, species dynamics, species richness, indicator species, invasive and exotic species, nutrient cycling and renewal systems for ecosystem health.

### 1) Intuitive Development for Inquiry (Beginner)

#### Learning Outcomes:

- Observe a range of organisms to illustrate the biodiversity within the prairie and riparian ecosystems.
- Understand how the biodiversity of an ecosystem contributes to its sustainability
- Gain a sense of personal and shared responsibility for maintaining a sustainable environment.
- Increase intuitive ability to understand and solve problems for an ecosystem.
- Compare a natural and a disturbed (altered) ecosystem and suggest ways of assuring their sustainability.

#### Key Concepts

- A set of interrelated components forms a *system*.
- *Biodiversity* is a measure of the number and variety of species in an ecosystem.
- A *community* is all of the organisms in an ecosystem.
- Observation of food webs and trophic levels.
- A *nutrient* is any substance needed by an organism for proper growth, repair, and function such as nitrogen, oxygen, carbon, water, phosphorus, sulfur, hydrogen.
- A *biogeochemical cycle* or *nutrient cycle* is the path of a nutrient through an ecosystem.

#### On-Site Activity Flow

This session begins with a exploration hike of the site, identifying ecosystems and landmarks of the area. The group is then dispersed throughout an area for the students to have time for solo reflection and observation, some students in the forest and some in the nearby prairie. During this time the students will draw and describe their surroundings with leading questions.

The group will come back together to take part in a sensory activity to increase their observation abilities. Students will share their perspective of the experience and draw on ideas that will help them to focus and be more aware of their surroundings. This is followed by another solo session where the students switch the ecosystem of focus recording the detail with more leading questions.

#### Questions:

- i) How many different species are around you (how many different looking species)? Include plants, insects, birds, lichens, and mosses, everything you see.
- ii) Draw a detailed sketch of a specific species and one of the landscapes it is found in.

- iii) Find a species that you are interested in. Make a detailed sketch and answer the following questions. Where does it get its nutrients from? Where does it draw water from? Is it a producer or a consumer? What other species would it interact with in this environment?

## 2) Biodiversity and the health of ecosystems (Intermediate)

### Learning Outcomes:

- Observe a range of organisms to illustrate the biodiversity within the prairie and riparian ecosystems.
- Understand how the biodiversity of an ecosystem contributes to its sustainability
- Examine the impact of invasive species on an ecosystem.
- Identify the factors that result in species becoming at-risk in Saskatchewan , the Prairies, and Canada
- Explore ecology-related work settings and work roles in the community.
- Compare a natural and a disturbed (altered) ecosystem and suggest ways of assuring their sustainability.

### Key Concepts

- A set of interrelated components forms a *system*.
- *Biodiversity* is a measure of the number and variety of species in an ecosystem.
- An *introduced species* is an organism that is not native to the place or area where it is considered introduced and instead has been accidentally or deliberately transported to the new location by human activity.
- An *invasive species* means an alien species whose introduction does, or is likely to, cause economic or environmental harm or harm to human health.
- A *population* is all the members of a species that are living in the same habitat at a particular time.
- A *community* is all of the organisms in an ecosystem.
- Observation of food webs and trophic levels.

### On-Site Activity Flow

The facilitated session will start with a hike through the various ecosystems. Discussion of the plants they have studied before coming to brightwater and where they expect to find these plants.

Questions:

- Find the plants that you have studied in class and record the following: Draw the plant and the surrounding community of plants, is it sunny or shaded, is there a slope and what direction is the slope facing, a description of the soil.
- What regenerative processes would renew the ecosystem where you are sitting – fire, grazing, drought, flooding, severe weather?

### 3) Water for Life – Chemistry and us (Advanced)

#### Learning Outcomes:

- Understand how the biodiversity of an ecosystem contributes to its sustainability.
- Students will begin to understand the cycling of nutrients throughout the ecosystem through observing different soil layers in the forest and on the prairie, the presence of mycelium and other decomposers, the accumulation of organic matter, the presence or absence of terrestrial invertebrates (soil tests to determine fertility – questioning the adaptability of new plants to established ecosystems – supporting the protection of local functioning ecosystems).
- Identification of aquatic food webs and invertebrate communities including indicator species.
- Understand how to take water samples to test pH, DO, conductivity and temperature and how these indicate water quality and changes in the aquatic ecosystem over time.
- Gain a sense of personal and shared responsibility for maintaining a sustainable environment.
- Explore ecology-related work settings and work roles in the community.
- Explore the technologies used to study biotic and abiotic components of ecosystems.
- Discuss the ethics of studying biotic components of ecosystems.
- Compare a natural and a disturbed (altered) ecosystem and suggest ways of assuring their sustainability.

#### Key Concepts

- A set of interrelated components forms a *system*.
- *Biodiversity* is a measure of the number and variety of species in an ecosystem.
- A *nutrient* is any substance needed by an organism for proper growth, repair, and function such as nitrogen, oxygen, carbon, water, phosphorus, sulphur, hydrogen.
- A *biogeochemical cycle* or *nutrient cycle* is the path of a nutrient through an ecosystem.
- *Cellular respiration* is the process by which most living things generate useful energy by combining oxygen and sugars to produce carbon dioxide and water.
- *Photosynthesis* is the process by which green plants and other producers use energy from the sun, and carbon dioxide and water to produce sugars and oxygen.
- *Nitrogen fixation* is the conversion of atmospheric nitrogen gas into compounds that are usable by plants, typically nitrate ions or ammonia.

#### On-Site Activity Flow

##### Questions:

- i) Draw and describe the riparian area. Draw and describe some of the plants found in the riparian forest and the plant communities found closer to the water's edge.
- ii) How does the soil change as you move from the forest to the water's edge?
- iii) Draw and describe one aquatic indicator species.
- iv) Test and record the aquatic pH, dissolved oxygen (DO), temperature and conductivity.