Protective Plants: WATER SCIENCE

AREA BEST LINKED TO

City of Kawartha Lakes, Haliburton County Municipality of Muskoka, Trent Severn Waterway.

OBJECTIVES

- for the students to gain a hands on understanding of the role of plants in absorbing moisture and nutrients from run off
- increase the student awareness of the pollution hazards of poor storm water management

MATERIALS

- topsoil and mulch
- native seeds/plants
- trees: willows (weeping willow), ash trees, white oak, red maple, etc.
- shrubs: dogwood, redbud, spice bush, arrowwood viburnum, highbush blueberry, american cranberry bush, inkberry and winterberry, etc.
- perennials: lily of the valley, wild geranium, spotted joe pye weed, cardinal flower, bluebells, wild columbine, many varieties of iris and mints, etc.
- tools: shovels, trowels
- small stones

CURRICULUM LINKS

Grade Four: Science and Technology, Understanding Life System, Habitats and Communities.

- Analyse the effects of human activities on habitats and communities.
- Investigate the interdependence of plants and animals within specific habitats and communities.
- Demonstrate an understanding of habitats and communities and the relationships among the plants and animals that live in them.

Grade Five: Science and Technology, Understanding Life Systems, Human Organ Systems

- Analyse the impact of human activities and technological innovations on human health.

Grade Six: Science and Technology, Understand Life Systems: Biodiversity.

- Assess human impacts on biodiversity, and identify ways of preserving biodiversity.
- Demonstrate an understanding of biodiversity, its contributions to the stability of natural
- systems and its benefits to humans

BACKGROUND INFORMATION

A rain garden is a small garden which is designed to absorb moisture and nutrients, particularly nitrogen and phosphorous that are found in run off. They are located close to run off sources to decrease soil erosion and to slow down run off as it travels. The idea is that storm water will be soaked up in the garden to infiltrate and not to allow run off to gain momentum. The garden will mimic the hydrologic cycle of a forest as it will improve stormwater quality, reduce run off volumes and facilitate infiltration of water. To achieve this, plants chosen for the garden must have fibrous roots that intake the stormwater. These plants should be able to withstand extreme flooding should be located in the middle of the garden as well as drought which should be on the upper edges of the garden. Soil used should be porous to slow down the flow of water and hold moisture longer. Plants with deep fibrous roots tend to have a competitive advantage in a rain garden and provide the most cleaning and filtration benefits to the environment. Most rain gardens include herbaceous perennials, woody shrubs and trees which allow for low maintenance.

TIMELINE AND WORK PLAN

Explain what run off is. (5 minutes)

Stormwater runoff is unfiltered water that reaches streams, lakes, sounds, and oceans by means of flowing across impervious surfaces. It is usually from precipitation. These surfaces include roads, parking lots, driveways, and roofs. When rain or snow falls onto the earth, it moves with the landscape. A portion of the precipitation seeps into the ground to replenish groundwater. Most of it flows downhill as runoff.

Explain the positive and negative impacts of run off. (5 minutes)

Positive: keeps rivers and lakes full of water

Negative: changes the landscape by the action of erosion, pollutants from run off into water bodies

Ask students how plants can alter this process. (5 minutes)

Vegetation can slow the movement of runoff, allowing time for it to seep into the ground especially in urban areas with surfaces that can not absorb water such as pavement and speed up run off. Plants can filtrate water by a process called phytoremediation. Phytoremediation is a general term for several ways in which plants are used to remediate sites by removing pollutants from soil and water. Plants can degrade organic pollutants or contain and stabilize metal contaminants by acting as filters or traps.

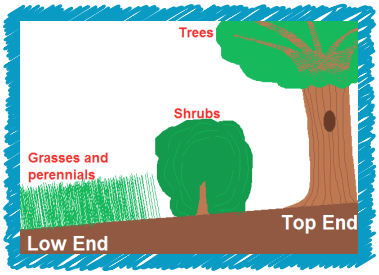
This includes the plant taking in contaminants, metals, and any pollutants in the run off to eliminate or reduce the amount of impact on the watershed.

Explain the idea of a rain garden. (10 minutes)

A rain garden is a natural system that mimics nature's manner of handling stormwater. Wetlands are nature's water filters and seasonal wetlands function as large scale rain garden systems. (see background information)

DESIGNING YOUR RAIN GARDEN

Location of the rain garden should be a run off problem area. For example: at the bottom of a slope or hill since water runs off quickly in these areas and does not have time to infiltrate, near a watershed or down slope from any gutters. It will probably be a location that remains wet after precipitation. A location in the school yard or a nearby park or watershed is recommended. The size of the garden can depend on funding and resources available. Parent volunteers or older students might be helpful for the planting process. The depression of the garden should be at least 8 inches below lawn surface being deepest in the middle. Sandy, fast-draining soil is ideal for rain gardens but you can amend other soil types to work well and absorb water. The goal is to collect the rain water from a storm in the depression of the rain garden, then let it slowly drain into the soil typically within 24-48 hours. Add organic compost and mulch material to the centre of the depression and plant the floor of the rain garden with native wildflowers, grasses, plants and shrubs based (see recommended species in materials). Other species will work as well these are only recommendations, consult your local nursery for advice. Arrange the plants and flowers by height. Trees would be at the top end of the garden, then shrubs then wildflowers and grasses (see diagram below). Stones or grass can be placed on the outside of the garden to direct storm water to garden centre.



Explain to students why the rain garden will help run off.
(see background information)

Introduce them to the type of plants that will be put into the garden with the reasons why.
(10 minutes)

Trees:
Tree cover can catch as much as half of the rain falling on their leaves. Their extensive root systems can absorb water from the soil and release it into the atmosphere through the process of evapotranspiration. Willows, ash trees, red maples and white oak grow successfully in wet soils.

Shrubs:
Shrubs interrupt rainfall before it hits the ground and absorb moisture from the soil through well-developed root systems. Native shrubs for wet areas include redosier dogwood, redbud, dogwood, spice bush, arrowwood viburnum, highbush blueberry, American cranberry bush, inkberry and winterberry thrive in wet soils.

Perennials:
An abundance of flowering perennials thrive in wet soils, absorbing the moisture and run off. Lily of the valley, wild geranium, spotted joe pye weed, cardinal flower, bluebells, wild columbine, many varieties of Iris and mints are productive in wet areas.

Get students involved in the planting once the location and depression are situated. Split up students into teams depending on type of plant they will be attributing to the garden. For example, a group of students planting trees will be directed to the top of the garden. A volunteer for each group should explain the specific way to plant the seed. The depth and distance apart should be made clear to students. It might be a good idea to have a sign on a stake indicating the purpose of the rain garden and that it is associated with the Haliburton-Muskoka-Kawartha Children's Water Festival.

Follow up:
Visit garden after rain fall. Maintain the garden by weeding although the garden should be low maintenance due to the choice of plants. Get community members involved in any summer maintenance needed. Garden can be used for other subjects as well, for example plant science.

RESOURCES/REFERENCES

- Conservation Ontario: Protect Water
  http://www.conservation-ontario.ca/source_protection/index.html
- United States Environmental Protection Agency: Phytoremediation Resource Guide
  http://www.epa.gov/tio/download/remed/phytoresgude.pdf
- Ministry of the Environment: Stormwater Management
  http://www.ene.gov.on.ca/environment/en/subject/stormwater_management/index.htm
- Rain Garden Design Template
  http://www.lowimpactdevelopment.org/raingarden_design/whatisaraingarden.htm
- The Groundwater Foundation: Rain Gardens 101
  http://www.groundwater.org/ta/raingardens.html

FEEDBACK

We appreciate your feedback! Please let us know…

- Did this activity continue the learning your students engaged in at the Water Festival?
- What curriculum requirements did this activity satisfy?
- Was the activity easy to facilitate to your class?
- Did students have fun and learn something new about water?
- Please send photos of your class using these activities!

Please send comments and photos to: **iheaven@outtolearn.ca**