



Teacher's Corner Lesson Plans

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Give Me Back My School: A Back to Basics Approach to Ecological Restoration

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Grade level: Grade 9.

Provincial curriculum links: Ontario.

Subject: Geography.

Keywords: Ecological footprint, ecological restoration, mapping, urban development, waste management, ecological pest management, mulching, composting, recycling.

Description

This lesson is intended to help students learn about the geography of the area in which their school is situated, in order to create a successful ecological school ground. Students will analyze local soil, average weather patterns for their area, topography and local precipitation and temperature graphs in order to develop a feasible method of small-scale land reclamation. They must also decide upon the best types of vegetation to plant within their plot of land. Vegetation should ideally (but not necessarily) be native vegetation to the area/ecozone. This is an on-going, year long project that can be extended to students over a number of years. The project is intended to draw awareness to ecology, ecozones, waste management, ecological impact of each human on the land, urban growth and the cost/benefit of land reclamation.

Curriculum Framework

Ontario Curriculum Geography of Canada, Grade 9, Academic (CGC 1D)

Strand: Geographic Foundations: Space and Systems

Specific Lesson Goals:

- demonstrate an understanding of how human activities (e.g., agricultural and urban development, waste management, parks development, forest harvesting, land reclamation) affect the environment;
- explain how the effects of urban growth (e.g., development on former farm lands, destruction of wildlife habitats, draining of marshes) alter the natural environment;

- research and report on ways of improving the balance between human needs and natural systems (e.g., recycling, river clean-ups, ecological restoration of local woodlots or school grounds, industrial initiatives to reduce pollution);
- analyse and evaluate the success, in environmental and economic terms, of local waste management methods.

Preparation

Preparation time: You will need to get the approval of the principal for this project, therefore, notify as soon as possible. It is also important to plan your actions thoroughly; it may be a good idea to plan for this project over the summer so you will be ready by the commencement of the following school year.

Length of lesson: This project should be conducted over the school year, depending on your resources.

Resources required:

- Historical maps of the area (if possible)
- seeds of plants/trees/shrubs native to the area
- plant guides
- shovels
- rakes
- spades
- extra soil
- student worksheets

Procedure

1. Read the article “An Explanation of Ecological Footprints” at the following website: <http://www.rbg.ca/cbcn/en/information/footprints/dglectures/footprint1.html>, and answer the following questions:
 - (a) In your own words, describe the term “ecological footprint”. What information does this calculation provide? Why is this information significant?
 - (b) Has calculating your ecological footprint made you more aware of your impact on the environment? In which ways? How can city planners or municipal governments use similar information to curb urban impact on the environment?
 - (c) Outline at least 5 reasons why populations living in developing countries have a smaller ecological footprint.
 - (d) Do you think the current methods of calculating one’s ecological footprint are reasonable? Are there any “holes” in the criteria used to assess a person’s ecological footprint?

- (e) How does an individual's ecological footprint differ from their "earthshare"? Which is a better measure of the amount of land needed to support us? Explain your reasoning.
2. Consult with your school's administration to ensure their support for your project.
 3. Students should visit their local library or perhaps the city archives or the city planning office to locate any original maps of the area. This will provide you with additional insight as to how the land upon which your school is situated was originally used and/or managed.
 4. Before you plan your landscape, consider what is already present in and around your intended area. Consider the following:
 - (a) **Water** - are there any natural sources of water in the area? Do you want to create a source of water such as a small pond?
 - (b) **Food** - are there existing plants, shrubs or trees that provide food (e.g. blueberries, apples)? Do you want to plant edible types of vegetation in your landscape?
 - (c) **Shelter** - which areas in your landscape are shady? Sunny? Will your landscape, once it is established, provide sunny or shady areas? Are there areas where small animals may seek shelter for the winter?
 - (d) **Space** - does your intended area provide spaces for students to sit and relax? How much space will you have to work with?
 5. You should prepare enough garden implements (shovels, gloves, tools, etc) for your classroom. There will likely be insufficient tools available within the school, therefore, ask your students if they have any extra garden tools at home. You can also petition local nurseries, garden clubs or garden centres for tools. Garage sales or flea markets and second-hand shops may also be useful to you.
 6. To keep track of garden tools, create a chart which will identify the group, the time they borrowed the tools and the time the tools were returned. Each group will be responsible for replacing missing garden tools. Groups should also keep a log of tools they borrow.

Group Members	Garden Tools Borrowed	Time Borrowed	Time Returned	Teacher Approval
<i>E.g. Group 1</i>	<i>Shovel, rake, bucket</i>	<i>10:10 am</i>	<i>11:10 am</i>	<i>(teacher's signature)</i>

7. With your class, consult plant guides for information on types of vegetation native to your ecozone, and specifically, to your area. You may also investigate via the internet

or by asking employees of local garden centres or members of garden clubs in your area.

8. Each group should prepare a scaled drawing of their planting area and the seeds/plants they intend to sow. This map should possess the following: a scale, a legend, a north arrow, a title and the names of each group member. This map can be drawn freehand or with the aid of a graphics program. Before their plans are approved, the group must present their ideas to the teacher.
9. All groups should schedule time before, during or after class where they are responsible for the maintenance of their area of the green space.
10. Decide, as a class how funds will be raised and the class budget for this project. Project outcomes are directly dependent on available funding.
11. Groups are given soil, seeds, water, garden tools and small pots. Each group is to plant and care for their own seedlings which will be used to create the green space in the spring.
12. To allow for optimal water drainage, loosen the soil in your garden once a week.

Discussion and Questions

1. As a class, discuss possible methods to reduce a person's ecological footprint. Make sure that these methods are realistic. What is involved on a personal basis? What would be the government's role in pursuing this goal? Is it likely that our government will be willing to devote a large portion of its budget toward achieving a "greener" society?
2. Investigate European cities that have already begun to reduce their impact on the environment while maintaining a high standard of living. What are some methods they have used? Can these methods be used in Canada as well?
3. What are the advantages to having a "green" school? In your answer, consider composting programs, rainwater collection programs, recycling programs as well as the beautification of the school ground.
4. How would you help reduce costs of school ground greening?
5. In which ways do you think your school green space helps to reduce your ecological footprint? Explain your answers.
6. How has urban growth affected the land, soil, plant life and natural waterways around the school?
7. What are the long-term benefits of creating a communal green space on the school grounds?

Student Evaluation

- Completion of worksheets
- Observation
- Final results (success of planting operation, overall appearance, etc)
- Peer and self-evaluation

Enrichment and Extension Activities

- Organize a drive to collect hazardous material (paint cans, oil bottles, etc) and bring them to a cleanup station.
- Present findings to local MPP or local government.
- Poll the community to assess local interest in ongoing greening of school ground or woodlots, etc.
- Research and plant native grasses to replace the regular lawn around the school.
- Present proposed plans or established practices for your ecological school ground during a curriculum night.
- Organize fundraisers in the school community and in the local area to draw attention to your project and to increase funding.

Educator Notes

- Please note that a greening project of this scale requires a high level of commitment from the teacher, her or his colleagues, students, the principal and often the school board.
- Review the concept “Ecological Footprint” with your class. The ecological footprint is the area of biologically productive land and water area needed to supply the resources and assimilate the wastes generated by that population, using the prevailing technology.
- Have your students visit the following site to calculate their ecological footprint: http://www.mec.ca/Apps/ecoCalc/ecoCalc.jsp?FOLDER%3C%3Efolder_id=619029
- Ecological school grounds are outdoor learning environments that teach ecological principles through the design of the school ground landscape. These landscapes can significantly enhance the look of your school ground and may also be used as a teaching tool.
- What you can do with your class:
- Create an “Edible Garden”, complete with edible flowers, herbs, berries, fruit or vegetables.

- Create a landscape designed to attract certain types of native wildlife to the school (e.g. birds, butterflies, insects).
- Design a garden that is low maintenance and requires little, to no irrigation.
- Create a rock garden.
- Cutting costs is one of the most important aspects to the creation and maintenance of your landscape.
- Fertilization: Composting involves creating conditions to encourage the natural decomposition of plant matter in order to produce a mulch or a soil with a higher nutrient content. Composting will play an important part in the natural fertilization and the continued growth of your landscape. There are many different types of compost bins you can make or purchase. The key is to select the right type of composter for your needs. Investigate the different types of composters you require to achieve your set goals. Compost bins should be located out of the way of your work area (due to the odours created by decomposition). This spot should be easily reachable and should be large enough to allow students to work around it. A good compost bin should have a sufficient supply of air, water and composting material (e.g. grass clippings, dried twigs or plants, kitchen vegetable scraps, weeds). Note: do NOT place any milk products, meat scraps or bones into the composter; doing so will attract animals which may dig through the compost. Also, try to eliminate all diseased plant matter, for the disease may contaminate the compost soil. Research the types of materials that should and should not be composted BEFORE you begin this project.
- Irrigation: Your landscape, if composed entirely or almost entirely of native vegetation, should not require much irrigation. To collect water naturally, try purchasing or building a rain barrel with your class to save as much rainwater as possible.
- Wildlife: Attracting specific types of insects to your landscape will create a healthier garden, as the insects will help pollinate the plants. You may also want to build environmentally friendly birdfeeders to attract local species of birds to your landscape.
- A great way to collect material for composting is to place bins in the school cafeteria, in individual classrooms, or in designated areas to collect vegetable and fruit scraps. Be sure that all students are aware of the location of these bins and enforce the rule that ONLY plant matter can be disposed of in these bins.
- Inspect the soil quality and texture in your selected site. Soils differ greatly from area to area in their mineral content, pH and permeability to water, therefore, some soils may not be suitable for certain types of plants. You can purchase a soil testing kit to test for the presence of nitrogen, phosphorus, potassium in the soil, as well as the pH level. You may have to prepare the soil before planting by adding mulch, sand, loam, or extra earth to change the level of minerals present in the soil.
- Have students research the characteristics and ecological needs of species that are native to your ecozone. The information can be organized onto a chart during class. Students select the best possible types of vegetation for the landscape. Remember to consider costs in purchasing seeds/seedlings. Below is an example of a chart you can use to organize your plants

Name of Plant (common and Latin)	Type (grass / plant / shrub / tree)	Perennial / Annual / Biennial	Type of Soil	Sunlight	Bloom Period	Irrigation needs	Height (cm)
<i>e.g. Goldenrod</i>	<i>Plant</i>	<i>Perennial</i>	<i>Well-drained</i>	<i>Full sun to part-shade</i>	<i>Fall</i>	<i>Occasional irrigation</i>	<i>24 to 36 cm</i>

- Buying young plants for your garden can be quite costly. Organizing a fundraiser to collect funds to start your project is one way to defray the cost of the plants. Another way to help stay within your budget is to have the students plant seeds during the late winter and grow the seedlings indoors before transplanting them outdoors in the Spring. This may help promote ownership among all students working on the project.
- One way to save money in the long run is to select plants that are perennial or biennial.
- Most flowers are in bloom during the summer months. If you want to feature blooming flowers in your landscape, consider selecting plants that bloom in early spring or during the fall months (Goldenrod, native sunflowers, native grasses, Aster or Helenium). Flowers or shrubs which continue to bloom in the fall months tend to be more resilient to drought and temperature change.
- Plants that seed themselves may end up producing a rather large number of seeds. Cosmos are a great example. Be sure that when weeding, you thin out the plants which have spread a bit too far into your landscape.
- If you choose to begin growing seedlings inside the school (or in a school greenhouse, if you are lucky enough to have one), try to start seedlings in a mixture of store-bought soil and soil from the area in which you intend to plant. The soil from the school ground already has microorganisms and nutrients native to the area which will help increase the biotic factor of the potting soil while adding to its fertility.
- There are many plants to choose from when creating a green space on the school property. When selecting plants, try to aim for those which are hardy to temperature, differing soil and water conditions and insects.
- You will want to attract as many “good bugs” as possible to your garden. These insects feed mainly on pests which attack your plants. Select plants that attract insects which, in turn, feed on pests in your garden. For example, butterfly milkweed is a beautiful addition to any garden, however, they usually attract aphids, which feed on young shoots and flower buds. “Good bugs” such as Ladybugs and Lacewings

habitually feed on aphids. To draw these beneficial insects to your landscape, try planting Dill, Fennel, Dandelion or Yarrow around your more vulnerable plants.

- With your class, review the elements of designing a landscape which is both functional and attractive. The landscape should be safe, it should provide shade and it should attract insects to pollinate flowers. The garden can be whimsical, inspiring and can also reflect the culture of the area around the school and of the students as well. Incorporate ecological principles in your landscape (i.e. integrating people, land, plants, animals, buildings and communities).
- Have your students interview the maintenance staff in the school to get their advice on the care and maintenance of the school grounds (e.g. irrigation, weeding, planting, pest removal).
- Be sure not to plant toxic vegetation such as *Atropa Belladonna* or Deadly Nightshade (the berries can be poisonous) and be on the lookout for invasive species such as purple loosestrife or poison ivy. When removing such plants, be sure to wear gloves and protect bare skin at all times. Try to remove invasive species before they begin to seed. Wash all garden tools immediately after use.
- The more people working on this project, the better! Search for volunteers from within the school and from the local community. Ask for help from all students, staff members, parents, members of garden clubs, local volunteer organizations or members of environmental groups.
- It is recommended that this investigation be started in the fall, as early as possible.
- SAFETY NOTE: Consult your school board's policy regarding safety precautions for outdoor excursions and plan your trip accordingly. Be aware of any students with allergies to insect bites and plants and ensure they carry the required medications. Students should wash their hands after handling soil, plants and equipment. Encourage students to wear sunscreen and appropriate clothing (e.g. hat, long-sleeved shirt) to minimize the damaging effects of sun exposure.

References

- Wackernagel, Mathies and Rees, William. *Our Ecological Footprint: Reducing Human Impact on the Earth*. Philadelphia: New Society Publishers. 1996.
- For information on the ecological footprint of the average Canadian, visit: <http://www.rbg.ca/cbcn/en/information/footprints/dglectures/footprint1.html>
- For information on how to calculate a personal ecological footprint, visit: http://www.mec.ca/Apps/ecoCalc/ecoCalc.jsp?FOLDER%3C%3Efolder_id=619029
- For information on Toronto's ecological footprint, visit: <http://www.city.toronto.on.ca/eia/footprint/index.htm>
- For the article "An Explanation of Ecological Footprints", visit: <http://www.rbg.ca/cbcn/en/information/footprints/dglectures/footprint1.html>

- For information on creating ecological schools, visit: <http://www.ecoschools.com/>
- For excellent information on starting and maintaining a school garden, and on how to collect funds, visit: <http://www3.sympatico.ca/gary.spears/Schoolgardens1.HTML>
- For information on types of composters and methods to conserve rainwater, visit: <http://www.composters.com/main.shtml>
- For information on “Composting for Kids”, visit: <http://aggie-horticulture.tamu.edu/sustainable/slidesets/kidscompost/cover.html>
- For information on how to create a butterfly garden, visit: <http://www.ext.colostate.edu/pubs/insect/05504.html> (Note, this is an American web site, featuring plant species common to the ecozone encompassing Colorado, USA. Select the appropriate plant species based on your ecozone. Try to use plants native to your area).
- For information and links to sites about butterfly gardens, visit: <http://www.thebutterflysite.com/gardening.shtml>
- For information on “good bugs”, visit: http://www.farmerfred.com/plants_that_attract_benefi.html
- For information on how to create a wild garden, visit: http://www.wildaboutgardening.org/en/get_started/section3/
- For information about school ground greening and native plants, as well as lists of recommended species and information about funding opportunities, visit Evergreen’s web site at www.evergreen.ca, and link to the Learning Grounds home page.

Worksheets

Student Worksheet

Date: _____

Group Members: _____

In this investigation you will explore how to create a green space for your school which promotes education and reduces the school’s ecological footprint while at the same time, creates a safe and welcoming area for relaxation and recreation.

1. Draw a sketch of your area of the green space. Indicate the area in which you are to work with your group. List the plants you will be using and their intended location.
2. Explain your selection of vegetation. Why did you choose the plants you did and what is your goal for your area of the green space?
3. Use this chart to record your daily/weekly work in your area of the green space.

Task	Day 1	Day 2	Day 3	Day 4	Day 5
Time worked (from..to)					
Weeding					
Irrigation					
Thinning					
Mulching					
Fertilization					
Transplanting					

4. Use the following chart to indicate any problems you encounter in your area of the green space.

Date	Plant Species	Location	Problem	Recommendation	Action Taken and Date
<i>e.g. June 15</i>	<i>e.g. wild roses</i>	<i>e.g. Left quadrat</i>	<i>e.g. Large Aphid infestation</i>	<i>e.g. Spray with insecticidal soap</i>	<i>e.g. Roses sprayed on June 16</i>