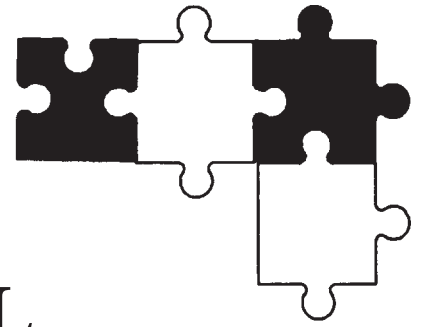




## Activity 24 (Lesson One of Two Lessons)



# CREATING THE "PERFECT" SOIL

### STUDY QUESTION:

How can we safely improve the quality of soil to grow more of the crop we want?

### THE ACTIVITY:

Students will design a method to improve the productivity of a soil. They will then carry out their experiment in a controlled manner.

### CURRICULUM FIT:

#### GRADE EIGHT - SCIENCE

- Unit 5: Growing Plants

### AGRICULTURE CONCEPTS:

Importance of soil and water.

### PURPOSE:

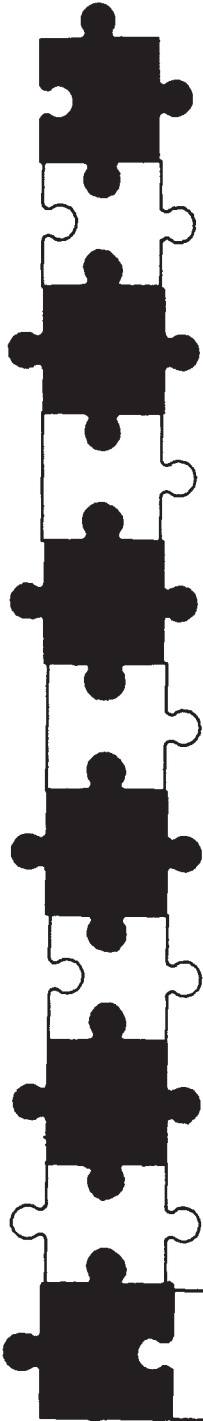
- To identify the health of a soil.
- To use organic or inorganic substances to create a more productive soil.
- To compare and evaluate methods used to increase soil fertility.

### MATERIALS REQUIRED:

Soil samples  
Trays  
Soil testing kits  
Tin cans with holes in bottom  
Balance scales  
Graduated cylinders  
Beakers

### TIME REQUIRED:

Two class periods with three-minute monitoring time every class period for two weeks.



# BACKGROUND - For the Teacher

Soil is more than just black dirt and holds some essential responsibilities. The functions of the soil are:

- a) to provide nutrients
- b) to anchor plants
- c) to hold water.

Throughout the province of Alberta, some soils are naturally more valuable than others and are labelled Class 1, 2 or 3. The Red Deer region, for example, contains Class 1 soil and as a result, produces the highest values of products sold per farm. (Statistics Branch, Alberta Agriculture, Food and Rural Development).

Traditional farming practices have caused a degradation in some Alberta soils. Soils become degraded due to the following farming operations: cultivation, summerfallowing, continuous grain or oilseed production, baling and removal of straw, lack of barnyard manure.

The common farming practice is to apply those nutrients that are lacking through application of chemical fertilizers or barnyard manure. Normally, the application is directly related to the specific requirements of the crop to be planted.

There are some techniques that can be employed which increase the preservation of soils without addition of chemical substances. These include: leaving straw on land, crop rotations, including grasses and legumes conservation tillage and decreasing the amount of summerfallowing.

In this lesson, students will attempt to improve the quality of a selected soil. It will include initial testing of nutrients, porosity and water holding capacity. Students will then select a method to improve the value of the soil in relation to the requirements of a chosen seed. Finally, they will then retest the soil as done initially and attempt to grow a crop. The final value of their soil will be tested on both their crop production and the test results.

***NOTE: The initial testing of the soil will require one 40-minute period. The soil applications will require five to ten minutes in next period. Monitoring and recording of results will require one to two minutes a day for about two weeks. Another class period will be needed for second testing of soil before plants are planted. The total time will depend on specific plant chosen.***

## PROCEDURE

### Part 1

#### Preparation

1. Gather enough soil for class group to have one tray full each. A poor quality soil is preferred.
2. Set up the following materials for each group: soil in tray, soil testing kit, tin cans, balance scales, a graduated cylinder and a beaker.

### Part 2

#### Introduction

3. Review the functions of soil. Emphasize the importance of having all the necessary nutrients available to harvest a valuable crop.
4. Outline the test procedures and provide each group with soil sample and equipment.

### Part 3

#### Activity

5. Day 1
  - a) Clear soil of any sticks, rocks or other debris.
  - b) Measure 100g of soil and determine volume. Record.
  - c) Place in can with holes in bottom. Add 200 ml of water. Record the time it takes for the water to drip through and the amount of water retained in beaker placed underneath. Determine the mass of the moist soil. Record all results.
  - d) Using a commercial soil testing kit, test the nutrients in the soil. Record results.
  - e) Describe the appearance of your soil. Record.
  - f) Discuss the nutrient deficiencies in your soil and decide on a choice of application.

**NOTE:** *Instruct students in safe use of chemicals.*

Soil fertilizers may be brought from home or arranged by teacher.

If a soil testing kit is not available, contact local district agriculturist. One test may be done and results recorded by students.

Stress the importance of recording all information accurately.

6. Day 2
    - a) Apply fertilizers to all but one of the test plots.
    - b) Leave undisturbed for 5 - 7 days (or follow package directions).
  7. Monitoring
    - a) Plant same number of seeds in each tray. Selection of seeds will vary, but could include oats, radishes, beans or another quick germinating plant.
    - b) Students should follow strict instructions regarding watering and tillage each day, so that all plots receive identical conditions.
    - c) Record changes and number of plants each day for up to two weeks. (The time will depend on plant chosen.)
- Part 4**
- Conclusion**
8.
    - a) Make final observations of test plot.
    - b) Summarize the success of growth through soil improvements plan and share with rest of class.

## DISCUSSION QUESTIONS

1. What were the positive and negative attributes of the soil you were given?
2. What did you add to your soil and what was the basis for your selection?
3. Using your results, would you suggest that your experiment was successful? Explain.
4. If you were to do this experiment again, what would you do differently?
5. Would you call the experiment a controlled one? Explain why you agree or disagree.
6. How would you use your knowledge to help farmers in Alberta?

## RELATED ACTIVITIES

1. Guest speakers - crop tester or sprayer.
2. Test soils in various locations, such as gardens or flower beds. Relate to nutrient requirements of plants grown there.

## RESOURCES

### Alberta Agriculture

- A Matter of Soil (videotape)
- The Urge to Till (videotape)
- The Story of Soil and Water Conservation in Alberta

### Prairie Farm Rehabilitation Administration

- Soil and water conservation service
- Prairie Soils: the case for conservation

### Preserve Agricultural Land pamphlet (PAL)

*By Allison Belt*



# STUDENT RESOURCE

## SHEET ONE -- Observations & Data

Record all experimental observations and data on this sheet.

Soil Characteristics	BEFORE Application	AFTER Application
Appearance of Soil	_____	_____
Volume of 100g of soil (ml)	_____	_____
Total water added (ml)	_____	_____
Percolation time of water (seconds)	_____	_____
Water in collecting container (ml)	_____	_____
Soil water holding capacity (ml) (water added - water in container)	_____	_____
Mass of moist soil (g)	_____	_____
Amount of nitrogen present	_____	_____
Amount of potassium present	_____	_____
Amount of phosphorus present	_____	_____
Amount of sulfur present	_____	_____
Acidity of soil	_____	_____

### Fertilizer Application

Name (type) of fertilizer	_____	_____
Components of fertilizer	_____	_____
Concentration of fertilizer	_____	_____
Amount applied	_____	_____

### Planting of Seeds

Day of planting	_____	_____
Type of seed planted	_____	_____
Number of seeds planted	_____	_____

**STUDENT RESOURCE**  
**SHEET ONE -- Cont'd**



**Daily Observations**

<b>Date</b>	<b>Appearance of Soil</b>	<b>Number of Germinated Healthy Plants</b>
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
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**Conclusions**

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