



WESTERN-ALBERTA
TEACHERS' FEDERATION

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**A Teaching Module for use in Biology 20: Ecological Organization
Unit, Saskatchewan Evergreen Curriculum**

**Jennifer Dauk
Kendall Avis
Sharon Brown-Szydowski**

2004

S106.7

**Teaching Materials
from the
Stewart Resources Centre**



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Note: Each lesson has all necessary information, overheads, evaluation tools, and student handouts.

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Acknowledgements

Many people helped make this project a success.

We would like to acknowledge Ms. Kyla Storzuk, a teacher at Wynyard Composite High School, who allowed us to come in and pilot this module. The feedback we received from her and her class allowed us to make some beneficial changes to the lessons. We would like to thank them for sacrificing three days of their class time so close to the end of the year.

We would also like to acknowledge Bonnie Lawrence and Anna Leighton, scientists studying the Western Red Lily. We are grateful for the information and photographs they provided about our provincial flower.

Lastly we would like to acknowledge Dr. Janet McVittie of the College of Education at the University of Saskatchewan whose guidance and support made this project possible.

A Letter to Teachers Using this Module:

To commemorate Saskatchewan's centennial anniversary, SaskPower is releasing one hundred thousand Western Red Lily bulbs in 2005. To accompany these bulbs, this module has been created to incorporate information and activities involving our province's floral emblem into the existing curriculum. We suggest that information about the Western Red Lily lends itself well to the Ecological Organization Unit in the Biology 20 curriculum.

This module includes everything you will need to execute three lesson plans on the Western Red Lily. These lessons can be taught in succession or can fit into the unit however you wish. Also included is some general information about the flower and how to care for the bulbs.

Pride in Saskatchewan is an important value to instil in our students. Help us teach future generations a little bit more about our province.

Sincerely,

Jennifer Dauk
Kendall Avis
Sharon Brown-Szydlowsky

Foundational Objectives of Module:

1. Students will be able to contribute to discussions regarding the significance and history of the Western Red Lily.
2. Students will be able to use basic mathematical principles to estimate the population of Western Red Lilies in a given area.
3. Students will be able to construct arguments regarding proposed uses of an untouched piece of prairie land, while respecting other people's opinions and views.
4. Students will enter into a debate while following the established rules and procedures for the activity

This module fits in with the Ecological Organization Unit of Biology 20. The Foundational and Learning Objectives from Saskatchewan's Evergreen Curriculum for this unit were used to create this module. The following are the objectives from Saskatchewan's curriculum that this module meets:

- 1.4 Describe how climatic variations in Saskatchewan influence plant growth.
- 2.7. Investigate a natural community in the neighbourhood of the school.
- 4.1. Recall the criteria which define a population.
- 4.2. Identify some populations of plants or animals in the local area.
- 4.3. Describe methods of estimation by sampling.
- 4.4. Estimate some populations using one or more methods.
- 5.1. Identify factors which influence reproduction rates and death rates.

Lesson #1: Introduction to the Western Red Lily and Growing and Caring for Lilies

Objectives:

1. Students will learn the history and significance of the Western Red Lily.
2. Students will be able to recognize the Western Red Lily as it appears in its natural surroundings.
3. Students will be able to discuss ideas that will preserve the Western Red Lily in our natural habitats.
4. Students will be able to demonstrate understanding of and care for the Western Red Lily.
5. Students will be able to design planting sites for lilies based on growth requirements.

Methods: lecture, co-operative learning, brainstorm, and surveying walk.

Materials: quiz cards, candy prizes, picture of Western Red Lily, lily, lily bulb, overhead projector, Growing and Caring for Lilies (handout), Significance and History of Western Red Lily sheet, school yard maps, overhead of school yard map, and overhead pens.

Preparation: create and photocopy maps of school yard (aerial view), photocopy handout "Growing and Caring for Lilies".

Procedure:

1. Show the students the picture of the Western Red Lily, inquire how many of them have seen it before and where they saw the lily. Also point out the lily and explain the differences between your sample lily and the WRL.
2. Tell students we will be playing a quiz game to see how much they know about the Western Red Lily. Tell them they have to put up their hand if they want to answer. Whoever is called on first who gets the right answer, wins a prize. Keep track of winners on the board and award prizes at the end of the game.
3. Read questions from cards. Call on first student who has hand raised. If a student gives a wrong answer, one other student can try

to answer the question. After that just give the answer out to the class.

4. Explain the significance of the Western Red Lily; discuss the history. Take note of the teacher information sheet "Significance and History of Western Red Lily".

5. Ask students to brainstorm ways to help retain the Western Red Lily population in Saskatchewan (education through schools, posters, publicity about the flower, local conservation committees established, patch grown on every government experimental farm, tourist information, National Film Board create a documentary). Tell students that a part of conserving it will be to plant these bulbs provided by SaskPower.

6. Ask students what they think a natural habitat garden is and what kind of plants can be grown in them. Talk about these gardens and the role WRLs could have in them. (see link to "Creating a Natural Habitat Garden" on our homepage).

7. Hand out information sheets on the Western Red Lily (*Growing and Caring for your Western Red Lily*). In pairs, the students should read through the information sheets carefully.

8. Provide each group with a school map. Tell students that, knowing what they have learned from the information sheet, they need to select an ideal planting site for the lily bulbs. Remind them that

Western Red Lilies are sun-loving plants that need shelter and plenty of water. Let students be creative and have fun with this! You may extend this activity to having the students design an entire native plant garden or courtyard on the school grounds. Students should also write a paragraph (rationale) on why they choose those locations.

9. Ask students to walk around the school grounds to look for appropriate planting spots.

10. After returning to the classroom, students should work on completing their design.

11. Brainstorm factors affecting health and population of Western Red Lilies. Be sure to address the following: herbivores/herbivore populations, insects (pollinators AND predators), fire, drought, competition with other plants.

12. Once students are aware of these factors, they may want to revise their planting sites. In addition, students should develop a list of ways of ways in which future students can help to promote lily growth and proliferation in the schoolyard. They should keep in mind the legalities of destruction, removal, and cutting of the provincial flower and incorporate them into their lists.
13. Discuss chosen locations as a class. Have students mark on overhead version of school yard where their planting sites were located. Students should explain why they choose their site.
14. Students should submit their maps and lists for evaluation.

Evaluation: See checklist in Materials for Lesson #1. You may use the checklist to create your own rubric.

CEL's: PSVS, COMM, CCT, IL

Materials for Lesson #1:

Western Red Lily Quiz Game

Significance and History of the Western Red Lily

Growing and Caring for Lilies

Evaluation Checklist for Planting Site Activity

WRL Quiz Game

<p>1. The WRL is which province's provincial emblem?</p> <p>a) British Columbia b) Alberta c) Saskatchewan d) Nova Scotia</p>	<p>2. The WRL can be seen on which of the following artifacts?</p> <p>a) Canadian currency b) Saskatchewan's flag c) Government cheques d) Your SaskPower bill</p>
<p>3. In which year was the WRL chosen as our provincial flower?</p> <p>a) 1941 b) 1905 c) 1982 d) 2004</p>	<p>4. Where does the WRL normally grow?</p> <p>a) Rainforests b) Bodies of water c) Sandy areas d) Meadows and ditches</p>
<p>5. Which of the following is not another name for the WRL?</p> <p>a) Sun Lily b) Fire Lily c) Wood Lily d) Tiger Lily</p>	<p>6. Which of the following is not a reason for the current decline in WRLs?</p> <p>a) Lack of natural fires b) Widespread herbicide use c) Expansion of agriculture d) Higher deer populations</p>
<p>7. What can be the consequence of picking a WRL in its natural habitat?</p> <p>a) A three year jail term b) A \$500 fine c) An order to plant five WRL plants for every one flower you picked d) 15 hours of community service</p>	<p>8. When does the WRL flower?</p> <p>a) Early fall b) Start of May to the end of July c) Start of August to early fall d) Middle of June to middle of July</p>
<p>9. How high do the WRL grow?</p> <p>a) 3-6 inches b) 12-30 inches c) 50 inches d) 80 inches</p>	<p>10. Aboriginal people used ground WRL bulbs in what way?</p> <p>a) To treat brown spider bites b) To sprinkle on their food as a seasoning c) To treat head lice d) To spread on ice so they wouldn't slip</p>
<p>11. What part of the WRL was cooked like a potato and eaten by Aboriginal people?</p> <p>a) The flower b) The root c) The stem d) The bulb</p>	<p>12. What is special about Melville, SK and Chamberlain, SK?</p> <p>a) They have constructed WRL models made of metal measuring about 12 feet tall b) They have the largest natural WRL population in Canada c) They each have WRL festivals in July d) The WRL has completely vanished from these areas</p>
<p>13. How long does it take WRL to flower when planted from seed?</p> <p>a) One year b) Three to Five years c) Six to Seven years d) Within the first growing season</p>	<p>14. What animals commonly eat the WRL?</p> <p>a) Domesticated dogs b) Bears c) Deer d) Birds</p>
<p>15. What is the most common colour for Western Red Lilies?</p> <p>a) Bluish Green b) Pinkish Purple c) Yellowish Orange d) Orange Red</p>	<p>16. What kind of growing conditions do Western Red Lilies favour?</p> <p>a) Sunny, dry conditions b) Mountainous regions c) Shady areas d) Sheltered, sunny places</p>

Significance and History of the Western Red Lily

(For teacher information)

Western Red Lily bulbs, grown and produced by SaskPower in the Shand Greenhouse, will be released to the public to mark Saskatchewan's 100th birthday in 2005. This is why we must educate the public and our students on the significance of this beautiful flower.

The Western Red Lily became Saskatchewan's official floral emblem in 1941. In the past it was a relatively common plant growing freely in Saskatchewan's parkland. There has been a drastic decline in the numbers of naturally growing lilies due to the ploughing of grasslands, widespread herbicide use, the increase in non-indigenous competitive plants and the lack of natural fires.

The Latin name for the Western Red Lily is *Lilium philadelphicum* variety *andinum*. The Western Red Lily has also been referred to as the prairie lily, tiger lily, fire lily, wood lily and in Cree is referred to as mouse-root.

In response to the decline of the Western Red Lily population, the Floral Emblem act was established in 1981. This Act protected the Western Red Lily in several ways.

Growing and Caring for the Western Red Lily

GENERAL INFORMATION

Western Red Lilies grow from a walnut-sized bulb several inches under the ground. Lily bulbs have a scaly texture and each of these scales is capable of breaking off and producing an entirely new bulb! Lilies are also prolific seed producers with pods that may contain up to 300 seeds, approximately 280 of which are viable. Lilies are readily cross-pollinated with other plants by means of insects such as large butterflies.

It generally takes at least 4 years for lilies to flower when started from seeds or bulb scales in a greenhouse for the purpose of being released in to the wild. The general time line reads as follows:

Year 1: small oval leaves

Year 2: long strap-shaped leaves

Year 3: stem production

Year 4: flowers

Lilies tend to bloom between mid-June and mid-July. However, mature plants don't necessarily flower every year and may revert to vegetative form or show no above ground growth. Lily flowers range in color from bright red to yellow, including pale salmon pink and a spotless yellow form. Red-orange is by far the most common color of lily and is observed on our provincial flag.

GROWING YOUR WESTERN RED LILY

You may plant your bulbs in the fall or the spring. They can also be grown in containers. Lily bulbs are termed as scaly because they lack the outer protective, dry papery covering such as onions have. As a result, the lily bulbs can be damaged quite easily. Bulbs need to be stored damp, and are best preserved when kept in soil, or vermiculite where drying out is prevented.

Roots of the lily bulbs are fleshy and somewhat fragile and should be handled carefully to prevent breakage and drying out. Plant the bulbs about 5 to 15 cm deep. Many lilies have contractile roots that are capable of pulling the bulbs down to their ideal depth. Once you have planted your bulbs, thoroughly water them to ensure root growth. Lilies require sufficient drainage which is why the soil in which you are planting the bulbs should have a bit of sand mixed in. It might be a good idea to add some nutrients to your soil in the form of compost or natural fertilizers.

Most lilies are sun-loving plants that grow best in sheltered areas. Once your lilies grow tall, you may want to stake them to prevent them from being broken by wind, rain, or hail.

As your lilies grow, ensure that they are receiving plenty of water. You might want to talk to your school's groundskeeper about paying careful attention to these beautiful plants!



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http://www.bigeastern.com/eotp/lilium_philadelphicum.htm

Evaluation Checklist for Planting Site Activity

Note to teachers: This checklist is a rough outline of what you might be looking for when evaluating your students. This can be adapted to suit your and your students' needs. This can also be formatted into a rubric quite easily. If you are extending this lesson into a Native Garden Project, you will likely have to modify the evaluation tool.

Checklist:

1. Students have selected planting sites thoughtfully, carefully, and with regard to the biotic and abiotic factors discussed in class.
2. Students have selected planting sites that are visible and aesthetical pleasing to those visiting the school.
3. Students have developed a creative planting "blueprint" (planting patterns, plant varieties, etc).
4. Students have developed a list of at least 5 points that future students may use as a guideline for continuing lily care at the school.
5. The list provided was creative, comprehensive, and sufficient for adequate lily care.
6. Students explained in paragraph form why they chose their plot.

Lesson # 2: Population Sampling

Objectives:

1. Students will be able to contrast different methods of sampling populations.
2. Students will be able to define population density.
3. Students will be able to practice quadrant sampling of WRL populations.

Methods: simulation, co-operative learning group

Materials: grids, rice in bags (about 4500 grains/bag), handouts (note: you may want to use something in place of the rice as it is very tedious to count out the bags)

Preparation: prepare bags of rice and grids, photocopy lab handouts

Procedure:

1. Ask students how Stats Canada knows how many Canadian citizens there are. Ask students how scientists can figure out the population of animals. Describe mark/recapture sampling. Ask students how scientists figure out the population of plants.
2. Discuss the populations of the Western Red Lily. Key questions: Where do they grow? By what other plants do they grow? What kind of climate do they need to grow?
3. Explain how to do population sampling lab. Ask students to scatter the bag of rice over their grid. They should choose ten random squares and count the grains of rice in each of those plots. Explain how to do the calculations on the lab hand out.
4. Explain expectations for lab write up. Students should define populations and quadrant sampling (2). Observation and Data chart (5). Calculations (6). Discussion questions (6).
5. Students have the rest of the period to do this lab.
6. As students finish their calculations, ask them to write their results on the board.
7. Labs should be handed in by the end of class in good copy.

Summarize by asking Key Questions: What are the limitations of this sampling method? What are the benefits of this sampling method? What were possible sources of error?

Evaluation: mark lab (see evaluation scheme in Materials for Lesson #2)

CEL's: CCT, COM, NUM

Materials for Lesson #2:

Population Sampling Lab

Population Sampling Grid

Population Sampling Evaluation Tool

Population Sampling Lab:

An ecosystem is a community of interacting organisms. To get a better understanding of the community of organisms living within an ecosystem, ecologists take random samples to gain a representation of what relationships exist in a certain area. A random sampling procedure requires that all portions of the area or group being studied are equally represented in the samples taken. Actual counts of organisms, as well as notes on behaviors of organisms are important to better understand a specific ecosystem. Ecologists must also consider environmental conditions that affect each population within an ecosystem. Things such as temperature, drought, and pollution can have an impact on certain populations. For this lab you will be conducting quadrant sampling of a population of Western Red Lilies.

Quadrant Sampling:

Procedure:

1. Dump the bag of rice on the grid.
2. Randomly choose a quadrant and count the number of grains of rice in that quadrant. Record this number in your data table.
3. Choose nine other random quadrants and repeat step 2 for each quadrant.
4. Calculate the average population for the quadrants. Add the populations of each quadrant and divide by the total number of quadrants (10).
5. Multiply the average by the total number of quadrants. This is the total population for this area.

Observations and Calculations:

Quadrant Number	Location on Grid	Population of Quadrant
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		

A) Average population of quadrant:

B) Estimated total population of Western Red Lilies for the area:

Discussion Questions:

1. The quadrant method is really only an estimate. What factors (variables) might cause a difference between your population estimate and a census in the same area?
2. What do you think is the best way to select the quadrants?
3. What are three possible sources of error that you may have encountered when completing this lab?
4. With what kind of populations would you use this method (plants or animals)? Why?

Population Sampling Lab: Evaluation

Observations and Calculations

Fill out chart /5

Question A /3

Add up "Population of Quadrant" column and divide by 10.

Question B /3

Average population of quadrants multiplied by number of quadrants.

Discussion Questions

1. Population could be clustered in one area. /2

2. Randomly. /1

3. Counted incorrectly, did not randomly select quadrants, did not spread out rice on quadrants at all. /3

4. Sampling method can be used on stationary populations. /2

Name/Date /1

Total: /20

Lesson #3: Conservation: What do we do with untouched prairie?

Objectives:

1. Students will be able to explain the significance of native plants.
2. Students will be able defend their position on what should be done on a section of native prairie.
3. Students will be able to apply knowledge of abiotic and biotic factors and ecological relationships to a case study.

Method: structured controversy, debate

Materials: Use of Untouched Prairie handouts, debate format handout

Preparation: make groups, photocopy handouts

Note: This lesson may be started at the end of Lesson #2 if time permits.

Procedure:

1. Discuss native prairie and native plants. Ask students why these are important to the province.
2. Key questions: What does it mean for a species to be a native plant? What does virgin prairie mean? What is the significance of native plants? Why is untouched "virgin" prairie so rare? If a species is not a native plant, where does it come from? How could alien (non-native) plants threaten biodiversity? What are the environmental benefits of planting native plants? (see: teacher handout)
3. Explain activity to students. They will be put into groups and assigned a committee that is lobbying for human use of an untouched section of native prairie land. They must prepare their argument taking into consideration the rules for debate. Distribute the "Use of the Untouched Prairie" handout.
4. Go over the rules of debate on the debate format handout.
5. Read scenario to students.
6. Break students into groups, assign committees, and pass out handouts.
7. Students will work in their groups.
8. Presentations will take place in the last 30 minutes of class.
9. Collect written answers to discussion questions at end of class.

Evaluation: informal evaluation of presentations

CEL's: CCT, COM

Materials for Lesson #3:

Use of Untouched Native Prairie

Format for 30 Minute Debate on Western Red Lily

Possible Issues to Raise

Use of Untouched Native Prairie

There is an area of about nine square kilometres that remains as untouched native prairie. This is one of the only plots left untouched in the province. In this area there are an abundance of endangered plants, including the Western Red Lily.

Different groups of people want to do different things with this untouched land. All these groups believe their use is important and that they have the right to use this land in their way.

Your group will be assigned a role as a potential user of the land. With your group, discuss the arguments that your user group would make to support their proposed use. With your group, answer the following questions and then prepare a three minute presentation promoting your user group's use of the land. Be prepared to support your argument.

Proposed use: _____

Questions:

1. What benefits would your potential use bring to the neighbouring city? List three reasons why your use should be approved.
2. What effect would your use have on the land? Would the land be affected? Would the surrounding area be affected?
3. If your user group convinces the committee that your use should begin, are there other uses that could also begin or would be stopped? If so, which ones? Are there other uses that could not begin? If so, which ones?
4. Is it possible for all the users to use this land in some way? Why or why not?
5. Now separate yourself from your group's agenda. Which uses do you think should take place on this land?

Committee Uses:

- A. You are a group of scientists who want to research the Western Red Lily in its natural habitat. This section of virgin prairie is the only section of land that has not been affected by human populations.
- B. You want to build a drive-in theatre on this land. This site has been deemed the best possible location for the theatre. The city does not

currently have a drive-in and this type of theatre is currently the most popular venue for movie watching.

- C. You work for the city. This section of land is in the way of city expansion. Due to natural boundaries (river and swamp land), the city can only expand in the direction of this land. There has been a surge of population growth in the city and housing prices have sky rocketed. Expansion must occur immediately so that a housing crisis does not result.
- D. You are a group of naturopaths who are studying native plants for their medicinal benefits. A recent discovery suggests that native plants found on this land may be linked to a cure for cancer. Further research is necessary.
- E. You are members of an organization that caters to at risk youth. You want to use this land to set up a permanent camp site for the students involved in the program. The site would be used to discuss issues of conservation and ecology with the students.

Format for 30 minute debate on WRL

Your team will make an opening statement about 1-2 minutes long. You should state your team's position and the arguments you will be proposing.

You should have at least 3 questions that can be asked of each of your 4 opponents. The questions should be concise and clear.

Prepare answers which will be used to respond to your opponents questions. Try to figure out what will be asked of your team.

Prepare a final argument for the conclusion of the debate. There will be a two minute time limit on your concluding remarks. You should take notes during the entire debate so that you can refer to these at this time.

The team that wins will:

- have prepared a clear argument
- support their claims
- have worked well together and presented themselves as a team
- be clear and concise when presenting their case

Teacher Information: Possible Issues to Raise

What does it mean for a species to be a native plant?

Native plants are those that are growing in the region where they evolved. Certain plants evolve due to an area's surrounding circumstances: climate, soils, rainfall, frost, etc.

What does "virgin" prairie mean?

"Virgin" prairie means that it has not been tampered with by humans in any form. Thus, even land that has been used for pasture cannot be considered "virgin".

What is the significance of native plants?

They are hardy and thus more likely to survive. They have adapted to local environmental conditions and often require less fertilizer and pesticides than non-native plants. They provide familiar sources of food and shelter for wildlife.

Why is untouched "virgin" prairie so rare?

With advancements in urbanization and agriculture, there isn't much land that hasn't been "claimed" by humans.

If a species is not a native plant, where does it come from?

People bring in plants from other region for aesthetic reasons. North Americans want variety in everything and this is also true in horticulture.

How could alien (non-native) plants threaten biodiversity?

They can out-compete native plant species. They may become invasive and crowd out existing vegetation.

What are the environmental benefits of planting native plants?

They provide familiar forms of food and shelter for wildlife.

What are biotic and abiotic factors?

Biotic factors are the living things in an ecosystem. Abiotic factors are those things that are non-living.

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- Images: www.ncl-bnc/8/11/r11-204-e.html photographs courtesy of Bonnie Lawrence and Anna Leighton. **PLEASE NOTE: the above URL does not work and may have changed.**
- Lesson #3 is an adaptation of a lesson from: Canadian Wildlife Foundation (2002). *Project Wil Activity Guide*, Canada: Council for Environmental Education.