

# Grade 9

## Focused Study: Plant Reproduction and Native Plants of Saskatchewan



Native Plant Society  
of Saskatchewan

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The Native Plant Society of Saskatchewan is a strong advocate of nature education.

In addition to this lesson plan, we also support schools by:

- providing free printed resources.
- leading field tours.
- delivering outdoor and classroom presentations.
- hosting opportunities to "ask an expert", where students can interact with a professional biologist or related occupation though in person events or Skype. In some cases, we can arrange for French speaking experts.

**We also support the establishment of native plant learning gardens on school grounds** by offering free native seeds, printed resources, personal visits, presentations and expert advice to help with all stages of the process. The gardens can be as small as a square meter.

**All of what we do is always free for participating schools.**

Does any of this sound like something you'd want? If so, please call us at (306) 668-3940 or e-mail us at [info@npss.sk.ca](mailto:info@npss.sk.ca)

**Free Electronic Resources on the Native Plant Society of Saskatchewan Website ([www.npss.sk.ca](http://www.npss.sk.ca))**

- A Guide to Small Prairie Restoration - How to Grow Your Own Patch of Native Prairie
- Saskatchewan's Native Prairie: Taking Stock of a Vanishing Ecosystem and Dwindling Resource (Also available in print)
- On the Prairie - A webpage on our site with a "Build a Prairie" game, field guide to prairie plants and animals, curriculum goodies like a English-Dakota language guide, and virtual reality panoramas of prairie places
- The Watershed Game

**Free Printed Materials Available Through the Native Plant Society of Saskatchewan:**

- Native Plants, Water and Us! (Booklet)
- Native Plants, Water and Us! (Poster)
- Native Plant Communities of Saskatchewan (Poster)
- Native Plant Communities of Saskatchewan (Activity Sheet)

# FOCUSED STUDY: PLANT REPRODUCTION AND NATIVE PLANTS OF SASKATCHEWAN

## GRADE 9

### OVERVIEW AND PURPOSE

To form an understanding of the continuance of life in nature through a lesson on native plant reproduction, pollination, the reproduction of symbiotic species and the effects of differing types of reproduction methods on populations.

In groups or as individuals, each student will choose 4 native species as examples of differing types of reproduction in the Kingdom Plantae to study (out of our native trees, shrubs, forbs, mosses, grasses, cacti, ferns, algae, lichens or symbiotic organisms such as gall flies).

A visit to a local ecosystem is integral to this study. If possible, visit two or more differing ecosystems: prairie, deciduous forest, coniferous forest, wetland, riparian area, bog, etc; whatever is most accessible to you.

By focusing on a small number of plants, instead of many, a relationship can be built between the student and the plants. As John Muir wrote, 'When one tugs at a single thing in nature, he finds it attached to the rest of the world.' When a child can focus on something in nature, something tangible that holds a story, and an adult helps to illuminate that story by asking more questions, the child can begin to see the connections on their own as a revelation of their own exploration. This is the beginning of ecological literacy.

### OUTCOMES AND INDICATORS

- a. Identify questions to investigate about sexual and asexual reproduction in plants.
- b. Compare advantages and disadvantages of sexual and asexual reproduction for individual plants and animals, and for populations.
- c. Describe various methods of asexual reproduction in plant species (e.g., budding, grafting, binary fission, spore production, fragmentation, and vegetative reproduction) and list specific examples.
- f. Describe the process of sexual reproduction in seed-producing plant species, including methods of pollination.

### MATERIALS

Identification books (see resource list below). The internet (if possible). Pens, pencils, paper. Garbage bags (to clean the area where you visit of any litter that may be found).

Free Publications from the Native Plant Society of Saskatchewan:

*Native Plants, Water and Us!*

*Native Plant Communities of Saskatchewan Poster*

*Native Plant Communities of Saskatchewan Placemat*

*Saskatchewan's Native Prairie: Taking Stock of a Vanishing Ecosystem and Dwindling Resource*

### INTRODUCTION

By this grade level a student should have a good understanding of what a native plant is. However, it is always beneficial to reinforce and remind. A plant native or indigenous to Saskatchewan is one that has



evolved here. This means that it was here prior to European contact. Native plants are adapted to their specific climatic zone and soil type. There are both native aquatic plants and terrestrial plants. Plants that are not native are considered 'introduced' or 'exotic'. If these introduced species spread rapidly and out-compete other plants in an ecosystem they are considered 'invasive' or sometimes referred to as 'noxious weeds'. Native plants are part of the biodiversity that help to keep our ecosystems healthy. They support a vast number of species that have evolved with them in an intricate relationship. The loss of this biodiversity has an impact throughout the ecosystem resulting in species endangerment and extinction. It is important to promote a sense of respect through ecological knowledge of place.

This study will include a focus on diverse species in the Kingdom Plantae such as trees, shrubs, forbs, grasses and grass-like (sedges and rushes), ferns and fern allies (other ancient plants similar to ferns), mosses, algae, and lichens.

There are two methods of reproduction in plants:

1. Sexual reproduction: Through pollination and meiotic spore formation.
  - a. Animal pollination: Birds, butterflies, moths, bees, wasps, flies.
  - b. Sexual spore formation: Mosses, ferns and fungi.
2. Asexual Reproduction: Budding, vegetative reproduction, and mitotic spore formation.

[http://www.diffen.com/difference/Meiosis\\_vs\\_Mitosis](http://www.diffen.com/difference/Meiosis_vs_Mitosis)

## INSTRUCTIONAL METHODS

This is a guided inquiry. Do not collect whole plants for this study. Leaf collection may be helpful for identification. Taking several close-up pictures would greatly help with plant identification.

Bring your students to a local ecosystem. In groups or as individuals have them explore the area, write a description and make a sketch of the habitat. Have them choose 4 different types of plant species based on differing reproductive methods.

For example:

**Animal pollinated plants:** Roses, primroses, asters, and most other plants with large, colourful flowers.

**Wind pollinated plants:** Many poplars, willows, grasses.

**Plants that send out runners:** Strawberry, dewberry.

**Plants that form rhizomes or root suckers:** Star-flowered false Solomon's seal, sarsaparilla, showy milkweed, cattail, raspberry, aspen.

**Plants that form spores:** Fungi (sexual and asexual spore formation), lichens, mosses, ferns.

**Plant association assisted reproduction:** Goldenrod gallfly, willow gallfly, juniper-saskatoon berry rust.

You would have to dig up the plants to see if they spread by rhizome; only do this if it is soft humus and rhizomes can be exposed without causing damage to the plants. If that is not a possibility, ensure plants are chosen for 3 other reproductive methods listed above and ask the students to choose a plant without this knowledge, based on a guess, to be researched later.

Make a sketch of the species they choose. Take pictures if possible. Have them look at every detail in order to help them identify their plants later. Or you can help them identify their plants on site if you bring an expert or native plant guides with you. Also look at what insects are visiting the plants, as it may give a clue to their method of reproduction.

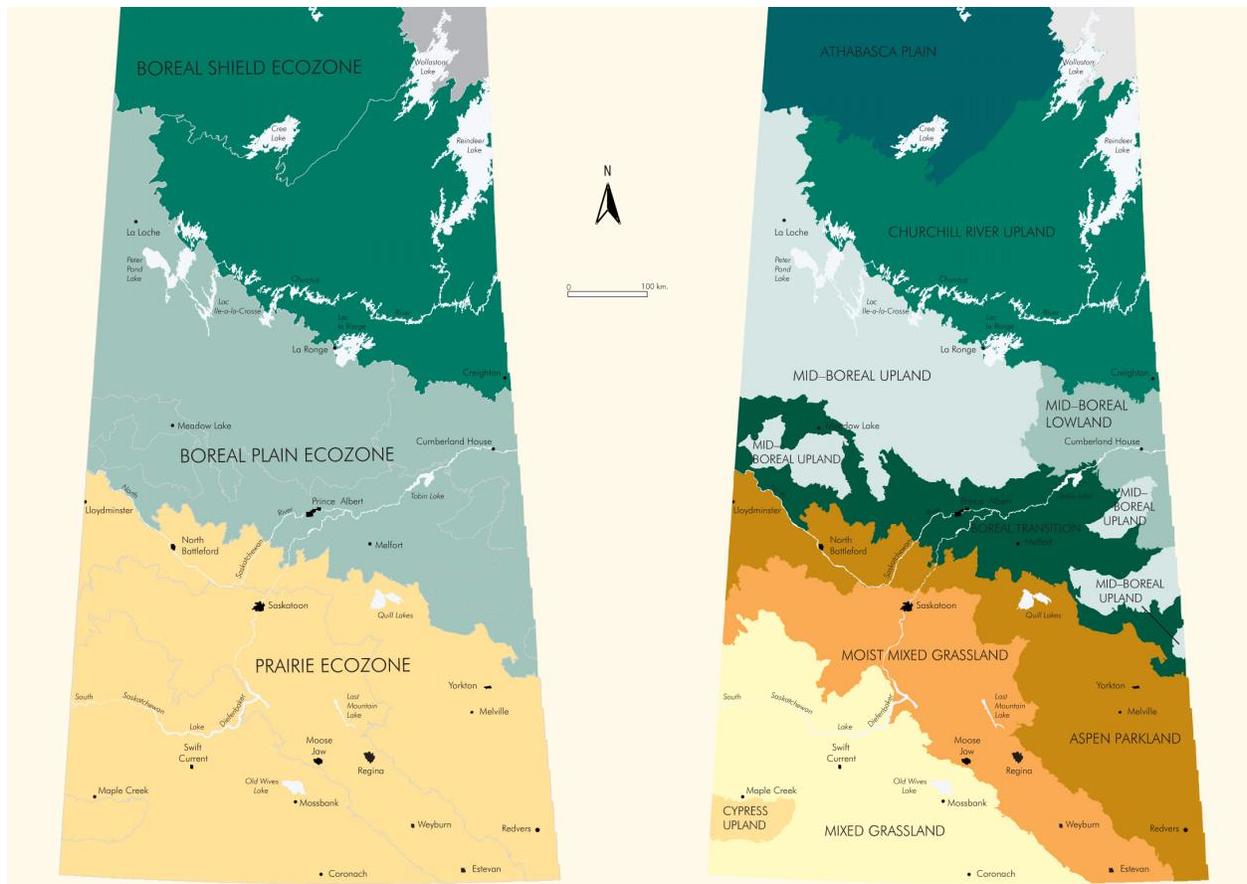


The proper identification of the plant is important, but not the purpose of the study. Have the students identify their species as closely as possible. Determine whether the plant is native to Saskatchewan or introduced. If it is introduced try to discover where this plant has journeyed from and how. Ask the students to put themselves in the position of the plant: to observe the plant's surroundings and assess what it needs to survive and where they can obtain it from (and from how far away?).

Seek resources to help your students; a biologist, a herbalist, a knowledgeable parent or community member, books from the resource list, an interpretive/nature center and the internet. Mushrooms can be very difficult to identify; if you have a student up for the challenge they will have to create a spore print. [http://www.mushroomexpert.com/spore\\_print.html](http://www.mushroomexpert.com/spore_print.html)

The Native Plant Society of Saskatchewan can help your students to identify their plants through email photo exchange or by a visit to your classroom or study location.

Knowing which ecozone you are studying will really help to narrow the possibilities of species in the search for your species' identity.



[http://esask.uregina.ca/entry/ecozones\\_and\\_ecoregions.html](http://esask.uregina.ca/entry/ecozones_and_ecoregions.html)

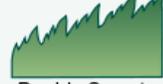
Find your ecozone. Are you in the Prairie, Boreal Plain, Boreal Shield or Taiga Shield ecozone? Locate your ecoregion to narrow your plant ID search.

Some botanical terminology may help your students understand the plant identification keys and plant descriptions:

## SHAPE & ARRANGEMENT

 Acicular needle shaped	 Falcate hooked or sickle shaped	 Orbicular circular	 Rhomboid diamond-shaped
 Acuminate tapering to a long point	 Flabellate fan shaped	 Ovate egg-shaped, wide at base	 Rosette leaflets in tight circular rings
 Alternate leaflets arranged alternately	 Hastate triangular with basal lobes	 Palmate resembles a hand	 Spatulate spoon-shaped
 Aristate with a spine-like tip	 Lanceolate pointed at both ends	 Pedate palmate, divided lateral lobes	 Spear-shaped pointed, barbed base
 Bipinnate leaflets also pinnate	 Linear parallel margins, elongate	 Peltate stem attached centrally	 Subulate tapering point, awl-shaped
 Cordate heart-shaped, stem in cleft	 Lobed deeply indented margins	 Perfoliate stem seeming to pierce leaf	 Trifoliate/Ternate leaflets in threes
 Cuneate wedge shaped, acute base	 Obcordate heart-shaped, stem at point	 Odd Pinnate leaflets in rows, one at tip	 Tripinnate leaflets also bipinnate
 Deltoid triangular	 Obovate egg-shaped, narrow at base	 Even Pinnate leaflets in rows, two at tip	 Truncate squared-off apex
 Digitate with finger-like lobes	 Obtuse bluntly tipped	 Pinnatisect deep, opposite lobing	 Unifoliate having a single leaf
 Elliptic oval-shaped, small or no point	 Opposite leaflets in adjacent pairs	 Reniform kidney-shaped	 Whorled rings of three or more leaflets

## MARGIN

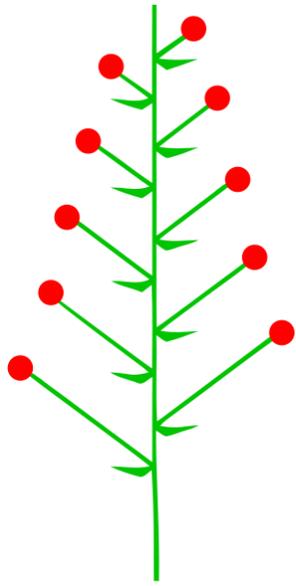
 Ciliate with fine hairs	 Crenate with rounded teeth	 Dentate with symmetrical teeth
 Denticulate with fine dentition	 Doubly Serrate serrate with sub-teeth	 Entire even, smooth throughout
 Lobate indented, but not to midline	 Serrate teeth forward-pointing	 Serrulate with fine serration
 Sinuate with wave-like indentations	 Spiny with sharp stiff points	 Undulate widely wavy

## VENATION

 Arcuate secondary veins bending toward apex	 Cross-Venulate small veins connecting secondary veins	 Dichotomous veins branching symmetrically in pairs
 Longitudinal veins aligned mostly along long axis of leaf	 Palmate several primary veins diverging from a point	 Parallel veins arranged axially, not intersecting
 Pinnate secondary veins paired oppositely	 Reticulate smaller veins forming a network	 Rotate in peltate leaves, veins radiating

Chart of leaf morphology characteristics. Source: [http://en.wikipedia.org/wiki/File:Leaf\\_morphology.svg](http://en.wikipedia.org/wiki/File:Leaf_morphology.svg)  
Image credit: McSush/Debivort

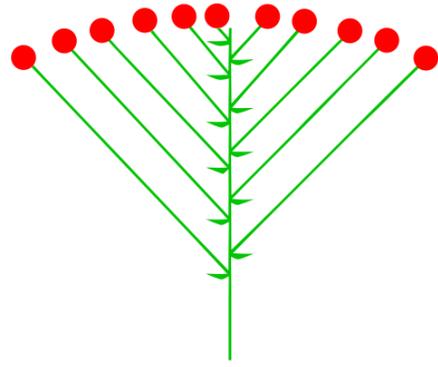




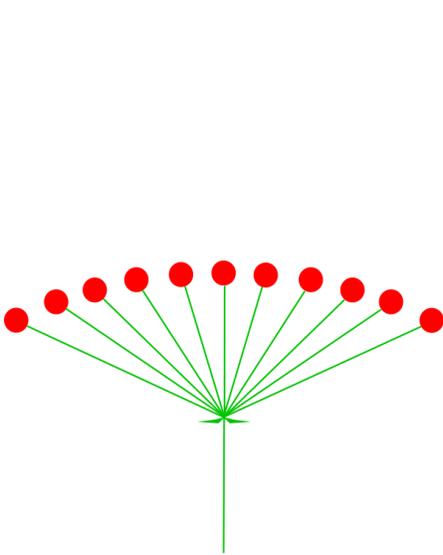
Raceme



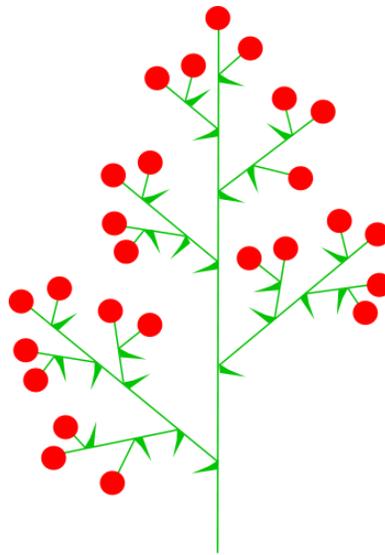
Spike



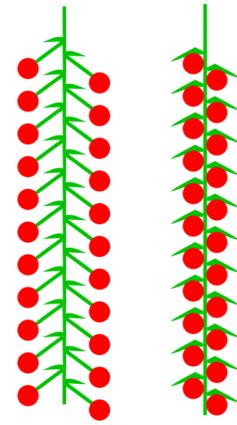
Corymb



Umbel



Panicle



Catkin

Chart of common inflorescence (flower) types. Source: <http://en.wikipedia.org/wiki/Inflorescence>  
Image credit: Amanda44, Shazz and Daniel Miłaczewski

## ASSIGNMENT

Once the student's species are identified and their method of pollination or reproduction determined ask your students to write a story, poem, or essay telling of how the plants survive. Alternatively they could create a poster or diagram. Their research should include the following information for each species:

- Common names (most plants have more than one).
- Latin name (look up the meaning of the Latin names).
- Method of reproduction (list possible pollinator species).
- Any stories of the plant type or species from visit with a Knowledge Keeper.
- Some answers to the inquiry questions below.
- Some questions that haven't been answered and are still a mystery.
- Pictures or drawings of each species.

### Steps in this study: A summary

1. Talk with your students about the purpose of the study – to have a hands-on experience in nature to figure out how individual species survive and reproduce in an ecosystem.
2. It is optional, though very beneficial, to have an elder come into the class to share knowledge on plant communities with your students.
3. Plan the trip together – is there a functioning native ecosystem near to the school? If not, how far do you have to travel? Have a discussion about this in terms of habitat loss and threats to biodiversity. Discuss the different reproductive strategies described above.
4. Visit a native ecosystem, sketch the habitat, clean up the garbage and **choose 4 different species to study**. Try to choose 4 that have different reproductive strategies.
5. Identify and determine the reproductive strategy of 4 different types of species (out of our native trees, shrubs, forbs, mosses, grasses, ferns, algae, or lichens).
6. Have the students complete their assignment and generate further inquiry questions to accompany those listed above and below.

## INQUIRY

Explore, observe, investigate, acknowledge sources, interpret, plan, and create.

**Questions:** (These are not the essential questions to be answered; they are to help the teacher and students to explore the possibilities of what can be learned about their plant).

How prevalent was this plant in its habitat? Was it growing densely or were there few? How does this relate to its reproductive method?

What does the habitat of these species look like? Are they dry loving, sun loving, or moist and shade loving? Which animals might use this plant? How? What other creatures did you see near this plant?

What other roles could this plant have in the ecosystem?

What is around the plant that can help it/harm it?

## ASSESSMENT

Have the students share their research with each other in small groups. Invite community members to be involved in the presentations. Display the student research in a location where other students from your school can learn from it.

## RESOURCES

### Books:

Aikenhead, G. and H. Michell. 2011. *Bridging Cultures: Indigenous and Scientific Ways of Knowing Nature*. Pearson Canada. Toronto.

Grant, T. and Littlejohn, G. 2010. *Greening School Grounds: Creating Habitats for Learning*. New Society Publishers. Gabriola Island.

Hammermeister, A., D. Gauthier and K. McGovern. 2001. *Saskatchewan's Native Prairie: Taking Stock of a Vanishing Ecosystem and Dwindling Resource*. Native Plant Society of Saskatchewan. Saskatoon.

Johnson, D., L. Kershaw, A. MacKinnon, and J. Pojar. 1995. *Plants of the Western Forest: Alberta, Saskatchewan & Manitoba Boreal Forest & Aspen Parkland*. Lone Pine Publishing and the Canadian Forest Service. Edmonton.

Keane, K. and D. Howarth. 2003. *The Standing People: Field Guide of Medicinal Plants of the Prairie Provinces*. Root Woman and Dave. Saskatoon.

Kershaw, L. 2003. *Saskatchewan Wayside Wildflowers*. Lone Pine Publishing. Edmonton.

Lahring, H. 2003. *Water and Wetland Plants of the Prairie Provinces*. Canadian Plains Research Center. Regina.

Neufeld, C. 2010. *Saskatchewan's Prairie Places*. Native Plant Society of Saskatchewan. Saskatoon.

Saskatchewan Indian Cultural Centre. 2009. *Cultural Teachings: First Nations Protocols and Methodologies*. Available through the Saskatchewan Indian Cultural Centre: <http://www.sicc.sk.ca/index.html>

Saskatchewan Indian Cultural Centre. 2009. *Practicing the Law of Circular Interaction*. First Nations Environmental & Conservation Principles Binder. Available through the Saskatchewan Indian Cultural Centre: <http://www.sicc.sk.ca/index.html>

Savage, C. 2011. *Prairie: A Natural History*. Greystone Books. Vancouver.

Vance, F.R. et al. 1999. *Wildflowers Across the Prairies*. Greystone Books. Vancouver.

Wruck, G. and K. Gerein. 2003. *Native Plants, Water and Us!* Native Plant Society of Saskatchewan. Saskatoon.

## Websites:

Center for Ecoliteracy

<http://www.ecoliteracy.org/essays/systems-thinking>

The Native Plant Society of Saskatchewan

<http://www.npss.sk.ca/>

The Importance of Cattails

<http://www.iisd.org/media/press.aspx?id=223>

Ducks Unlimited

<http://www.greenwing.org/dueducator/ducanadapdf/99993844.PDF>

Saskatchewan Indian Cultural Centre

<http://www.sicc.sk.ca/index.html>

University of Saskatchewan Herbarium Rare Plants Index

[http://www.usask.ca/biology/rareplants\\_sk/root/htm/en/index.php/](http://www.usask.ca/biology/rareplants_sk/root/htm/en/index.php/)

Gabriel Dumont Institute

<http://www.metismuseum.ca/media/document.php/11389.pdf>

## References:

Johnson, D., L. Kershaw, A. MacKinnon, and J. Pojar. 1995. *Plants of the Western Forest: Alberta, Saskatchewan & Manitoba Boreal Forest & Aspen Parkland*. Lone Pine Publishing and the Canadian Forest Service. Edmonton.

Wruck, G. and K. Gerein. 2003. *Native Plants, Water and Us!* Native Plant Society of Saskatchewan. Saskatoon.

Asexual and Sexual Reproduction in Fungi

<http://www.uwlax.edu/biology/volk/fungi3/sld032.htm>

University of Manitoba - Lichen Lifecycle

<http://home.cc.umanitoba.ca/~pierceyn/lifecycle.html>

Diffen - Difference Between Meiosis and Mitosis

[http://www.diffen.com/difference/Meiosis\\_vs\\_Mitosis](http://www.diffen.com/difference/Meiosis_vs_Mitosis)

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