

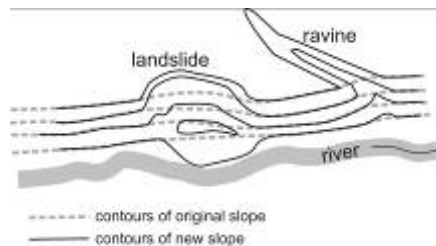
## Landslide activity 7: **Prairie landslides**

**Description:** This lesson includes map interpretation, topographic cross-sections, and a discussion of landslides along river valleys in the Prairies.

**Materials:** Overhead 1, map of Geology vulnerable to landslides  
Overhead 2, diagram of Common types of landslide movements in the Prairies  
Student worksheets 1 and 2, Prairie landslide and Topographic map

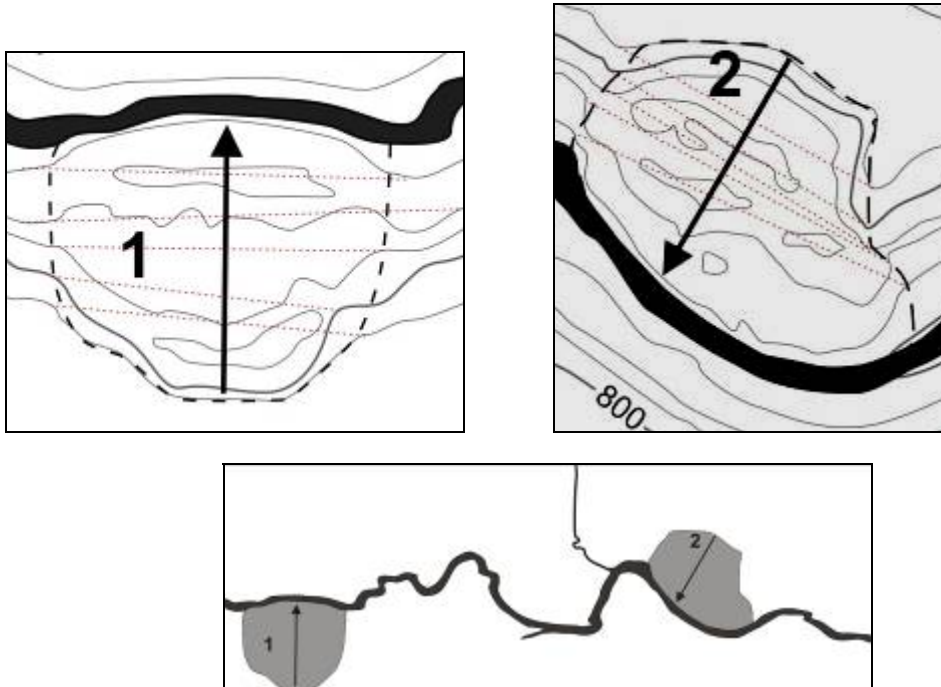
### Teacher instructions and notes:

1. Begin with a general discussion. Ask the students the following questions:
  - Where do landslides occur?
  - Are all landslides the same?
  - Do you think we have landslides in the prairie region?
  - If so, where?
2. Explain that slopes occur even in the prairies (usually along river valleys) and landslides may occur along those slopes. Landslides in the prairies rarely involve fatalities but the economic costs to infrastructure may be considerable. For example, the most costly landslide in Canada was the 1957 collapse of the Alaska Highway suspension bridge across the Peace River when a landslide moved the northern abutment (\$60 million in 1957).
3. Explain that different types of landslides occur in different types of geology and topography. In the prairies landslides are typically associated with the following geology:
  - Landslides happen in the clay and silt banks of some rivers. This clay and silt was deposited at the end of the ice age when large volumes of glacial meltwater formed temporary glacial lakes (e.g. Glacial Lake Agassiz) over much of the prairies and a glacial sea covered the northeast corner of Manitoba. In places rivers have eroded deep valleys into these sediments; however, even low banks are susceptible to landslides.
  - Weak Cretaceous bedrock underlies much of the prairies. Cretaceous refers to the geological era existing from 140 to 64 million years ago when a tropical sea covered what are now the prairies. Sedimentary rocks were formed in that sea. Some formations consist mainly of shale bedrock and that rock contains some very weak clay layers. As rivers steepen the valley walls, the weak layer may collapse causing the overlying layers to slide on the weak failed layer. Landslides in this material generally move as a rotational or translational slide. (See diagram.)
4. Distribute copies of the map of the prairies or show on an overhead.
  - Where might landslides occur in your province?
  - What underlies your area (rock? glacial lake clay? other?)
  - Where might landslides occur locally?
5. Review how to interpret contour lines on a topographic map and how to draw a topographic cross-section.
6. Describe how a large landslide would look on a topographic map of a prairie valley. (Compared to the adjacent valley walls and floor, the top of the landslide extends further back into the flat land creating a scar; the landslide slope will be at a lower angle, but may have an irregular or stepped surface; and the valley floor may be narrower.) The teacher may want to sketch examples on the blackboard and show how contour lines in a landslide scar (irregular semicircle) differ from ravine morphology (narrow, coming to a point).

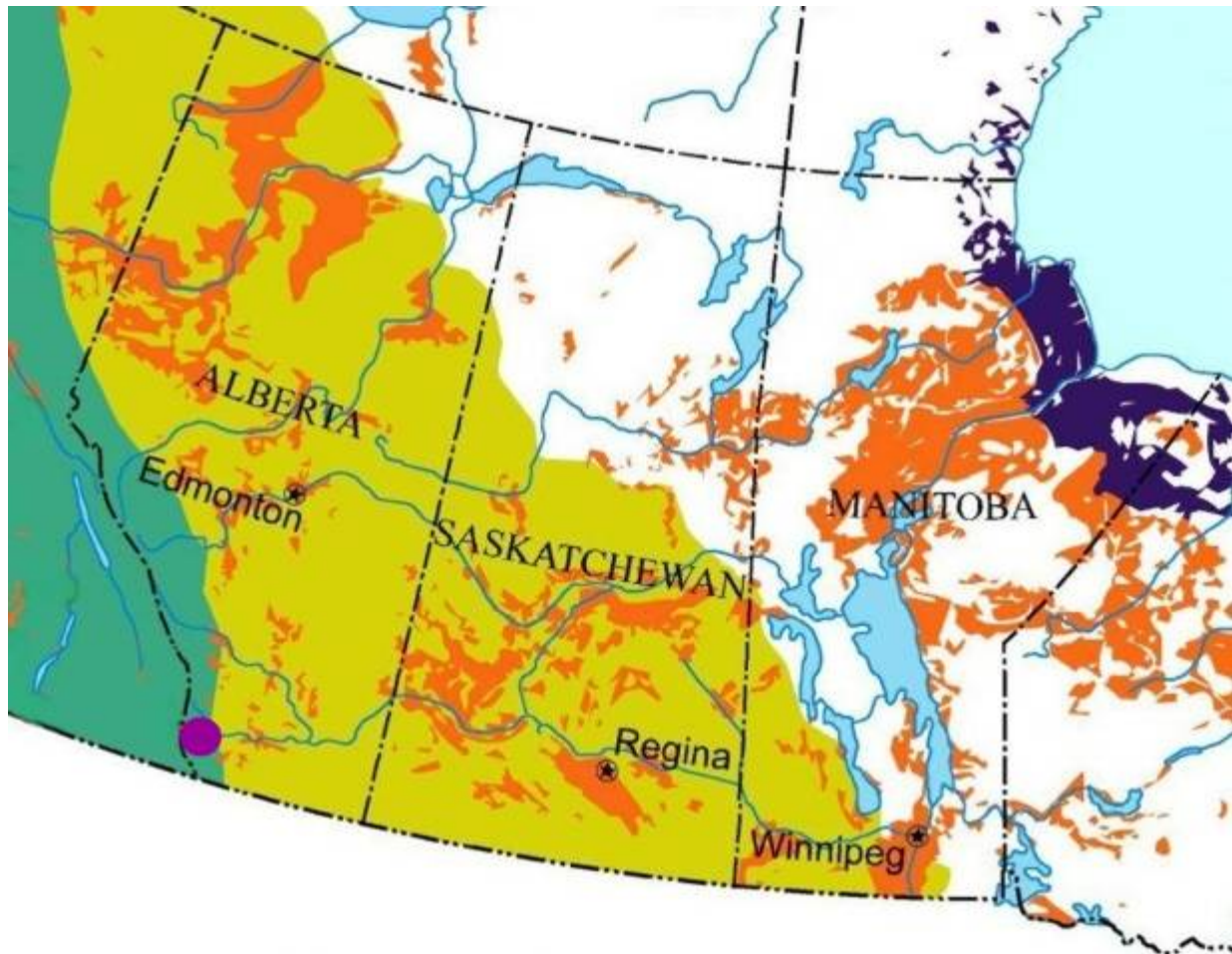


7. Distribute the worksheet and topographic maps. Students use map interpretation skills to identify the landslide (s) on the topographic map, and then draw and compare cross-sections of the landslide and the undisturbed valley wall, measure dimensions of the landslide, estimating the rough volume of material moved in the landslide, and answer questions.
8. Teacher may conclude the lesson with a classroom discussion of some of the impacts of landsliding in the prairies. These include damage to linear infrastructure that must cross these valleys (roads, bridges, railways, pipelines, and telecommunication lines), as well as property damage or loss to residents living along these slopes and impacts on rivers such as landslide dams, flooding and siltation.
9. As a homework activity, students may search the internet to find a story on a landslide in their community or a larger community in the prairies and report back to the class. Note that the word 'landslide' is also commonly used in association with elections ("landslide victory!") and students should refine their search by specifying other terms associated with landslides (earth, mud, rock, slope, collapse, river, bank, slide, damage etc.).

Answer:








## Geology vulnerable to landslides



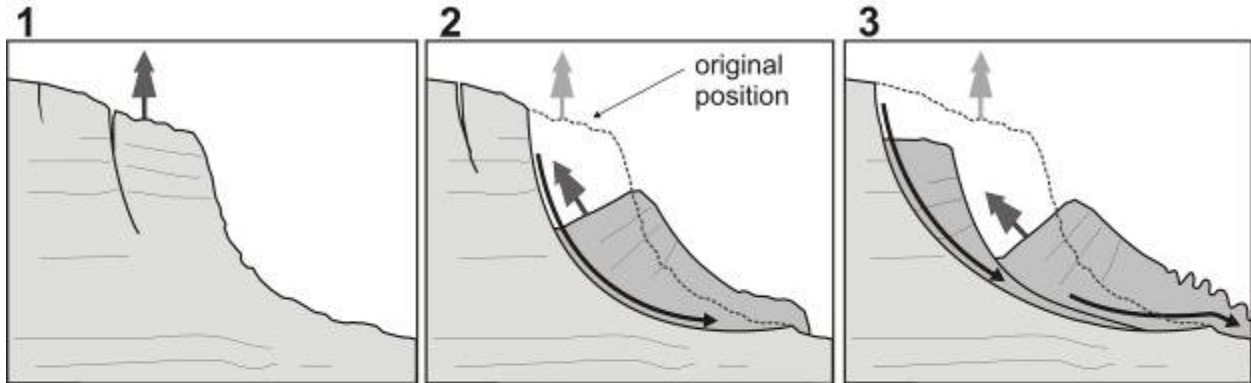
### Areas Particularly Vulnerable to Landslides

### Régions particulièrement vulnérables aux glissements de terrain

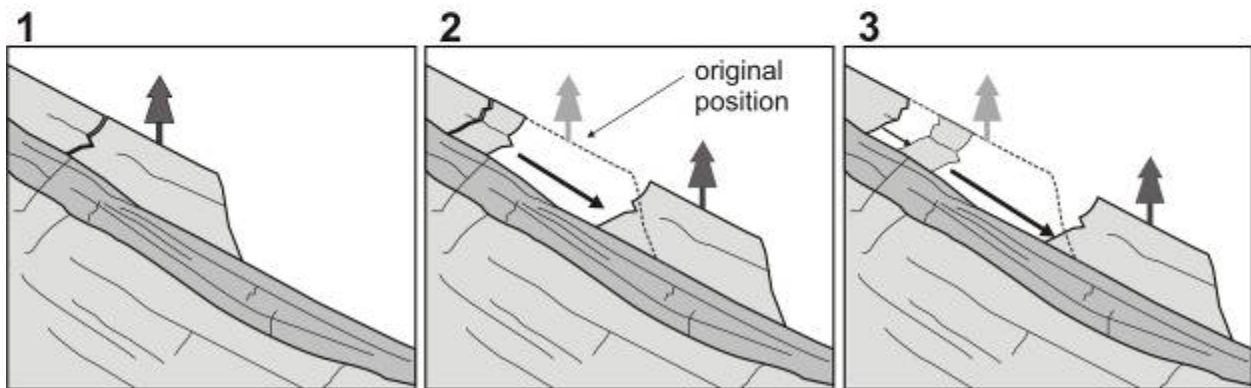
-  Area of glaciolacustrine clays and fine silt  
Zone de limons fins et d'argiles glaciolacustres
-  Area of glaciomarine clays and fine silt  
Zone de limons fins et d'argiles glaciomarines
-  Canadian Cordillera  
Cordillère canadienne
-  Areas of Cretaceous bedrock on the Plains  
Zones de plaines reposant sur des roches crétacées
-  Landslide Disaster  
Glissement de terrain catastrophique

## Common types of landslide movements in the Prairies

**Slide** : Downslope movement of bodies of relatively intact material along planes of weakness



**Rotational slide** : movement along a curved sliding plane



**Translational slide** : movement along a straight sliding plane

## Prairie landslide

1. Examine the topographic map. The river has eroded a deep, steep-sided valley into the bedrock. What is the contour interval? \_\_\_\_\_metres
2. Identify a landslide along the valley wall. Outline the area of the landslide.
3. Draw cross-sections across the valley. Superimpose the 2 sections on the same graph. Line XY should cross the valley in the middle of the landslide. Line AB should cross an undisturbed section of the valley, close to the landslide.



4. Calculate the vertical exaggeration. \_\_\_\_\_
5. Describe the difference between the 2 profiles.
  
6. Measure the landslide:
 

depth (bank height)	_____
width	_____
length	_____
7. Estimate the rough volume of material moved in the landslide. \_\_\_\_\_
  
8. On the map, draw lines to represent the probable position (top and bottom) of the pre-landslide valley side (extend from the unaffected valley side beside the landslide).
9. Identify on the topographic map, headscarp, the zone of depletion (landslide scar) and zone of accumulation (landslide tongue).
10. What do you think may have caused this land to slide?
  
11. Indicate another location on the valley side that may be a landslide and justify your reasons.
  
12. How do the landslides affect the river?



## Topographic map

Contours in metres.

