Landslide activity 5b: **Landslides in Canada quiz**

Description: This is an independent study activity for grades 11 and 12. Students will read about landslides in Canada in the accompanying document and then complete a quiz of true or false, or multiple choice questions.

Teacher instructions:

- Refer your students to the information about landslides in the document **Atlas of Canada: Landslides** [PDF] - included as part of these resources.

  or

  Provide your students with copies of the Landslides in Canada "PowerPoint" [PDF] and accompanying notes [PDF] included as part of these resources.

- Have students read the information on landslides and then complete the quiz on the following pages. If a student chooses 'false" on a true/false question, they must add a brief statement explaining why the statement is false.

- The correct answers are given below. Some talking points have been added for the teachers use.

Quiz answers and talking points for the teacher:

1. True
2. c)
3. c)
4. b) - In 1903 a landslide from Turtle Mt. buried the town of Frank, Alberta, killing more than 70 residents.
5. a) - In 1971 a landslide in sensitive marine clay partially destroyed the town of St-Jean-Vianney, Que., killing 31 residents. Remaining homes were evacuated and abandonned.
6. d) Landslides may move as a slow creep or with catastrophic speed.
7. d)
8. False. - Landslides are the downslope movement of material and they may occur in any type of material, from bedrock to loose sediment (gravel, sand, silt, clay). The type of geological material composing the slope will determine the type of landslide that will occur.
9. False. - For example, in 1929, a large submarine landslide on the continental slope near Newfoundland severed the transatlantic cables and triggered a disastrous tsunami on the Grand Banks.
10. d)
11. False. - Many landslides are the result of natural causes; including excessive or intense precipitation events, erosion of the bottom of slope by a river, wave action at the bottom of cliffs, groundwater pore pressure, thawing of ice-rich permafrost, and earthquakes.
12. d) - Landslides may dam rivers, causing flooding upstream. Landslides into or beneath water may cause tsunamis. The December 18, 1929, tsunami which struck Newfoundland was caused by a large landslide off the continental shelf. Landslides can also cause minor earthquakes. A massive rockfall in 1990 at Brenda Mine near Peachland, B.C. generated a seismic shock of magnitude 2.4 that was measured on seismographs up to 215 km away. The tremendous impact of debris in the 1965 Hope Slide registered as a magnitude 3 earthquake.

13. d) - Tsunamis waves may cause cliff erosion, triggering a landslide. Earthquake shaking may trigger landslides. Rivers in flood may cause bank erosion, triggering a landslide.

14. True. - Warmer temperatures will increase the depth of seasonal thaw of the surface “active” layer of permafrost. In addition, more extreme storms will cause more forest fires, which may destroy the insulating cover of peat, allowing deeper seasonal thaw. Landslides specific to permafrost regions (active layer detachments and retrogressive thaw flows) will be triggered by the thawing of ice-rich sediment. Changes in the permafrost regime and groundwater movement may also trigger other types of landslides.

15. a) - And, it also will flood the valley bottom **up stream** of the landslide site.

16. e)

17. False. - Damage caused by landslides is not covered by house insurance.

18. True

19. False. - These structures are designed to handle the ‘design maximum’ volume of debris. Should the landslide volume exceed the calculated design volume, or if the diversion track or catchment basin has been poorly maintained and allowed to fill with debris from earlier flows, they may be overtopped, resulting in damage in the protected area.

20. c)

 Name:_____

Landslides in Canada

Select the correct answer. **If you answer false** on a true or false question, **you must explain why** the statement is false.

1. All Canadian Provinces and Territories have landslides.
   True or False?

2. Approximately how many people have been killed by landslides in Canada in recorded history?

   a) 6
   b) 60
   c) 600
   d) 6000

3. Each year costs related to landslides in Canada cost Canadian taxpayers and businesses:

   a) $ 2-5 million
   b) $ 30-500 million
   c) $ 100-200 million
   d) $ 800-700 million

4. Where was the most catastrophic landslide in Canada?

   a) British Columbia
   b) Alberta
   c) Quebec
   d) Newfoundland

5. Which town was destroyed by a landslide?

   a) St-Jean-Vianney, Que.
   b) St. Vincent's, Nfld.
   c) St. Malo, Man.
   d) St-Louis-de-Kent, NB.

6. The velocity of a landslide is generally:

   a) several centimetres per year
   b) several metres per year
   c) several kilometres per hour
   d) all of the above

7. Which of these land-use changes in a watershed may contribute to an increased landslide hazard?

   a) construction of buildings at the top of a scarp.

   b) forest clearance.

   c) the construction of roads on a slope

   d) all of the above.

8. Most landslides occur in bedrock.

True or False?

9. Although landslides may enter into water bodies, the actual slope failure can only be triggered above water level.

True or False?

10. Landsliding along river banks can be caused by:

   a) river erosion.

   b) human construction activities

   c) deforestation of slopes

   d) all of the above.

11. Most landslides are caused by human action.

True or False?

12. Which of the following natural hazards can be triggered by a landslide:

   a) flood

   b) tsunami

   c) earthquake

   d) all of the above

13. Which of the following natural hazards can cause a landslide:

   a) tsunamis

   b) earthquake

   c) flood

   d) all of the above

14. In northern Canada climate warming is likely to lead to increased landslide activity.
True or false?

15. A large landslide in a river valley can dam a river. The formation of such a dam:

a) represents a major flooding hazard to areas downstream because landslide dams are commonly unstable and subject to rapid erosion that leads to breaching and rapid drainage.

b) is usually welcomed because it forms a new recreational lake along the valley.

c) will flood the valley bottom downstream of the landslide site.

d) is not a problem.

16. Damage to buildings during landslides can be caused by:

a) collision from heavy debris.

b) burial under debris.

c) collapse of ground under the building.

d) flooding upstream of a landslide dam.

e) all of the above.

17. House insurance will cover the costs of landslide damage.
True or false?

18. A cost-effective, long-term method of avoiding landslide damage and disasters in communities is to prohibit development on unstable slopes.
True or false?

19. A diversion chute is an artificial method of diverting the path of a landslide. A catchment basin is an artificial method of stopping the further movement of debris. Communities protected by diversion chutes and/or catchment basins are completely safe from debris flows.
True or false?

20. Which of the following methods can NOT be used to protect a building located on unstable slopes from landslides?

    a) lowering the angle of the slope.

    b) constructing a diversion wall (berm) around the building.

    c) increasing the height of the building.

    d) improving the drainage in the slope.