

# Permafrost

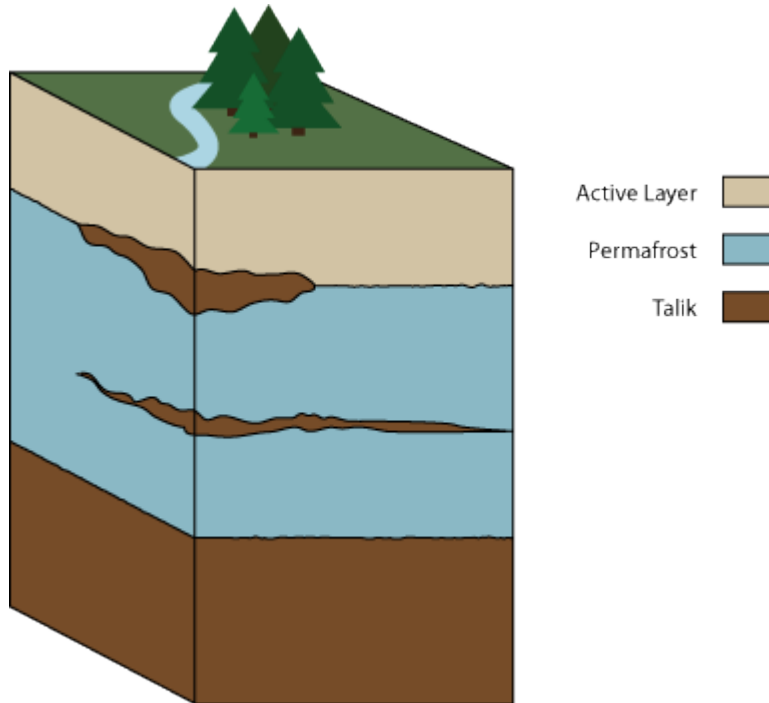


<http://www.cbc.ca/news/canada/story/2011/11/16/north-big-fix-permafrost.html>



# 1. What is permafrost?

Permafrost is a thick layer of permanently frozen ground.



2. Large parts of northeastern Russia and almost 50% of Canada's land can be frozen up to a depth of 0.5 km. Where else is this permafrost found?



Greenland, Alaska,  
Himalayas

3. What can happen to the top part (active layer) of permafrost during summer?

It can melt, but normally, the rest of the ground underneath remains frozen.

4. a) How could climate change lead to large amounts of methane being produced?

With rising temperatures, layers of the permafrost defrost and dead organic material is no longer preserved by the ice.

Decomposers(bacteria and fungi) then decompose the material.

In the absence of oxygen methane is produced.

- 10000 yr old woolly mammoth found in Siberian permafrost



## 4. b) What's wrong with releasing methane into the atmosphere?

- Methane( $\text{CH}_4$ ) is a strong greenhouse gas, which will make the Arctic even warmer.





Guido Grosse, another scientist at the University of Alaska, Fairbanks, took highly precise GPS measurements of methane seeps, hoping to match the information with satellite images and aerial photographs. The ultimate goal is to come up with an accurate calculation of methane emissions across the permafrost zone of the Northern Hemisphere.



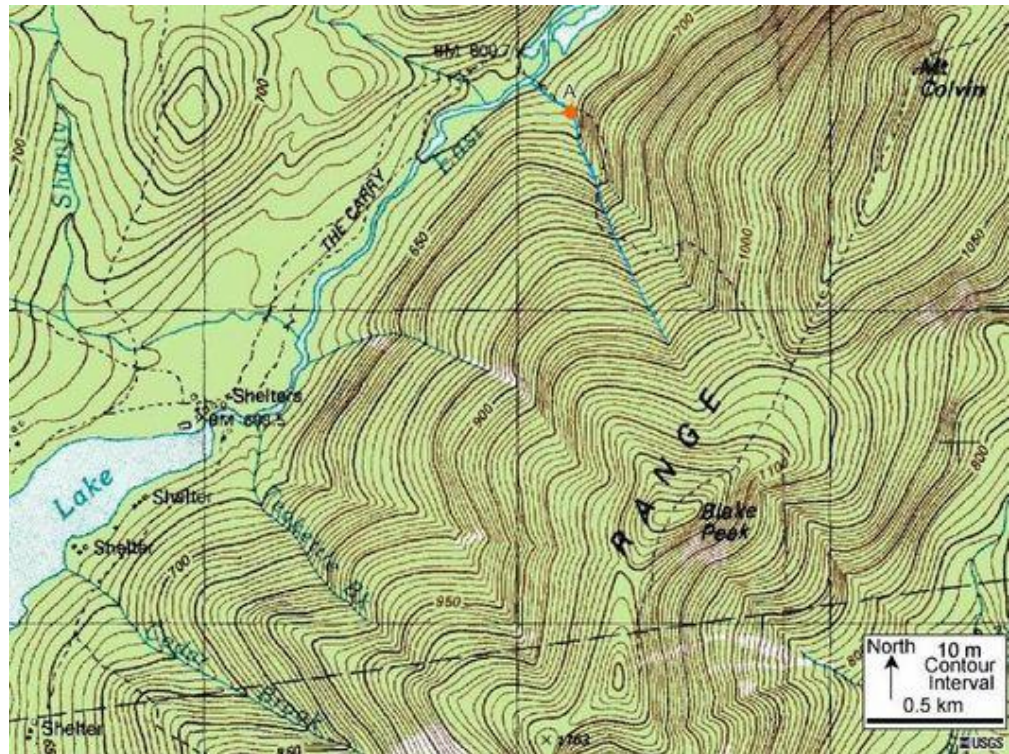
# Watershed= Catchment Areas

- A watershed is an area of land where all inland rain and snow drain into the same body of water (lake, river or sea).



# Factors Affecting Water Flow in a Watershed :

- a) **topography**: detailed map of the surface features of land. It includes the mountains, hills and creeks. Its slopes determine in which river water ends up.



## b) geology

- The type of rock affects how much water ends below the surface of the land (in reservoirs) or off in a river or stream.



Porous rock



nonporous rock lake Huron granite

## c) climate

- Temperatures and the amount of seasonal precipitation in a region affect how much water flows out of a watershed. Quebec receives a fair amount of snow and when it melts in the spring it stresses watersheds.



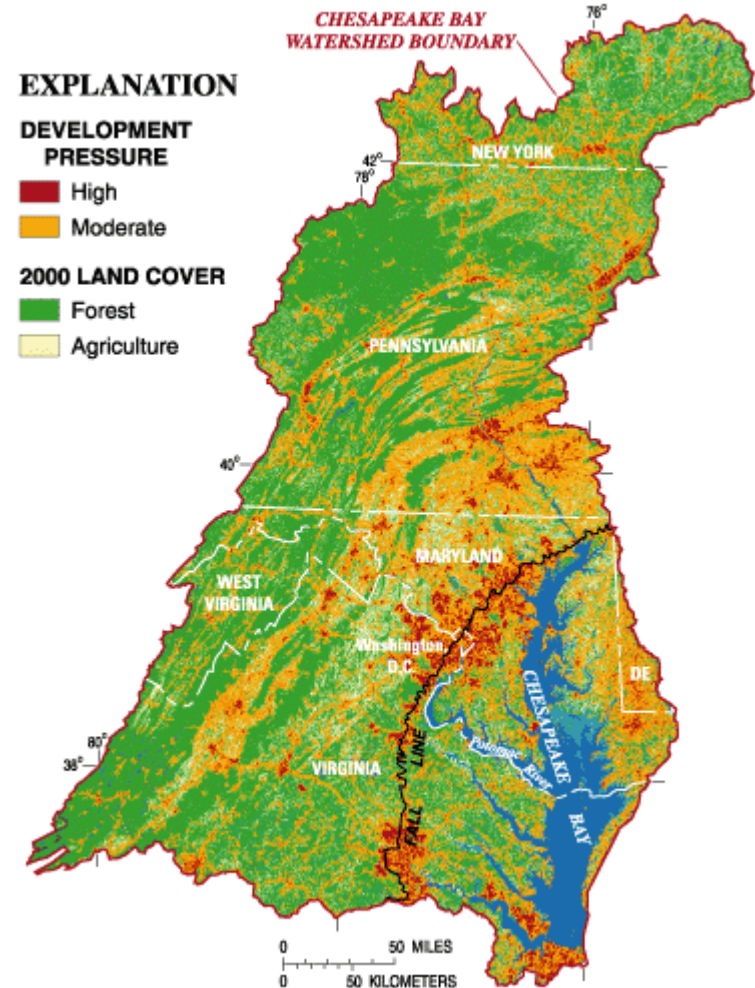
## d) vegetation

- Forests especially are good “sponges” of water and limit the amount of runoff and soil erosion from a watershed. Clearcutting has the opposite effect.



# e) Development

- Cities are often filled with asphalt and concrete, which do not retain water and add to the volume of water received by rivers and lakes

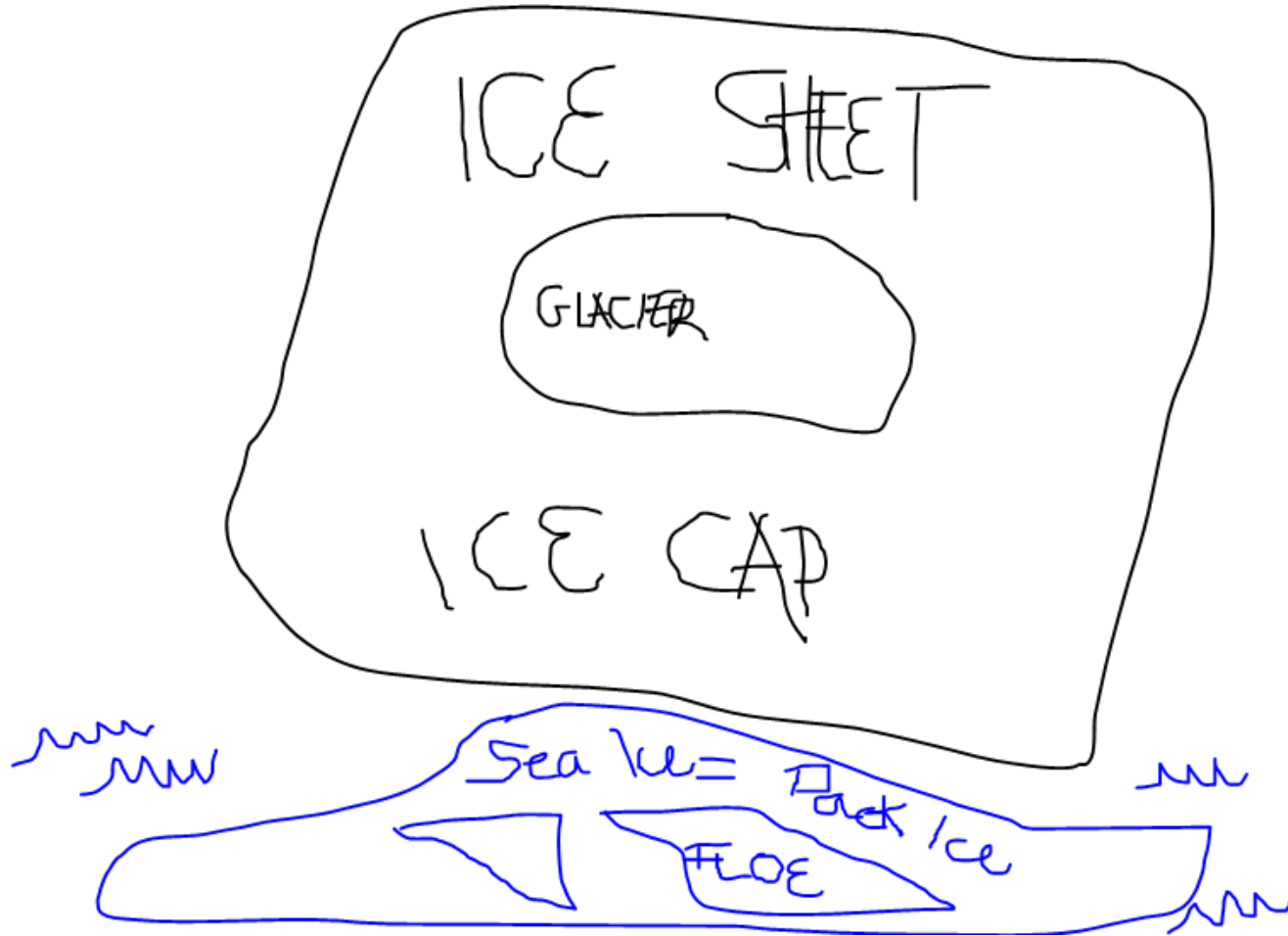


### 3. How does catchment affect economy?

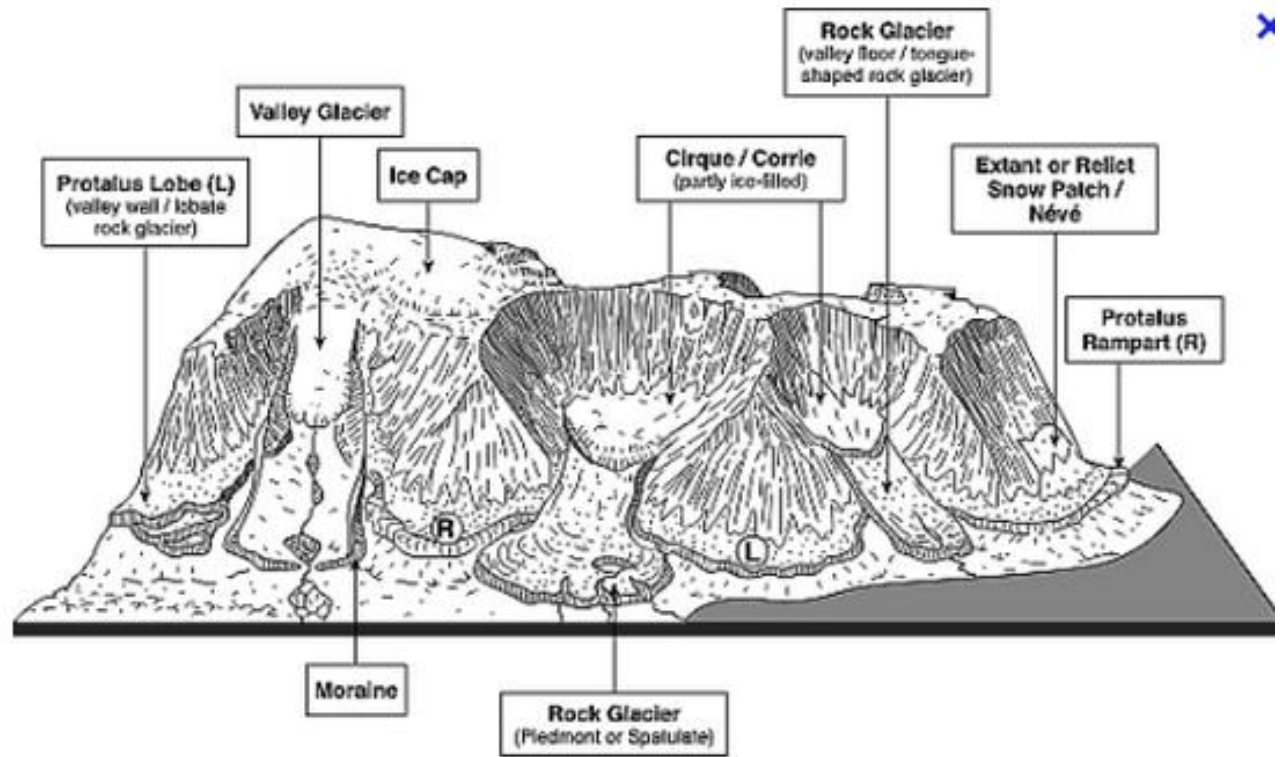
- Floods devastate farmlands, homes and businesses
- Excess soil erosion makes reforestation more difficult
- Amount of pollution in waterways is related to runoff in catchment areas(watersheds)



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**Glaciers:** These persistent sheets of ice at least 50 m thick are found on land, on mountaintops at mid or high latitudes and elsewhere on continents. Large glaciers are known as **ice sheets or ice caps**.



**1. How do they form:** from the accumulation of snow over many years and from the pressure of the layers above . The bottom then turns to ice, which makes a glacier move slowly.



Image IBCAO  
Data SIO, NOAA, U.S. Navy, NGA, GEBCO  
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**Ice Sheet or Ice Cap= large glacier**

Pack Ice: (Sea Ice) They are large sheets of ice found in the oceans around Antarctica and in the Arctic Ocean. Smaller ones are called *ice floes*.

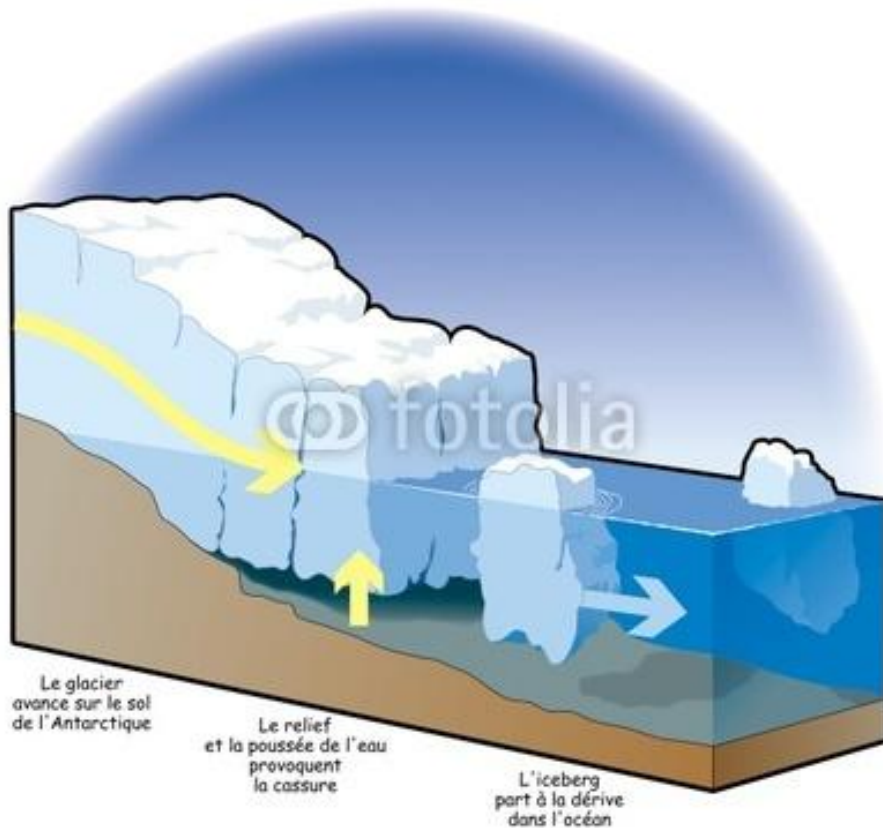




*Ice floes are frozen masses of seawater (saltwater) that float on the surface of the sea. The term is applied to any relatively flat piece of sea ice that is free moving – unlike [pack ice](#).*

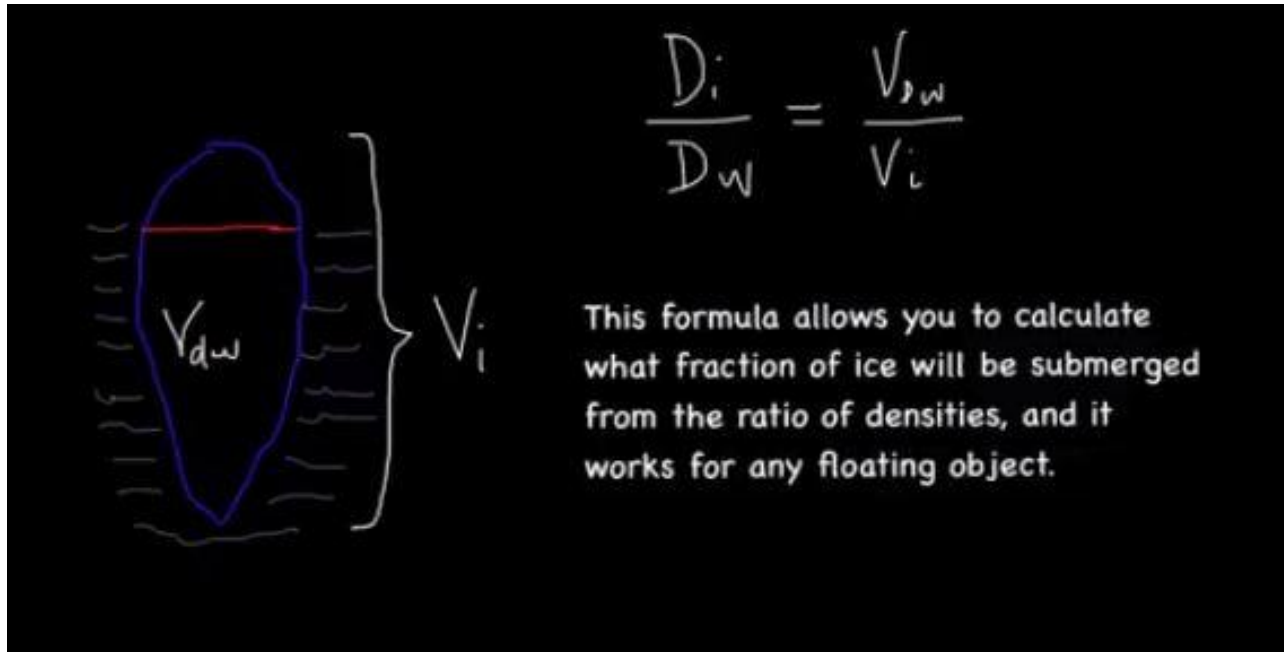
*The tracking of ice floes is important to both understanding critical environmental issues such as [global warming](#), and to aid in [Arctic navigation](#).*

## 2a) How are glaciers related to icebergs?



- When a glacier flows towards the edge of land and its tip breaks off into sea, an iceberg is formed.

## b) Proof that 90% of ice is submerged.(see board)



- 3. *As soon as ice falls into the sea there is a slight elevation in sea level.*

