



BENEFITS & HAZARDS OF GLACIERS

WEBQUEST

OBJECTIVE	Students will learn about the benefits and hazards associated with glaciers in a webquest using the <i>Views of the National Parks</i> multimedia education program.
GRADES	Middle or High School students
DURATION	1 50-minute class period
PROCEDURE	Students will work independently or in small groups to complete the <i>Benefits and Hazards of Glaciers</i> webquest.
MATERIALS	<ul style="list-style-type: none">▪ Copies of the webquest for each student▪ Computers for each student or pair of students▪ Access to the <i>Views of the National Parks</i> program (Internet or DVD)
KEY CONCEPTS	Reservoirs of water, commercial and tourism value, electric power generation, habitat, icebergs, surging, outbursts, ice avalanches, rising sea levels



BENEFITS & HAZARDS OF GLACIERS: WEBQUEST

NATIONAL EDUCATION STANDARDS:

Science:

NS.5-8.4 Earth and Space Science

- Structure of the earth system

NS.5-8.6 Personal and Social Perspectives

- Populations, resources, and environments
- Natural hazards
- Risks and benefits

NS.9-12.1 Science as Inquiry

- Abilities necessary to do scientific inquiry
- Understandings about scientific inquiry

NS.9-12.4 Earth and Space Science

- Geochemical cycles

NS.9-12.6 Personal and Social Perspectives

- Natural resources
- Natural hazards
- Risks and benefits

NS.9-12.7 History and Nature of Science

- Nature of scientific knowledge

Technology:

NT.K-12.2 Social, Ethical and Human Issues

- Students practice responsible use of technology systems, information, and software.

NT.K-12.3 Technology Productivity Tools

- Students use technology to enhance learning, increase productivity

Name: _____

DIRECTIONS

1. Access **Views of the National Parks** via a DVD or the internet, and choose the “**Multimedia Version**”.
2. Click on the **Knowledge Centers**, and choose the **Glaciers** knowledge center.
3. Enter the site by clicking on “**Explore Glaciers**”.
4. Click on the “**Monitoring**” option on the top toolbar.
5. Choose either the “**Benefits of Glaciers**” or “**Hazards of Glaciers**” side bar on the left side of the screen, depending on which section of questions you are answering.
6. After opening either the benefits or hazards section, you will see **5 buttons** on the bottom right. Click on the buttons to access information related to each set of questions.

BENEFITS OF GLACIERS

Reservoirs of Water:

1. From what source do a number of the world’s desert regions receive water?
2. Glacial runoff, the term used to describe the melted water that flows down off a glacier, contributes water to desert regions in times when they need it the most. When are these times?
3. Glacial deposits also act as reservoirs for _____.

Commercial Value of Glacier Ice:

1. List 4 ways that people all over the world have used glacier ice:
 -
 -
 -
 -

Electric Power Generation:

1. Electric power generation is enhanced from _____.
2. During the winter, how much of Switzerland’s energy production is generated by water released from glacier reservoirs?

Tourism:

1. List 5 ways that tourists can enjoy glaciers as recreational resources:

-
-
-
-
-

Habitats:

1. The increase or decrease in glacier area significantly impacts what 2 ecosystems?

2. Describe what happens in wetland communities as a glacier retreats and how this is beneficial to the species living in the area.

HAZARDS OF GLACIERS

Icebergs:

1. List 3 things that are put in danger by icebergs:

-
-
-

Surging:

1. Describe the surging and advancing of glaciers.

Outbursts:

1. Catastrophic outburst floods result from the failure of _____ .
2. Draining of glacier-dammed lakes occurs either _____ or _____ a glacier dam.
3. Describe the resulting destruction of an outburst flood and the major hazards.

Ice Avalanches:

1. Where is the threat from ice avalanches most apparent?
2. Which is more common: an ice avalanche or a snow avalanche?
3. Why is it difficult to monitor the development of ice avalanches?
4. List 2 reasons for continuing to research ice avalanches:
 -
 -

Sea Level Rise:

1. Where is most of the world's glacier ice held?
2. How much of the planet's freshwater supply is held in these places?
3. Describe, in detail, the 3 major consequences of rising sea levels.
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ANSWER KEY

DIRECTIONS

1. Access Views of the National Parks via a CD or the internet, and choose the “**Multimedia Version**”.
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BENEFITS OF GLACIERS

Reservoirs of Water:

1. From what source do a number of the world’s desert regions receive water?
FROM ADJACENT MOUNTAIN RANGES
2. Glacial runoff, the term used to describe the melted water that flows down off a glacier, contributes water to desert regions in times when they need it the most. When are these times?
DURING HOT, DRY SEASONS AND YEARS
3. Glacial deposits also act as reservoirs for **GROUNDWATER** .

Commercial Value of Glacier Ice:

1. List 4 ways that people all over the world have used glacier ice:
 - ***USED FOR REFRIGERATION***
 - ***USED AS AN EXPENSIVE WAY TO COOL DRINKS***
 - ***SOLD AS PURE MINERAL WATER***
 - ***SOLD AS LOCAL SNOW CONES***

Electric Power Generation:

1. Electric power generation is enhanced from ***MELTWATER FROM GLACIERS.***
2. During the winter, how much of Switzerland’s energy production is generated by water released from glacier reservoirs? ***HALF***

ANSWER KEY

Tourism:

1. List 5 ways that tourists can enjoy glaciers as recreational resources:
 - *SKIING*
 - *MOUNTAINEERING*
 - *SCENIC TOURS IN LARGE VEHICLES*
 - *SCENIC OVERFLIGHTS*
 - *BOAT EXCURSIONS*

Habitats:

1. The increase or decrease in glacier area significantly impacts what 2 ecosystems?
HIGH-MOUNTAIN and HIGH-LATTITUDE ECOSYSTEMS
2. Describe what happens in wetland communities as a glacier retreats and how this is beneficial to the species living in the area.
AS A GLACIER RETREATS, AN INCREASED AMOUNT OF SEDIMENT IS PROVIDED TO THE WETLANDS. THIS MAY CAUSE THE DEVELOPMENT OF SMALL LAKES, WHICH IN TURN PROVIDES ADDITIONAL HABITAT FOR THE SPECIES LIVING IN THE AREA.

HAZARDS OF GLACIERS

Icebergs:

1. List 3 things that are put in danger by icebergs:
 - *OCEAN TRANSPORTATION*
 - *OCEAN SHIPPING*
 - *OFFSHORE OIL INSTALLATIONS*

Surging:

1. Describe the surging and advancing of glaciers.
SURGING GLACIERS SUDDENLY AND DRAMATICALLY ACCELERATE, ADVANCING SEVERAL MILES IN A FEW MONTHS AND TRAVELING MANY TIMES THEIR NORMAL SPEEDS.

ANSWER KEY

Outbursts:

1. Catastrophic outburst floods result from the failure of ICE-DAMNED LAKES.
2. Draining of glacier-dammed lakes occurs either THROUGH or OVER a glacier dam.
3. Describe the resulting destruction of an outburst flood and the major hazards.
OUTBURST FLOODS CAN RESULT IN DENSE, VISCOUS DEBRIS FLOWS. THE MAJOR HAZARD OF DEBRIS FLOWS IS FROM BURIAL OR IMPACT.

Ice Avalanches:

1. Where is the threat from ice avalanches most apparent?
IN DENSELY POPULATED MOUNTAIN RANGES WITH GLACIERS
2. Which is more common: an ice avalanche or a snow avalanche?
A SNOW AVALANCHE
3. Why is it difficult to monitor the development of ice avalanches?
BECAUSE THEY OCCUR MOST FREQUENTLY AT HIGH ALTITUDES
4. List 2 reasons for continuing to research ice avalanches:
 - *MOUNTAIN RANGES ARE INCREASINGLY BEING USED FOR RECREATION*
 - *THE GENERATION OF HYDRO-ELECTRIC POWER*

Sea Level Rise:

1. Where is most of the world's glacier ice held?
IN TWO LARGE ICE SHEETS: ANTARCTICA AND GREENLAND
2. How much of the planet's freshwater supply is held in these places? *77%*
3. Describe, in detail, the 3 major consequences of rising sea levels.
 - *A RISE IN SEA LEVEL WOULD ALTER THE POSITION AND MORPHOLOGY OF COASTLINES;*
 - *CREATE OR DESTROY COASTAL WETLANDS AND SALT MARSHES AND INDUCE SALT-WATER INTRUSION INTO ACQUIFERS;*
 - *COASTAL EROSION.*

