Topic 4

Geomorphology and International Tourism: Niagara Falls

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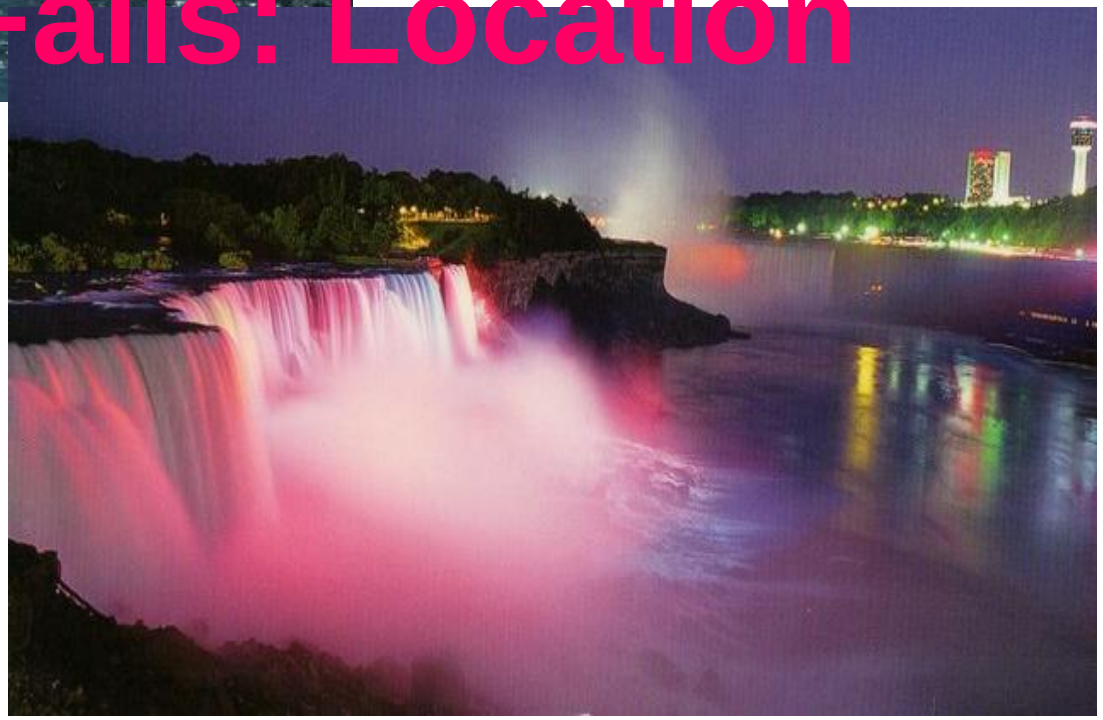
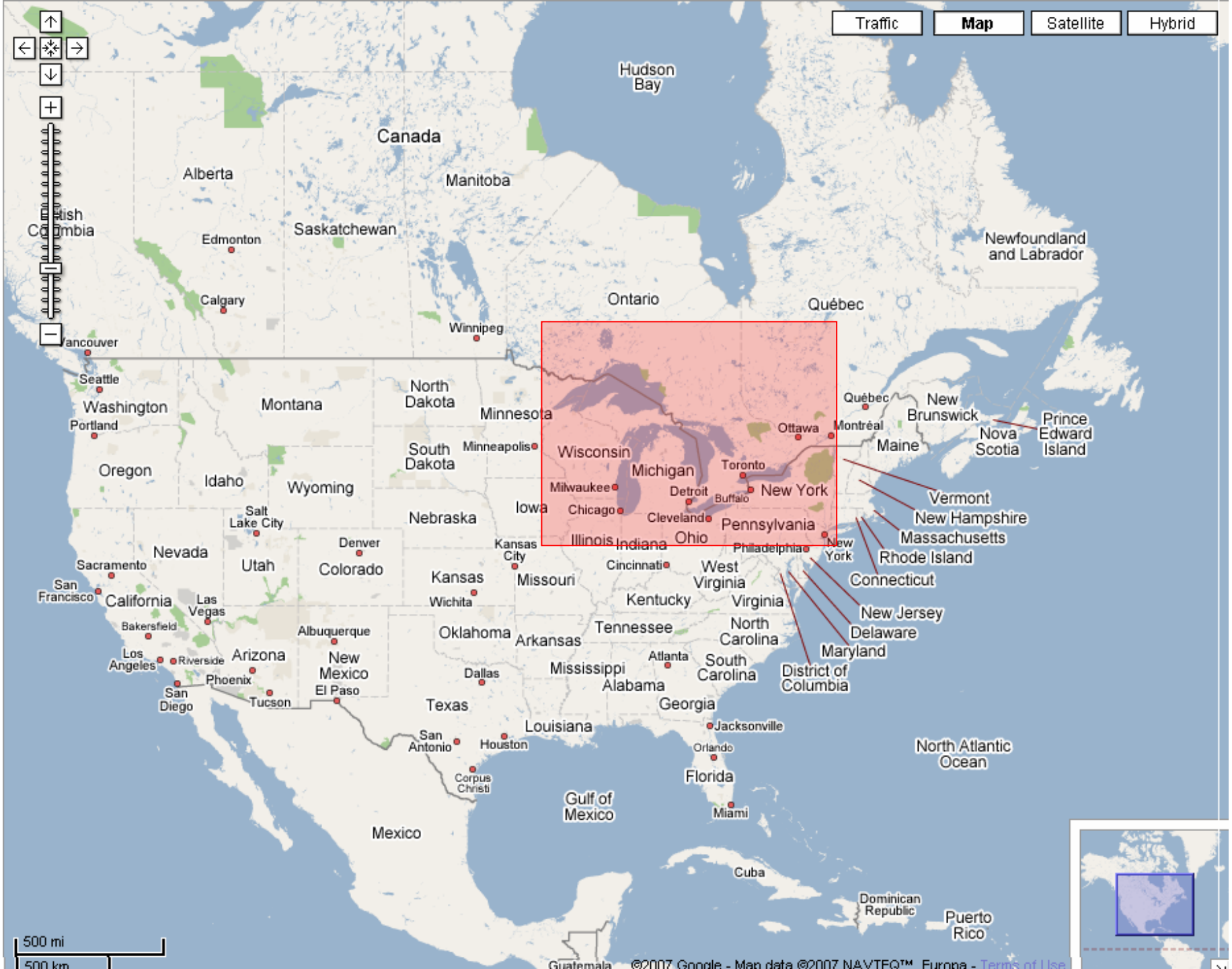
Niagara Falls: Location

Niagara Falls: Location

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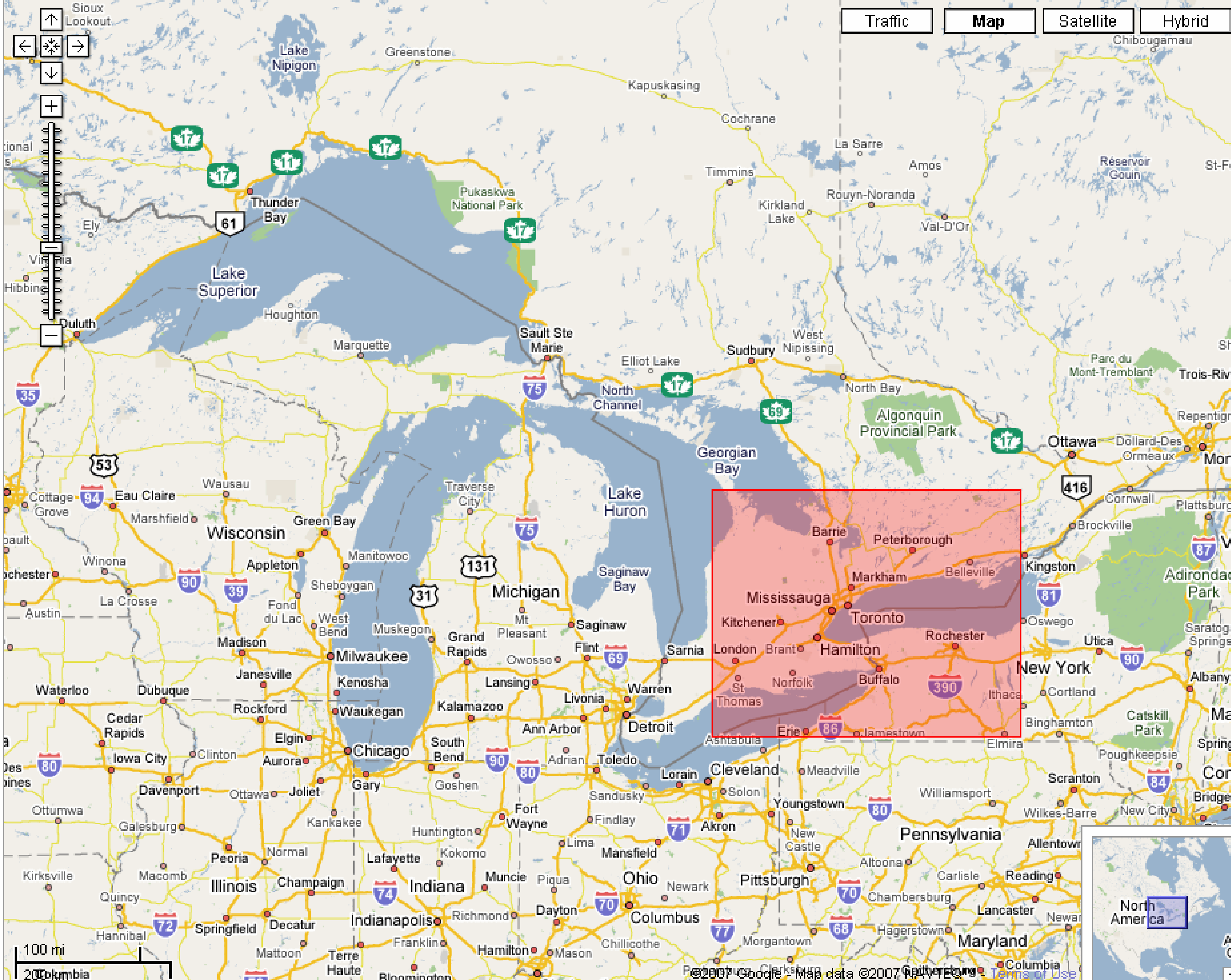

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Réservoir Gouin
Rouyn-Noranda
Kirkland Lake
Val-D'Or
Pukaskwa National Park
Thunder Bay
Ely
Virginia
Hibbing
Lake Superior
Houghton
Duluth
Marquette
Sault Ste Marie
Elliot Lake
Sudbury
West Nipissing
North Bay
Parc du Mont-Tremblant
Trois-Rivières
North Channel
Algonquin Provincial Park
Repentigny
Ottawa
Dollard-Des Ormeaux
Georgian Bay
Cornwall
Plattsburgh
Brockville
Lake Huron
Traverse City
Barrie
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Wausau
Cottage Grove
Marshfield
Wisconsin
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Manitowoc
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Rochester
Appleton
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Lake Erie
Niagara-On-The-Lake
Niagara Falls
St Catharines
Welland
Port Colborne
Tonawanda
North Tonawanda
Lockport
Buffalo
Depew
Hamburg
Toronto
Mississauga
Brampton
Oakville
Burlington
Hamilton
Pickering
Oshawa
Markham
Vaughan
Kitchener
Cambridge
Guelph
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Jamestown
Salamanca
Olean
Peterborough
Belleville
Barrie
Collingwood
Stratford
Woodstock
Lakeshore Medina
Albion
Brockport
Hilton
Webster
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Rainbow Bridge
N
U.S.A.
American Falls
Canadian
Horseshoe Falls
Canada

Canadian Horseshoe Falls

- Height 176 ft (54m)
- Width 2200 ft (675m)
- Volume of flow 90% of total

American Falls

- Height 184 ft (56 m)
- Width 1060 ft (320 m)
- Volume of flow 10% of total

Niagara Falls: Geomorphology

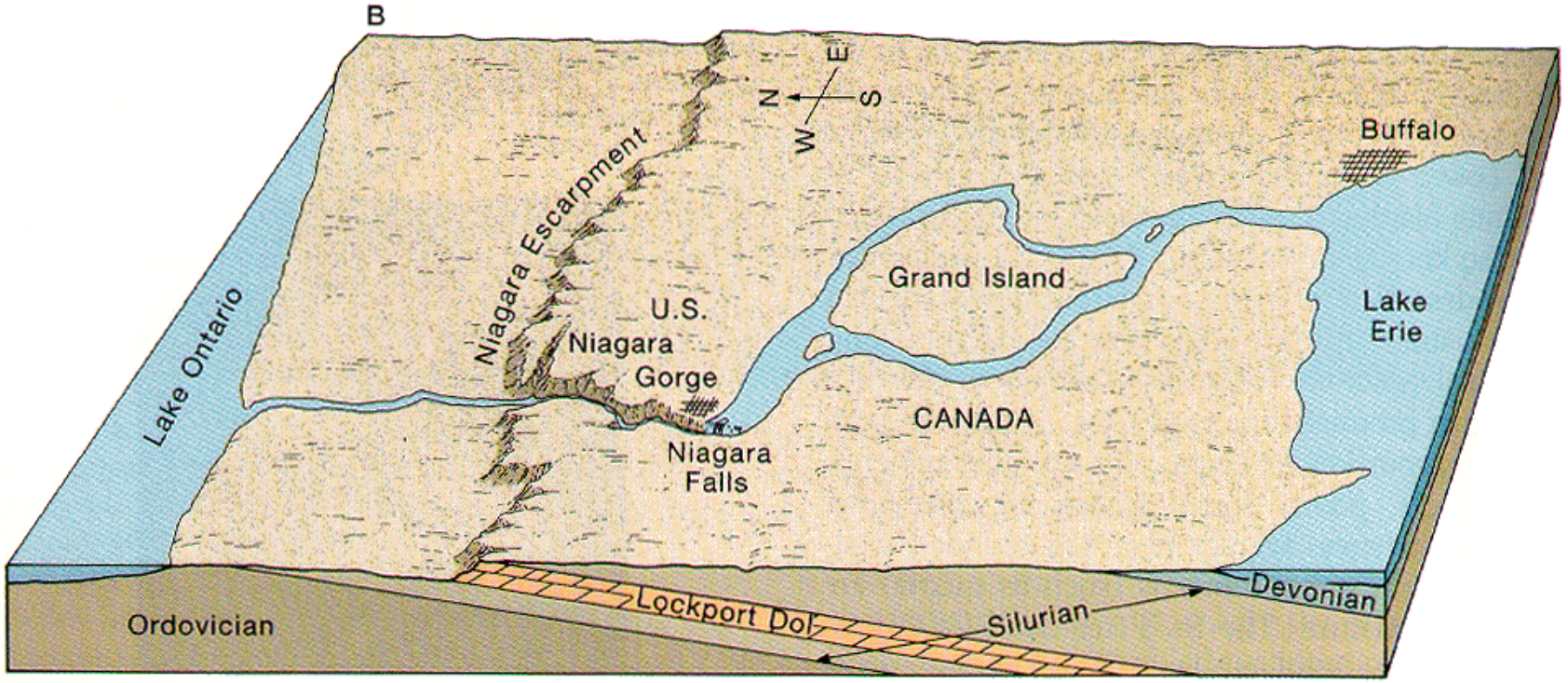
Geomorphology: Significance

- Actually relatively low and short river

BUT~!

- Enormous amount of water
  - 17,000 cubic meters per second
- Massive scale of retreat (Niagara Gorge)
  - 1 foot per year at current
- High Accessibility

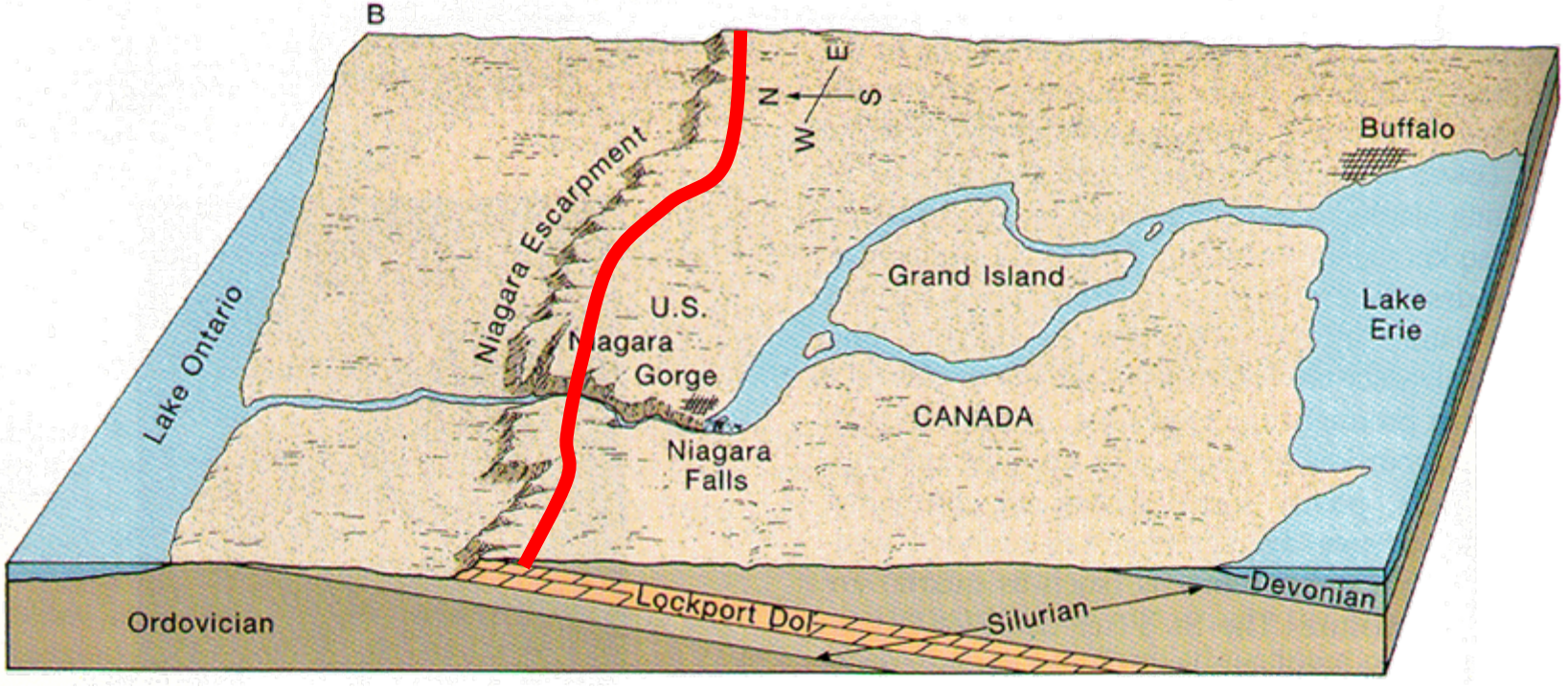
Geomorphology of the Niagara Falls



- Natural outlet from Lake Erie to Lake Ontario
- Elevation of the two lake : about 99m

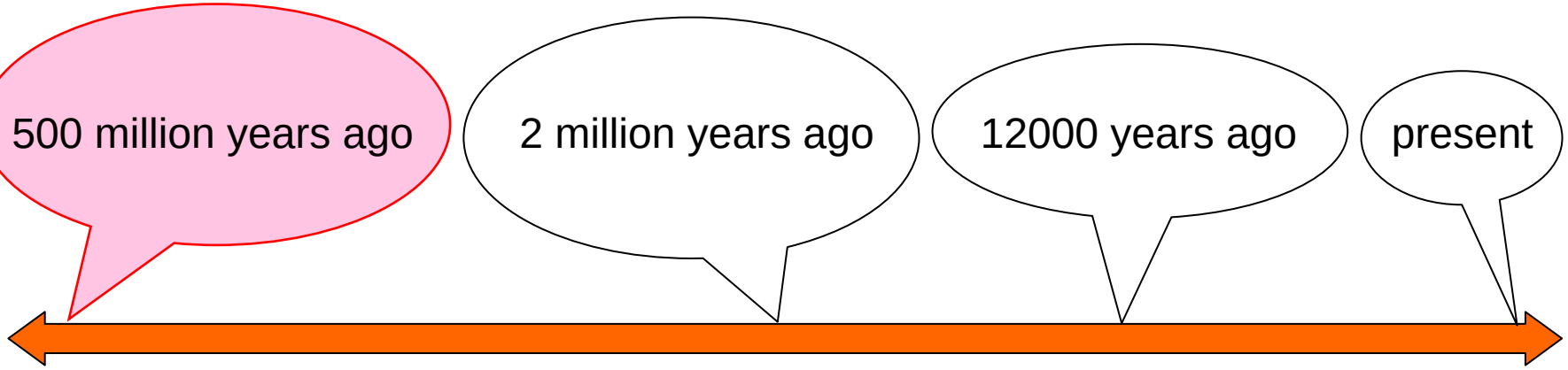
Geomorphology: Formation of the Niagara Falls

- About 12,000 years old
- **Niagara Escarpment**
- not a fault line or rift
- Weathered edge of a very ancient sea bottom
- Exists before the glaciations



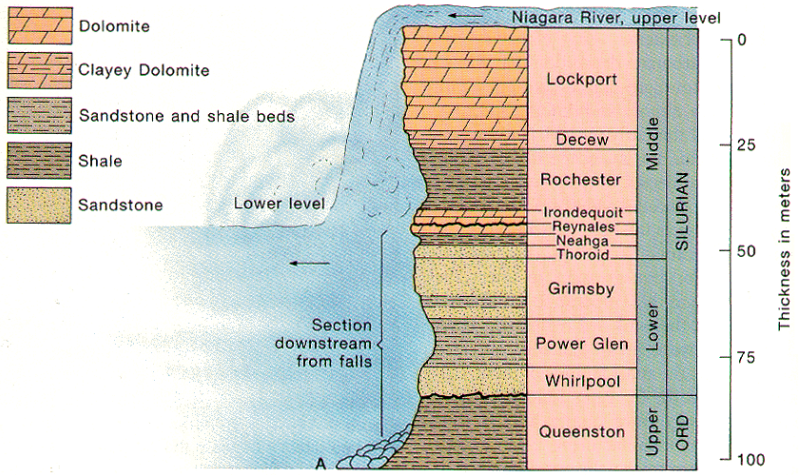
Geomorphology: Formation of the Niagara Falls

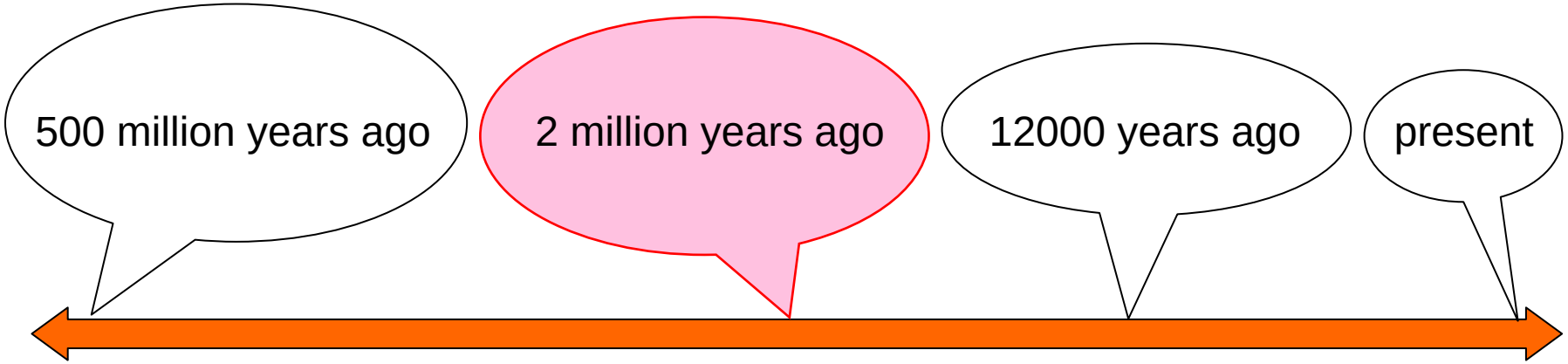
- Niagara: shallow sea
- Eastern America is dominated by the Taconic Mountains
- Erosion of the Taconic Mountains
- Sediment
- Compressed into different layers of rock



Geomorphology: Formation of the Niagara Falls

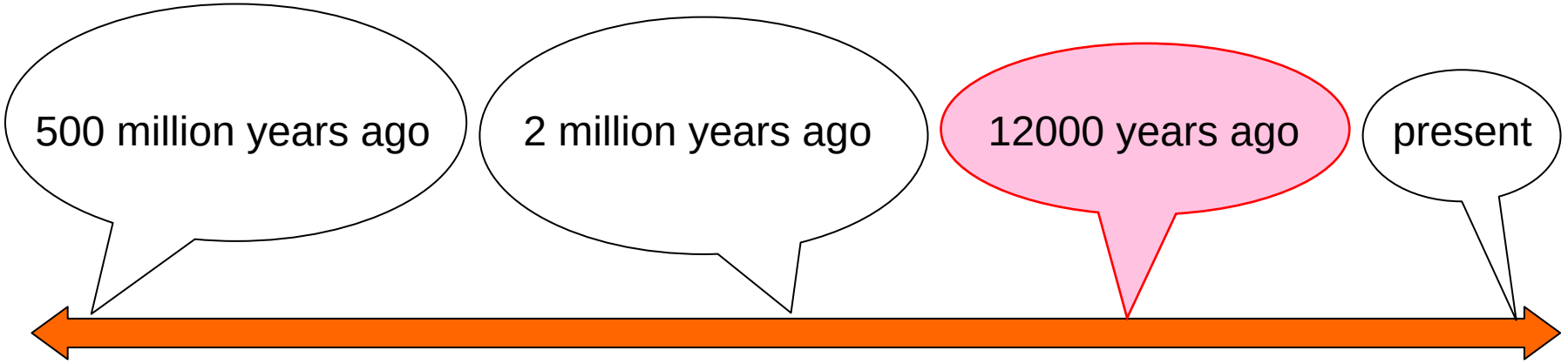
- Rock strata in the form of what today hold
- Earth climate change: become cooler
- The **glaciations** gorged out the Great Lakes basins



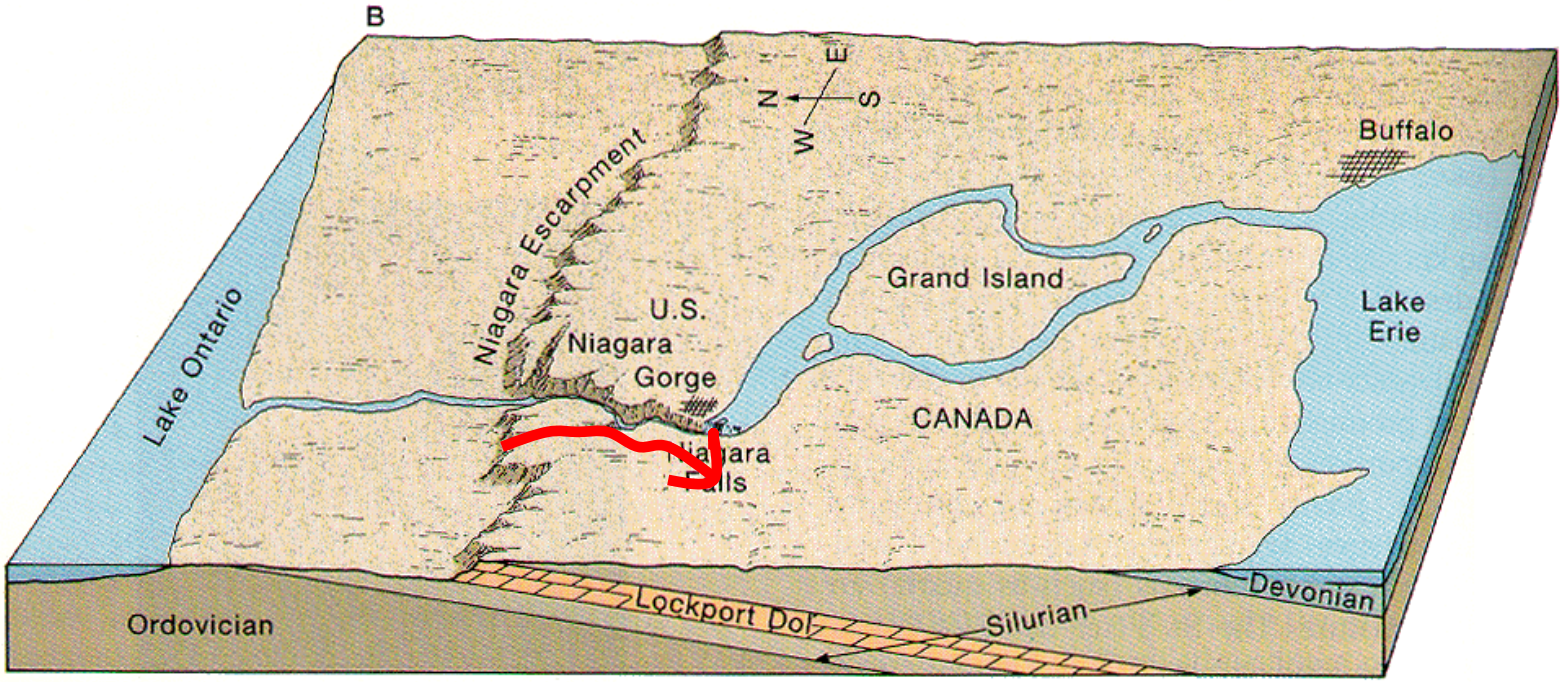


Geomorphology: Formation of the Niagara Falls

- Glaciers melted away
- water released into the upper Great lakes by the melting ice
- Retreating glaciers exposed the **Niagara escarpment**
- water of Lake Erie flow to north to Lake Ontario



Geomorphology: Erosion process



500 million years ago

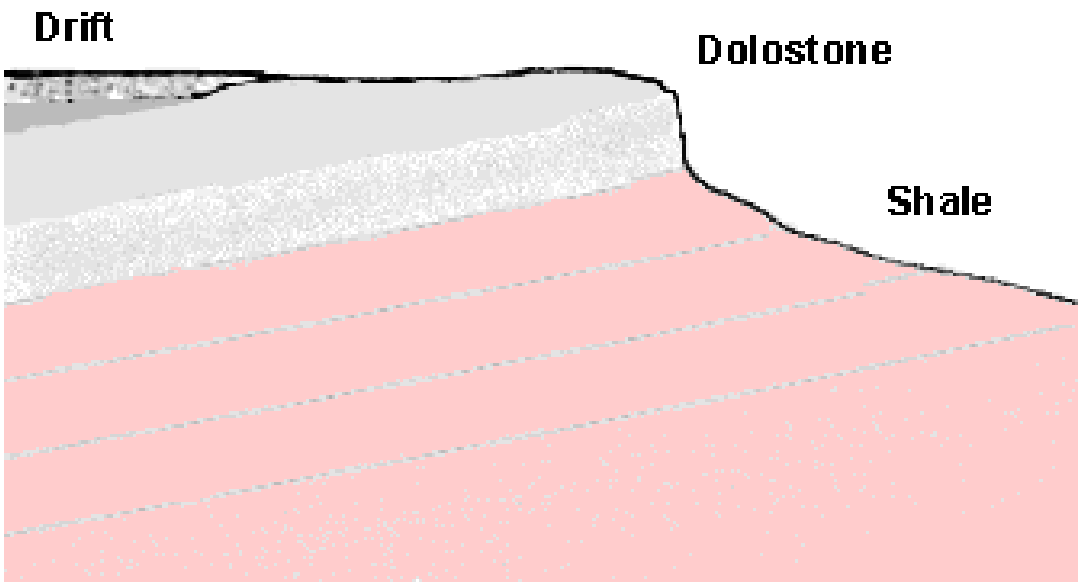
2 million years ago

12000 years ago

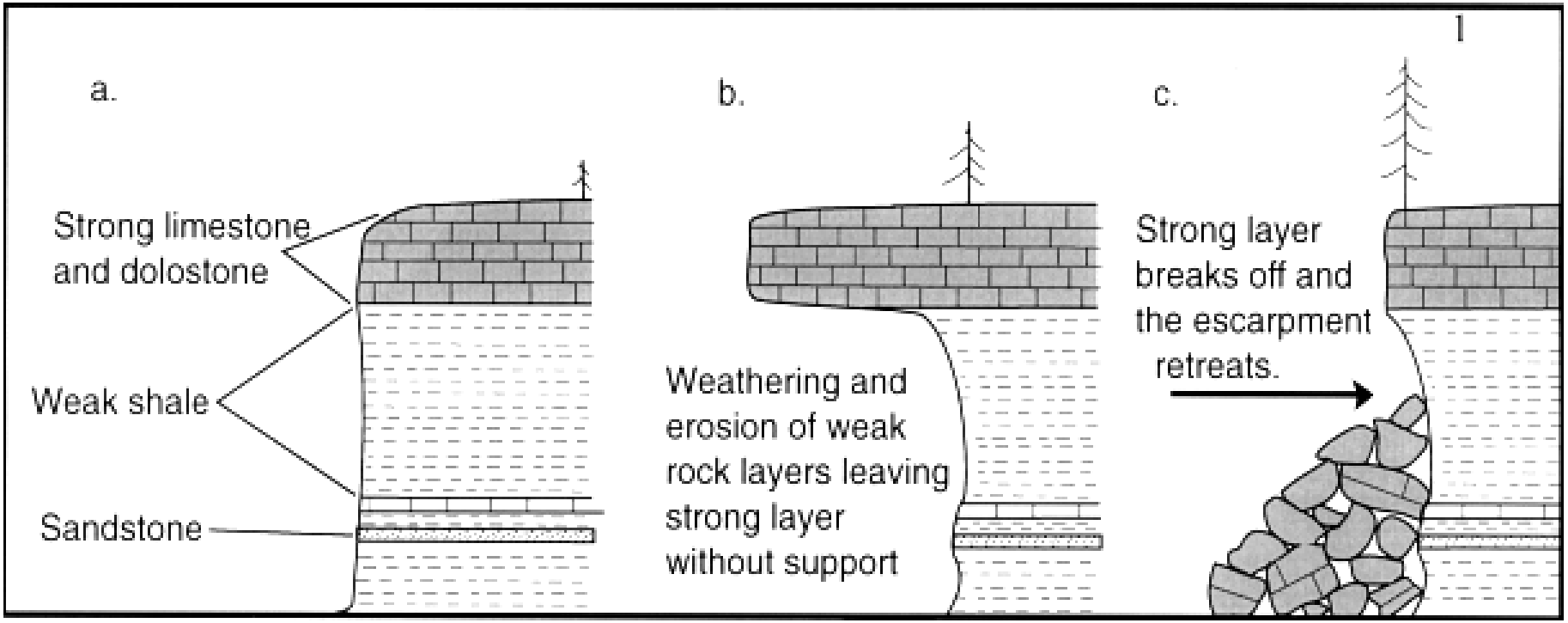
present

Geomorphology: Erosion process

- Erosion products: The **Niagara Gorge**
- Slightly inclined, different kind of rock layers
- Upper layer: limestone and dolostone
  - more resistant rock
- Lower layer: red shale
  - Queenston Shale
  - Softer, less resistant



Geomorphology: Erosion process

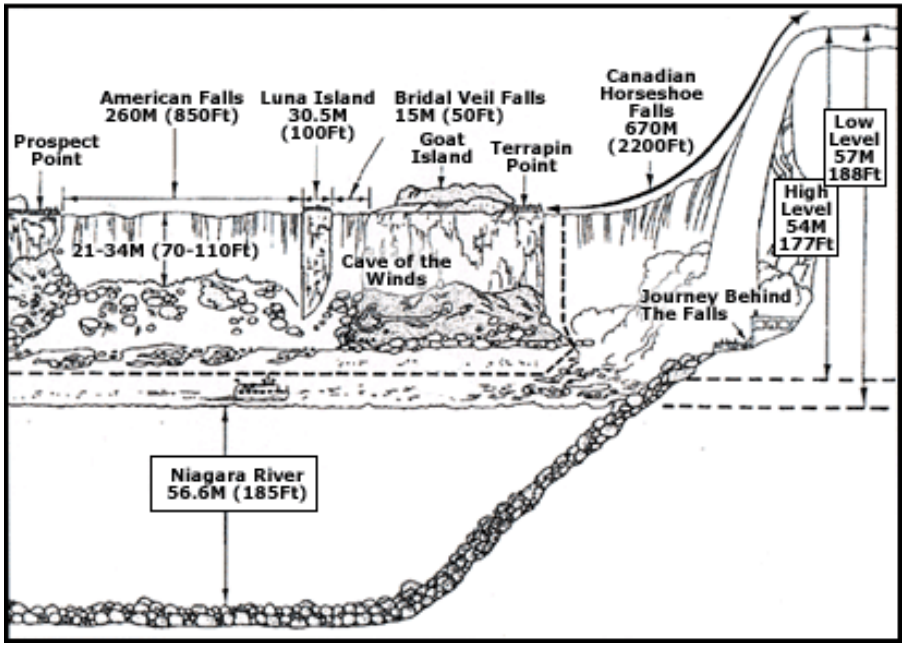


Geomorphology: Erosion process

- The Canadian Falls is eroding upstream at a faster rate
- The rate has been greatly reduced due to **flow control and diversion** for hydro-power generation
- Possible reduced rate :

  1 foot per 10 years

View of the Falls from the Canadian side



What we want to study?

- Are there any **potential problems** due to the retreat of the fall?
- What will be affected?
- Can the **measure** effectively control the erosion?

Why do we study tourism of Niagara Falls?

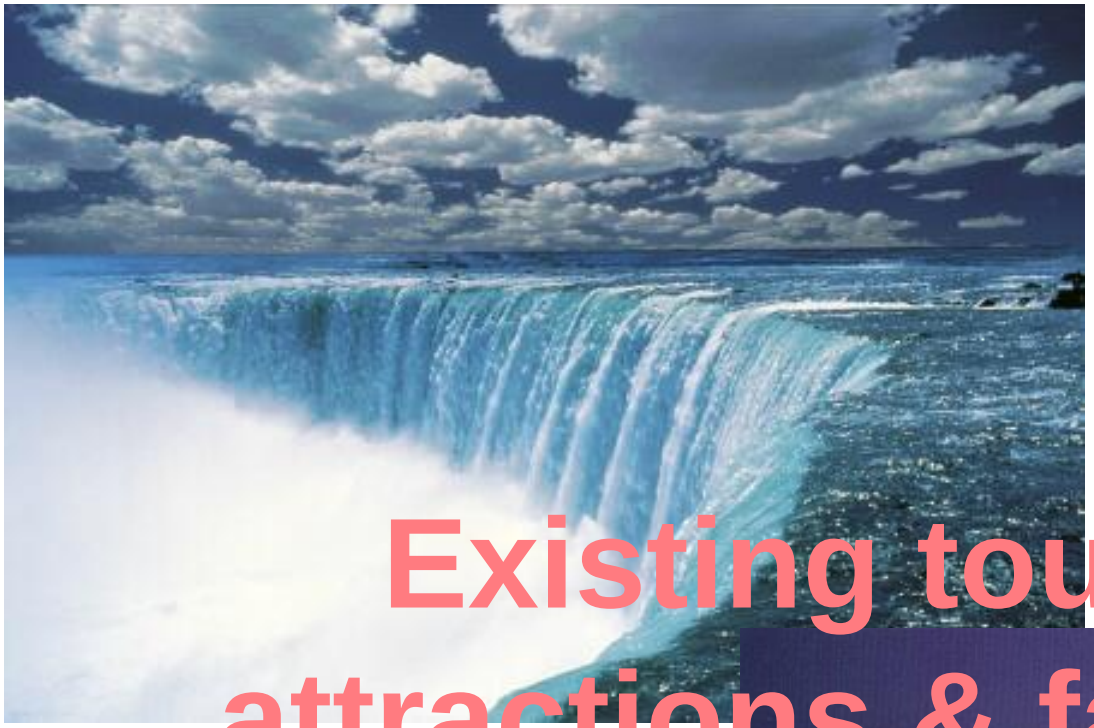
- One of the **Seven World Wonders**
- **Famous tourist site** for over a century
- Valuable source of **HEP**
- **Challenging project** for environmental preservationists
- preserve the **natural beauty** under overdevelopment while **meeting needs** of people

- Every year
- **12** million visitors

- 2007
- → expected no. of visitors = **20** million

- 2009
- → annual rate **28** million per year

- Therefore
- We need to investigate
- How it rises as an **international tourist spot**
- Is it really a perfect project that creates harmony btw preservation & development?
- Are there any **weaknesses**?
- Does it reach its **full capacity**?
- And is the tourism there **sustainable** in future?



Existing tourism attractions & facilities

1) Skylon Tower

- **Tallest** structure in the falls
- outdoor observation deck, glass elevators & an excellent revolving restaurant
- panoramic view of the Niagara area

2) Maid of the Mist

- Maid of the Mist **Boat Ride**
- Boats leave every 30 minutes
- open for business during **April**

3) Niagara Parks – Garden Trail

- "kitchen" gardens at two of Niagara Heritage Trail locations:
- McFarland House
- Old Fort Erie

- Queen Victoria Park

  -"heart" of Niagara Parks
- Oakes Garden Theatre

  - entranceway to

    Queen Victoria Park

- Queenston Heights Park
  – historic park

•Botanical Garden

- Butterfly conservatory

- Horse & Carriage Ride

Clifton Hill

- a) Dinosaur Park Mini Golf
  b) Sports Zone Bars & Games
  c) The Great Canadian Midway

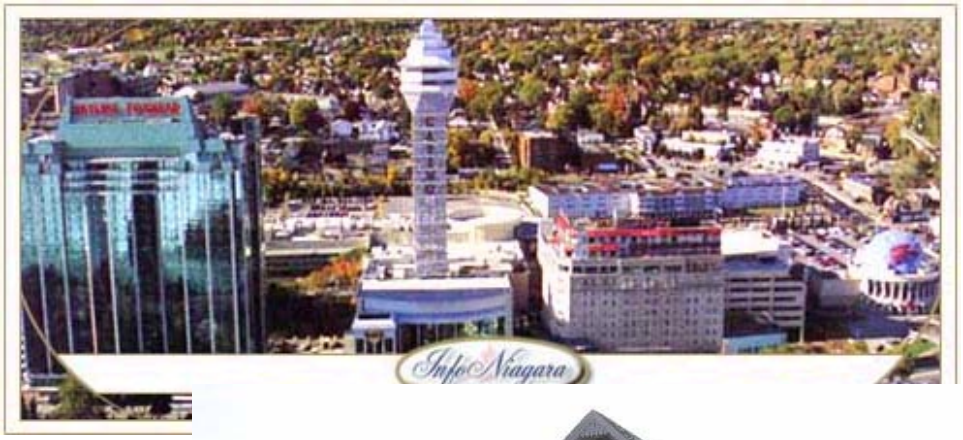
d) Movieland Wax Museum

e) Falls Tower Ride

f) FX Thrill Ride Theatre

Others

- Helicopter tour
- Souvenir city
- Whirlpool Aero Car
- Bird Kingdom
- Historical museums
- Casinos



Guided Tours

- Provided by the following companies

Environmental issues in Niagara Falls

Aquatic Pollution

- Sewage generated from tourists' visiting sites – was initially released directly into Niagara River
- During the early 1900's, it was common to dump garbage and refuse into the gorge and the river below
- The Boundary Waters Treaty (1909) was signed by Canada and the USA – prohibited either country from polluting shared waters (but seldom enforced)

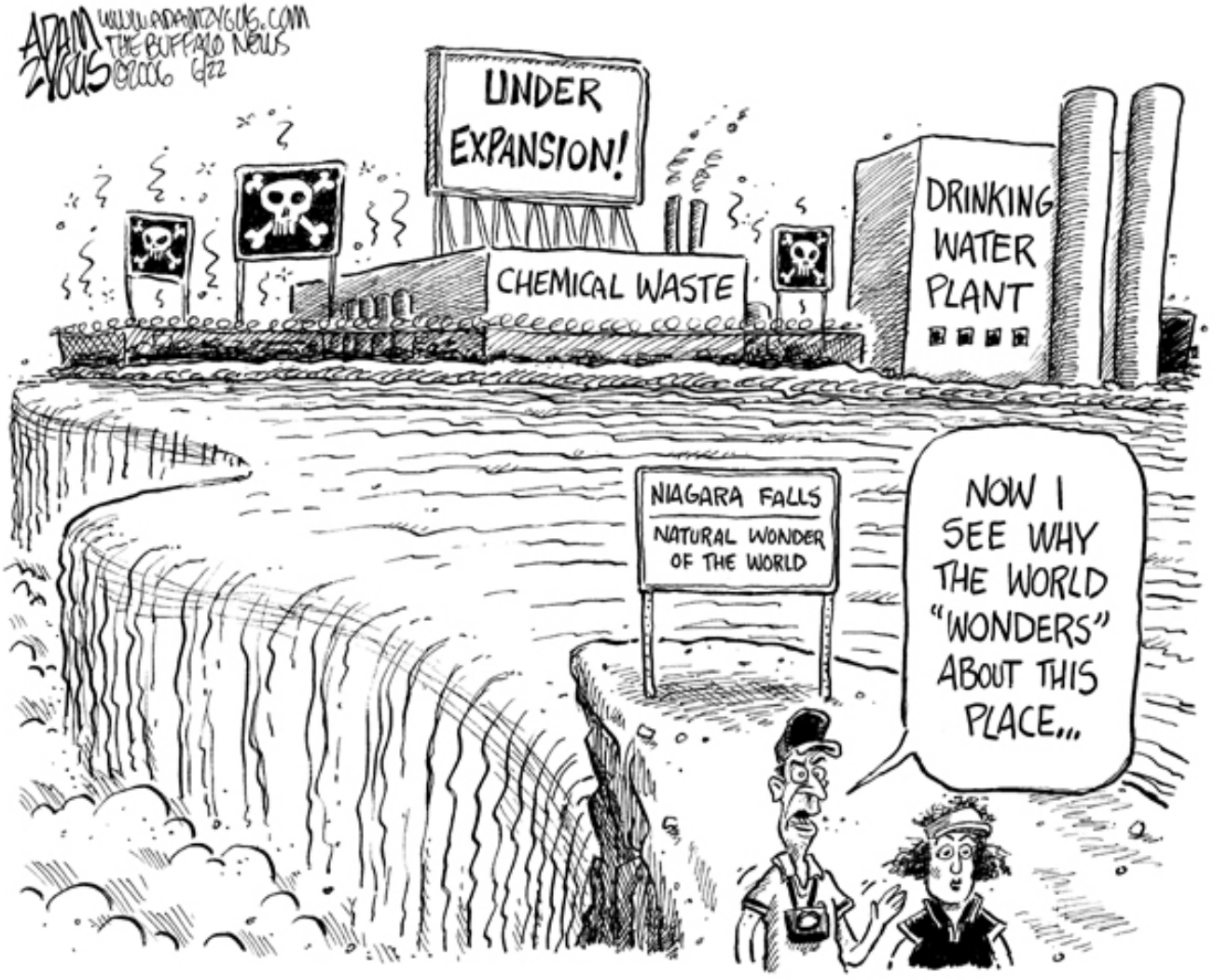
Aquatic Pollution

- The most serious problem is not from tourism
- Low-priced HEP → attractive to industry
- Many chemical plants established since the mid-1970s
- Pollution accidents, such as
  - 1981-1988: 110 million gallons by SCA Chemical Services (permitted by the state!!)
  - 1984: 9,000 pounds contaminants illegally dumped into the river
  - 1995: 150 hazardous waste sites along a three mile stretch of the Niagara River (identified by the USEPA)
- A threat to tourism?

Aquatic Pollution

- Today, 90% of all toxic waste pollution comes from chemical dumps left abandoned (since the plants were closed or move from the area)
- With all the toxic waste that has been poured during the past 100 years, it takes approximately 200 years for the river to rejuvenate
- Possible consequences
  - Polluting groundwater
  - Threat to drinking water source
  - Unpleasant smell and appearance of polluted river

Aquatic Pollution



Water Diversion

- Considerable amount of water is diverted from the Niagara River for power generation purposes
- Niagara River Water Diversion Treaty (1950)
- To preserve the scenic beauty of the Falls, it limits water diversions power generation as follows:
  - no less than 100,000 cubic feet of water per second (cf/s) from April 1st to September 15th, 8am-10pm
  - no less than 100,000 cubic feet of water per second (cf/s) from September 16th to October 31st, 8am-8pm
  - no less than 50,000 cubic feet of water per second (cf/s) from November 1st to March 31st

What we want to study?

- How the falls rise as an **international tourist spot**?
- Tourists' behaviour
- Tourists' satisfaction
- Is the tourism there **sustainable** in future?

The END

Thank you!!