

Hydroelectricity

Hydropower was used in ancient times to grind grains, pump water and for irrigation. In the late 19th century, hydraulics were used to produce electrical power. The world's first hydroelectric process was developed in 1878 in England by William George Armstrong. It was used to power a single arc lamp in his art gallery. The first power station was at Niagara Falls which began producing electricity in 1881.



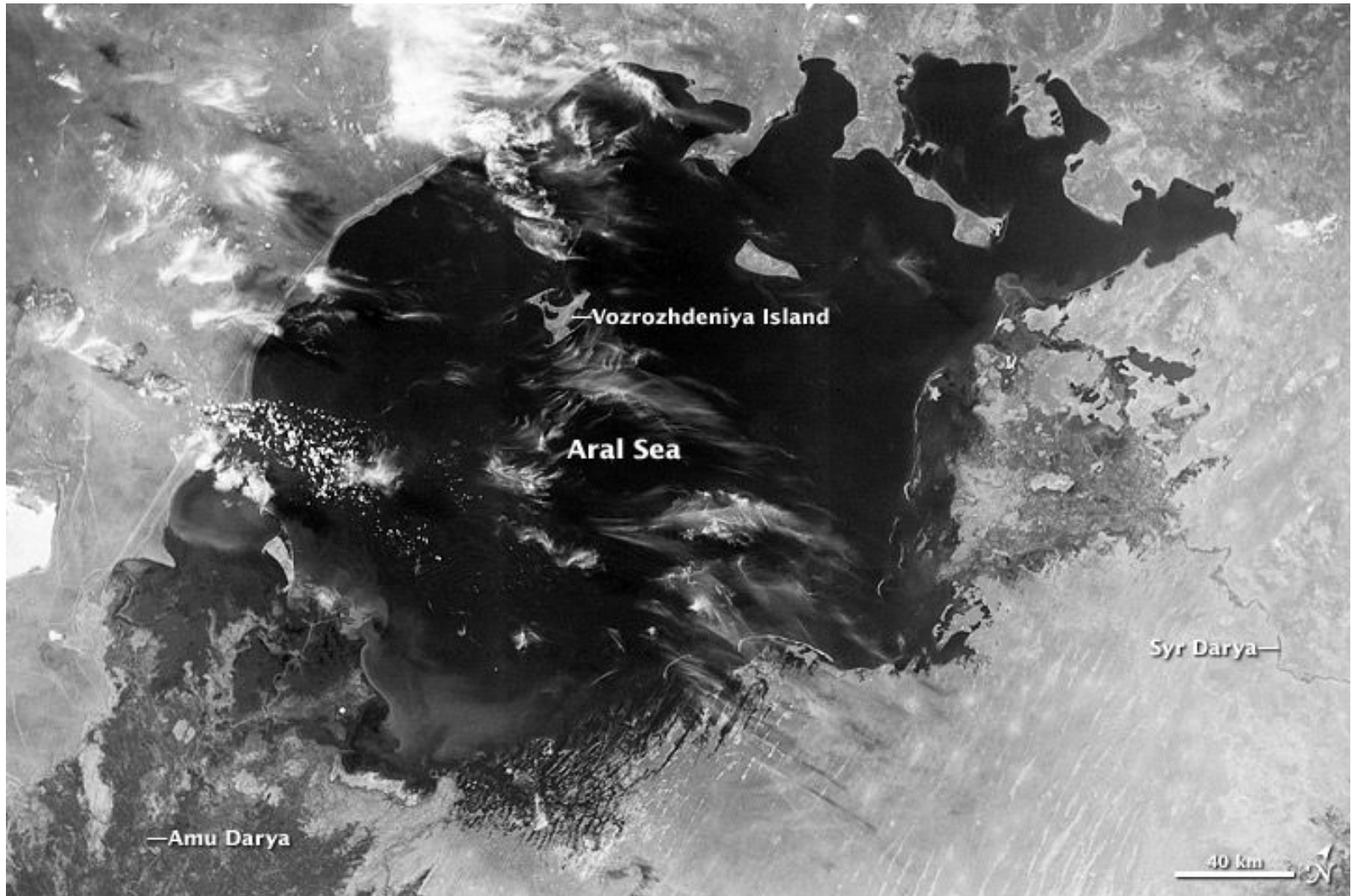
Hydroelectric Dams



Water News



The Aral Sea in 1964



Global Perspectives

- China is the largest hydroelectricity producer, with 721 terawatt-hours of production in 2010, about 17 percent of domestic electricity use.
- Paraguay obtains 100% of its electricity from hydroelectric dams
- Norway 98–99%
- Brazil, Canada, New Zealand, Austria, Switzerland, and Venezuela – majority of internal electric energy production
- 16 percent of global electricity generation.

<http://www.amusingplanet.com/2013/10/7-ambitious-hydroelectric-power-projects.html>

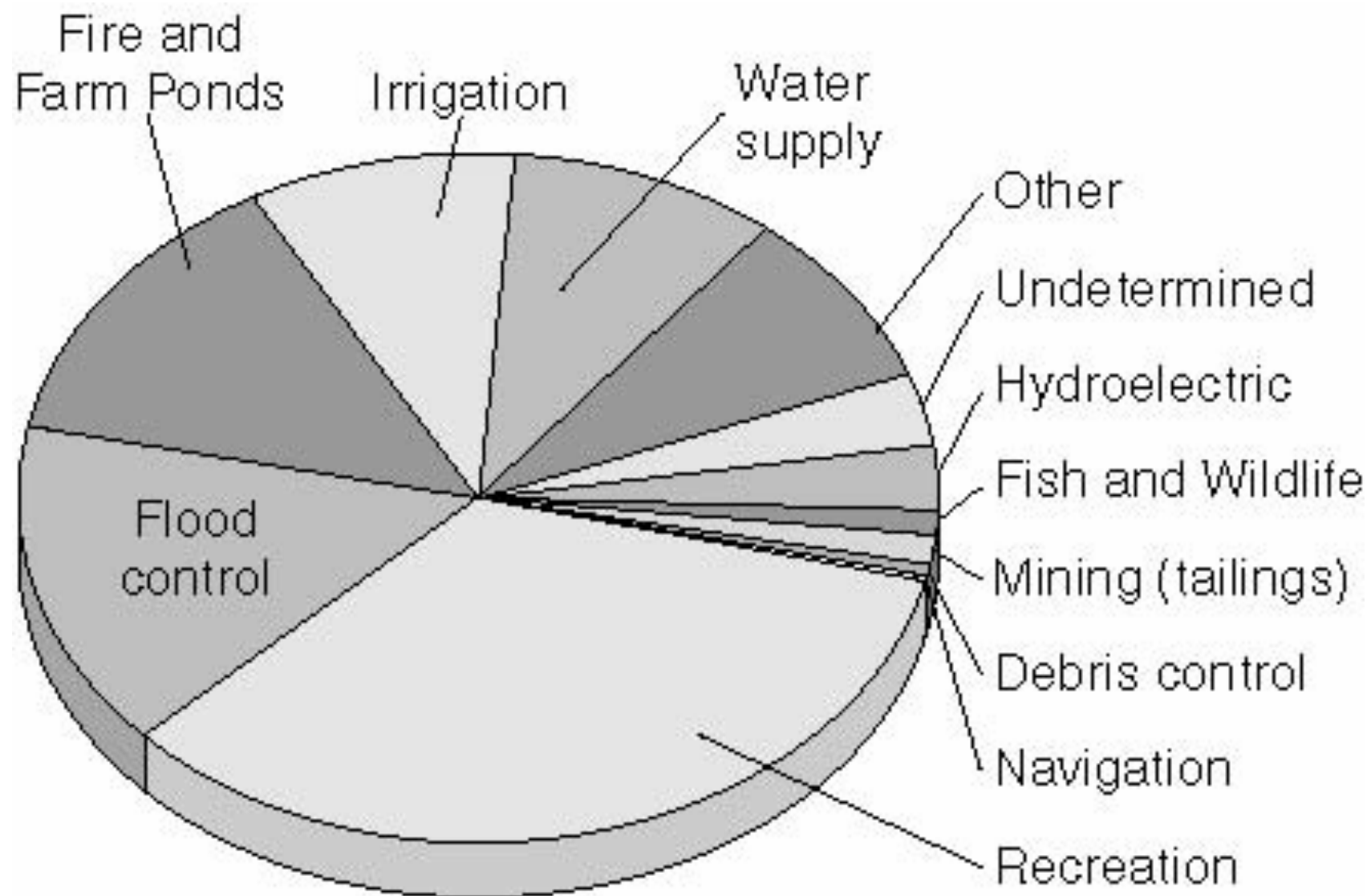
Dams: costs/benefits

Positive

- Economic growth
- Food production
- Flood management
- Recreation enhancement

Negative

- Loss of wildlife habitat
- Destruction of river corridors
- Displaced peoples
- Methyl mercury

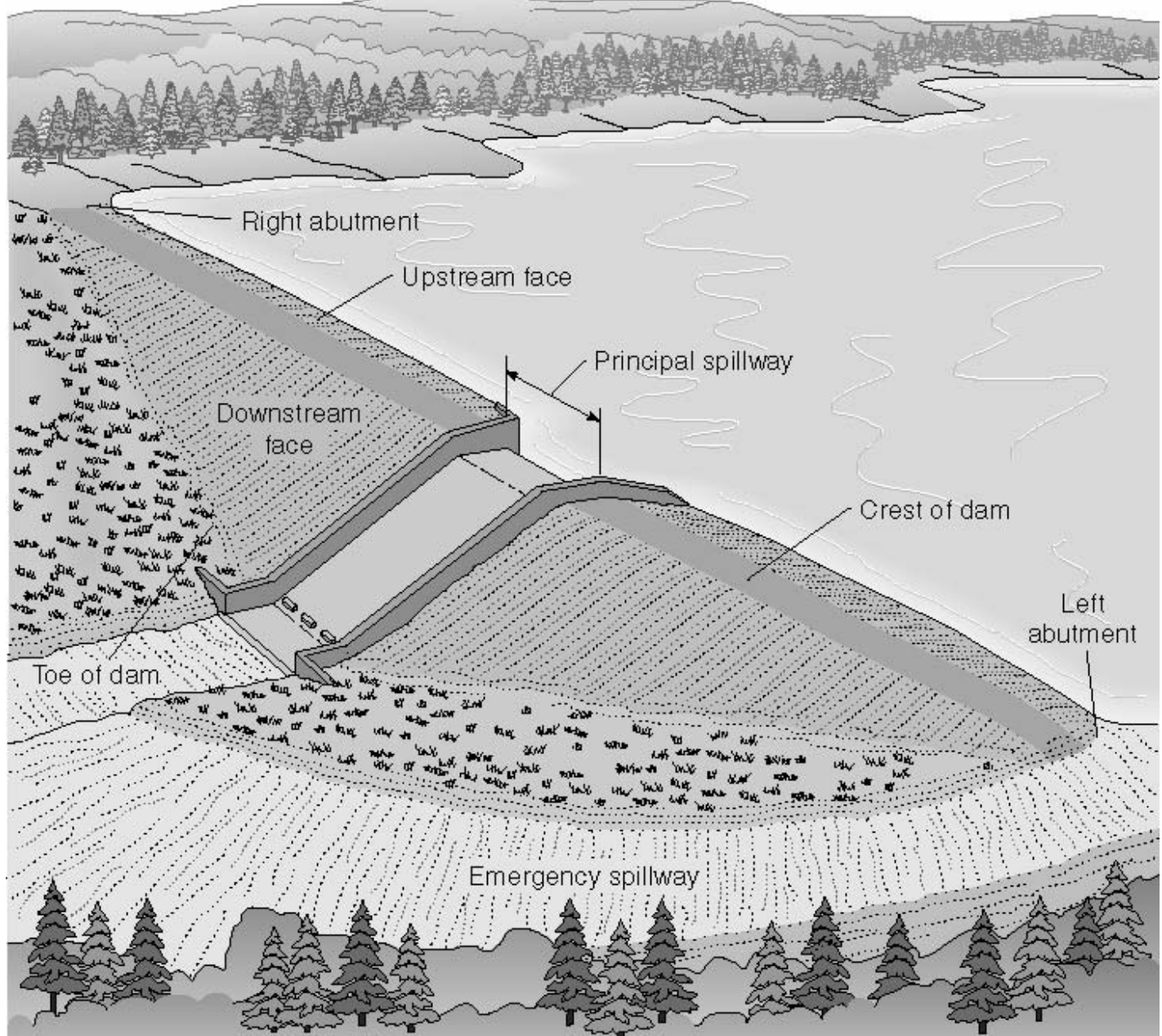


**TABLE 7.1 Primary Purposes of Dams
in the United States, 2001**

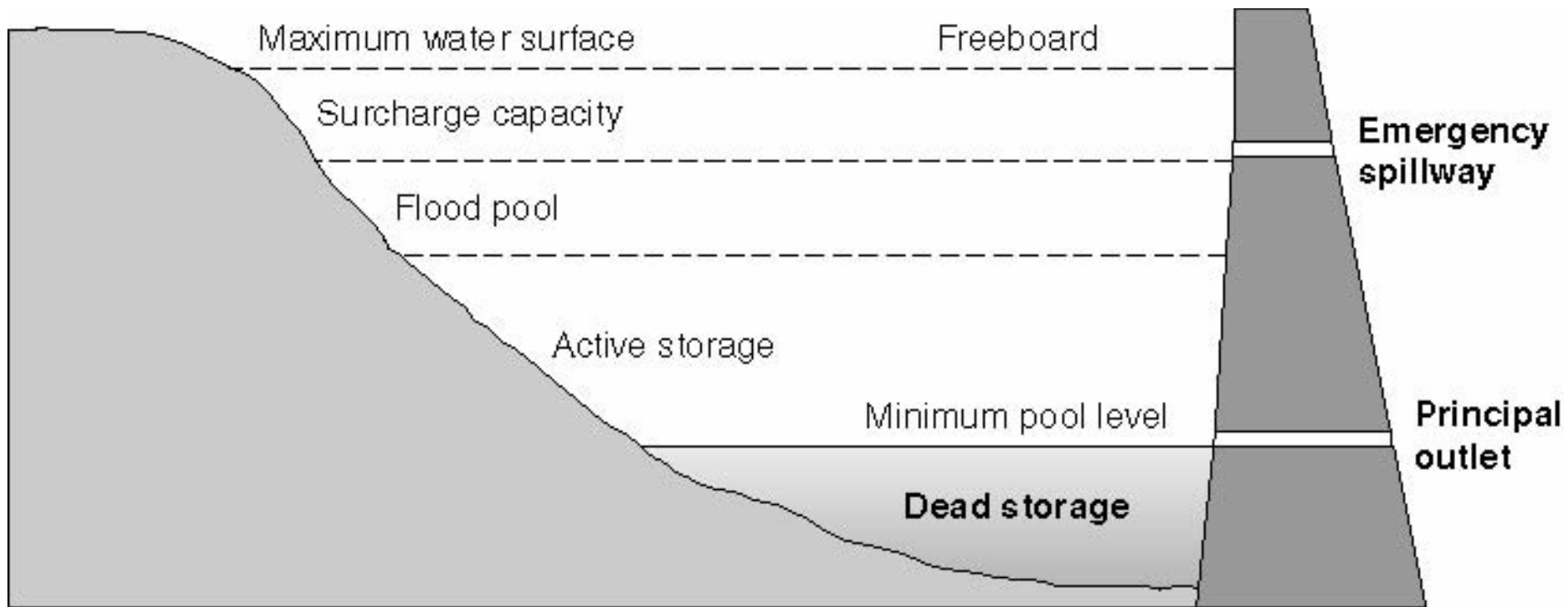
Primary Purpose	% of Total	Number of Dams
Recreation	33.8	26,152
Flood control	15.6	12,088
Fire and farm ponds	13.7	10,589
Irrigation	9.5	7,392
Water supply	9.4	7,297
Other	8.1	6,279
Undetermined	3.5	2,647
Hydroelectric	2.9	2,280
Fish and wildlife	1.4	1,046
Mining (tailings)	1.3	991
Debris control	0.5	396
Navigation	0.3	250
Total	100%	77,407

Source: U.S. National Inventory of Dams, U.S. Army Corps of Engineers, January 2001.

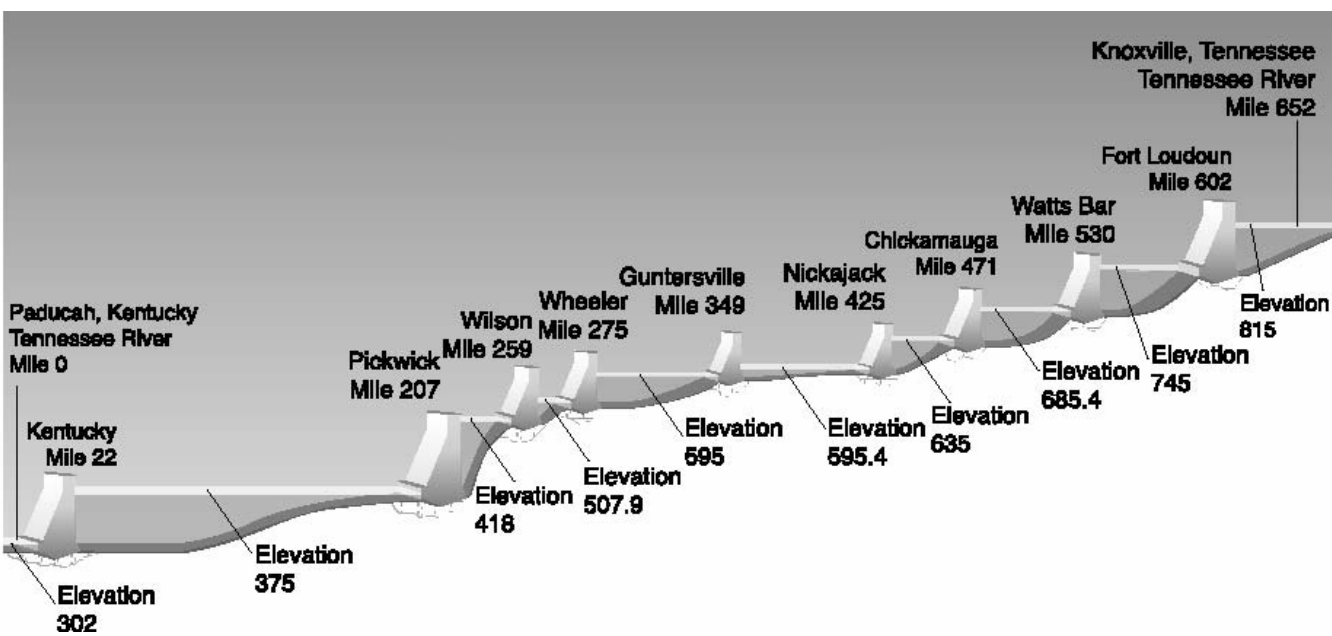
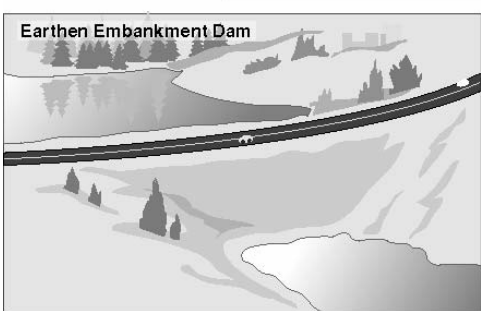
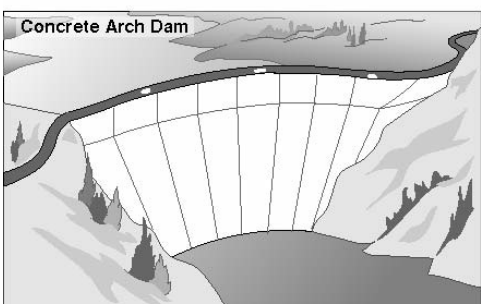
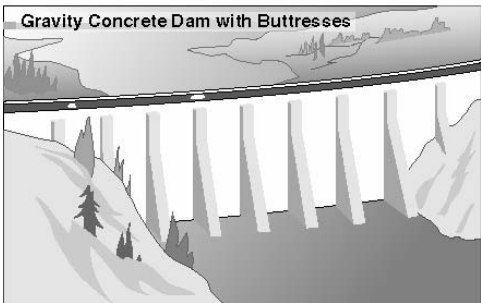
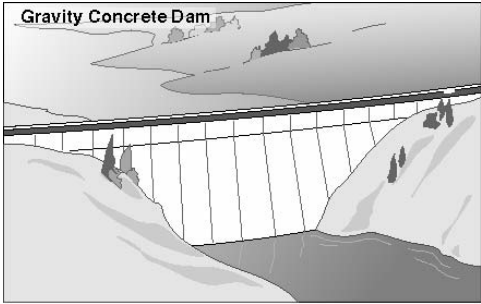
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CLASSIFICATION OF PRINCIPAL STORAGE ZONES IN A CROSS SECTION OF A MULTI-PURPOSE RESERVOUR



River dams (locks, levees) form a staircase of reservoirs that stretch the entire length of the Tennessee River

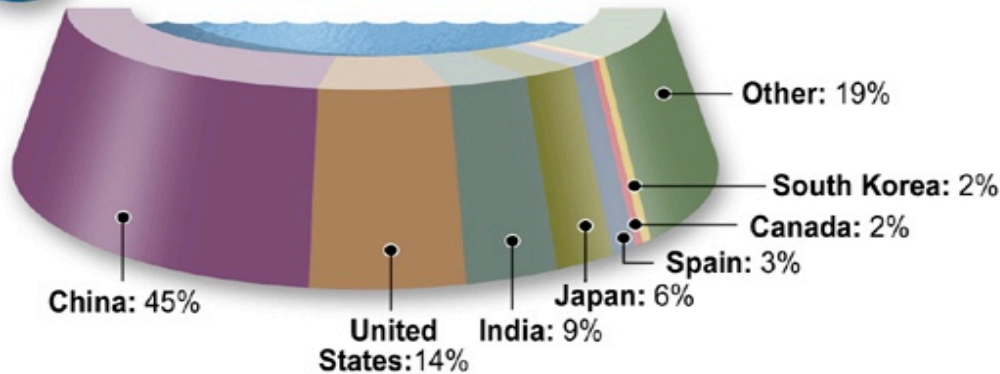


Global Overview of Dam Location



Distribution of large dams worldwide

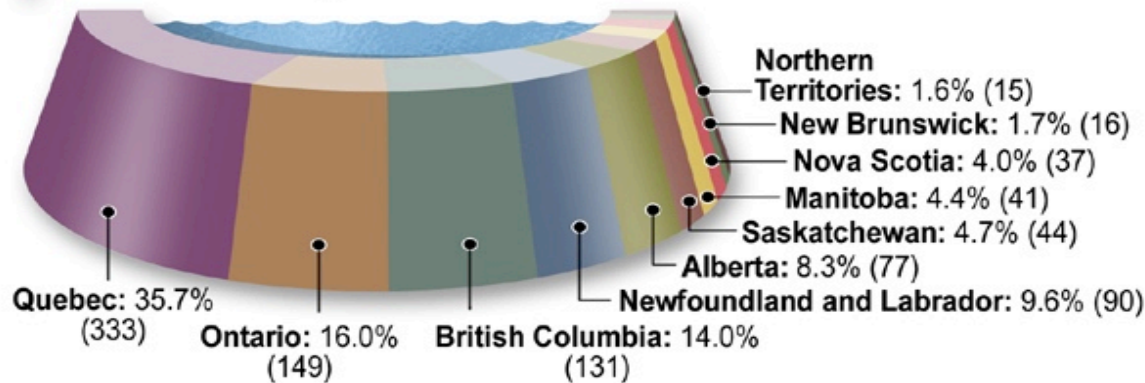
Shown as a percentage of total large dams worldwide



Distribution of large dams in Canada

Shown as a percentage of total large dams in Canada.

Actual numbers appear in brackets.



* According to the International Commission on Large Dams, a large dam is one with a height of 15 m or more from the foundation, or a height of 5 to 15 m with a reservoir volume of more than 3 million cubic metres.

In 2000 there were over 45,000 “large dams” world wide.

Half of the world’s existing large dams are built strictly for irrigation, while the remainder are build for hydro generation, water supply and flood control.

Powering the world with water

In 2000, one-third of the world's countries relied on hydropower for more than half their electricity supply and large dams generated 19% of electricity overall. About 70% of hydroelectric power generation potential has already been tapped in the developed world; only about 10% in the developing world.

The world's largest hydroelectric plants

Numbers indicate megawatts of installed generating capacity

1. Three Gorges	China	18 200 MW
2. Itaipu	Brazil/Paraguay	12 600
3. Grand Coulee	United States	10 100
4. Guri	Venezuela	10 100
5. Tucuruí	Brazil	7 500
6. Sayano-Shushensk	Russia	6 400
7. Krasnoyarsk	Russia	6 100
8. Corpus-Posadas	Argentina/Paraguay	6 000
9. La Grande 2	Canada	5 300*
10. Churchill Falls	Canada	5 200

* The combined output of all eight dams at James Bay is 15 237 MW

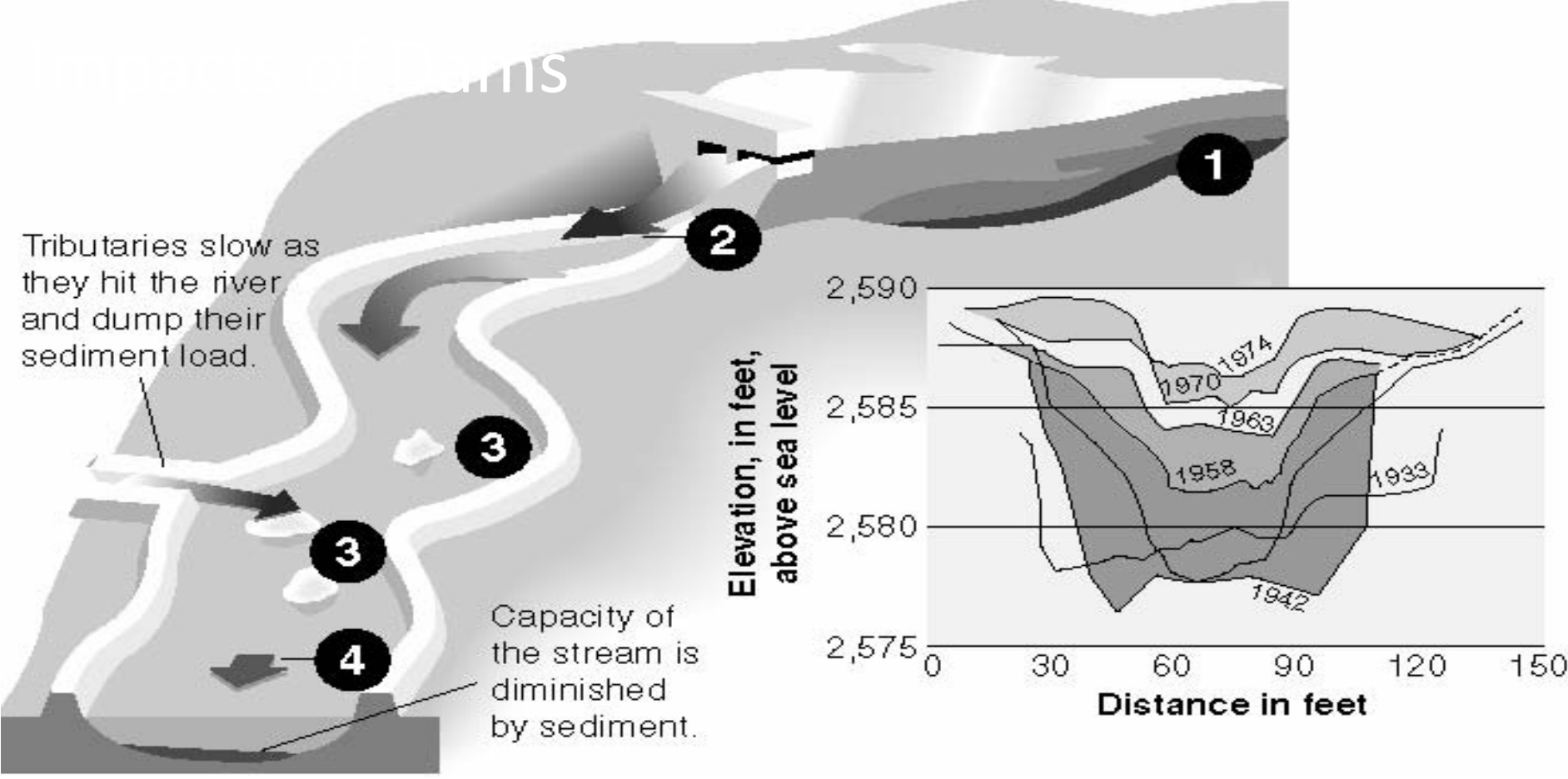


How much electricity is that?

La Grande 2 on James Bay, Canada's largest hydroelectric plant, produces enough hydro to constantly light a 60-watt light bulb for more than 10 000 years.**

** Assuming the plant is run at maximum capacity around the clock.

CHANNELS



- Dams change behaviour of rivers- sediment load settles behind a dam.
- Downstream, water released through outlet pipes causes channel erosion.
- Farther downstream, the opposite can occur with silt forming islands and sandbars.

