Water Resources

Why is water so important?

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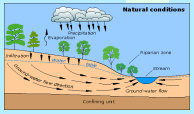
PowerPoint 97

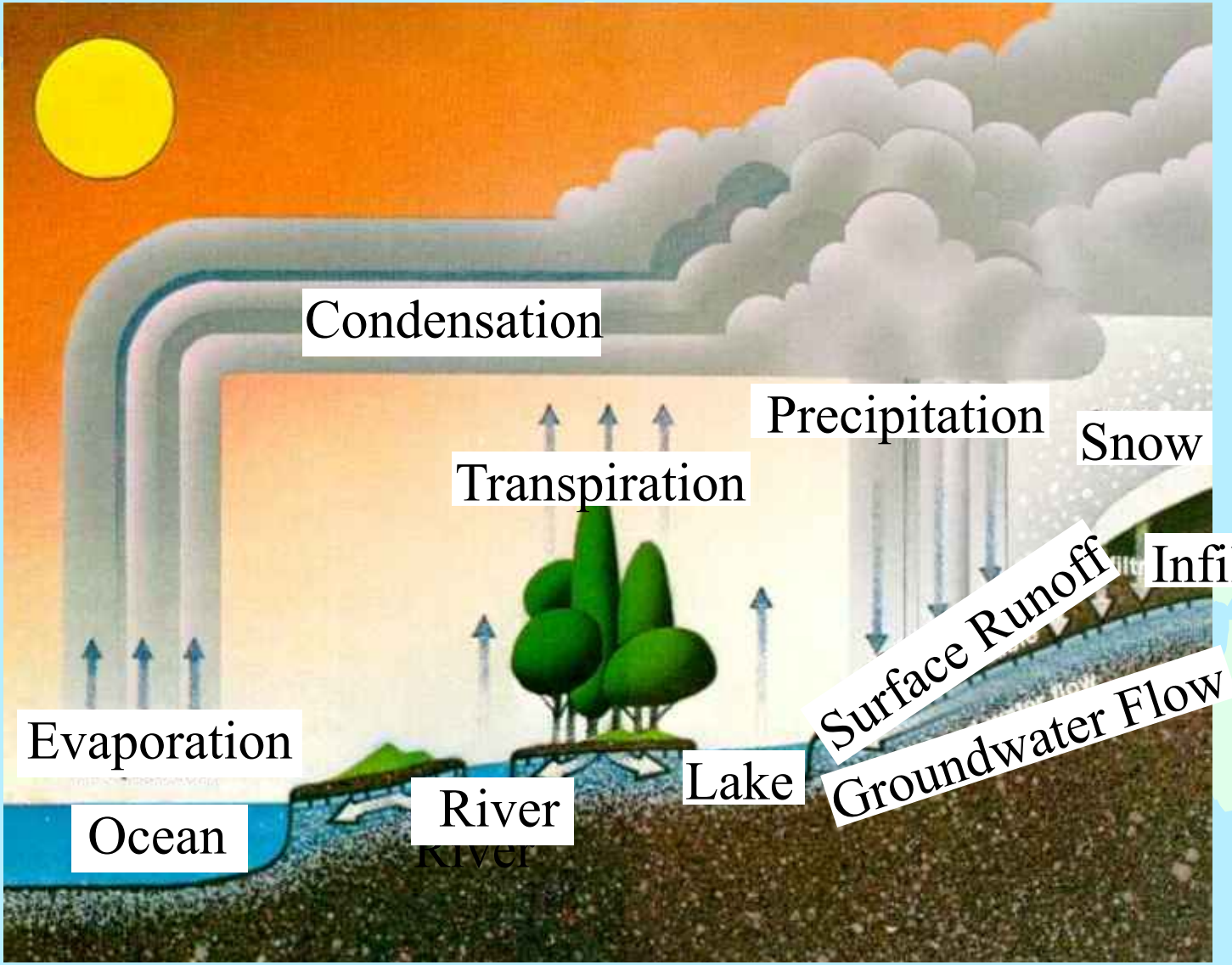


To enlarge an image, click on it

Key Points

- How much water is there?
- Using surface water (lakes and rivers)
- Using ground water (aquifers and wells)
- Pollution of rivers and wells
- Towards better management of the water supply

The Hydrologic Cycle



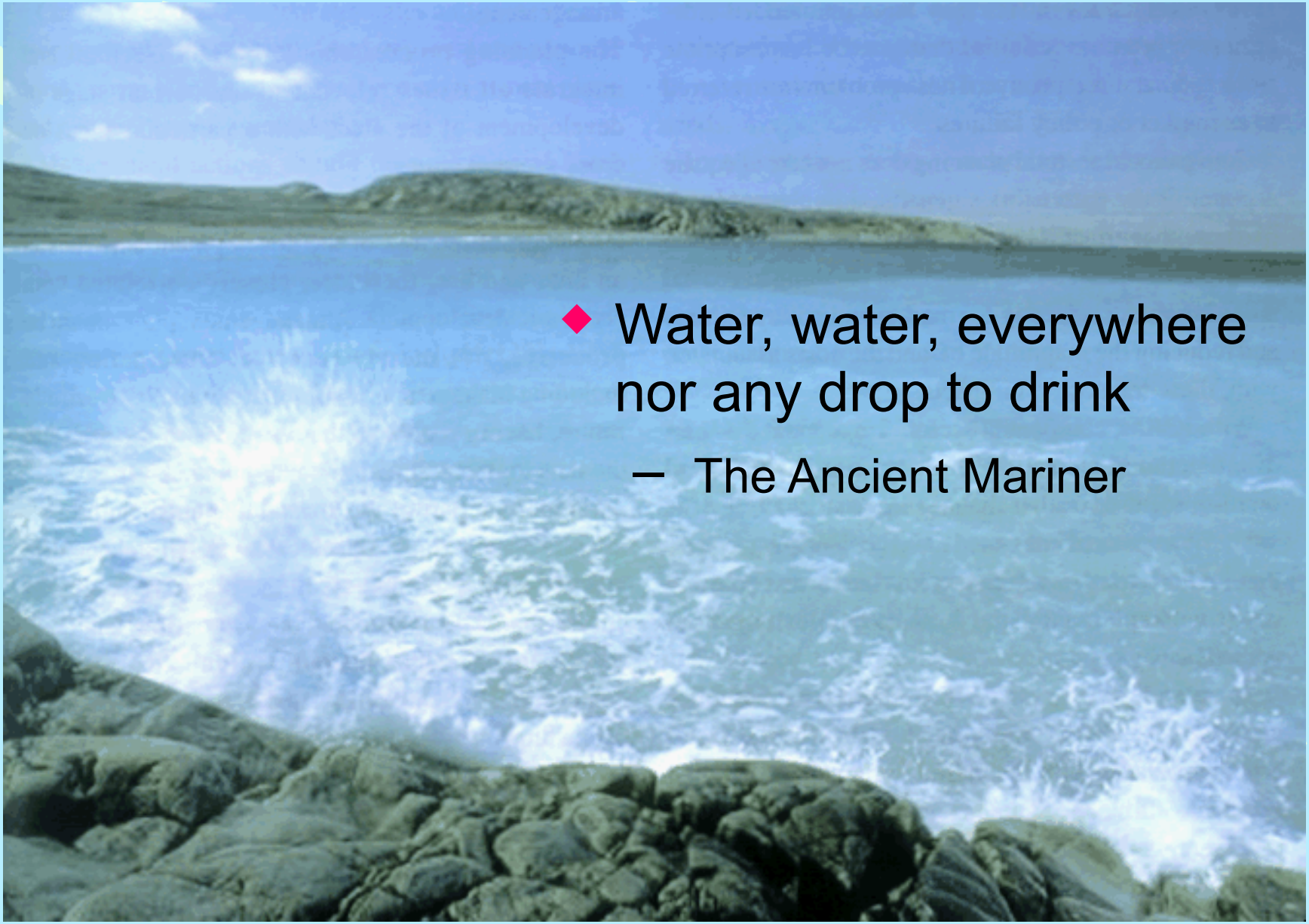
- Iowa's Natural Heritage

Where is the water?

- Oceans 97.5% (1.35 billion km3)
- Ice 1.8%
- Groundwater 0.63%
- Lakes and Rivers 0.02%
- Atmosphere 0.001%

- Total Freshwater Only 2.5%
  - 74 % ice
  - 25% groundwater
  - 1% lakes and rivers

Oceans - 97.5%



- Water, water, everywhere nor any drop to drink
  - The Ancient Mariner

Ice Sheets & Glaciers - 1.8%

- Margin of Greenland Ice
- Photo: Sandy Shipley

Ground Water - 0.63%

- Examining groundwater

Lakes & Rivers – 0.02%

- Motka Lake, Wisconsin
- Photo:Tom Algire

Atmosphere - 0.001%

- Photo: Chris Bretherton

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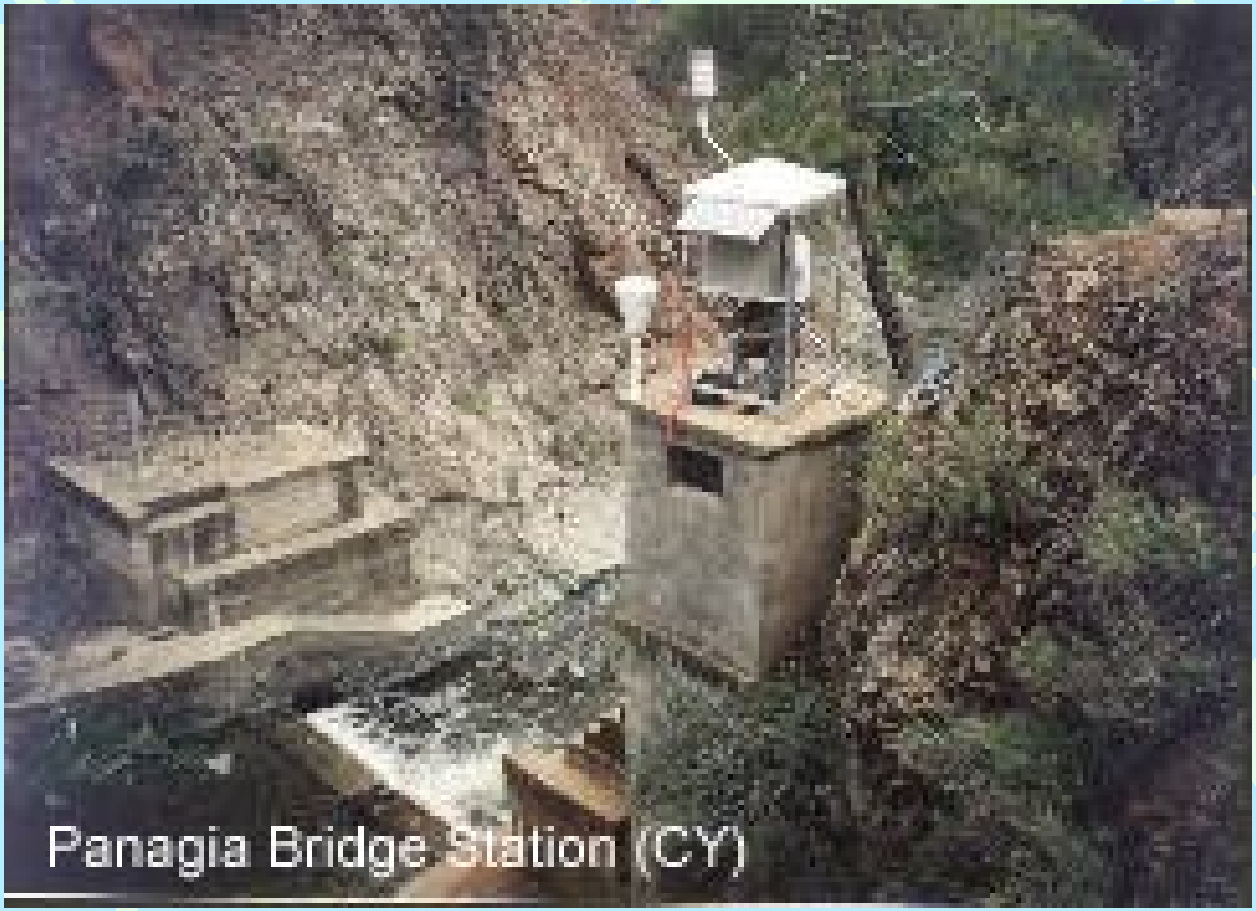
Surface water

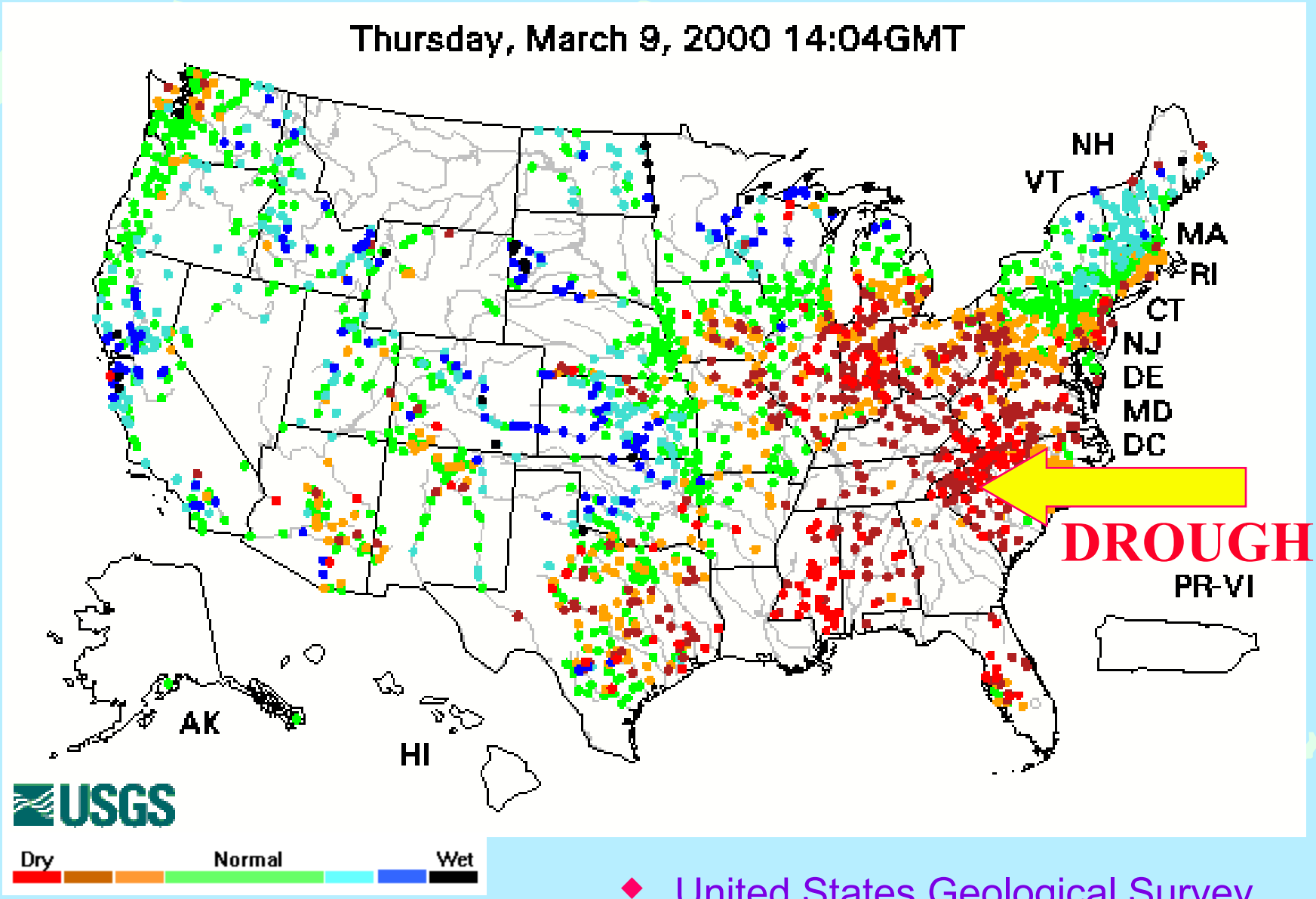
- Runoff/river flow is the standard measure of available freshwater
- Global River Flow ~ 40 000 km^3/y
- Runoff affected by:
  - topography/basin shape
  - land use
  - vegetation, soil type
  - “sinks”- lakes, ground, etc.

A River Gauging Station



- World Hydrologic Cycle Observing Network
  World Meteorological Organization

Daily River Flows

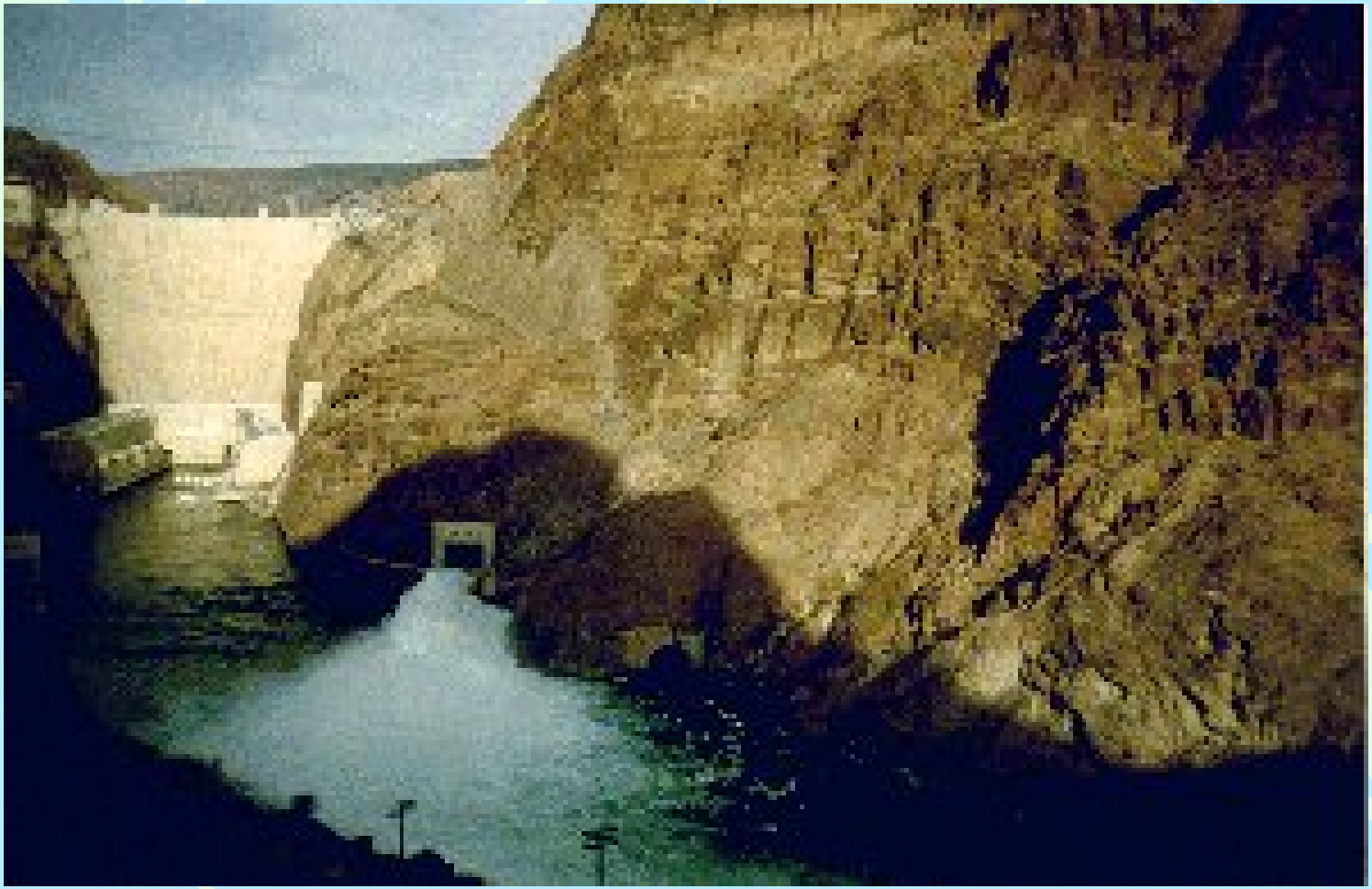


- United States Geological Survey

Surface Water for Irrigation

- Imperial Valley, CA

Surface Water for Hydroelectricity



- The Hoover Dam, AZ

Surface Water for Cooling

- Three Mile Island, PA

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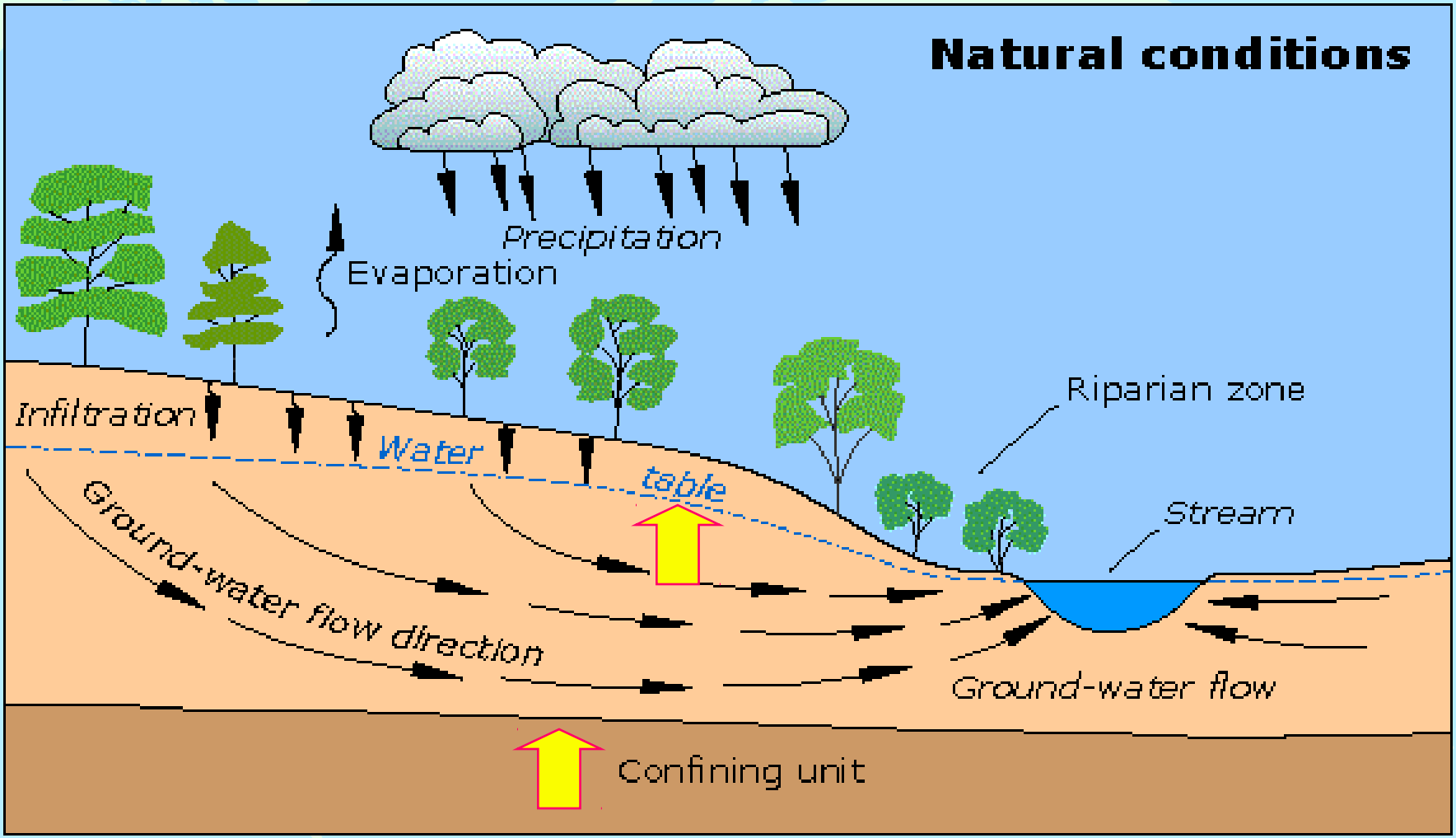
Groundwater Basics



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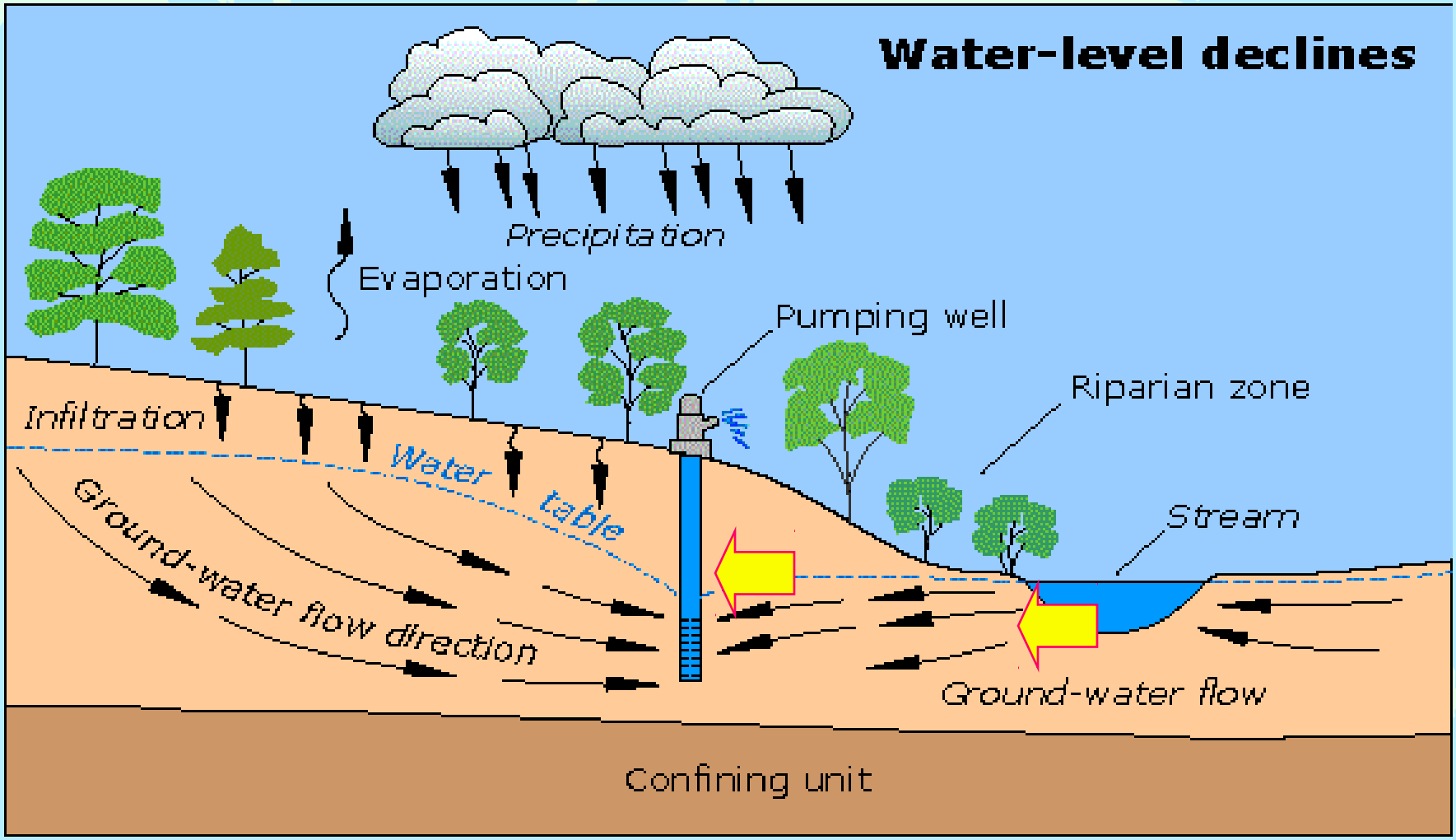
Pumping from a Well



- United States Geological Survey

Groundwater for Irrigation

- From Above
  - LANDSAT Image
    Red = Vegetation
  - Circles are irrigated

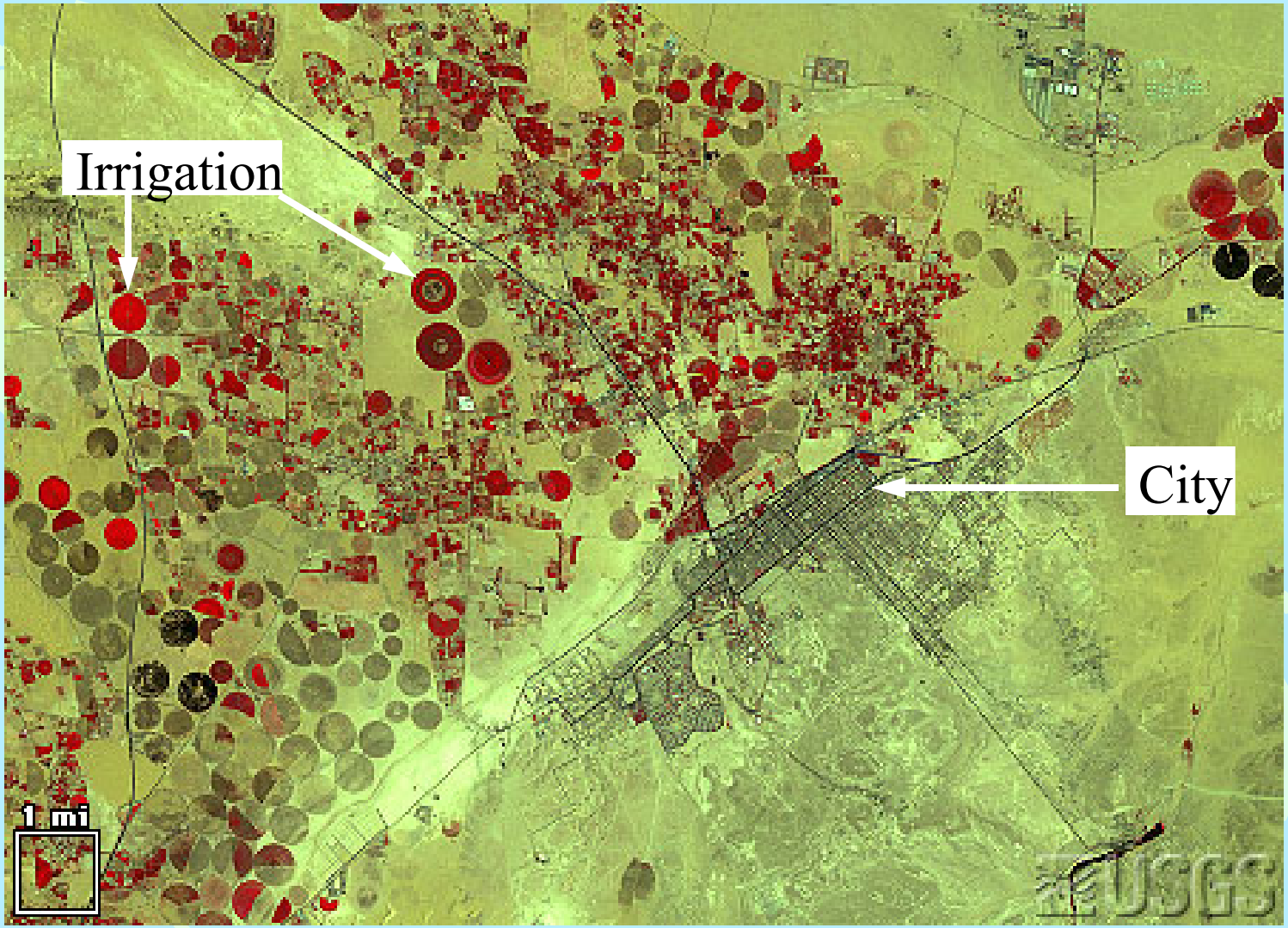
Landsat Image,

- From Below
  - Center Pivot Irrigation

Sprinkler

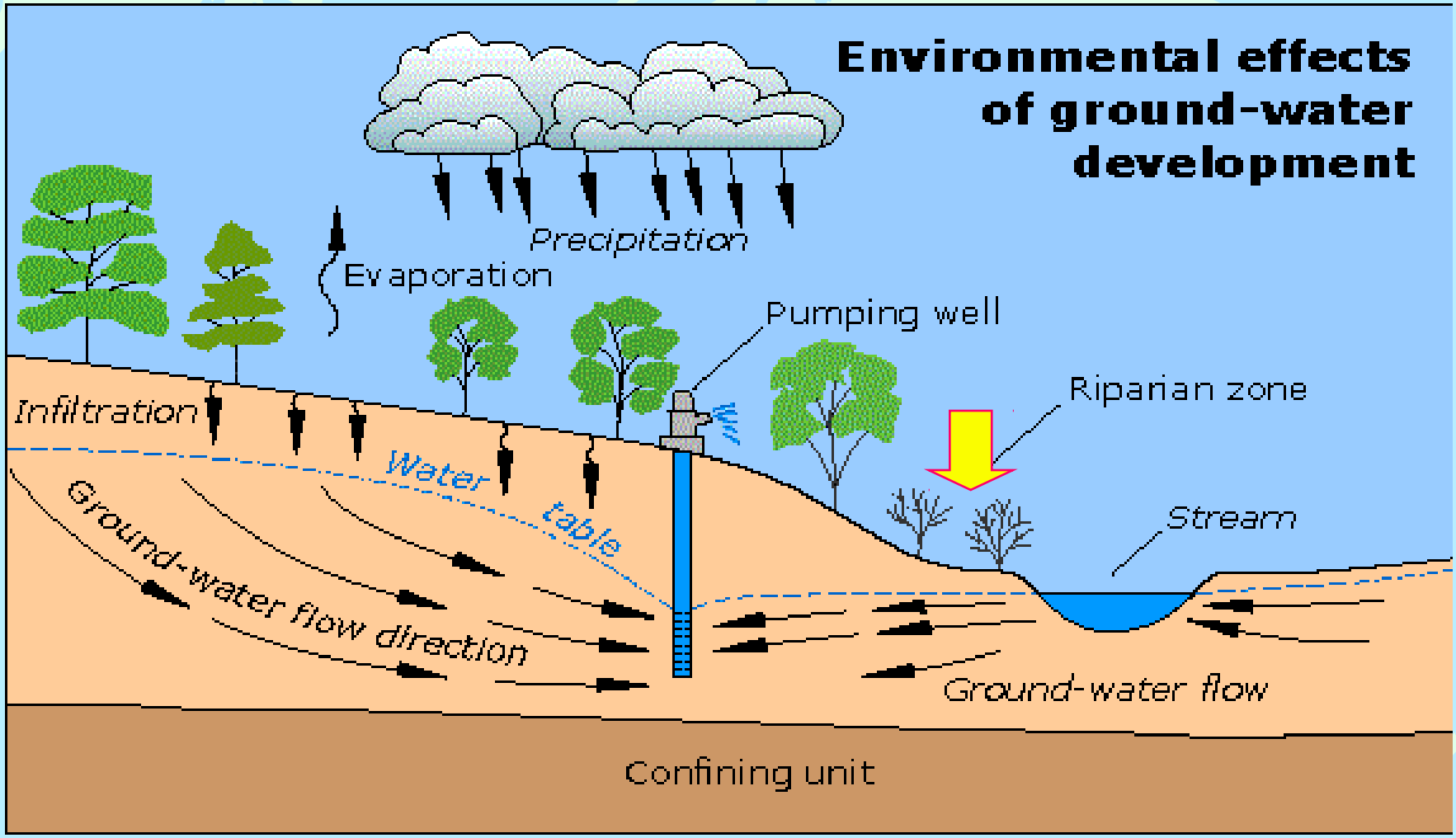
Along Holcomb Lane

Center Pivot Irrigation



- Riyadh Al Kharj - Saudi Arabia 1990

Disappearing Wetlands



- United States Geological Survey

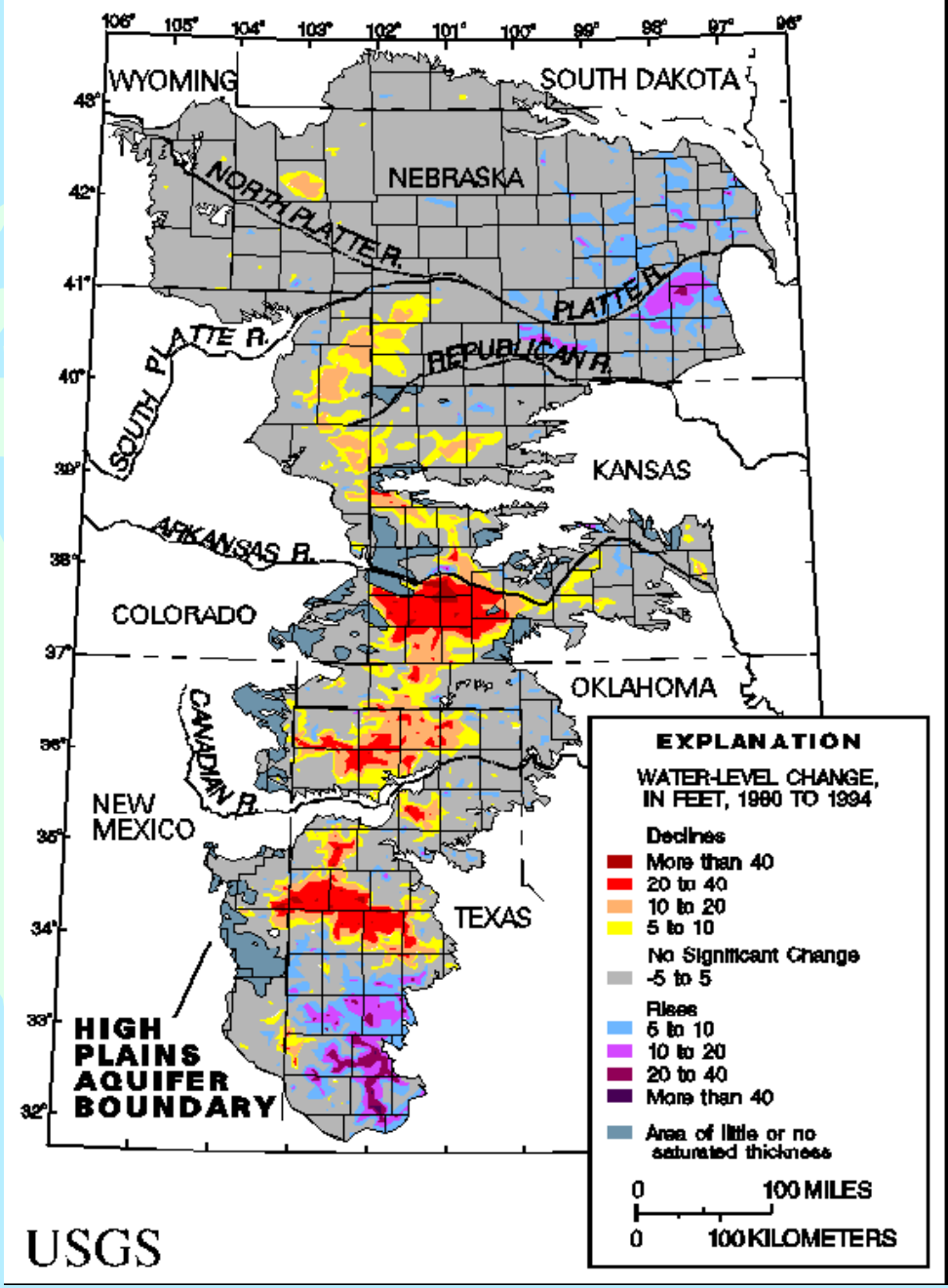
Ogallalla (High Plains) Aquifer

- stretches from South Dakota to Texas
- irrigates 14 million acres of land, including 40% of US cotton, wheat and flour exports
- fossil aquifer - recharges very slowly
- 1920 average thickness ~ 20 metres
- Today - <3 metres
- May be depleted by 2020

Ogallalla Aquifer 1980-94

Water Level

- Central regions
  - Large decline
- Northern and Southern Regions
  - Modest increase
  - Abnormally high precipitation 1993,4



- High Plains Aquifer

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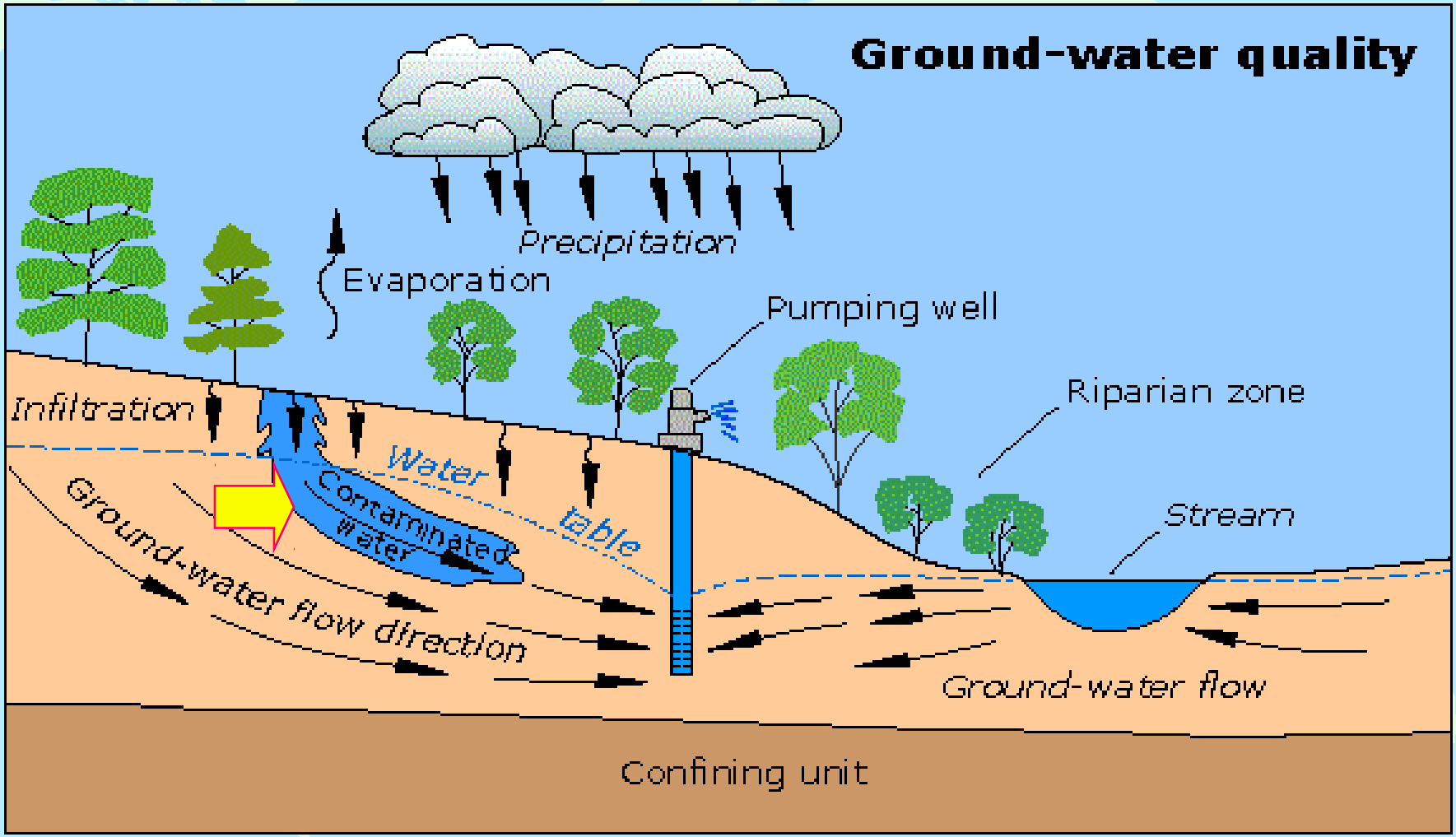
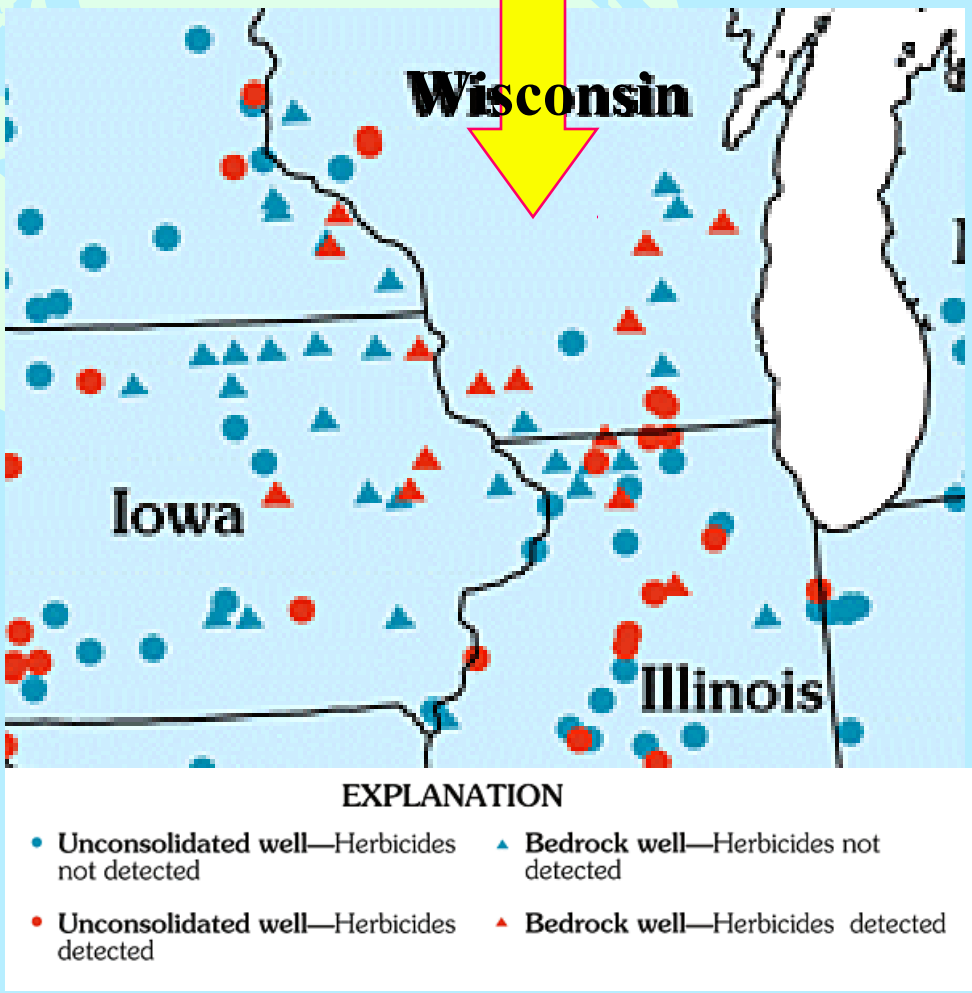
Polluted Runoff



- United States Geological Survey

Groundwater for Drinking

- Contamination of shallow wells by herbicides



- US Geological Survey: Fact Sheet 076-98

Spillage of Abattoir Effluent

- An African Water Page

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Usable Water is limited by Precipitation

- In arid regions most precipitation re-evaporates from vegetation and reservoirs
- In the long run lakes and ground water must be recharged
- Desalinization is generally too expensive

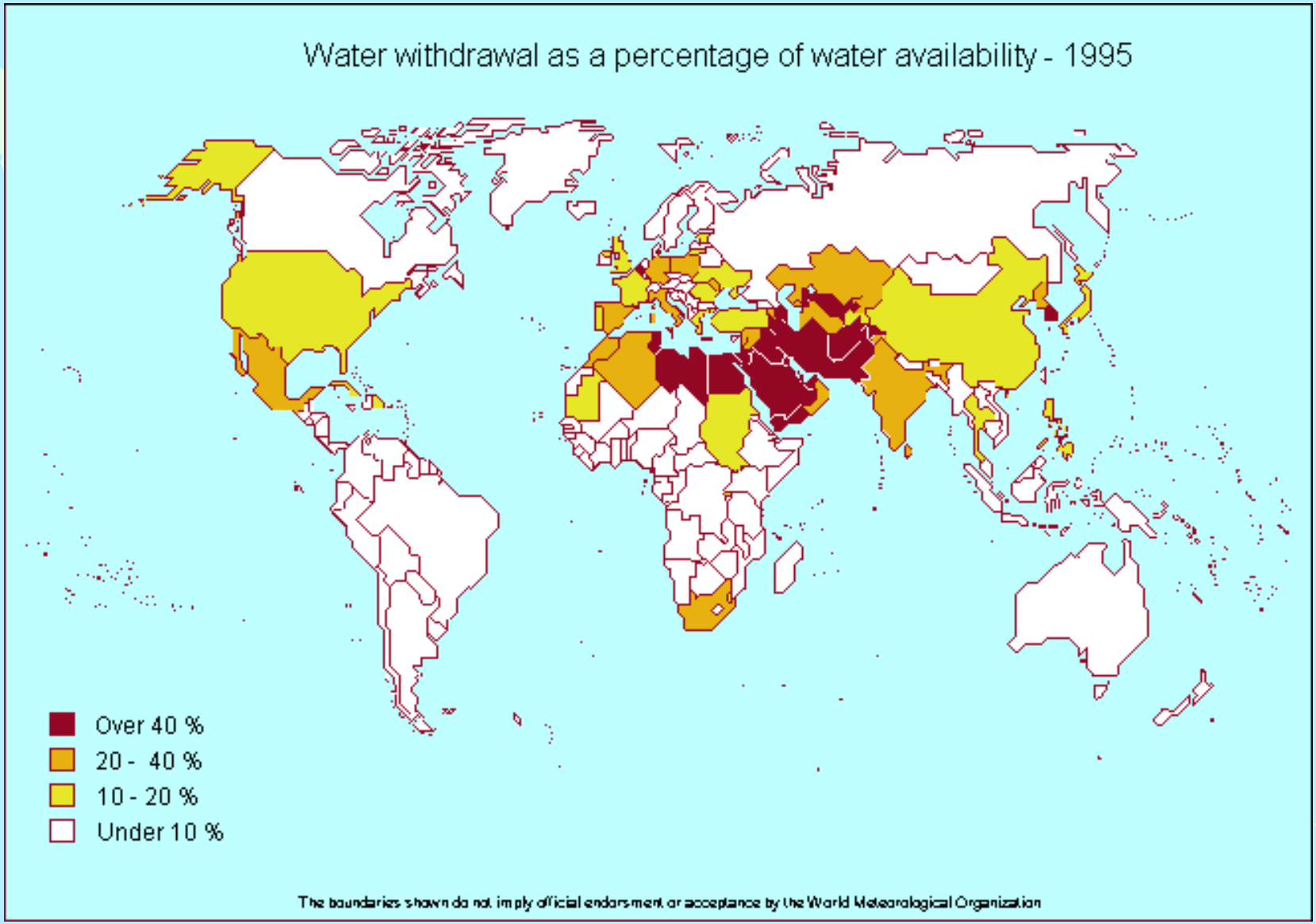
What are the real costs of water?

- The real costs
  - extraction, treatment
  - environmental costs
  - potential human health costs
- Most costs are not reflected in consumer charges!
- A false impression: water is cheap and always available
- Government subsidies provide no incentive to invest in water-efficient technology

More effective use of available water

- Conservation:
  - Changing irrigation practices:
    - agriculture is largest water consumer
    - efficient methods: drip irrigation (Israel)
    - raising different crops
  - Recycling wastewater, storm water
- Controlling pollution:
  - Tertiary sewage treatments
  - Limit excess pesticides and fertilizers
- Change water laws to reward responsible use

Water Stress



- World Meteorological Organization

Discussion Topics

- If you were President of the the United States and responsible for foreign policy, what would you do about water?
- What could you do in your community to preserve your water supply?

Some Useful Web Sites

- United States Geological Survey
  - Groundwater
  - Daily stream flow
- Eros Data Center
  - Earth Shots
- World Meteorological Organization
  - Water availability in other countries
- An African Water Page
  - Some thoughtful essays on water policy