Neighborhood Ground Water Network

Ground Water Science

Oregon State Water Resources Department
in collaboration with
Oregon State University Sea Grant Extension

Presentation Outline

Ground Water Science

- Ground Water Basics
- Well Construction
- Measuring Water Use
- Ground Water Quality
- Water Supply Problems

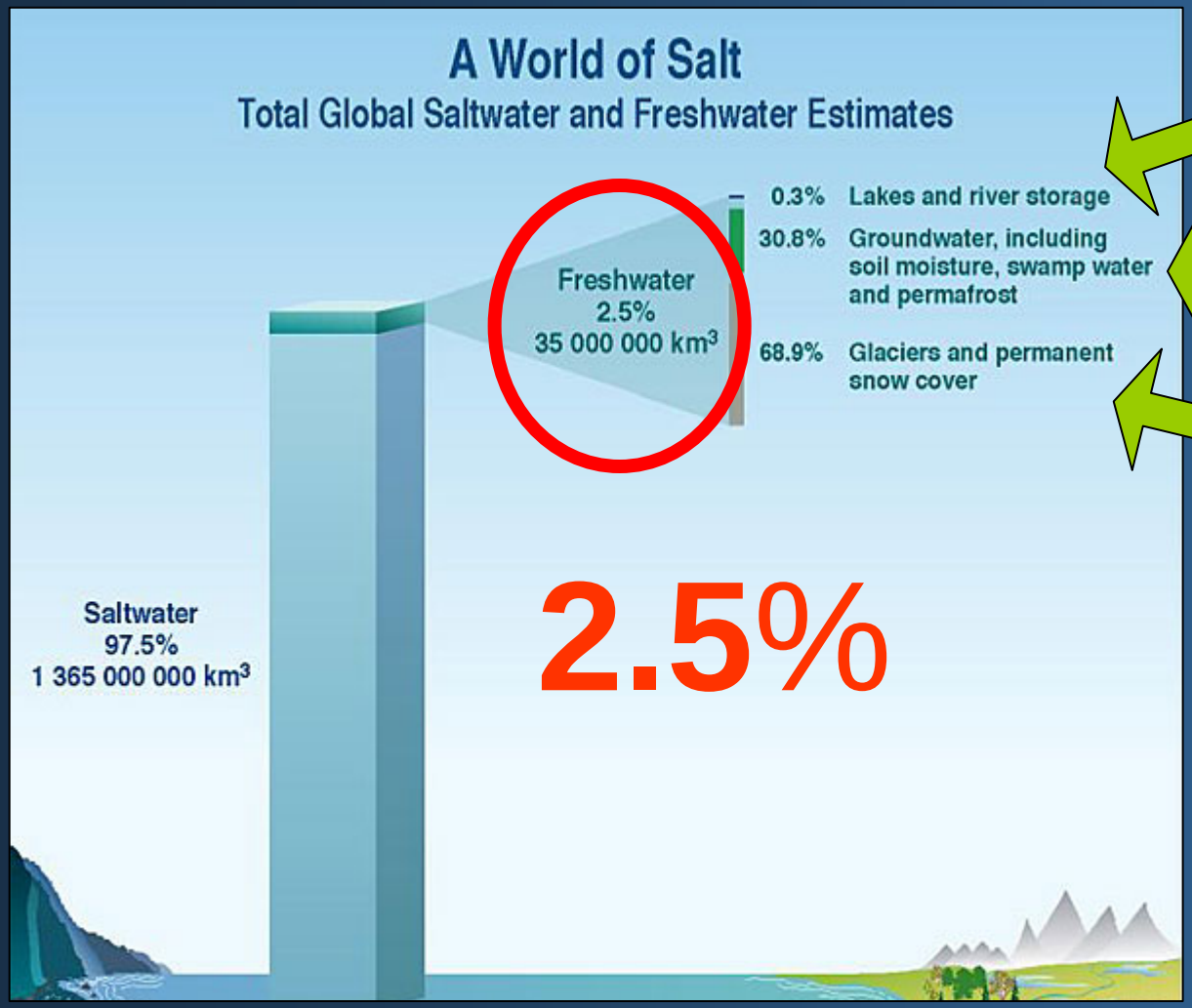
The Earth's Finite Water Supply

Salt Water **97.5**%

Fresh Water **2.5**%

"The Blue Marble" – Compilation Satellite Imagery Courtesy NASA Goddard Space Flight Center

Photo Credit: Adam Nieman / Science Photo Library



Source: Igor A. Shiklomanov and UNESCO via UNEP

Surface Water
0.3%

Ground Water
30.1%

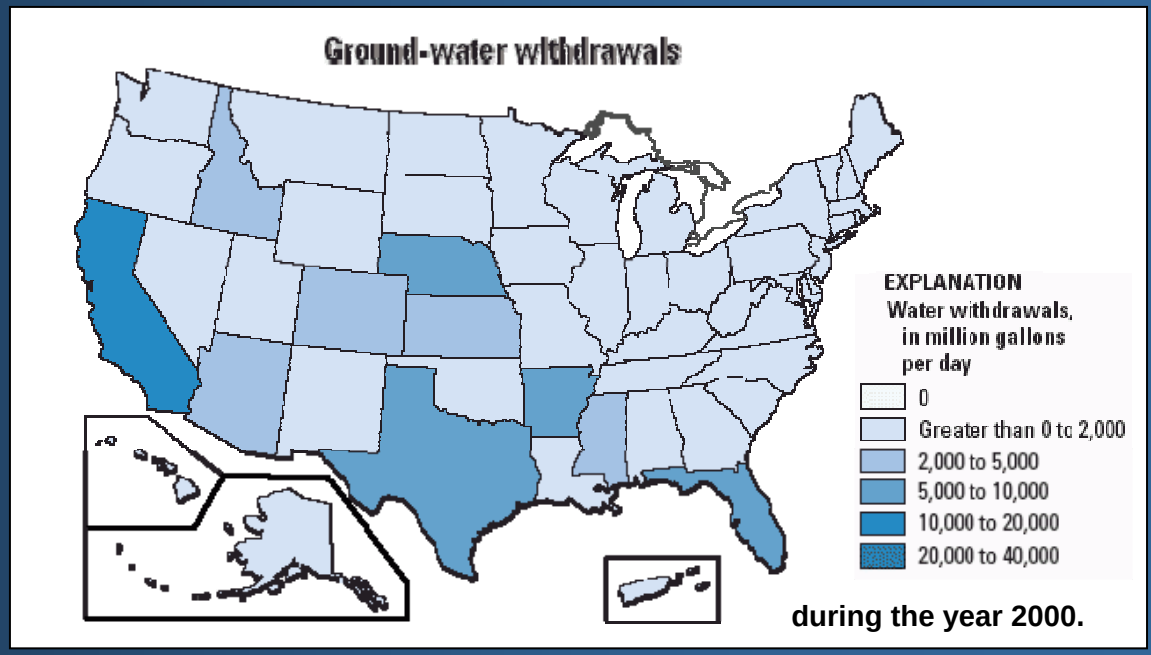
Icecaps and Glaciers
68.9%

Less than 1% of all freshwater resources are available for human and ecosystem use.

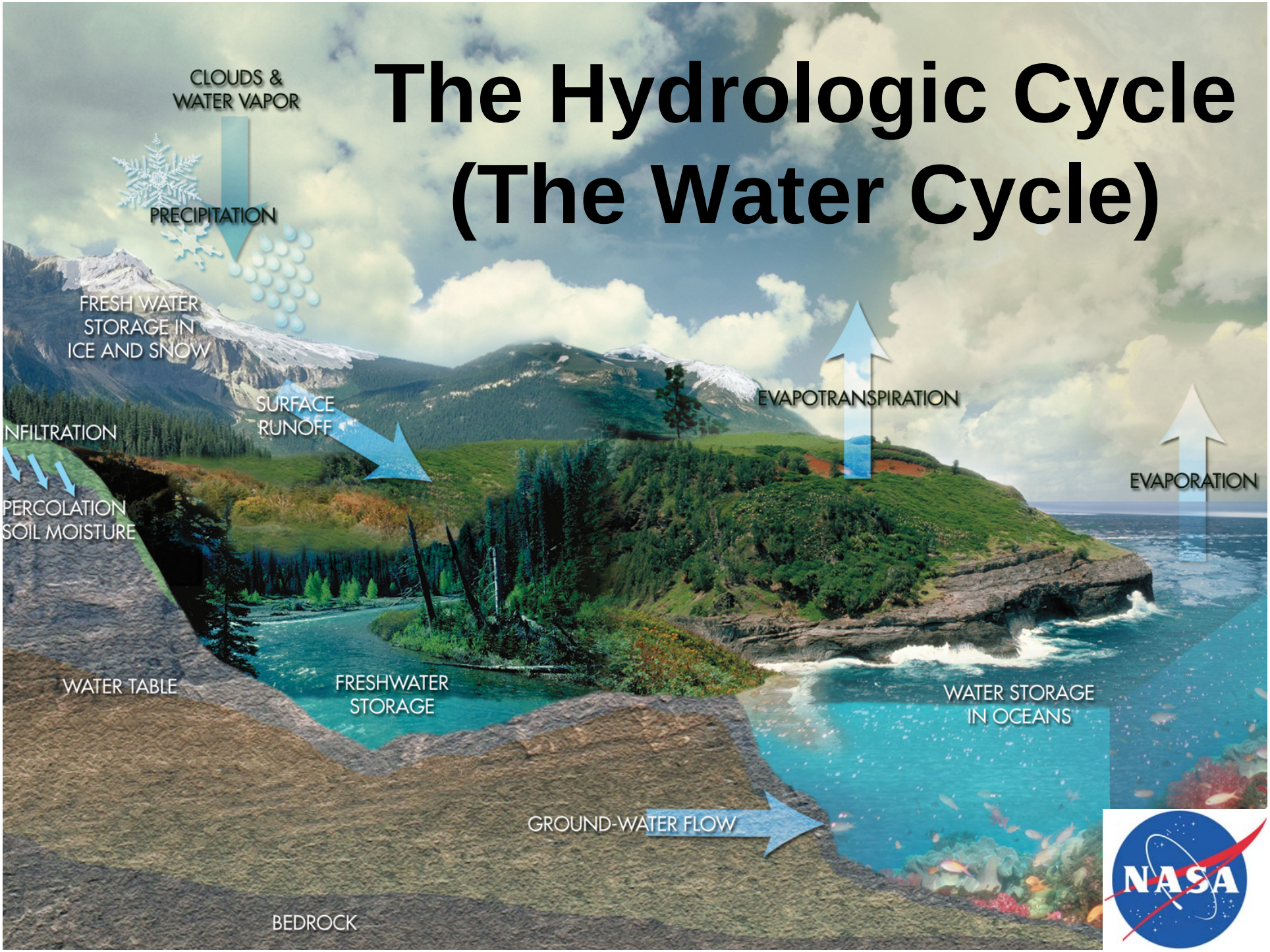
Why is ground water important?

- Ground water is a source of drinking water for more than 50% of people in the U.S.
- Agricultural irrigation is the largest user of ground water.
- Paper manufacturing, food processing, and other industrial processes also use a large amount of ground water.

Source: City of Gresham, Oregon



Source: USGS, Water Science Webpage

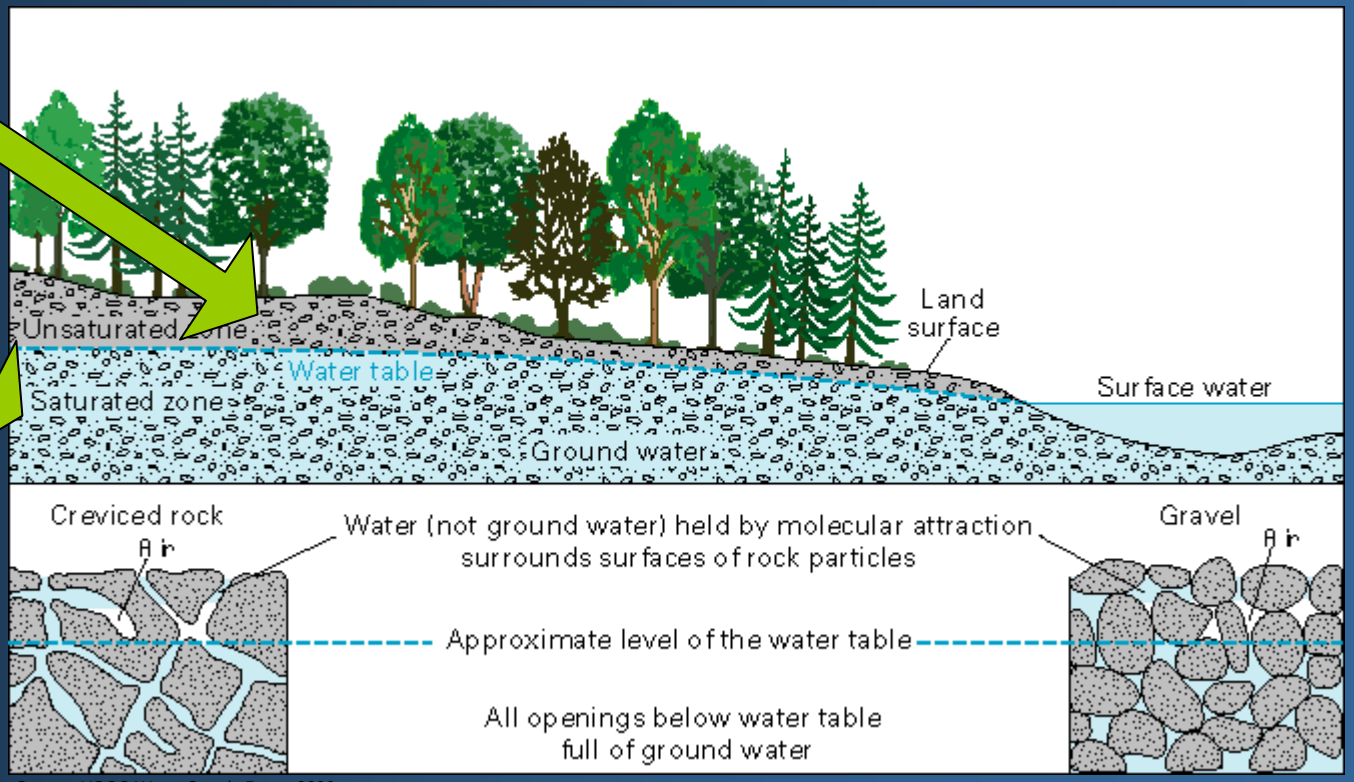

The Hydrologic Cycle
(The Water Cycle)
CLOUDS &
WATER VAPOR
PRECIPITATION
FRESH WATER
STORAGE IN
ICE AND SNOW
SURFACE
RUNOFF
NFILTRATION
PERCOLATION
SOIL MOISTURE
EVAPOTRANSPIRATION
EVAPORATION
WATER TABLE
FRESHWATER
STORAGE
WATER STORAGE
IN OCEANS
GROUND-WATER FLOW
BEDROCK
NASA

What is ground water?

- Ground water is water under the lands surface often stored in saturated pores of soil or rock.
- The division between the saturated zone and the unsaturated zone is called the water table.

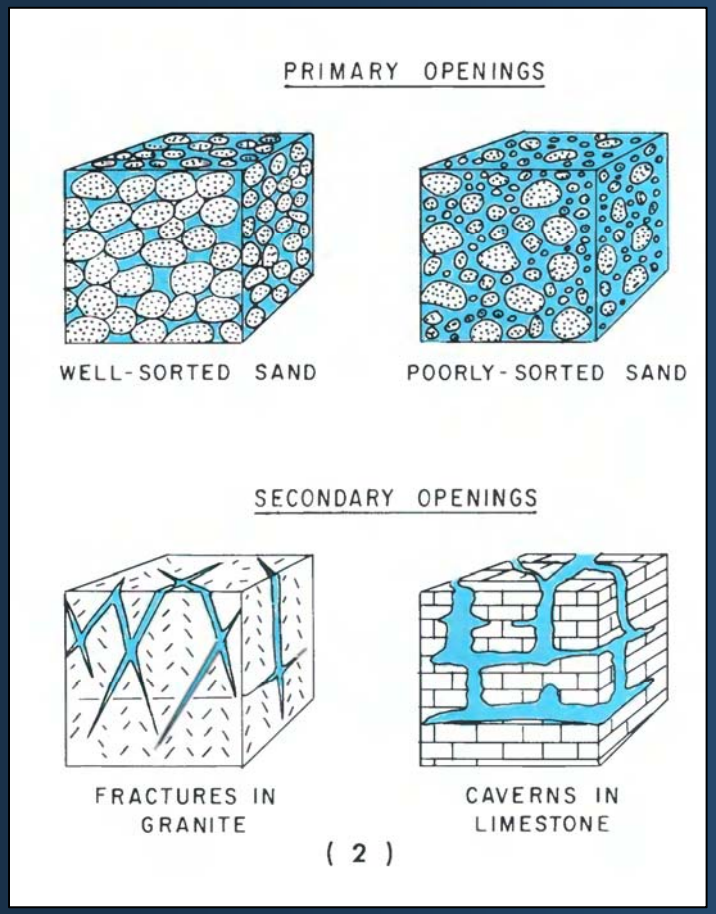
Water Table

Ground Water



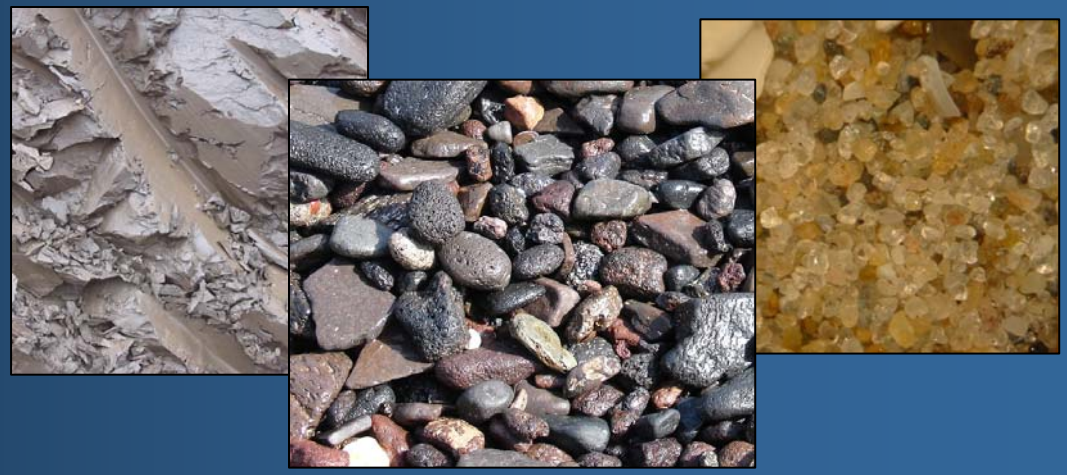
Source: USGS Water Supply Paper 2220

Rocks and Water



Source: USGS Water Supply Paper 2220

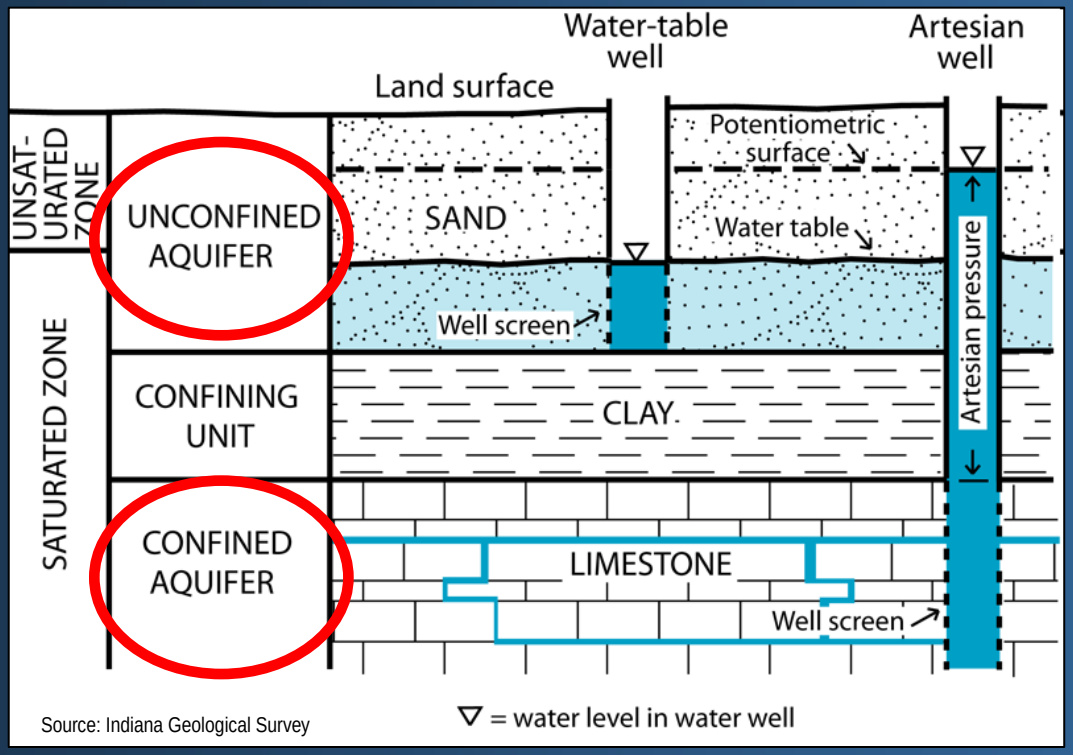
Unconsolidated Materials



Consolidated Materials

Aquifers

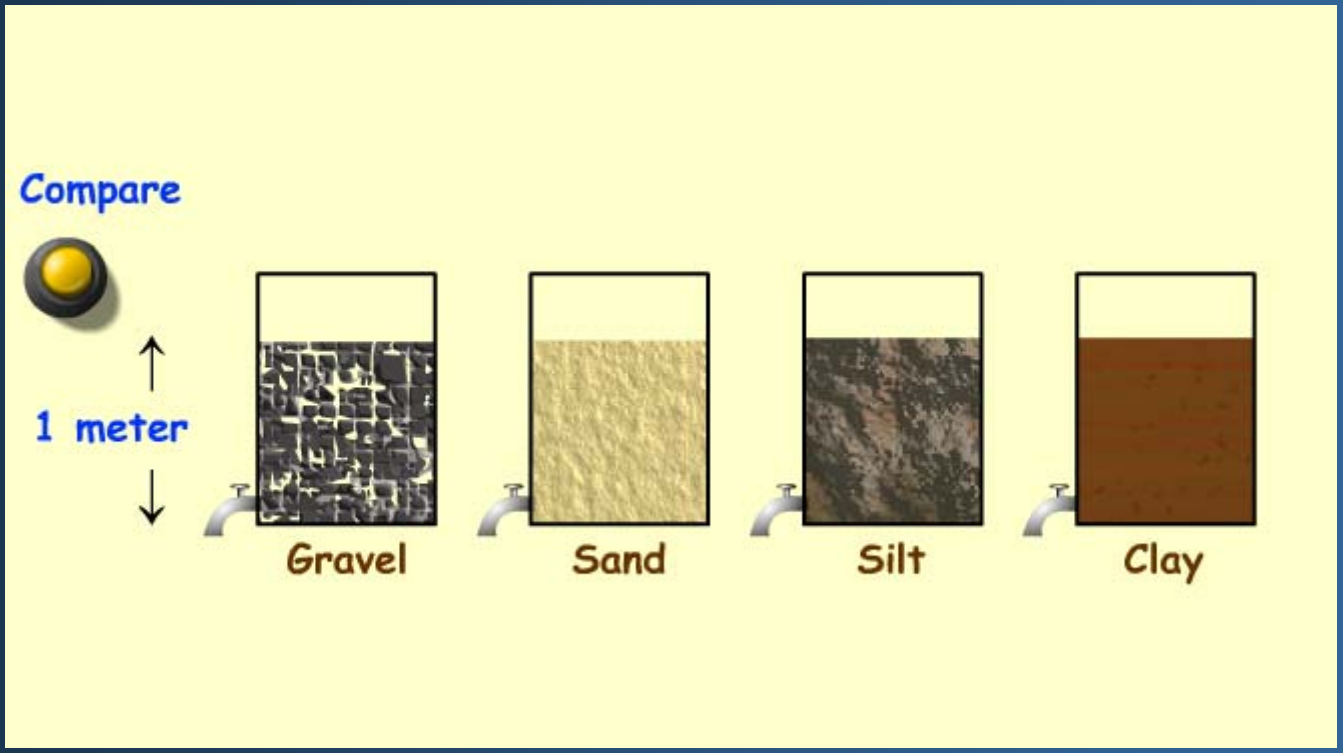
Unconfined Aquifer – Sometimes called a water table aquifer, these aquifers are not confined or under pressure. The water level in a well in this type of aquifer is the same as the water table outside the well.



Confined Aquifer – Sometimes called an artesian aquifer, this is ground water beneath a soil or rock layer under pressure. Water pressure in a confined aquifer will cause the water in a well in this aquifer to rise above the aquifer level.

Water Flow in Rocks

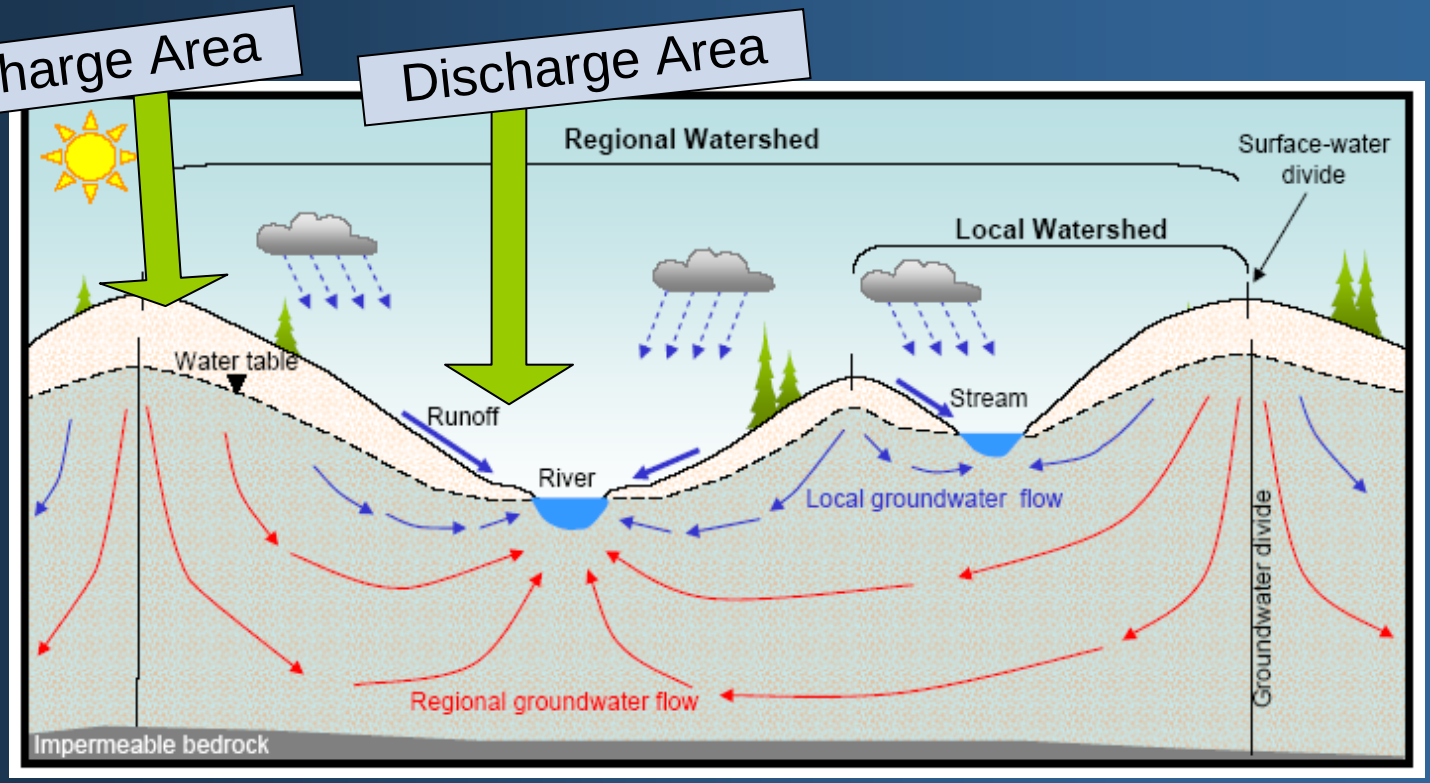
- A measure of how fast water will flow through openings in soil or rock layers of the ground is called permeability.
- Gravels and sands often have high permeability.
- Clays and solid rocks often have low permeability.



Source: Michigan Tech University.

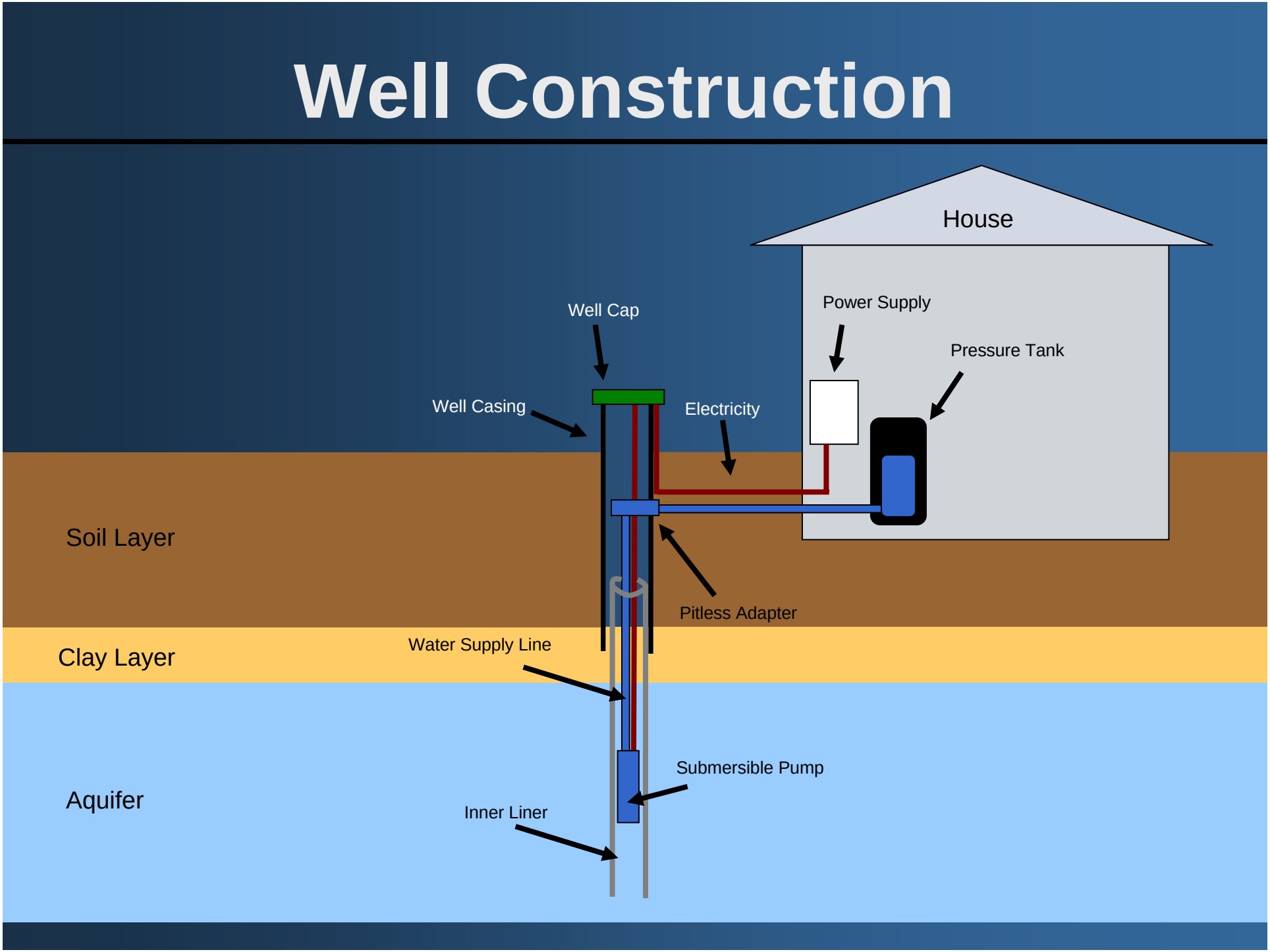
Ground Water Flow

- Water moves from aquifer recharge zones (from rainfall and snowmelt) to aquifer discharge zones (streams, springs, lakes, wetlands, and wells).
- Typically, ground water will flow from a high elevation to a low elevation.

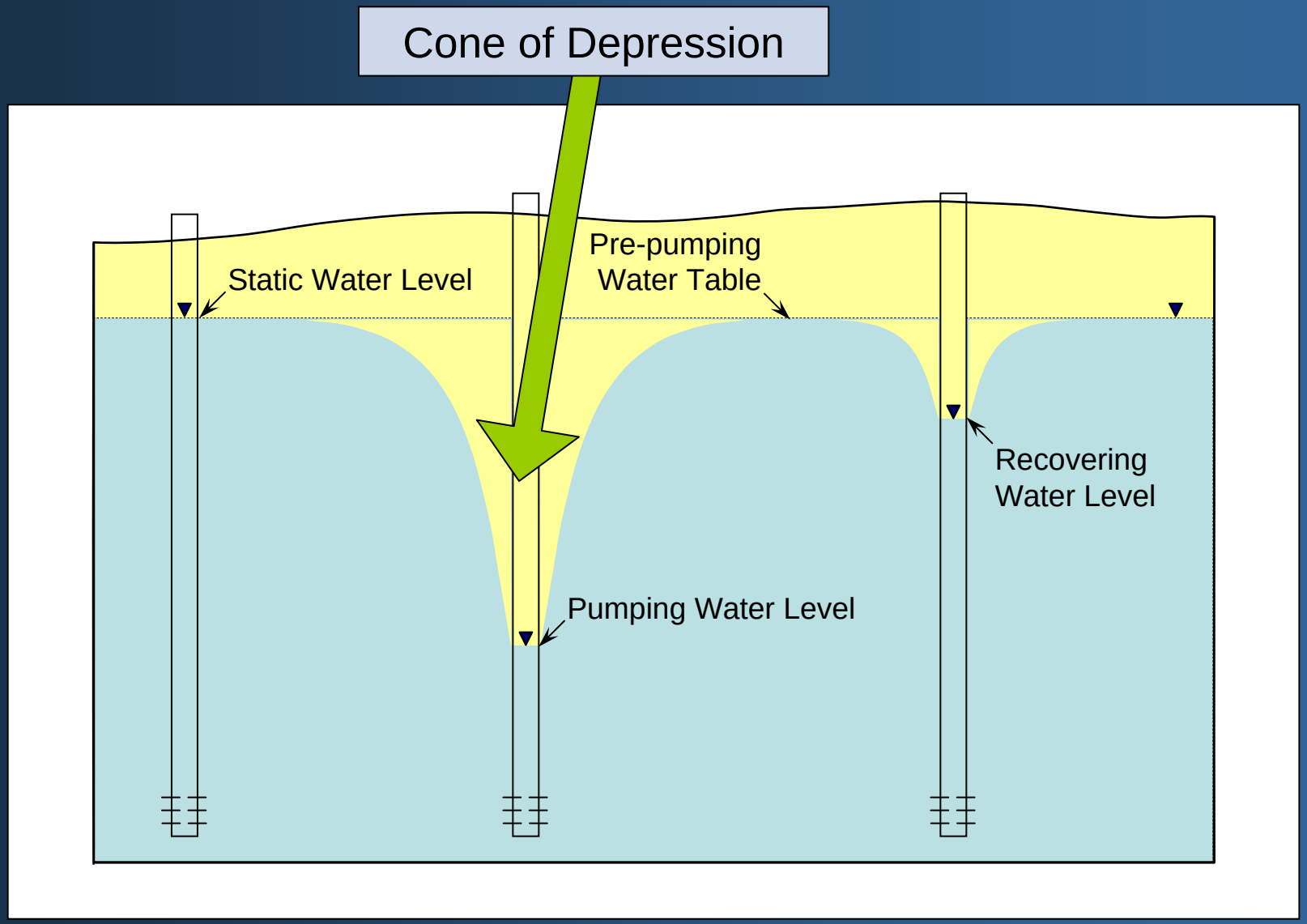


Source: Jenny Erickson, Sauk County UW-Extension

Well Construction



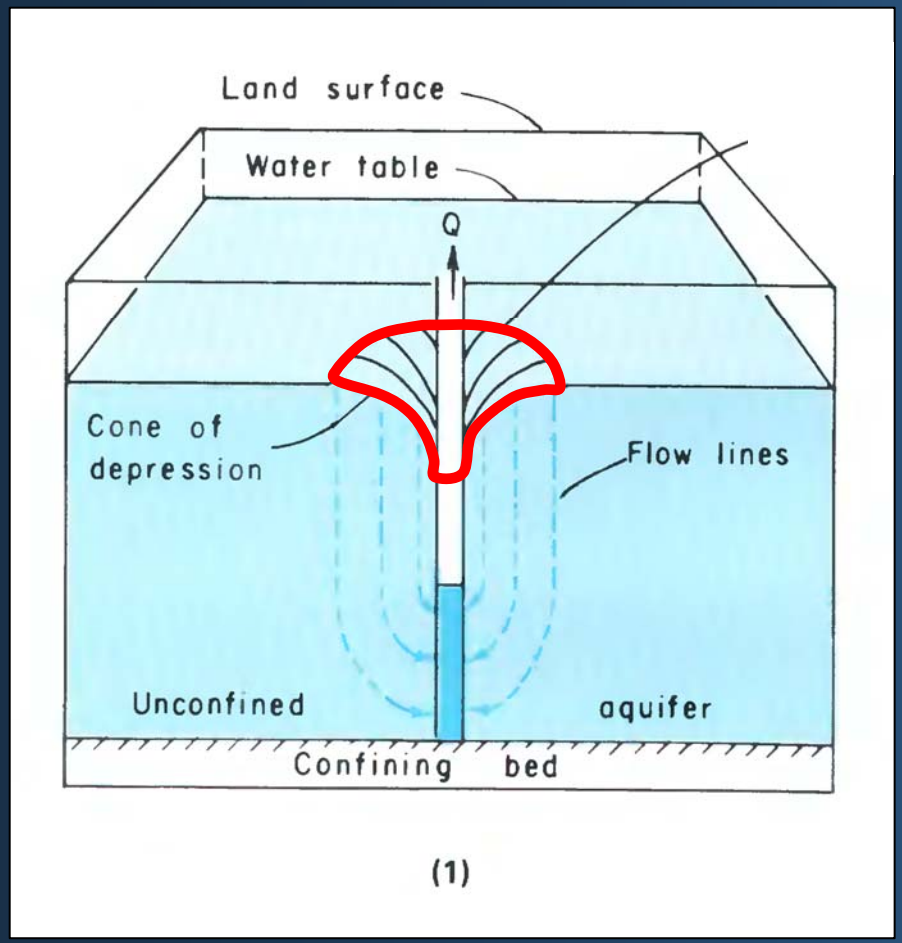
Ground Water Pumping



Source: Karl Wozniak, Oregon Water Resources Department

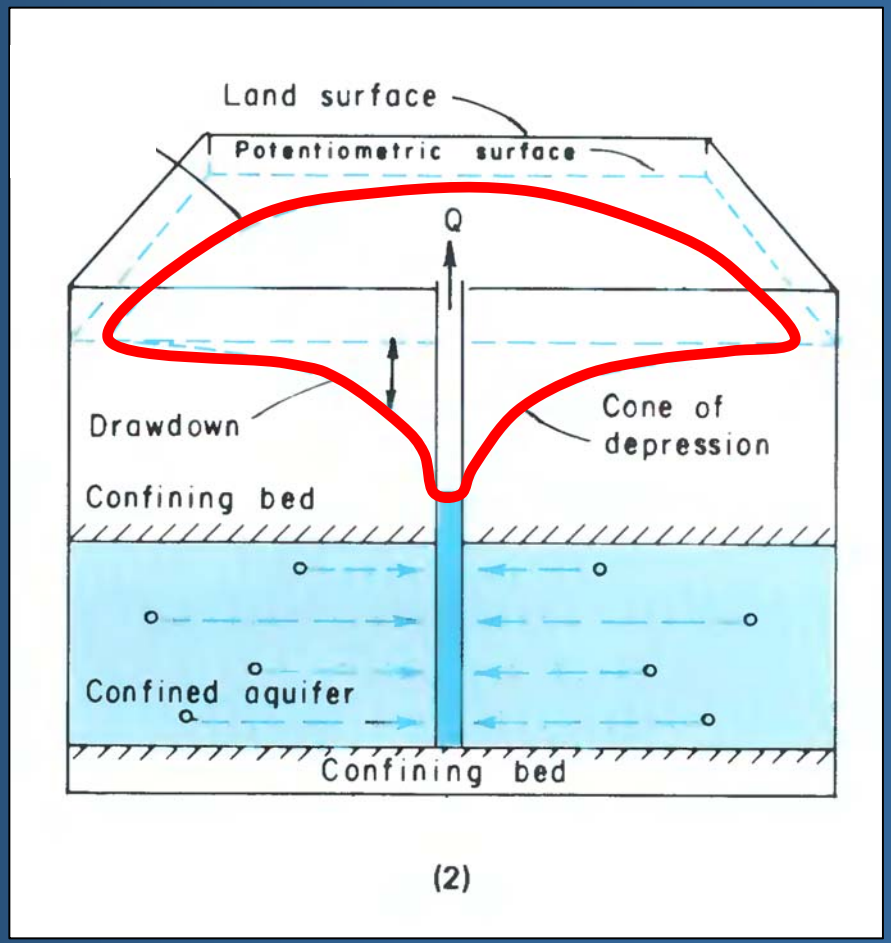
Ground Water Pumping

Unconfined Aquifer



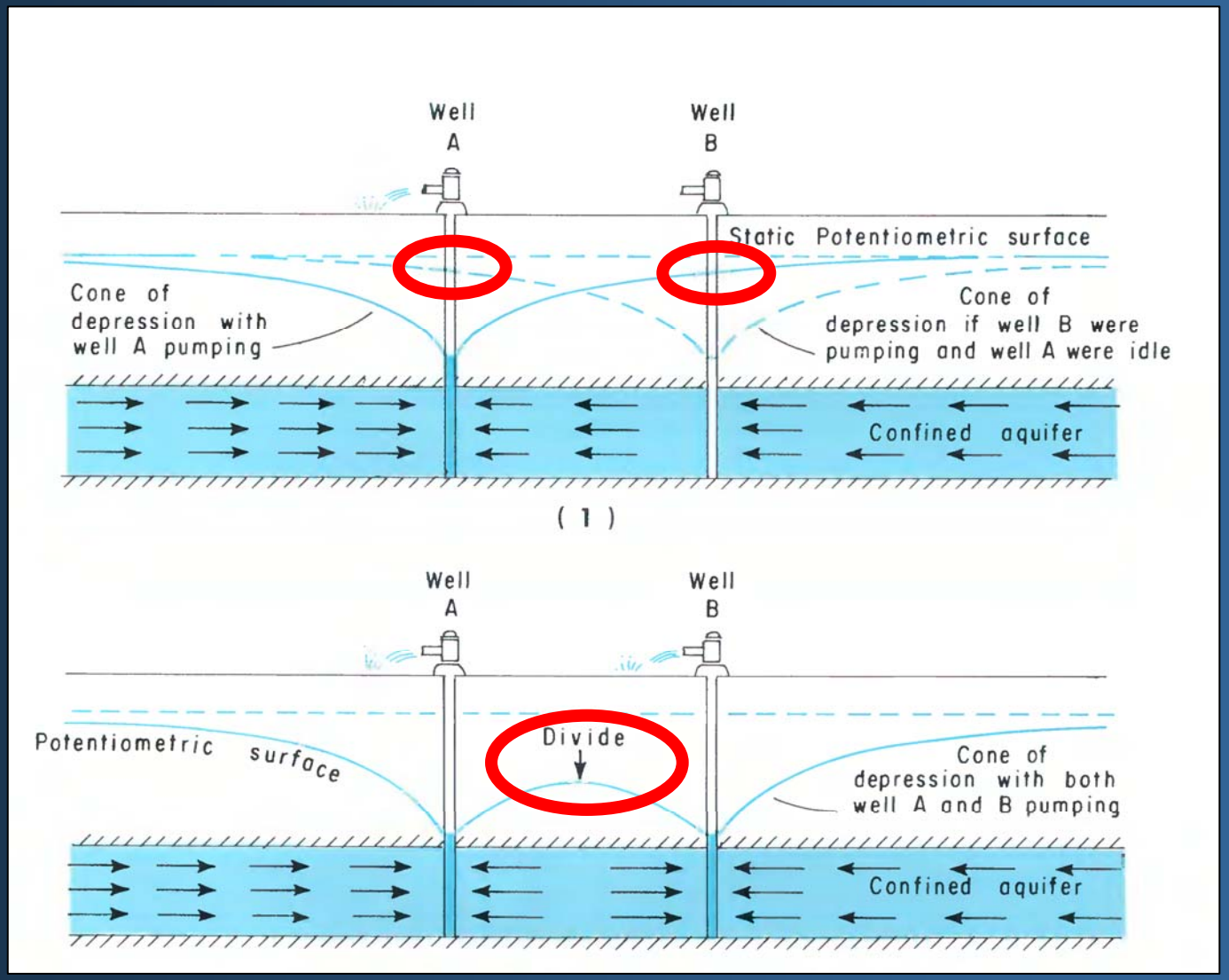
Source: USGS Water Supply Paper 2220

Confined Aquifer



Source: USGS Water Supply Paper 2220

Well Interference



Source: USGS Water Supply Paper 2220

Measuring Water Use

Measuring water use will...

- Help you manage your water supply.
- Help you detect leaky or broken water pipes.
- Provide you with information for land use and planning.

Source: Suckle Advertising and Design

Source: Suckle Advertising and Design

Measuring Water Use

How much water do you use?

- Check your well log or a recent well test and estimate your water use.
- Install a flow meter to measure your water use.

Source: HCCREMS

"One domestic home with two to four people will generally use 150 - 300 gallons per day to meet general household needs."

Ground Water Quality

How often should I test?

The National Ground Water Association (NGWA) recommends testing your water quality annually.

What should I test for?

Bacteria, Nitrates and other local contaminants (from landfills, industrial sites, or dumping of household wastes) or arsenic and radon (depending on your location).

What should I do if there are water quality problems?

Contact the Drinking Water Program at the State of Oregon – Public Health Division in the Department of Human Services or your County Health Department.

Drinking Water Program

Department of Human Services

503-731-4317

http://oregon.gov/DHS/ph/dwp/

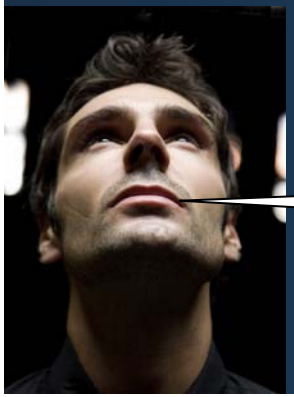
Water Well Problems

"My well doesn't pump as much water as it used too."

"My water is rust colored."

"My water is muddy."

"My water tastes funny."



"My well went dry"

Water Well Problems

“My well doesn’t pump as much water as it used too.”

Possible Causes: leak in the system, pump malfunction, well interference, sediment in casing, well interference, mineral buildup, or borehole problems.

“My water is rust colored.”

Possible Causes: sediment or iron bacteria, corrosion of well equipment, biofouling, human contamination, or limited aquifer recharge

“My water is muddy.”

Possible Causes: sediment, improper well design, over pumping of well, corrosion of well equipment, or failure of casing seal.

“My water tastes funny.”

Possible Causes: sediment or iron bacteria, corrosion of well equipment, biofouling, human contamination, or limited aquifer recharge.

“My well went dry”

Possible Causes: leak in the system, pump malfunction, well interference, sediment in casing, well interference, mineral buildup, or borehole problems.

Why is ground water important?

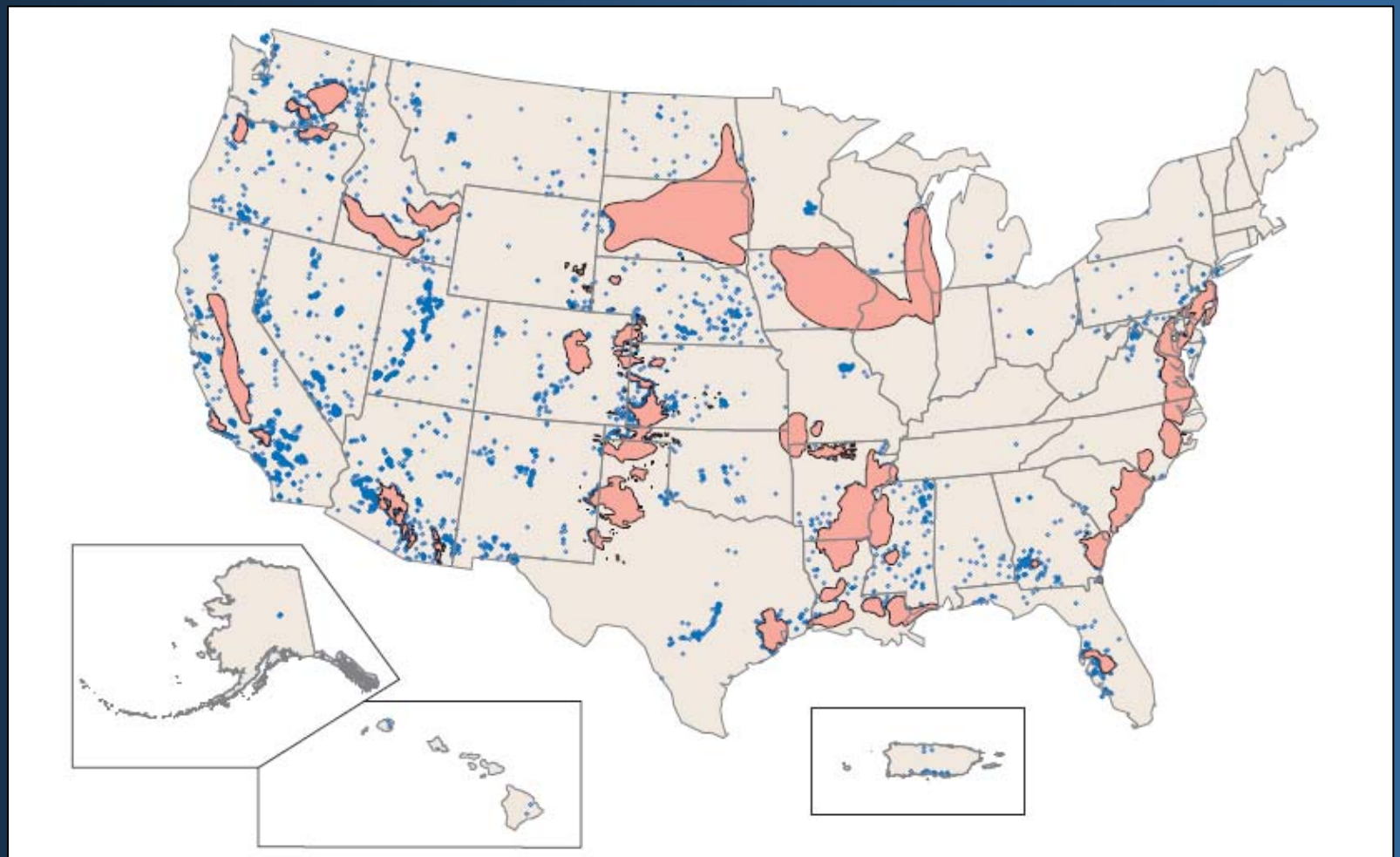


Figure 12. Water-level declines. Red regions indicate areas in excess of 500 square miles that have water-level decline in excess of 40 feet in at least one confined aquifer since predevelopment, or in excess of 25 feet of decline in unconfined aquifers since predevelopment. Blue dots are wells in the USGS National Water Information System database where the measured water-level difference over time is equal to or greater than 40 feet.

Source: USGS Circular 1323

Ground water is among the Nation's most important natural resources. It provides half our drinking water and is essential to the vitality of agriculture and industry, as well as to the health of rivers, wetlands, and estuaries throughout the country. Large-scale development of ground-water resources with accompanying declines in ground-water levels and other effects of pumping has led to concerns about the future availability of ground water to meet domestic, agricultural, industrial, and environmental needs…

Robert M. Hirsch,
Associate Director for Water, U.S. Geological Survey

Questions?

Neighborhood Ground Water Network

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