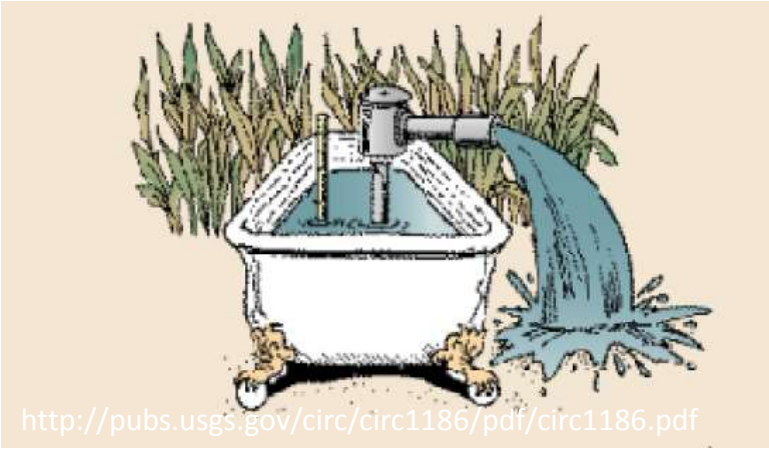
Wisconsin's Buried Treasure

Kevin Masarik
Center for Watershed Science and Education

University of Wisconsin-Stevens Point
College of Natural Resources

UW Extension
University of Wisconsin-Extension

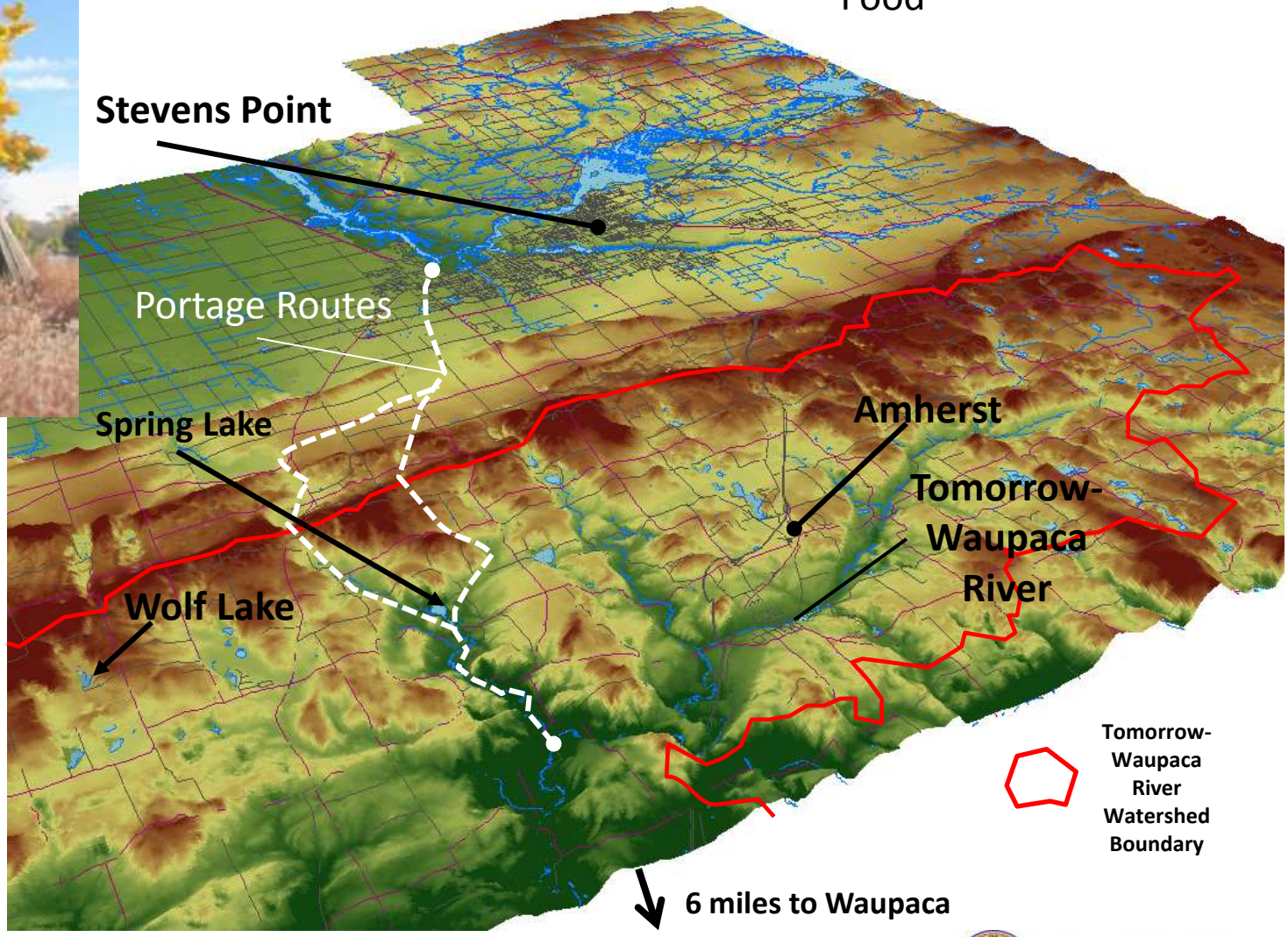
Wisconsin's Waters



- 15,000 Lakes
- 44,000 miles of River and Streams
- If we could bring all the groundwater in Wisconsin above ground it would cover the state to a depth of 100 ft.

Water Resources – Historical Evolution

- Transportation/Trade
- Food



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Water Resources – Historical Evolution

- Transportation
- Waste disposal
- Food??

Pollution from the Fox River entering Green Bay in 1969. Courtesy of The Carl Guell Slide Collection, Department of Geography, University of Wisconsin Oshkosh.

Photographer: Mace, Charles E. -- Milwaukee, Wisconsin. 1/26/44

Ephraim Historical Foundation

Contrast that with today

- Drinkable
- Recreation -“Fishable and swimmable”
- Aesthetically pleasing

http://www.mowind.org/wp/?page_id=47

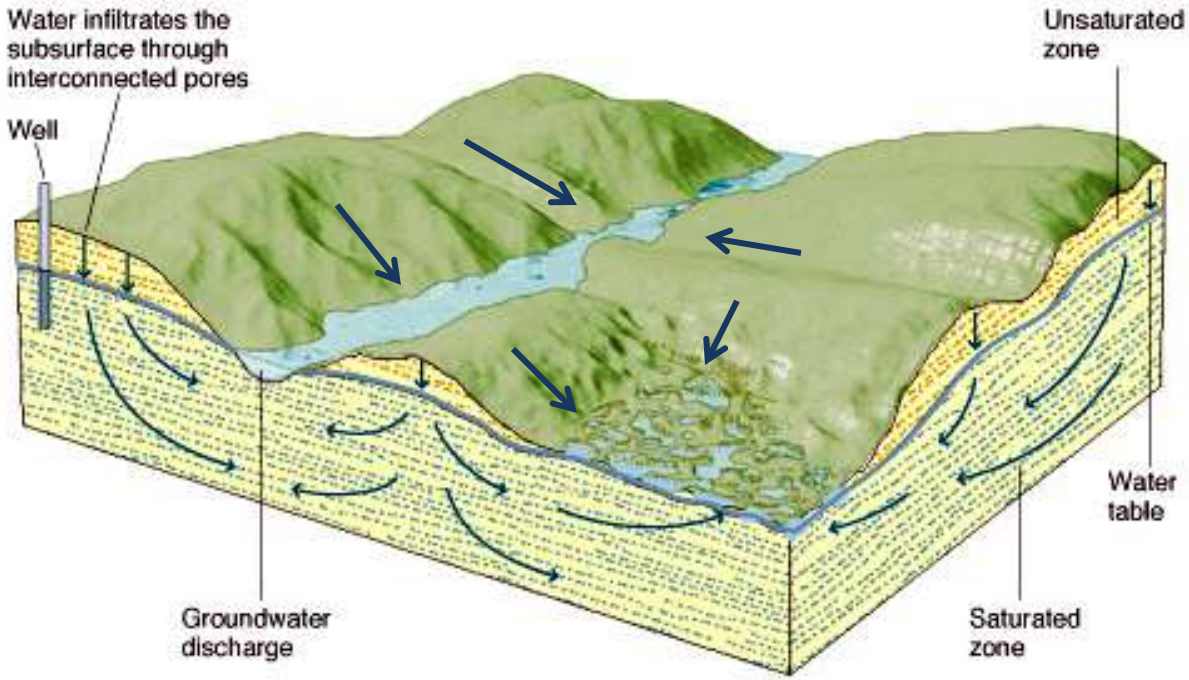
http://www.catchfivecharters.com/galleryimage.asp?ID=54

http://www.kayakdoorcounty.com/doorcounty-events.htm

Groundwater is Valuable to Wisconsin

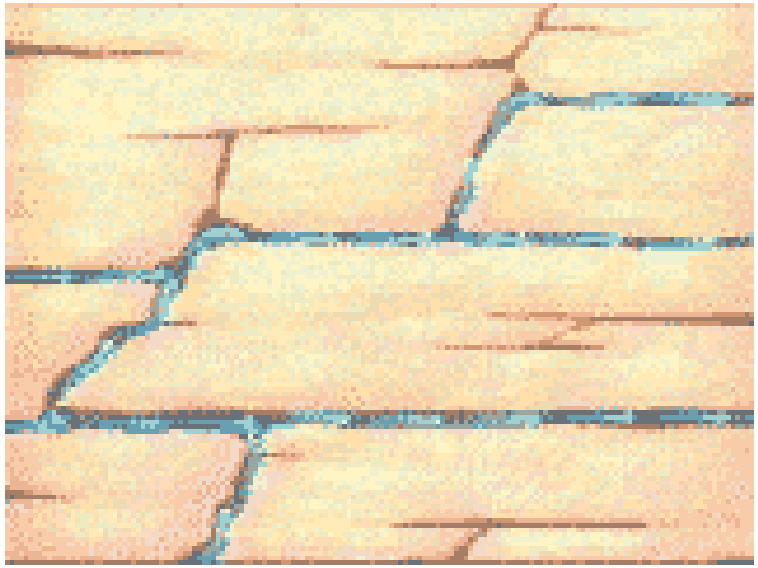
- 95% of Wisconsin Communities
- 75% of Wisconsin Citizens rely on it to meet their daily water needs
- Supplies almost all water for agriculture – livestock, irrigation, dairy operations
- 1/3 of industrial water use
- 1/2 of commercial water use

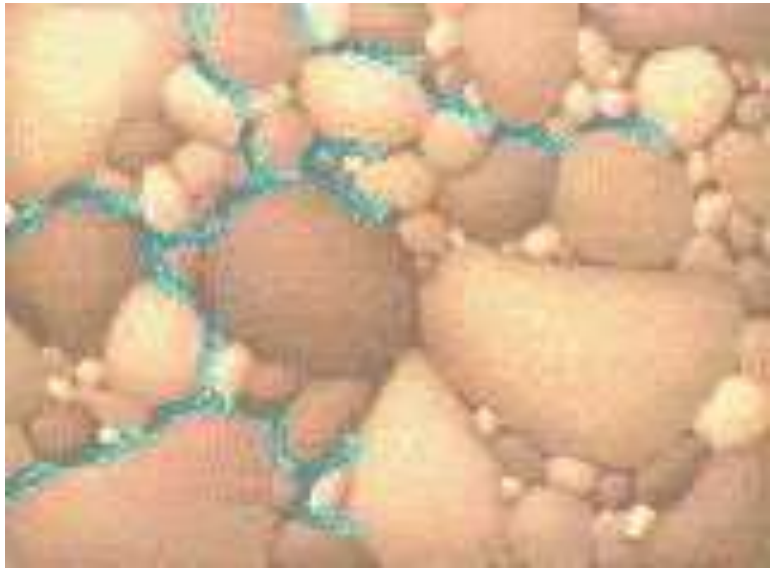
The Water Cycle: Where does all that water go?



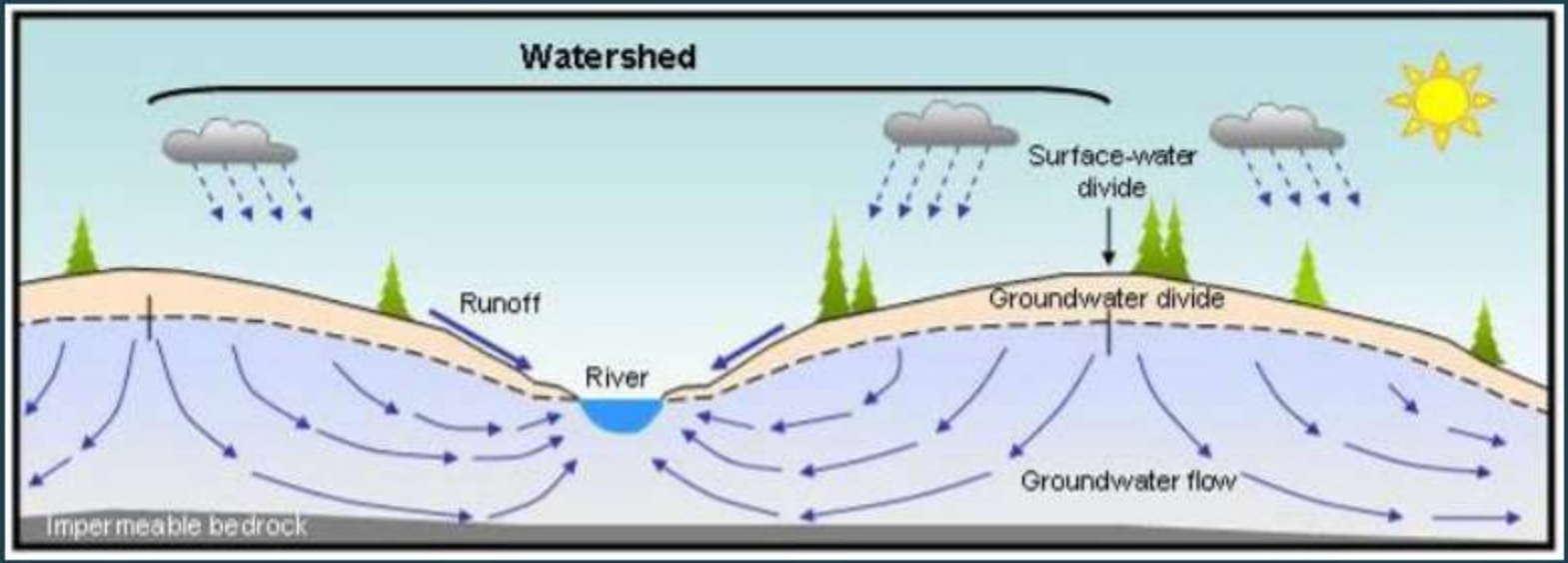
What is an aquifer?

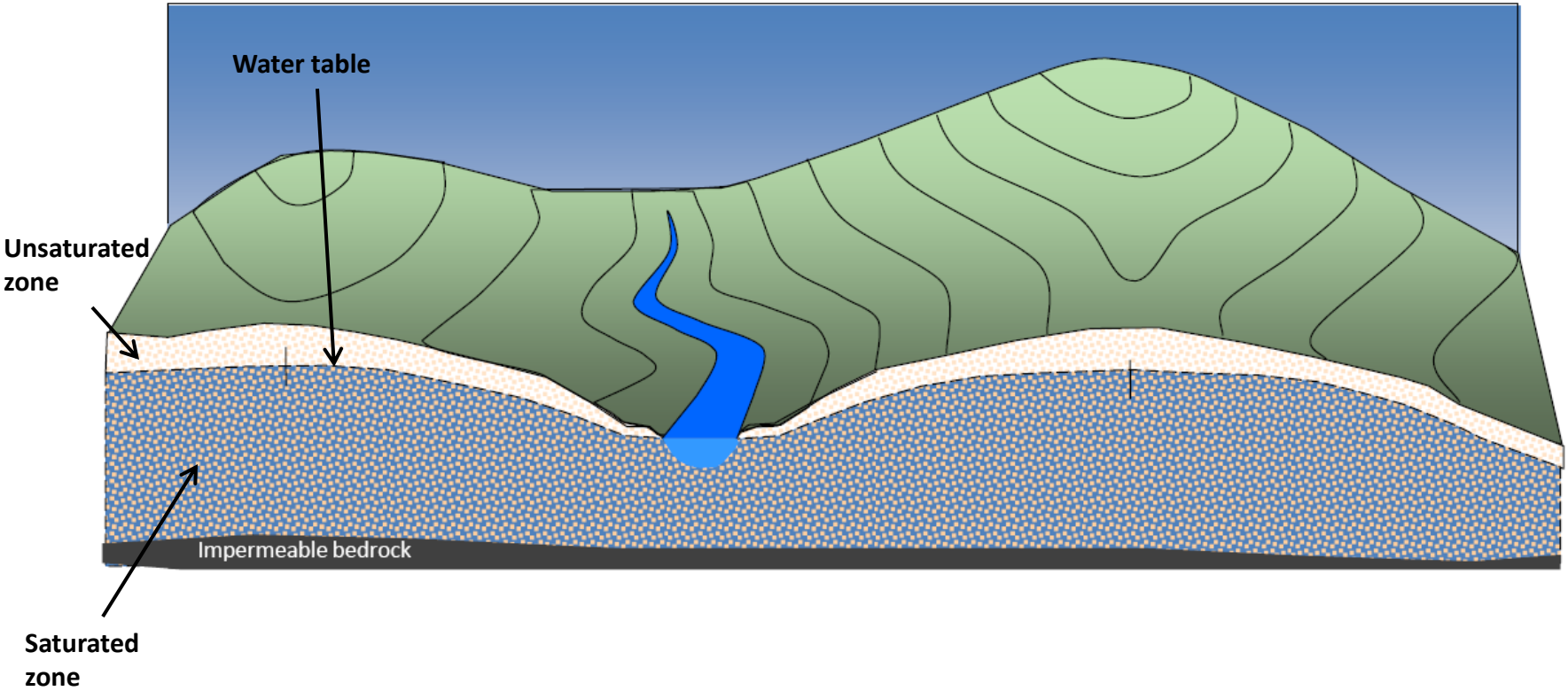
A water bearing geological formation.





Watershed – the land area where water originates for lakes, rivers or streams. Water flows from high energy to low energy.





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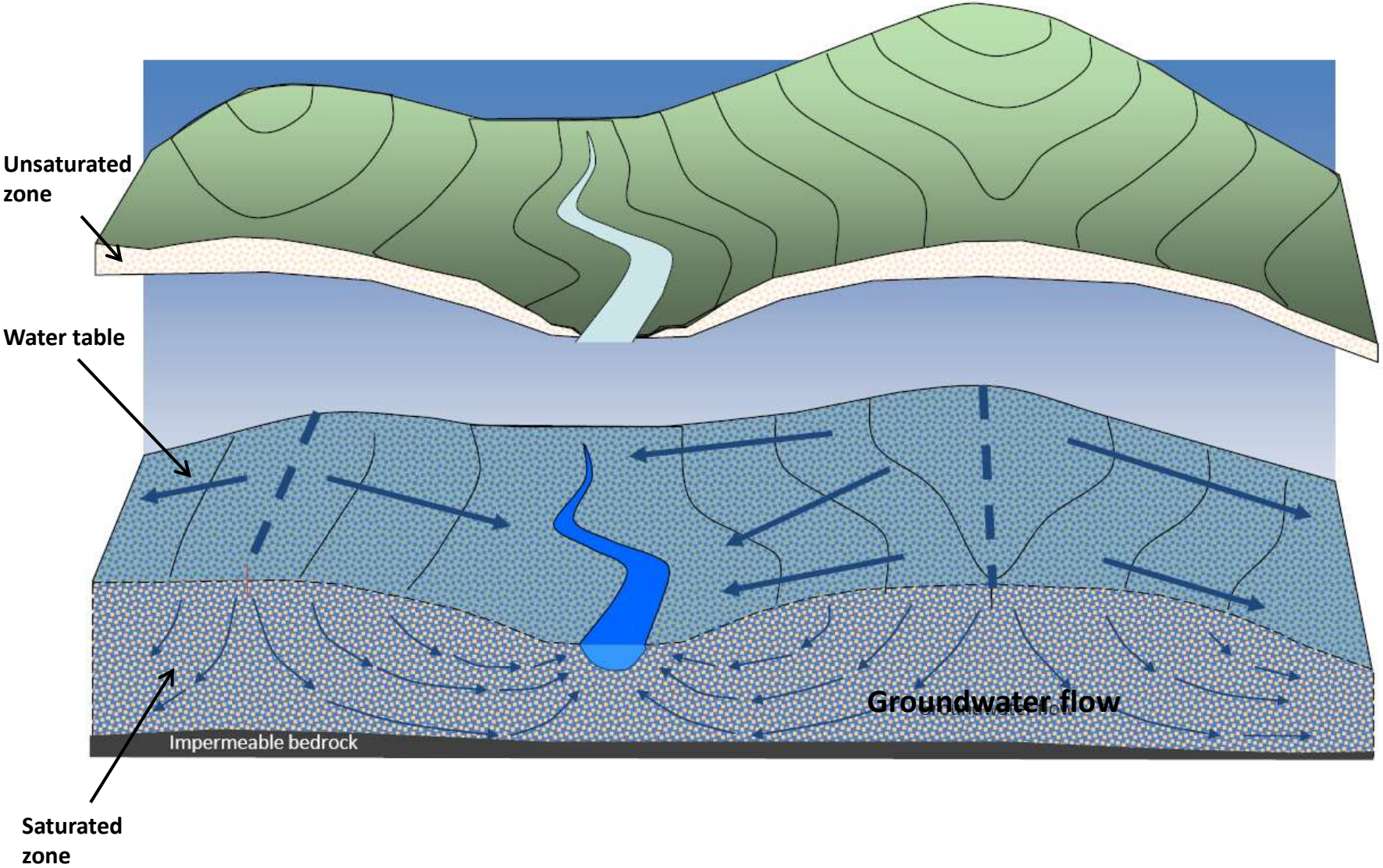

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What is a Watershed?

Rivers and streams act like the drain for our groundwater.

Large regional watersheds are made up of many small local watersheds that are tributaries of a larger river system.

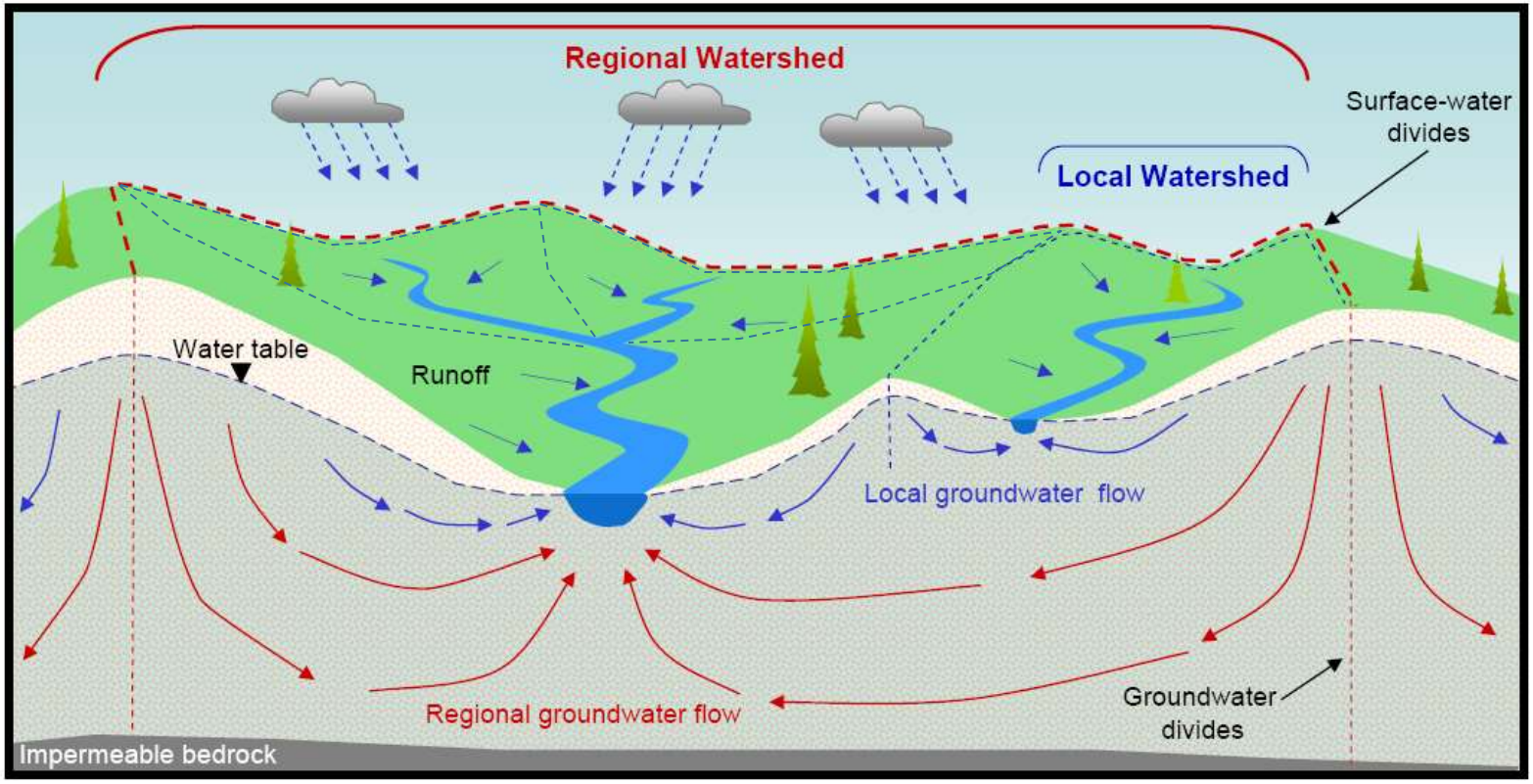

Figure by Kevin Masarik, CWSE

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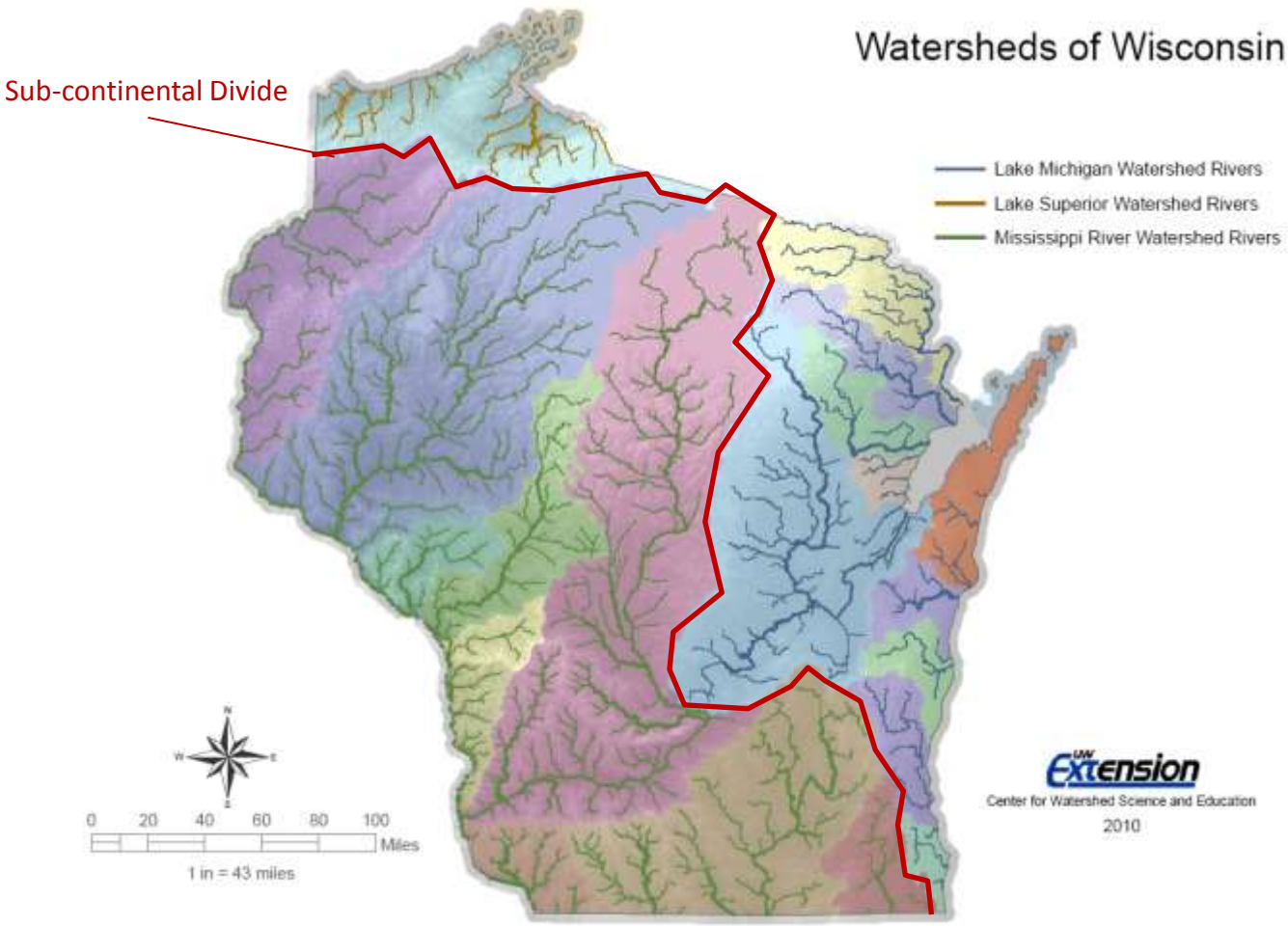
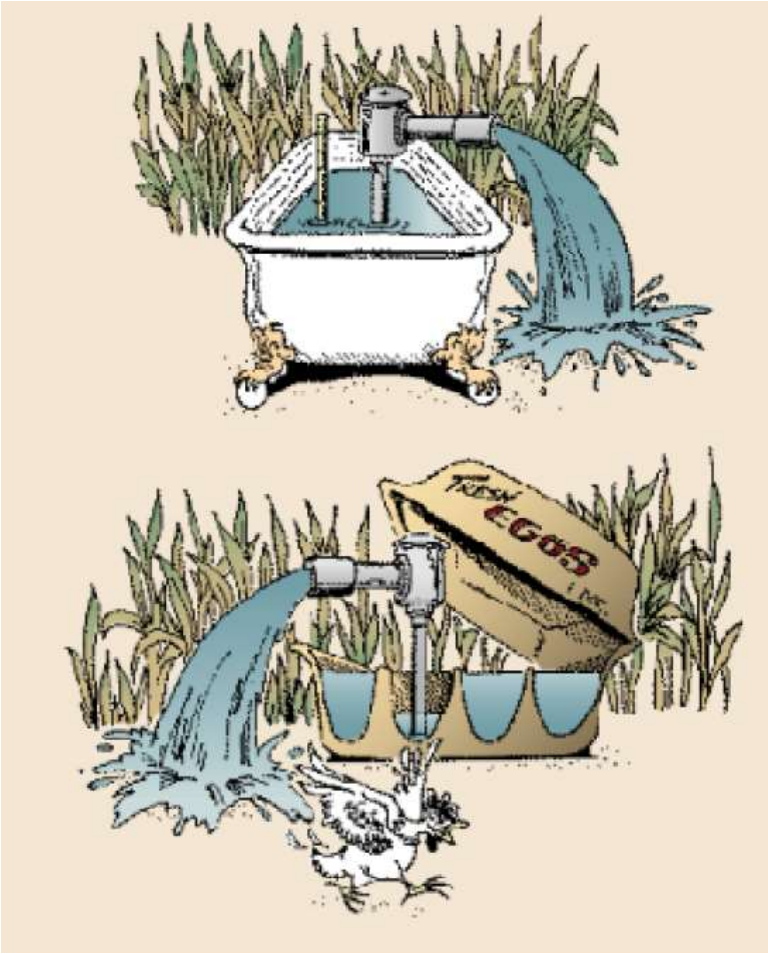
Wisconsin's Watersheds

Wisconsin has three major watersheds or drainage basins. Rivers in the Lake Michigan Watershed are indicated by blue lines, rivers in the Lake Superior Watershed are indicated by orange lines, and rivers in the Mississippi River Watershed are indicated by green lines.

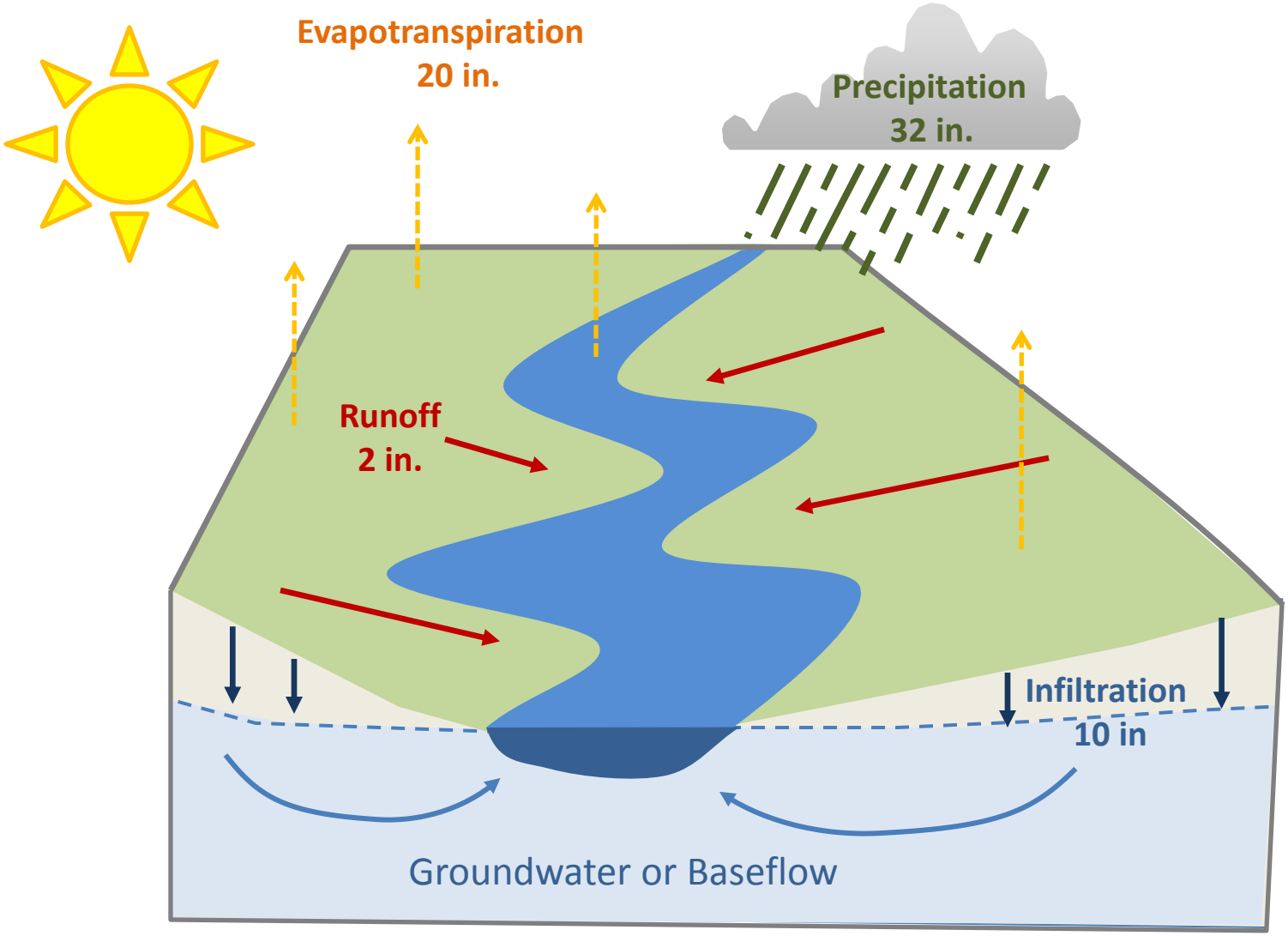
These three watersheds are further subdivided into the watersheds that you see below, represented by the different colors.



Groundwater Issues in Wisconsin



- Water Quantity
- Water Quality



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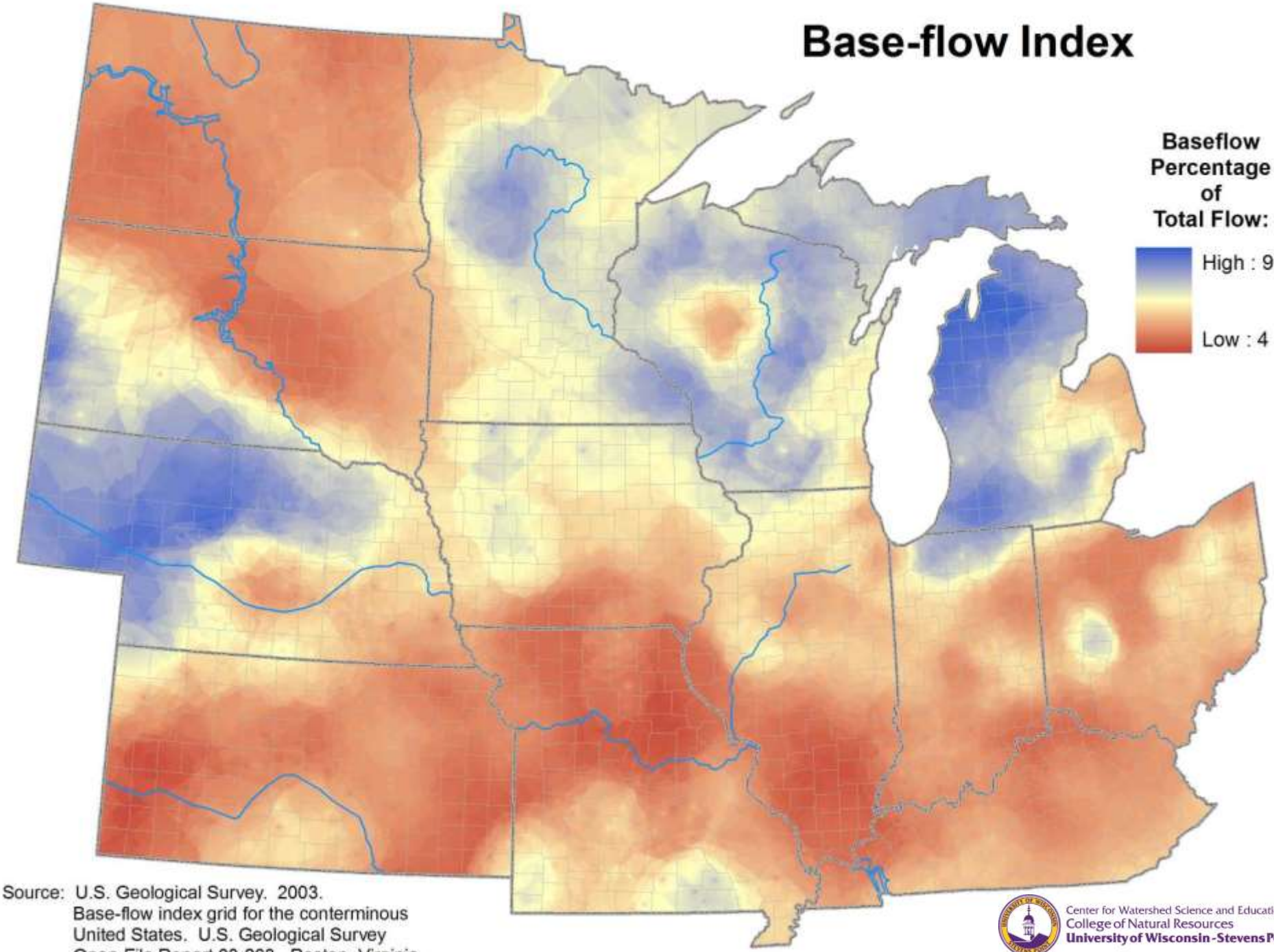
Base-flow Index



Source: U.S. Geological Survey. 2003.
Base-flow index grid for the conterminous
United States. U.S. Geological Survey
Open-File Report 03-263. Reston, Virginia.

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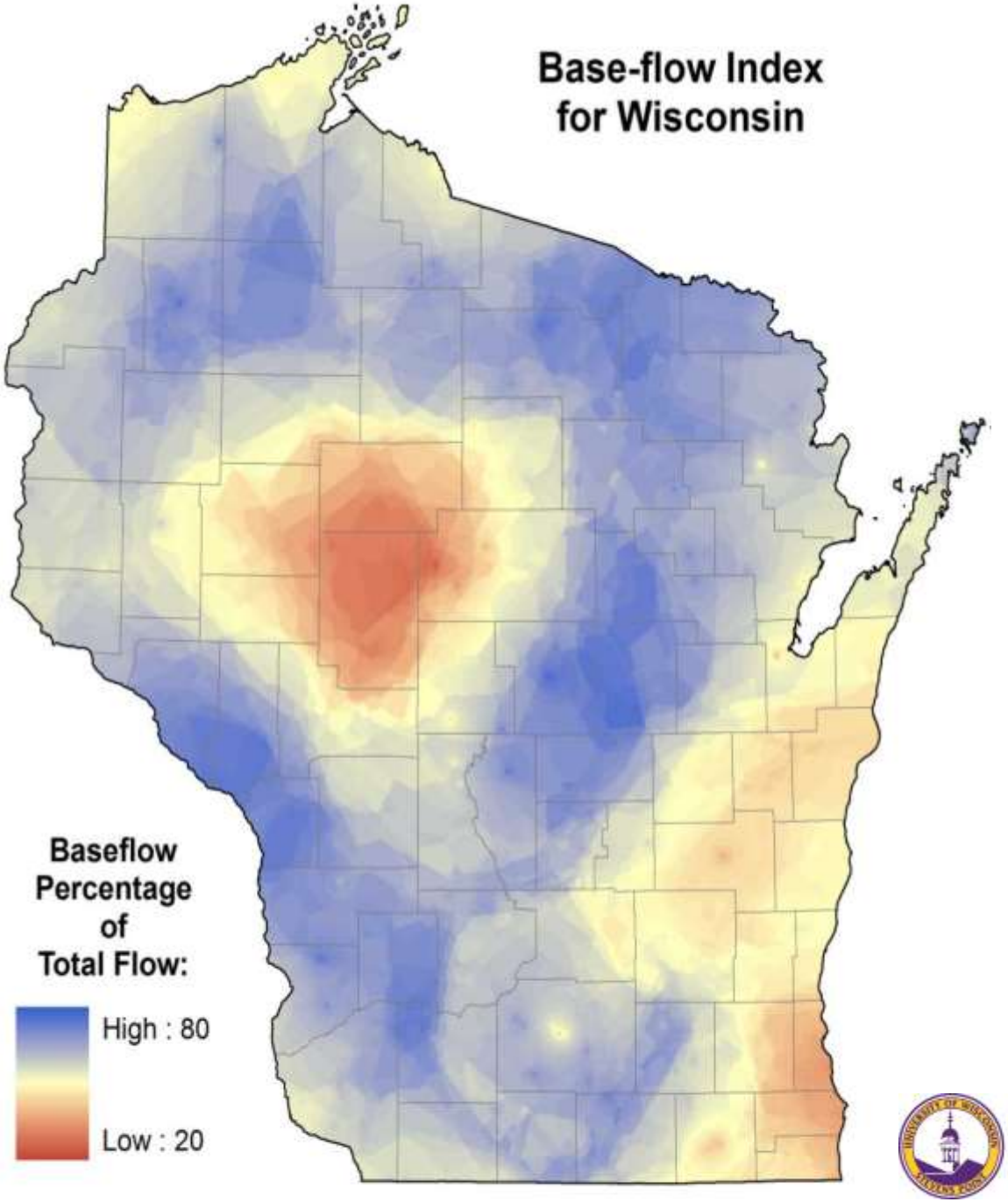

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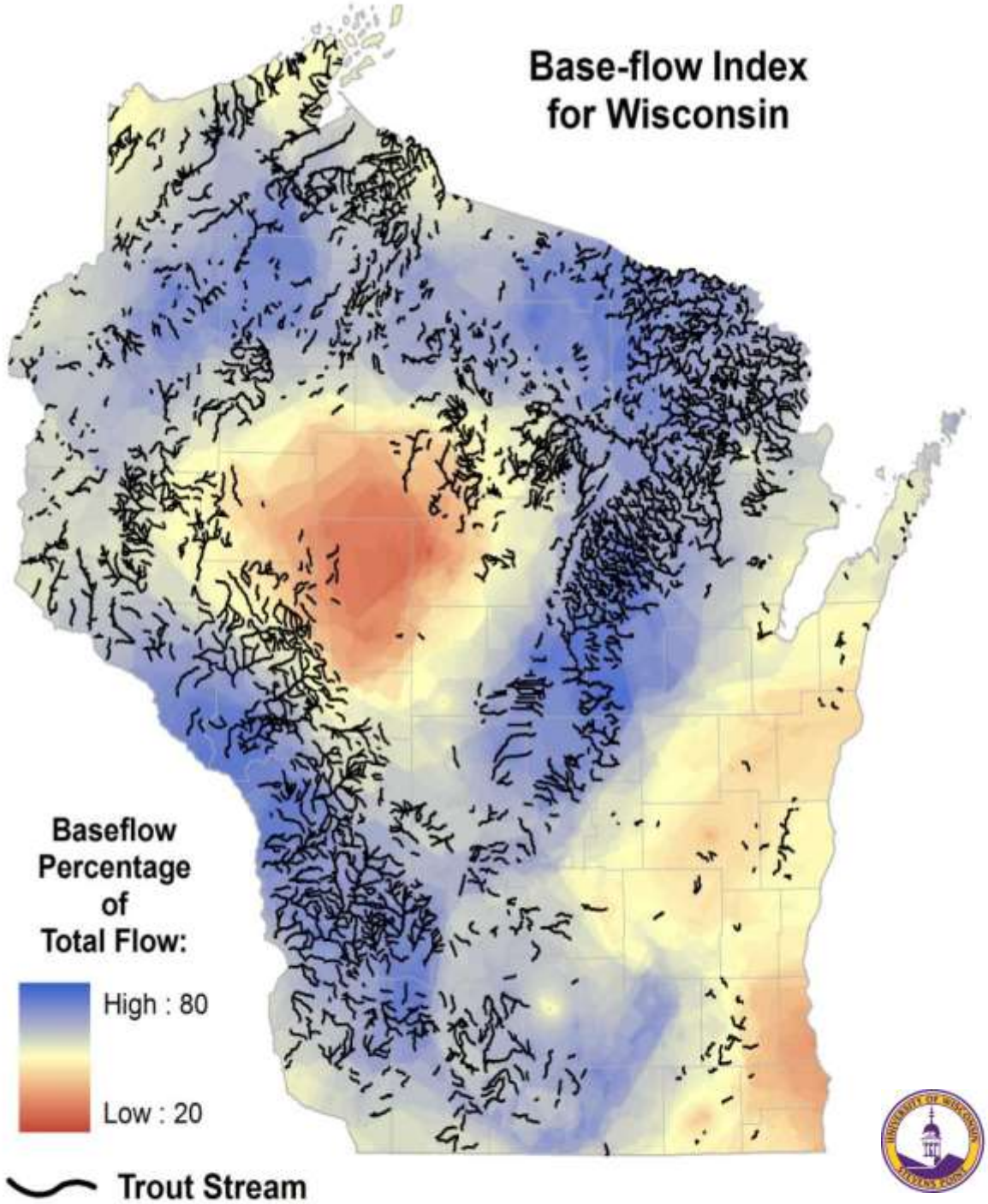

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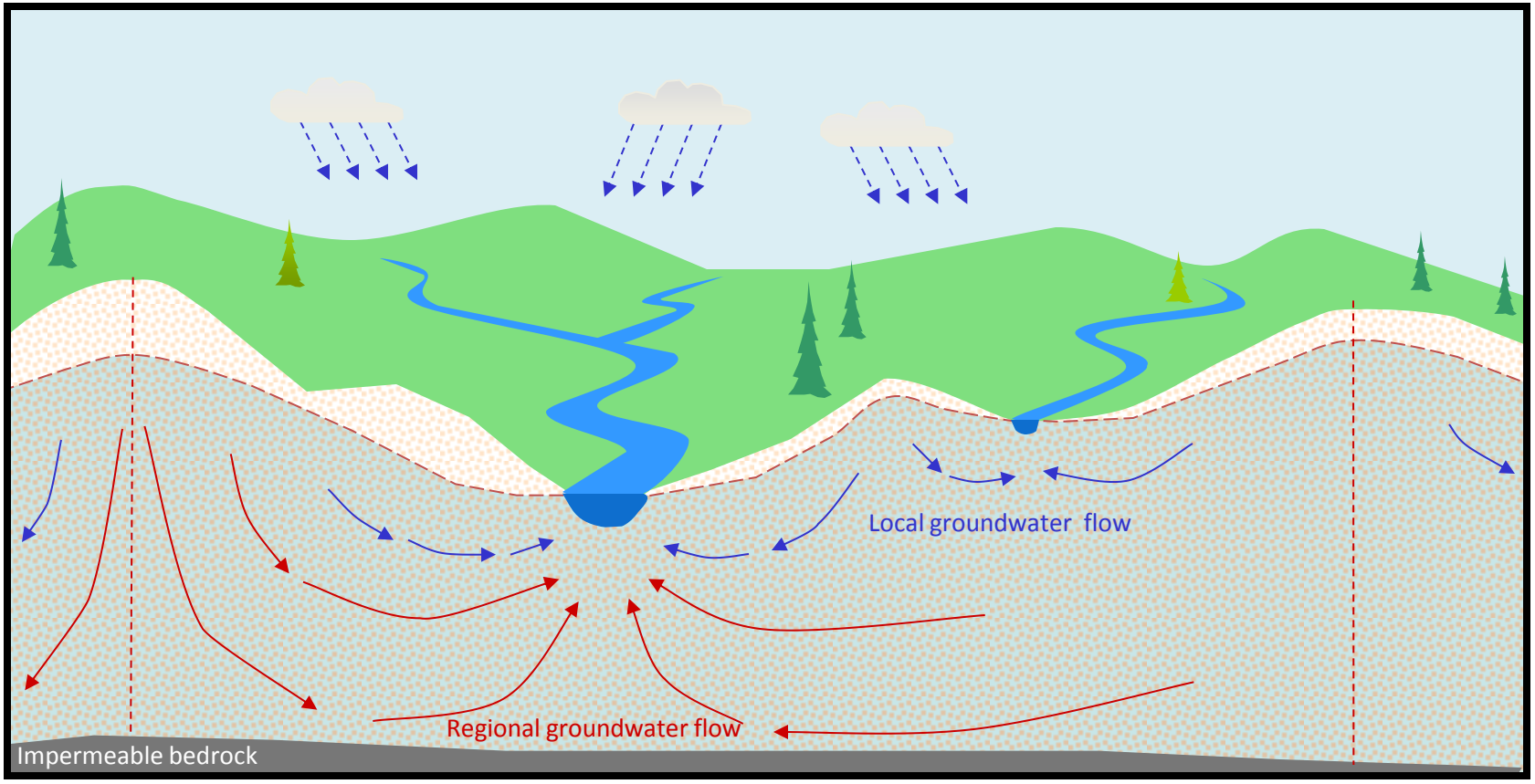
What happens when we have more rain?



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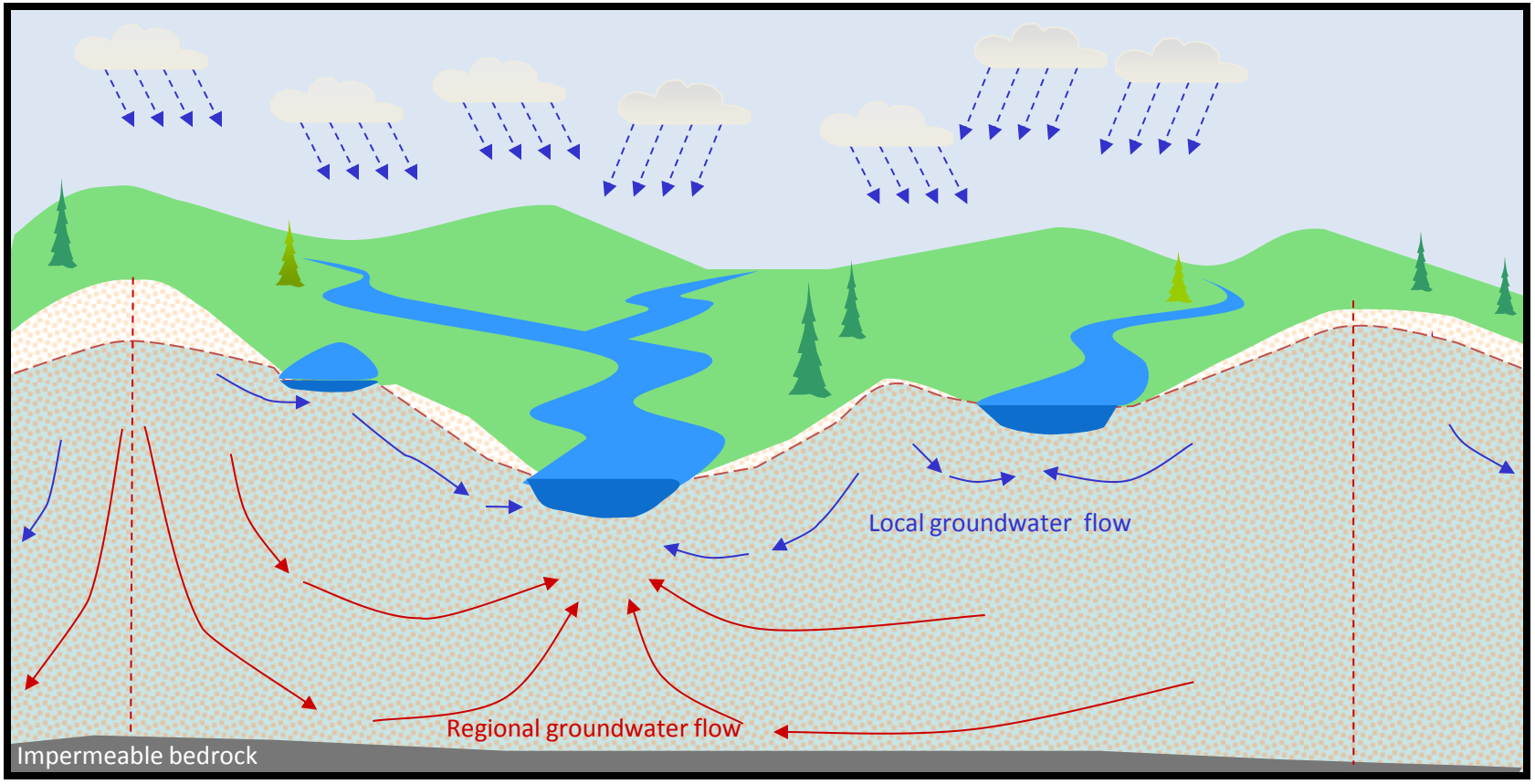

- More infiltration
- Groundwater levels rise
- More water in rivers, lakes and streams
- *Seasonal and climatic implications*

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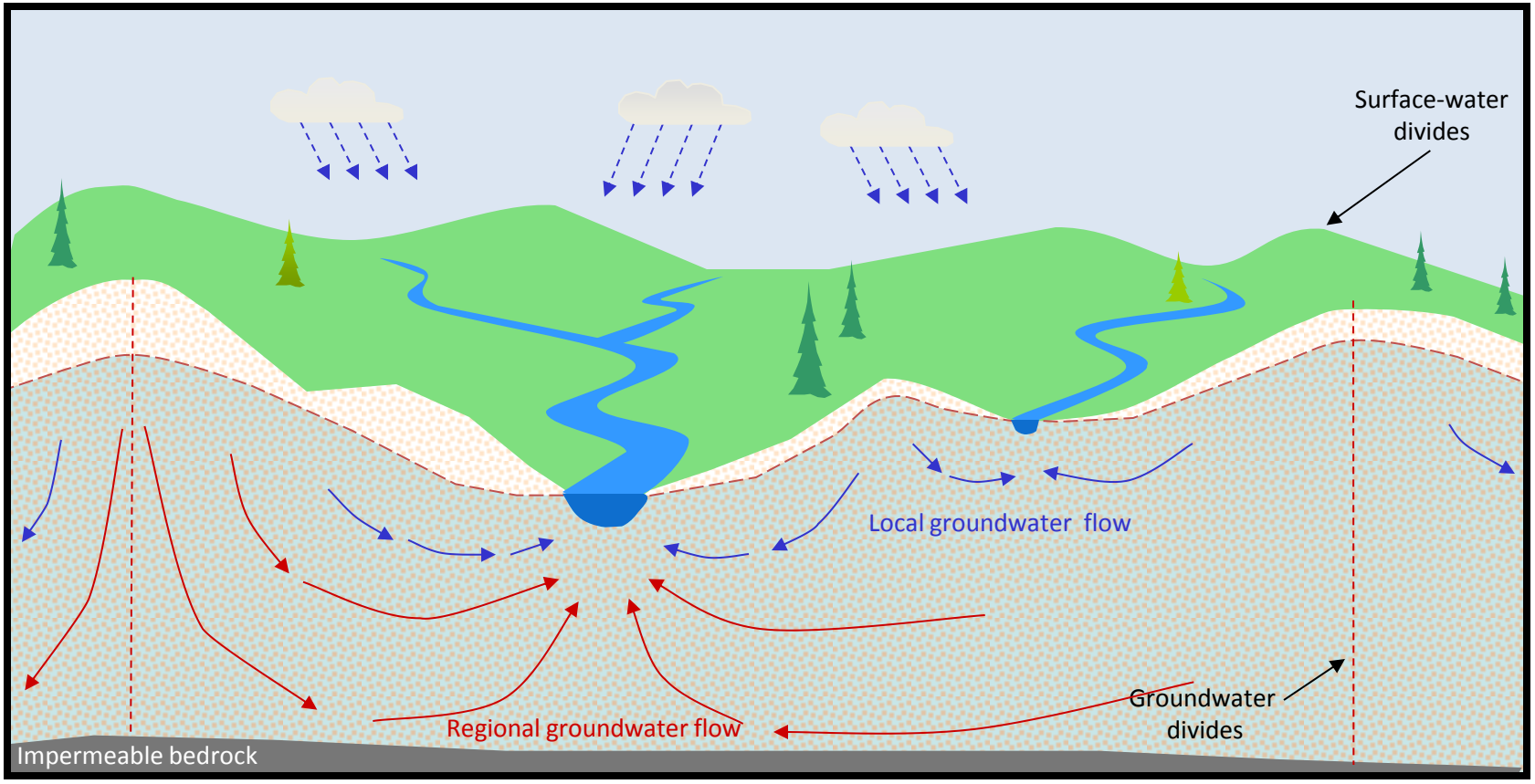
What happens when we have less rain?



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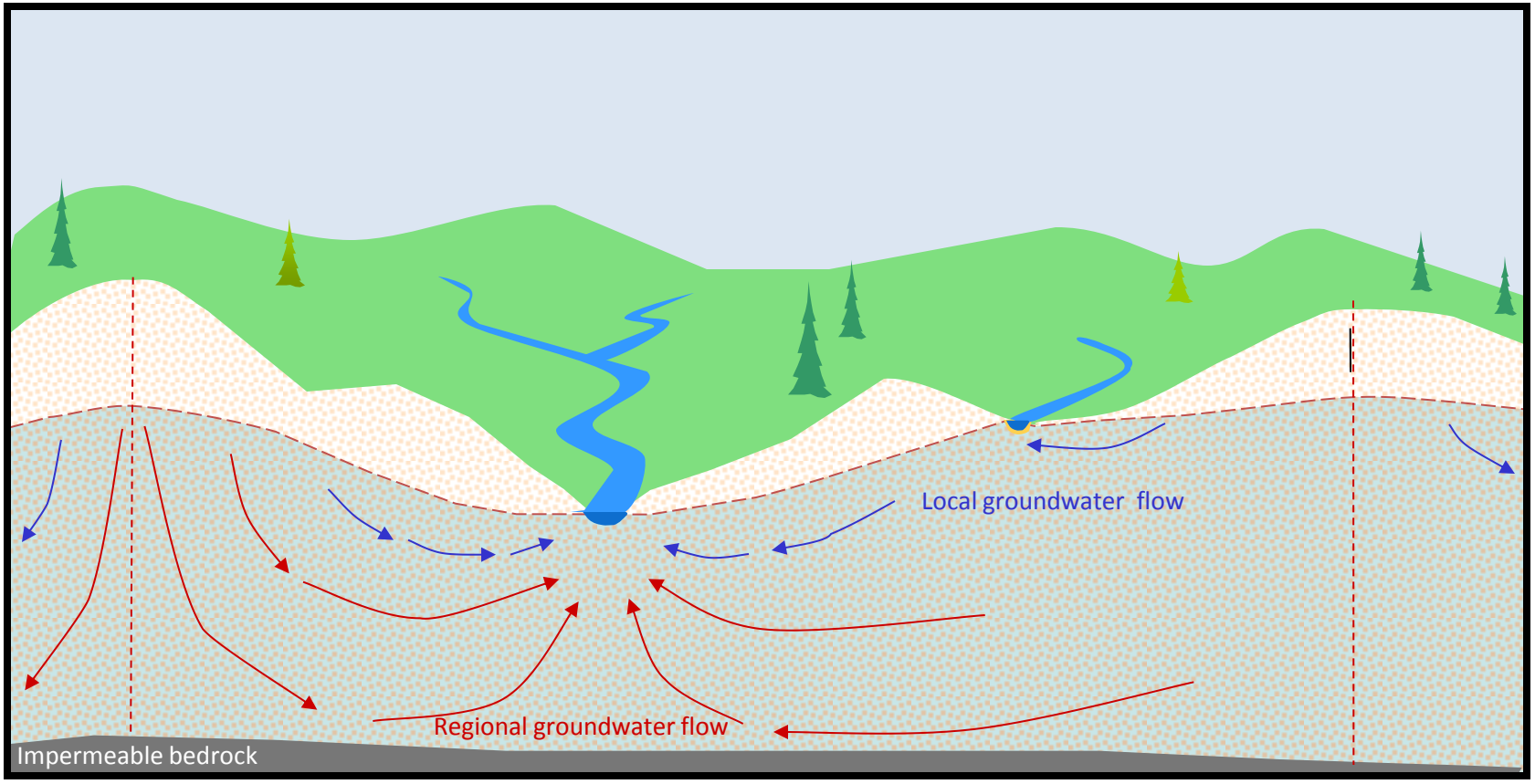
What happens when we have less rain?



- Less infiltration
- Groundwater levels start to go down
- Less water in rivers, lakes and streams
  - *Seasonal and climatic implications*

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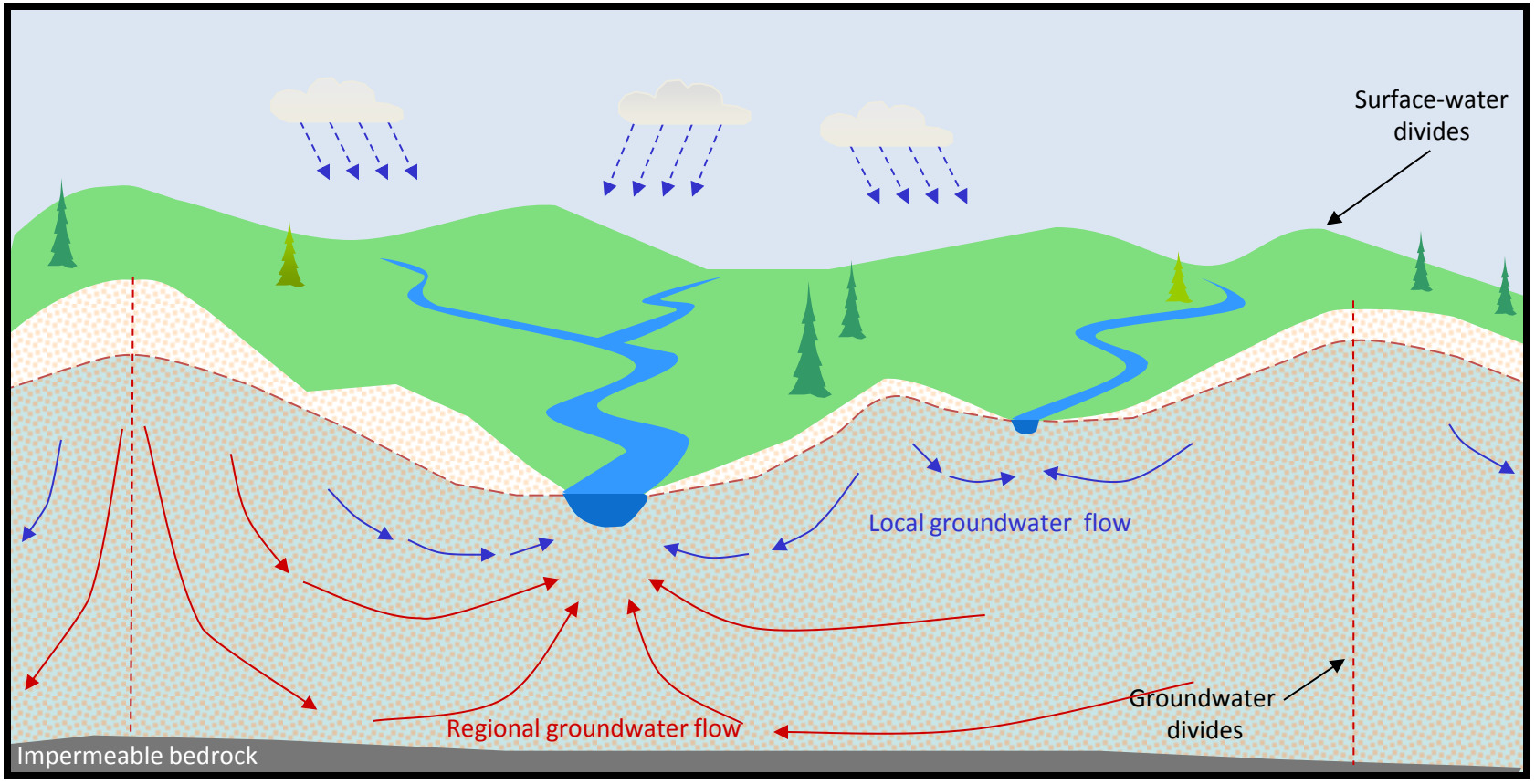
What happens when we decrease infiltration?



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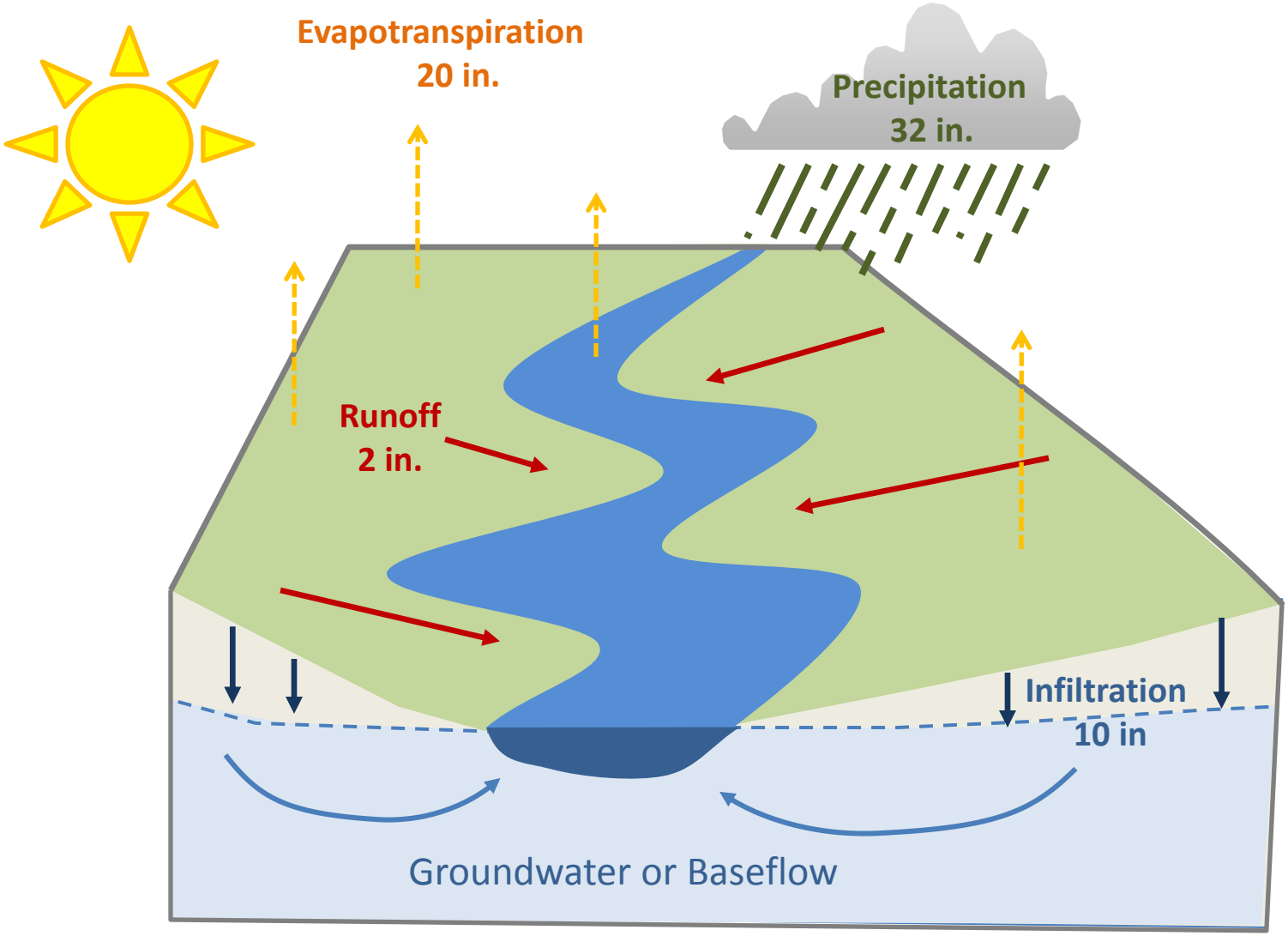

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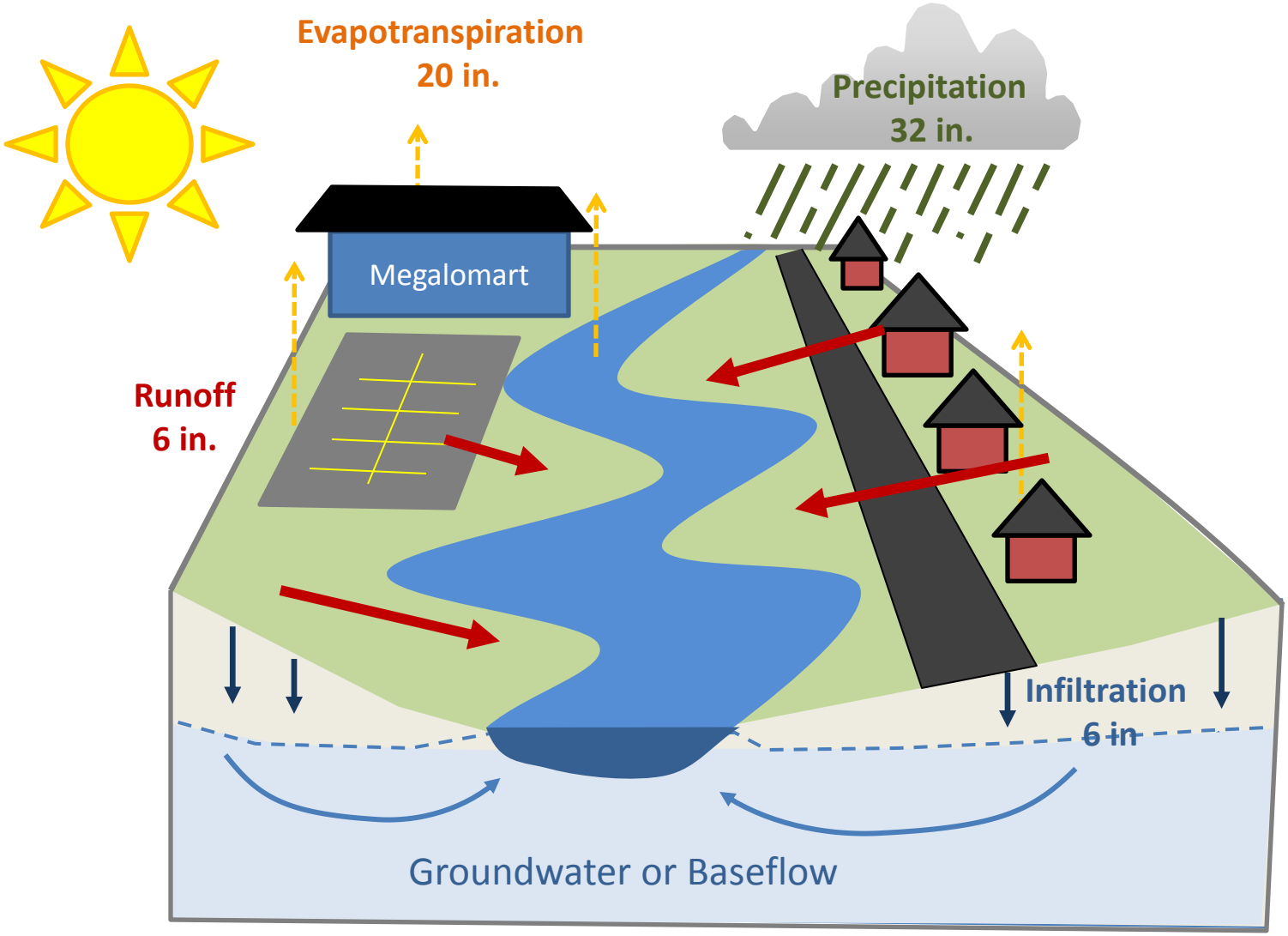

Increase in impervious surfaces means more flooding and more transport of pollutants, sediment *and heat*.

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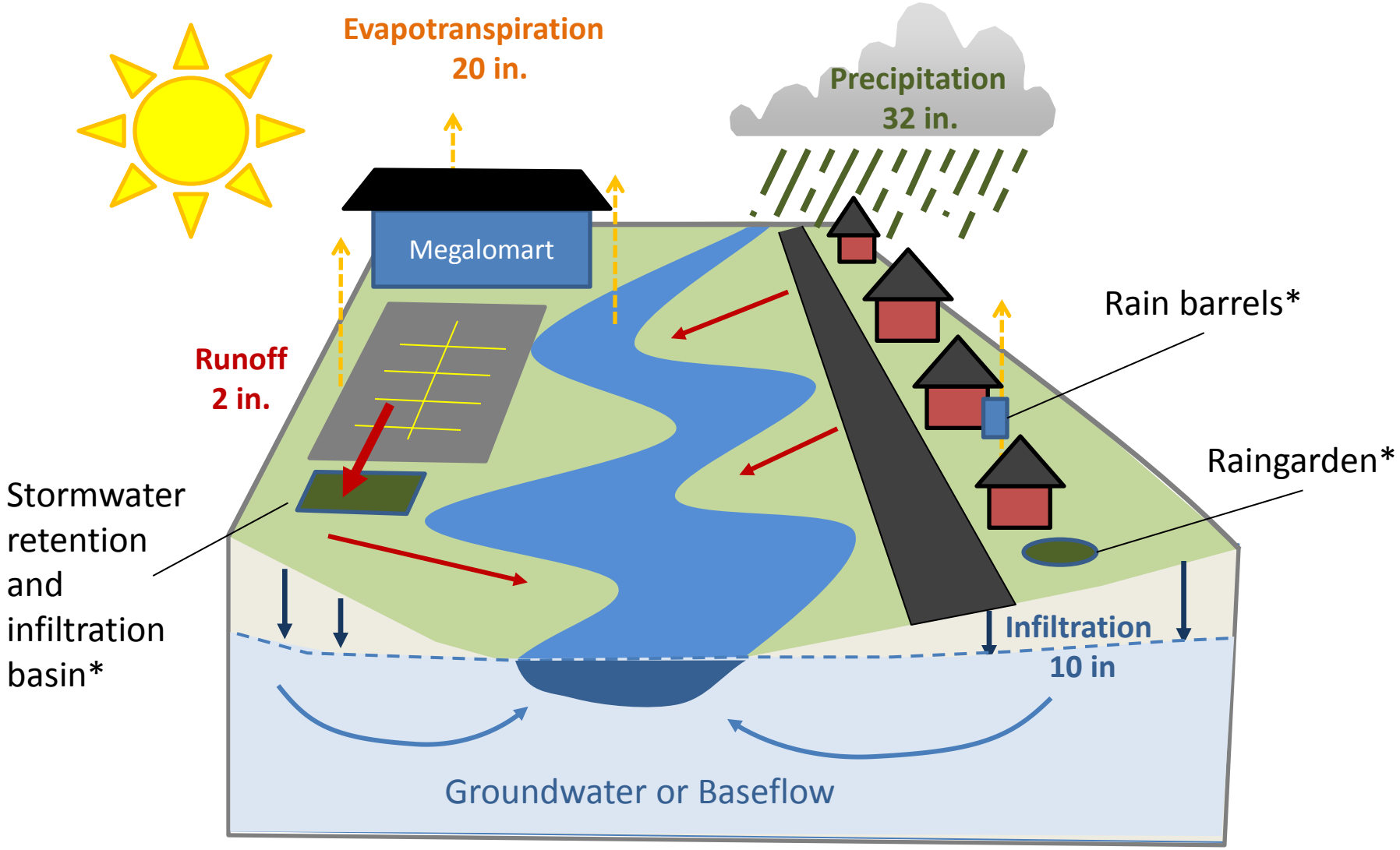

*All aimed at capturing storm water and releasing back into the environment slowly.

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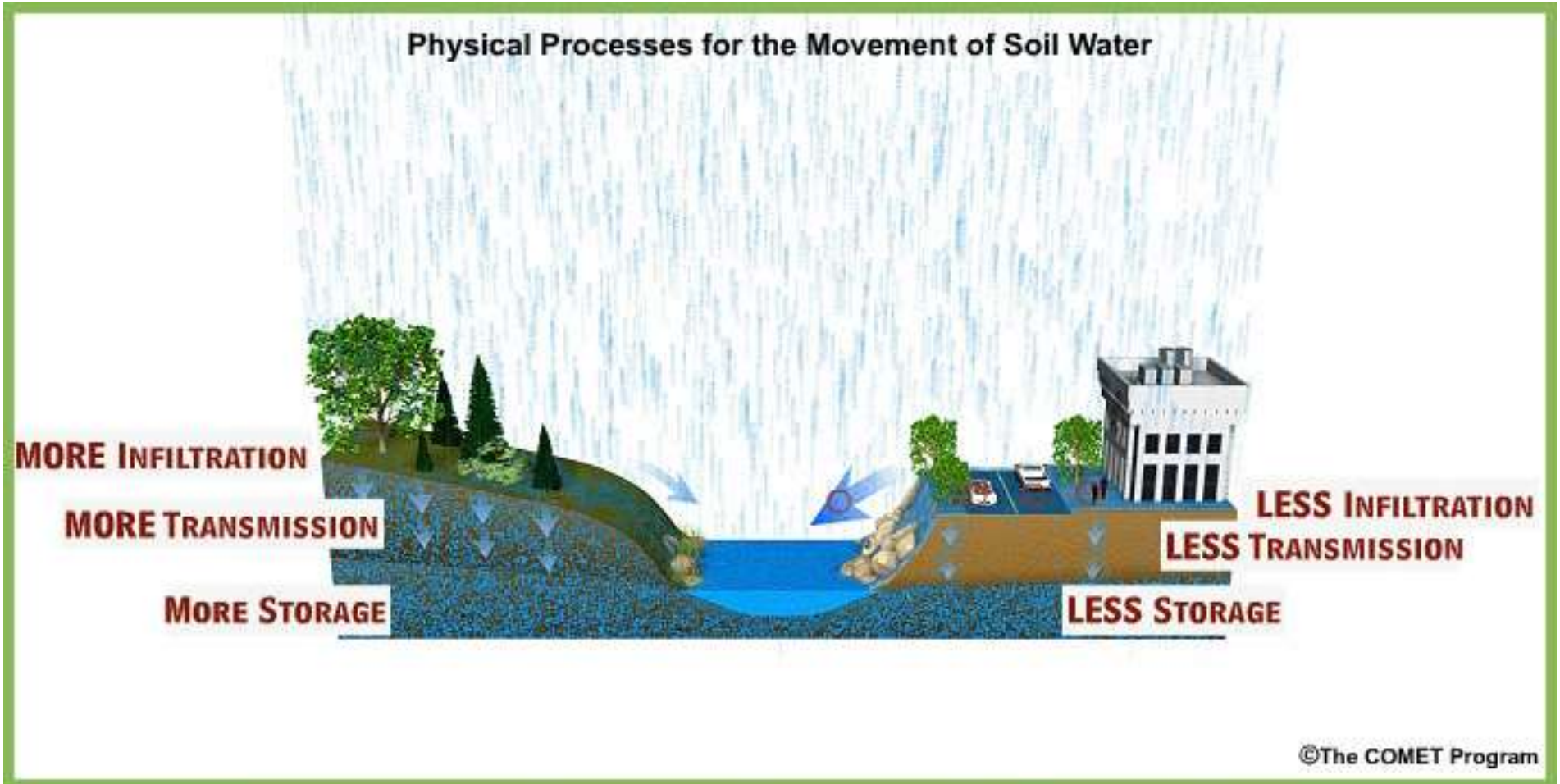
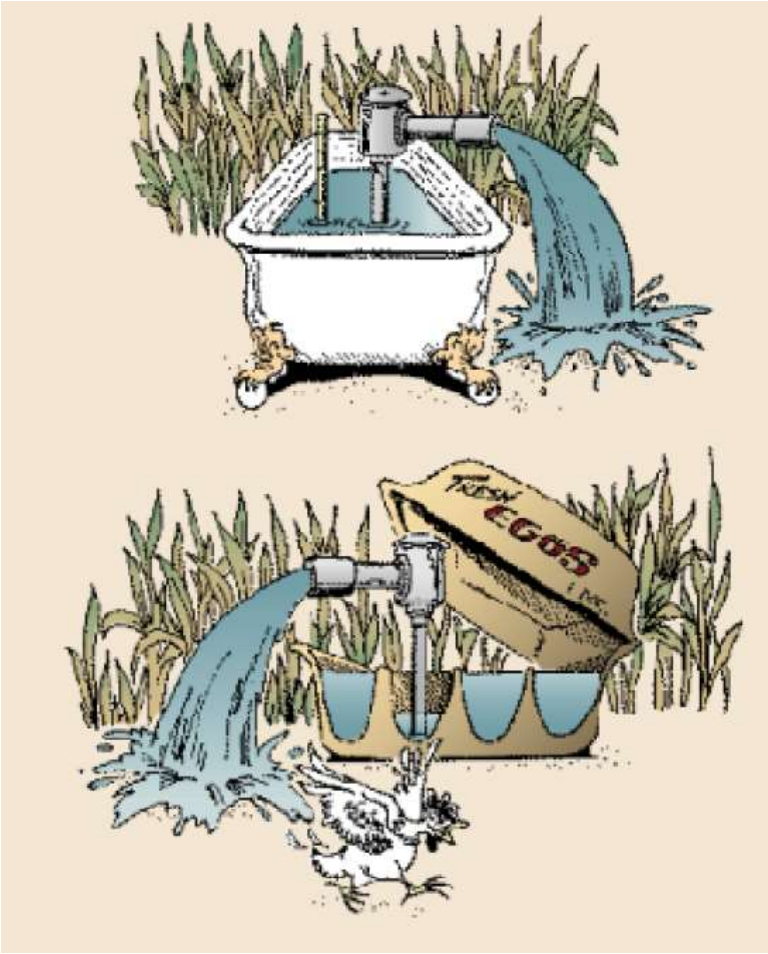


» Natural groundcover slows the speed of surface runoff, keeping water in contact with the ground surface for a longer time. This increases infiltration, transmission, and storage.

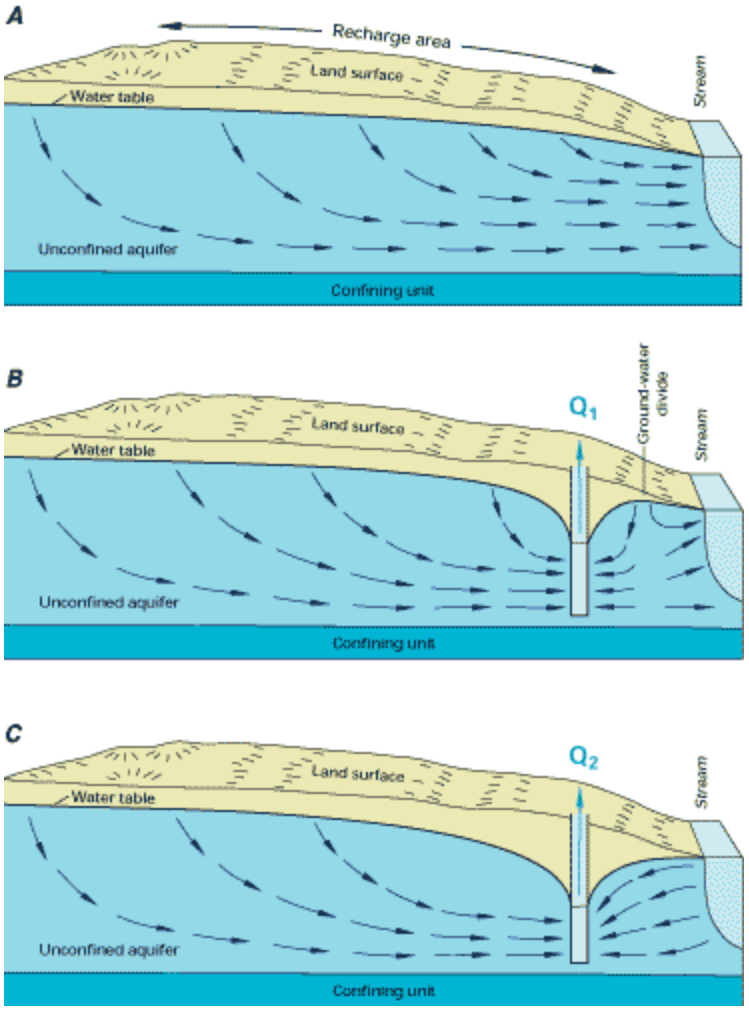
Groundwater Issues in Wisconsin



- Water Quantity
- Water Quality

Water quantity issues in Wisconsin:

- Concentrated pumping of groundwater threatens health of nearby streams and lakes.
- Communities have had to locate alternative sources of water because of contamination in existing aquifers.
- Some communities have trouble extracting sufficient groundwater because of local geologic conditions.



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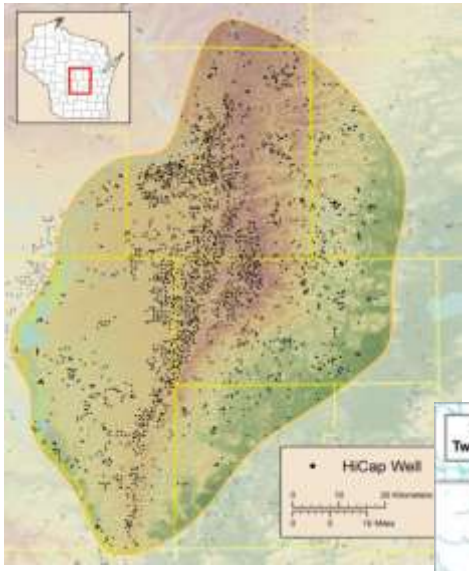

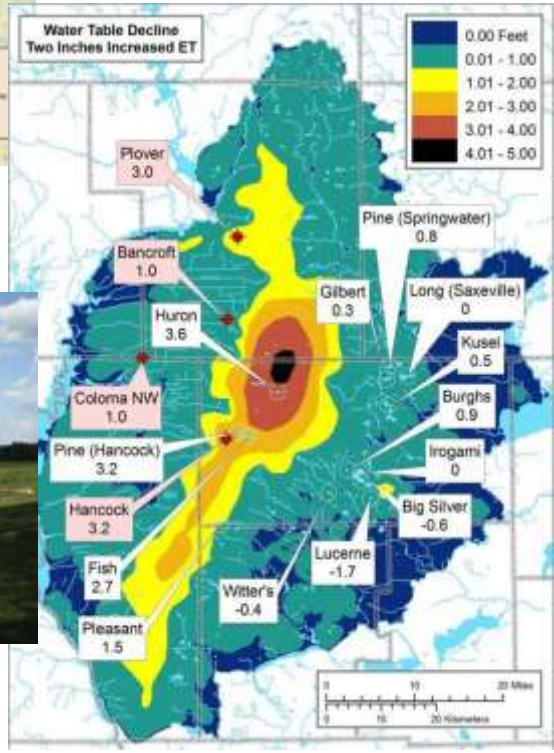

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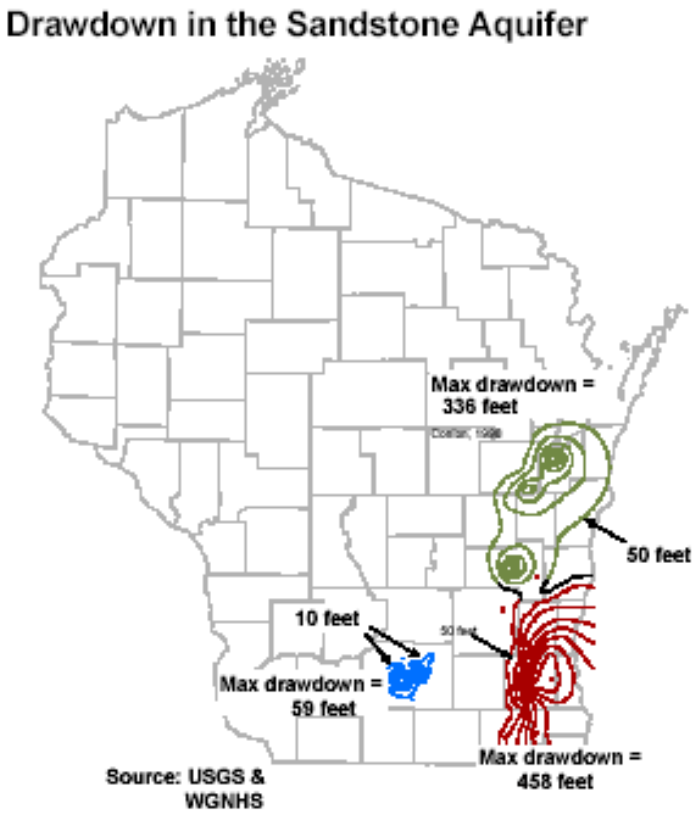

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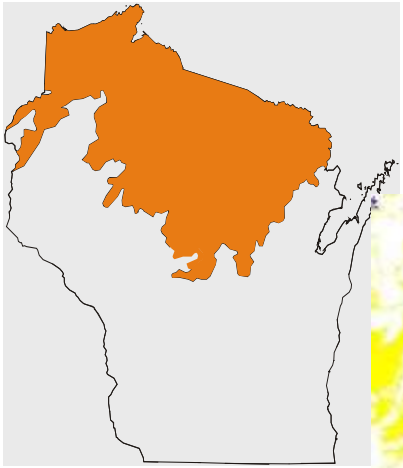
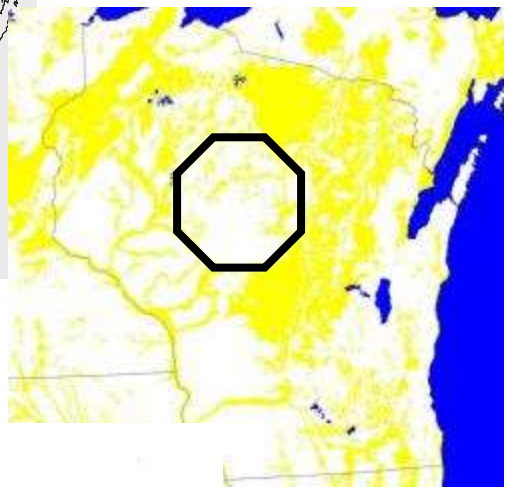




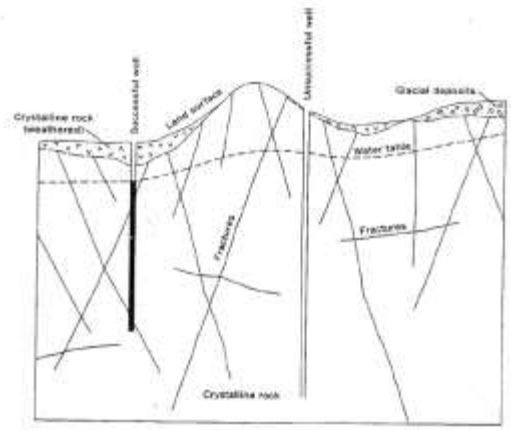
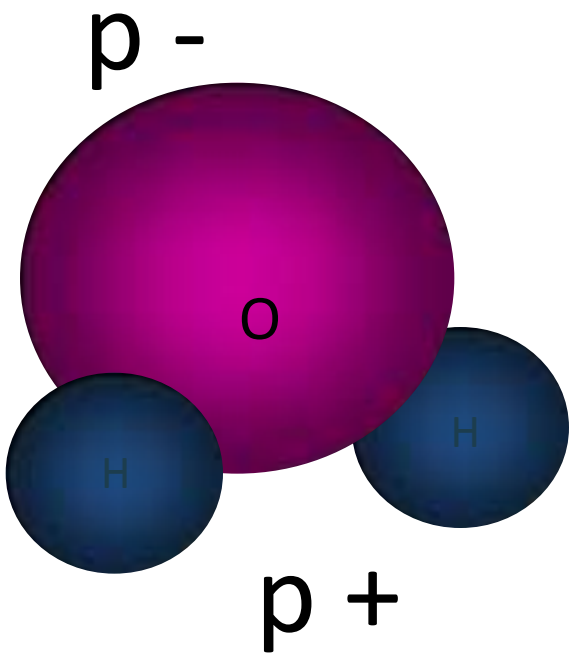


FIGURE 2.—Occurrence of ground water in crystalline rock.

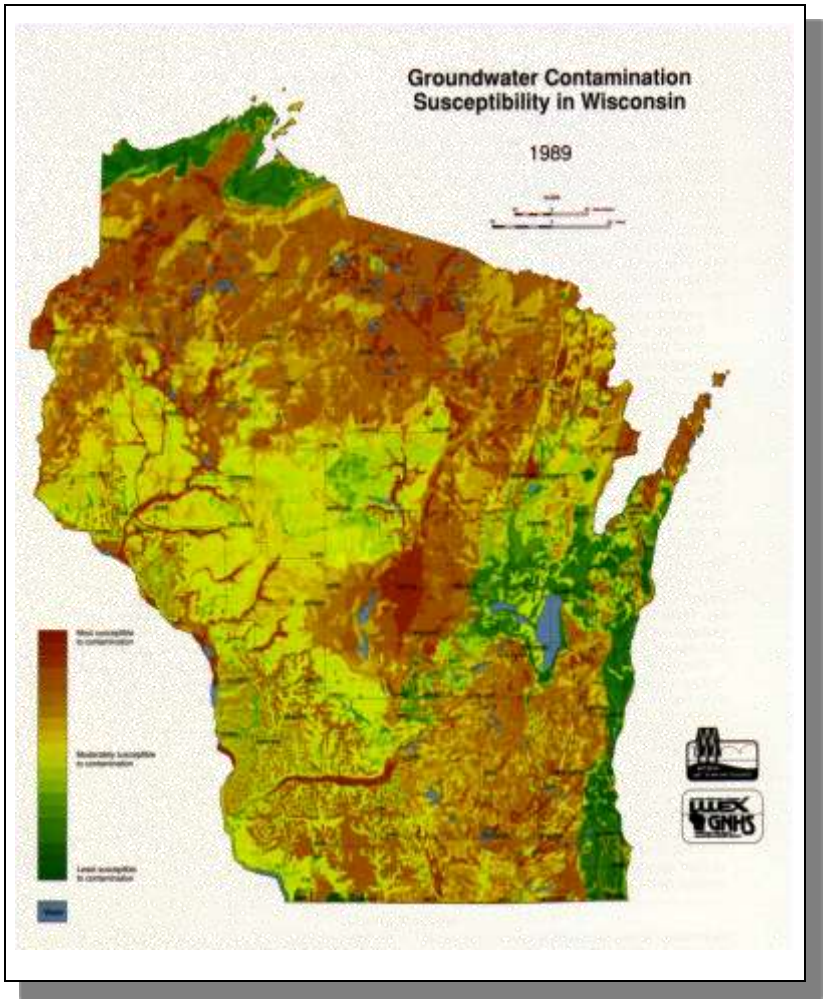
water basics

- "Universal Solvent"
- Naturally has "stuff" dissolved in it.
  - Impurities depend on rocks, minerals, land-use, plumbing, packaging, and other materials that water comes in contact with.
- Can also treat water to take "stuff" out

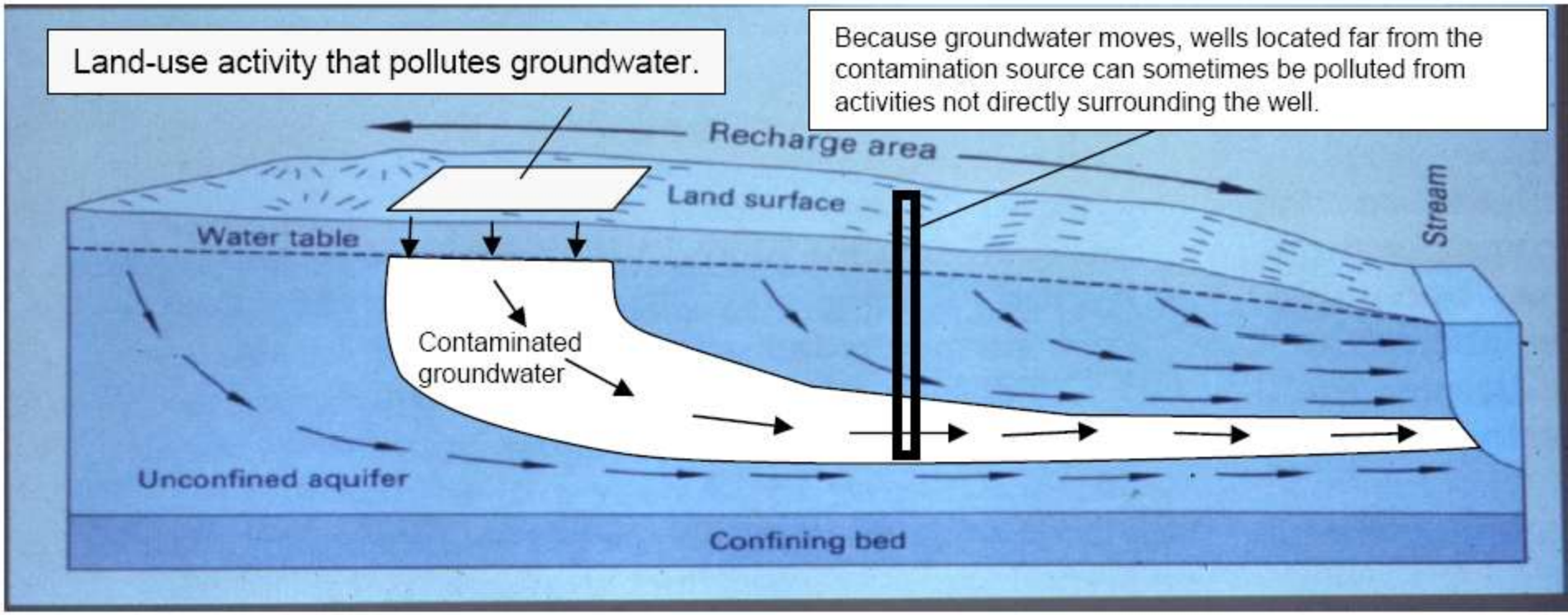


Contamination Susceptibility

- Susceptibility is related to the type of soil and the local geology.
- Land-use ultimately determines if groundwater becomes contaminated from human activities.




OIL
OIL
OIL
Soil


Land-use activity that pollutes groundwater.
Because groundwater moves, wells located far from the contamination source can sometimes be polluted from activities not directly surrounding the well.
Recharge area
Land surface
Water table
Stream
Contaminated groundwater
Unconfined aquifer
Confining bed