

Groundwater: Wisconsin's Buried Treasure

Center for Watershed Science and Education



University of Wisconsin-Stevens Point
College of Natural Resources

UW
Extension
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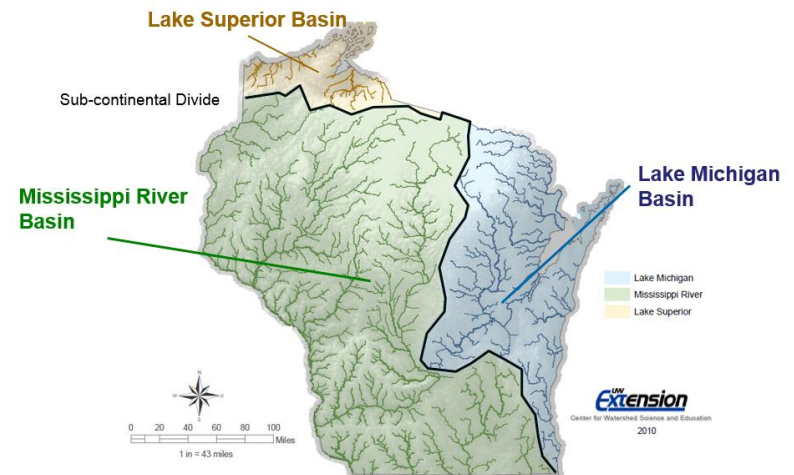
Water Resources – Historical Evolution



Charles E. Brown , Map showing distribution of Indian mounds in Wisconsin 1919
Wisconsin Historical Society



Wisconsin has 3 major basins



Slides courtesy of:
Dr. Ray Reser, Director of UW-Stevens Point Natural History Museum



University of Wisconsin-Stevens Point

Water Resources – Historical Evolution



Prior to widespread cultivation of crops, hunting and gathering were important food sources; many of which were tied to water.



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



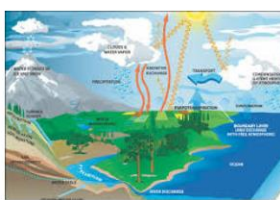
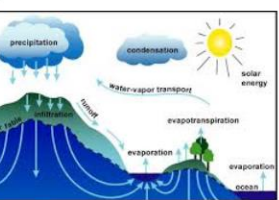
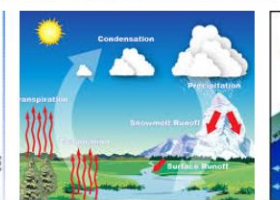
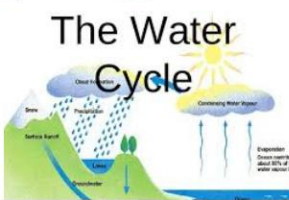
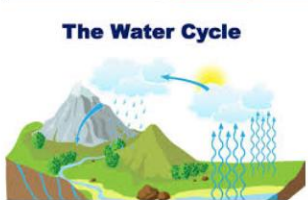
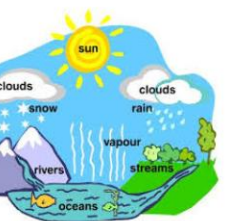
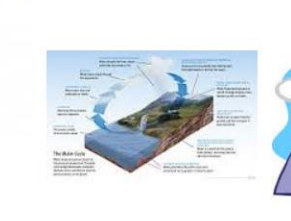
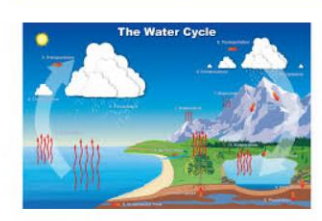
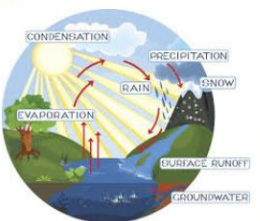
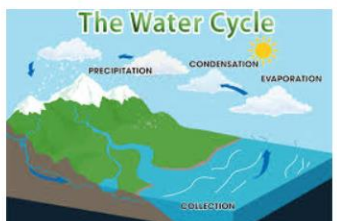
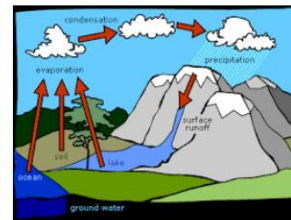
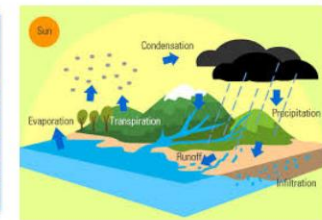
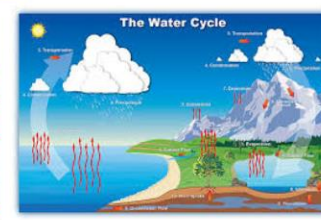
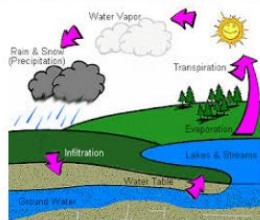
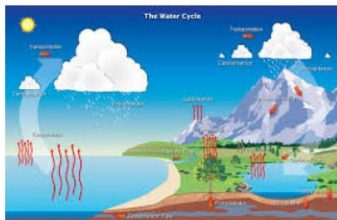
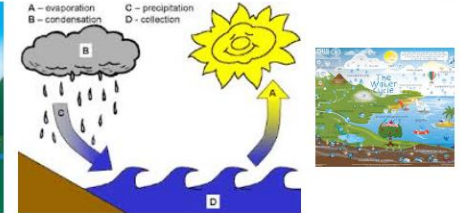
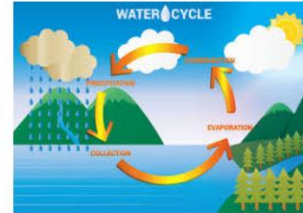
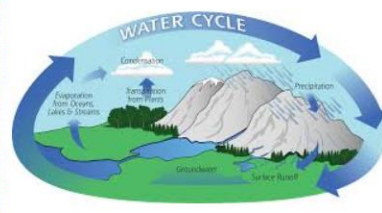
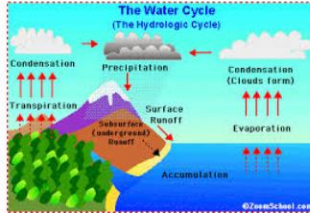
Groundwater is Valuable to Wisconsin

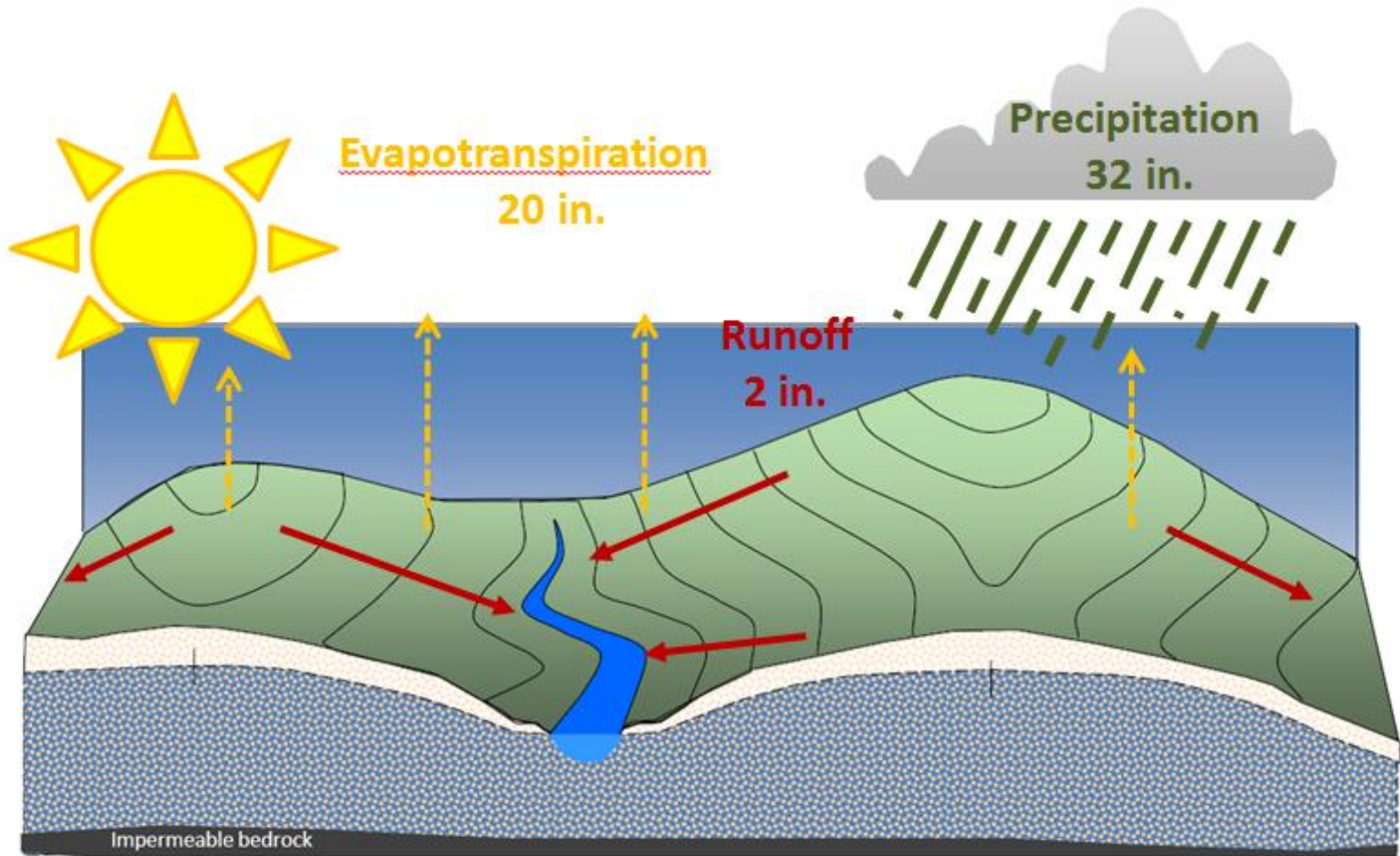
- 95% of Wisconsin Communities
- 75% of Wisconsin Citizens rely on it to meet their daily water needs
- Supplies almost all water for agriculture – livestock, irrigation, dairy operations
- 1/3 of industrial water use
- 1/2 of commercial water use

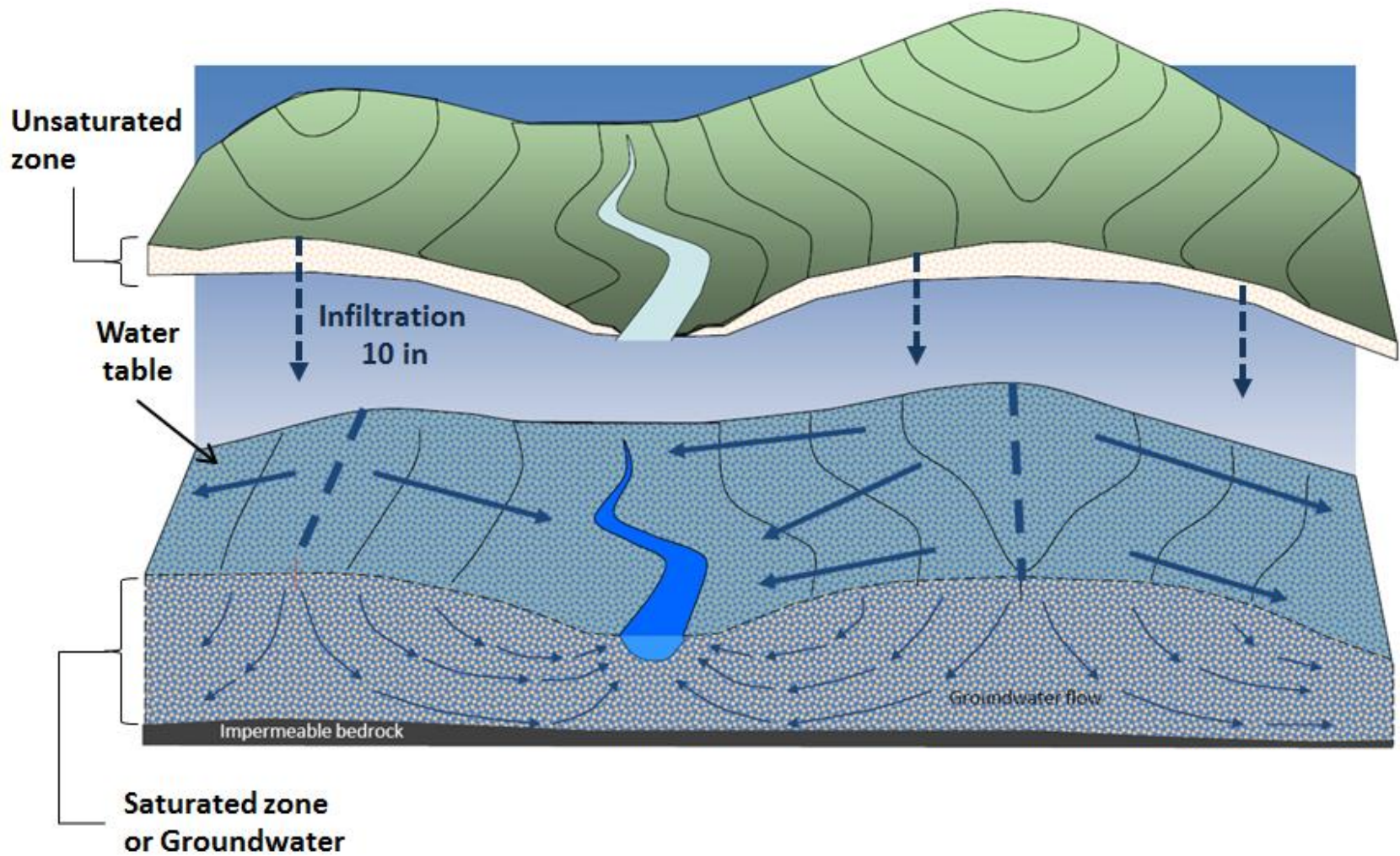


Water Cycle

- rain
- acid rain
- snow
- deforestation
- cloud
- runoff
- preschool
- kindergarten
- middle school
- year 7
- grade 1
- grade 7
- science
- earth science
- ecology
- biological

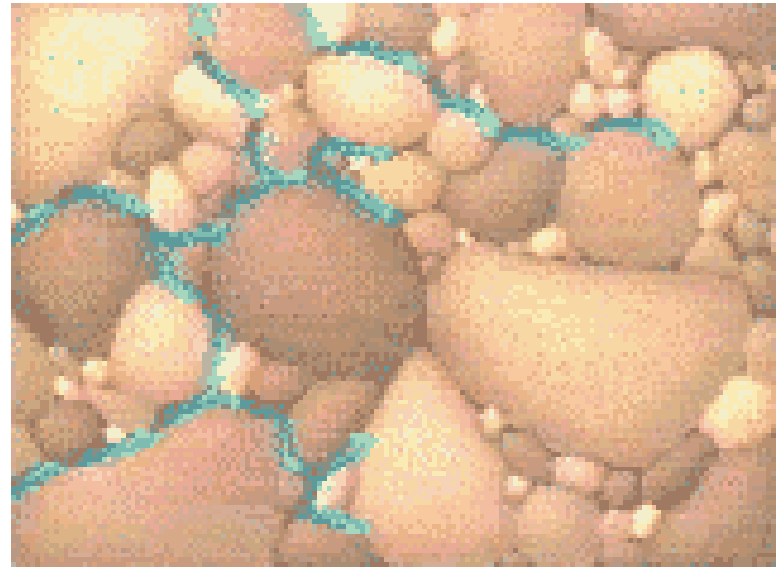
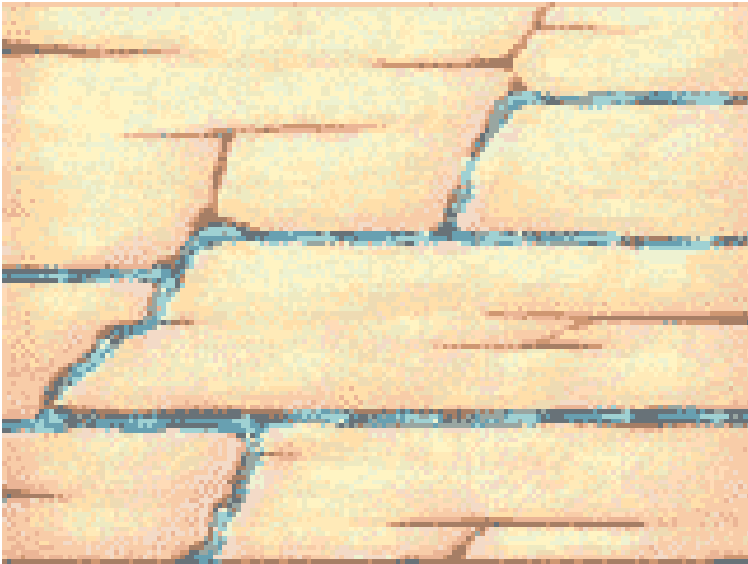




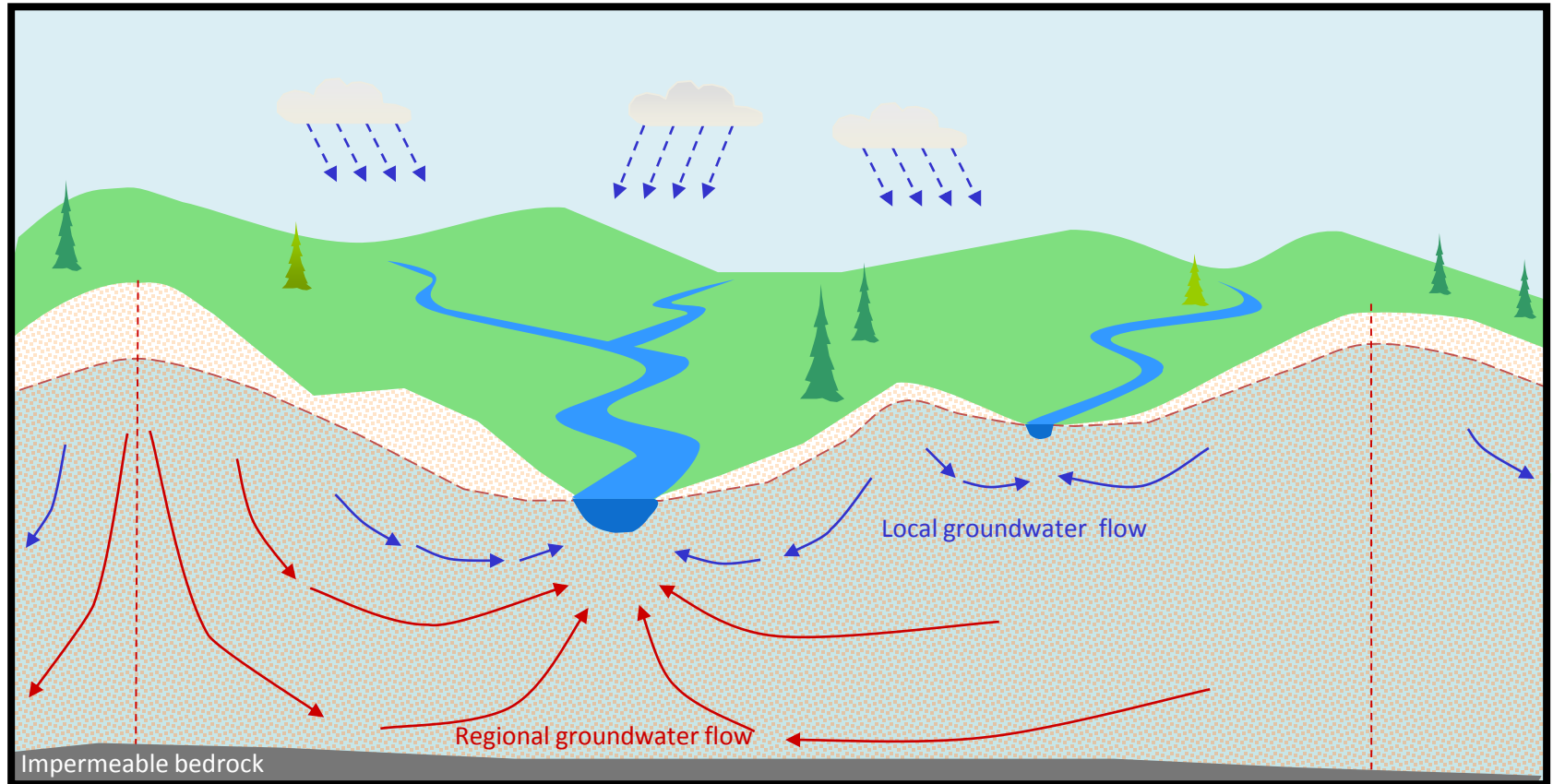


What is an aquifer?

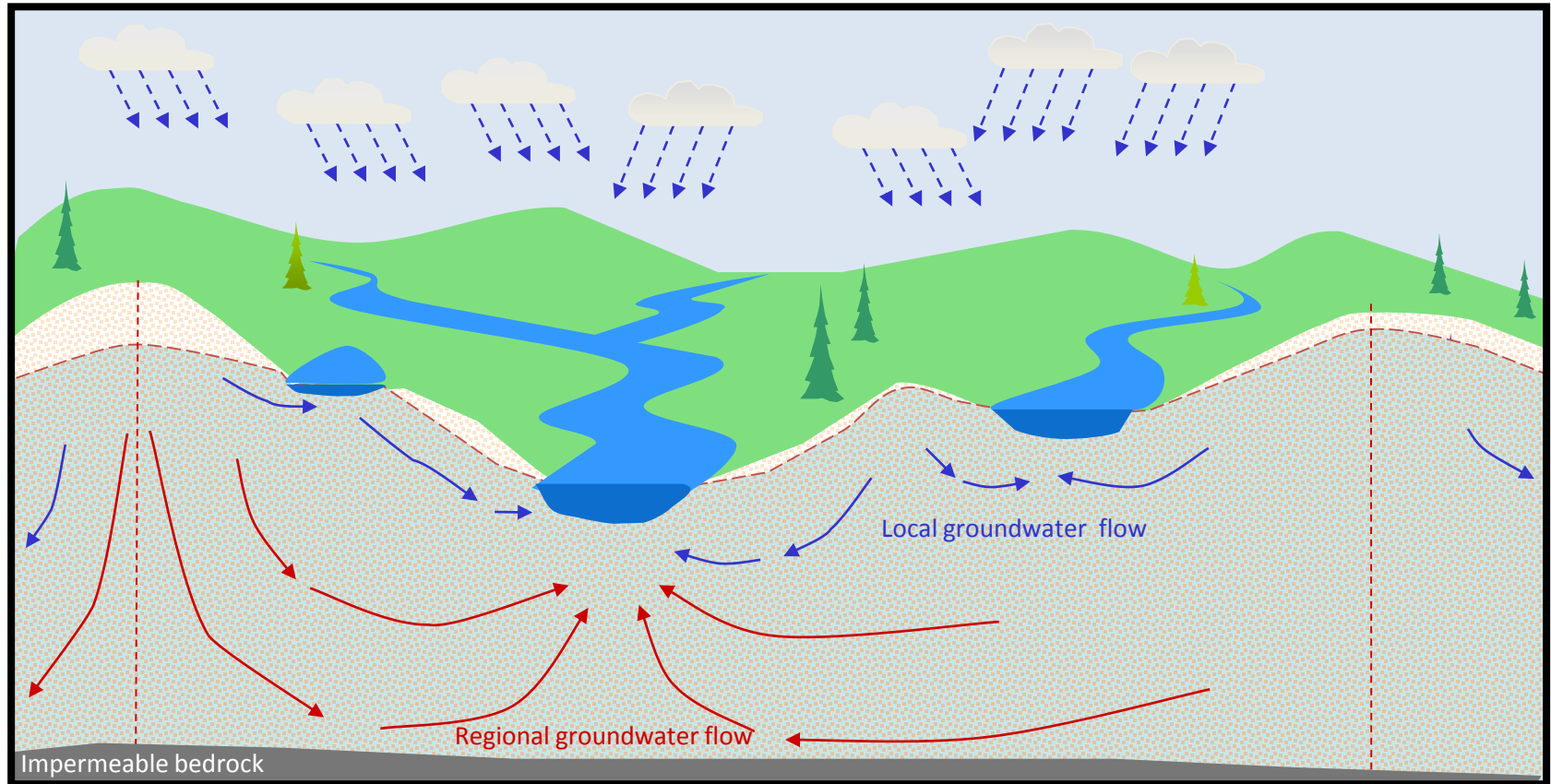
A water bearing geological formation.



What happens when we have more rain?



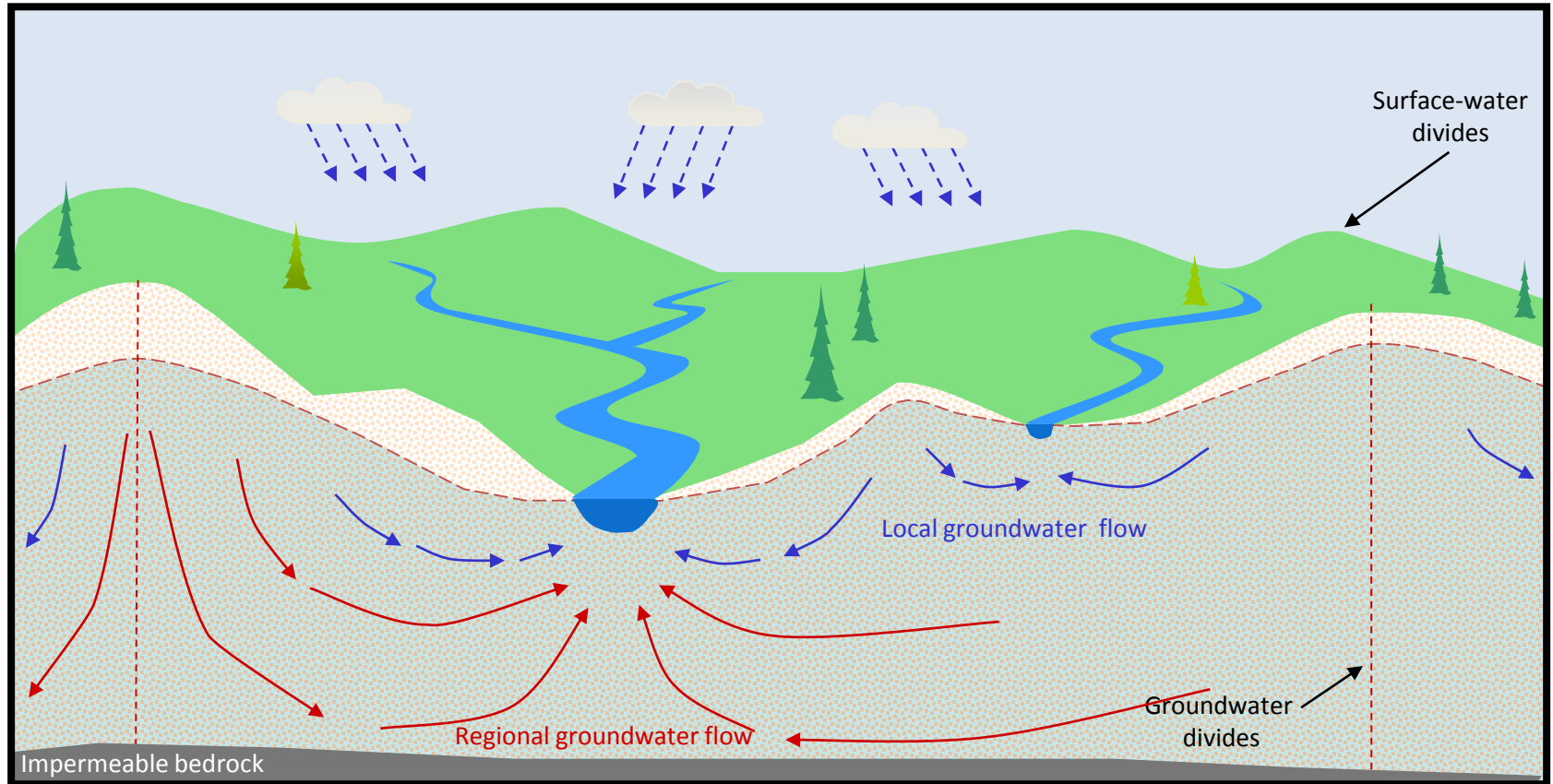
What happens when we have more rain?



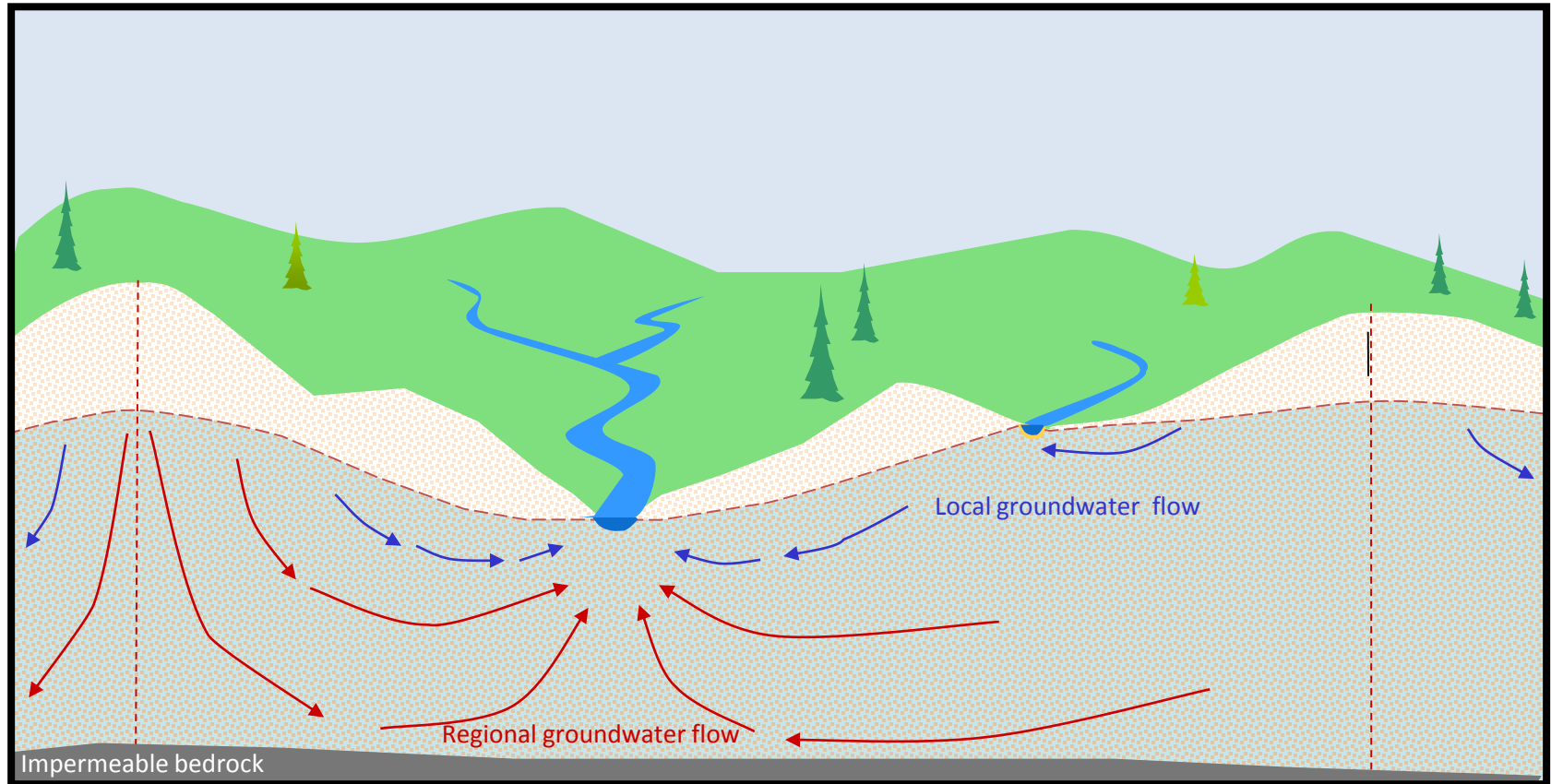
- More infiltration
- Groundwater levels rise
- More water in rivers, lakes and streams
- *Seasonal and climatic implications*



What happens when we have less rain?



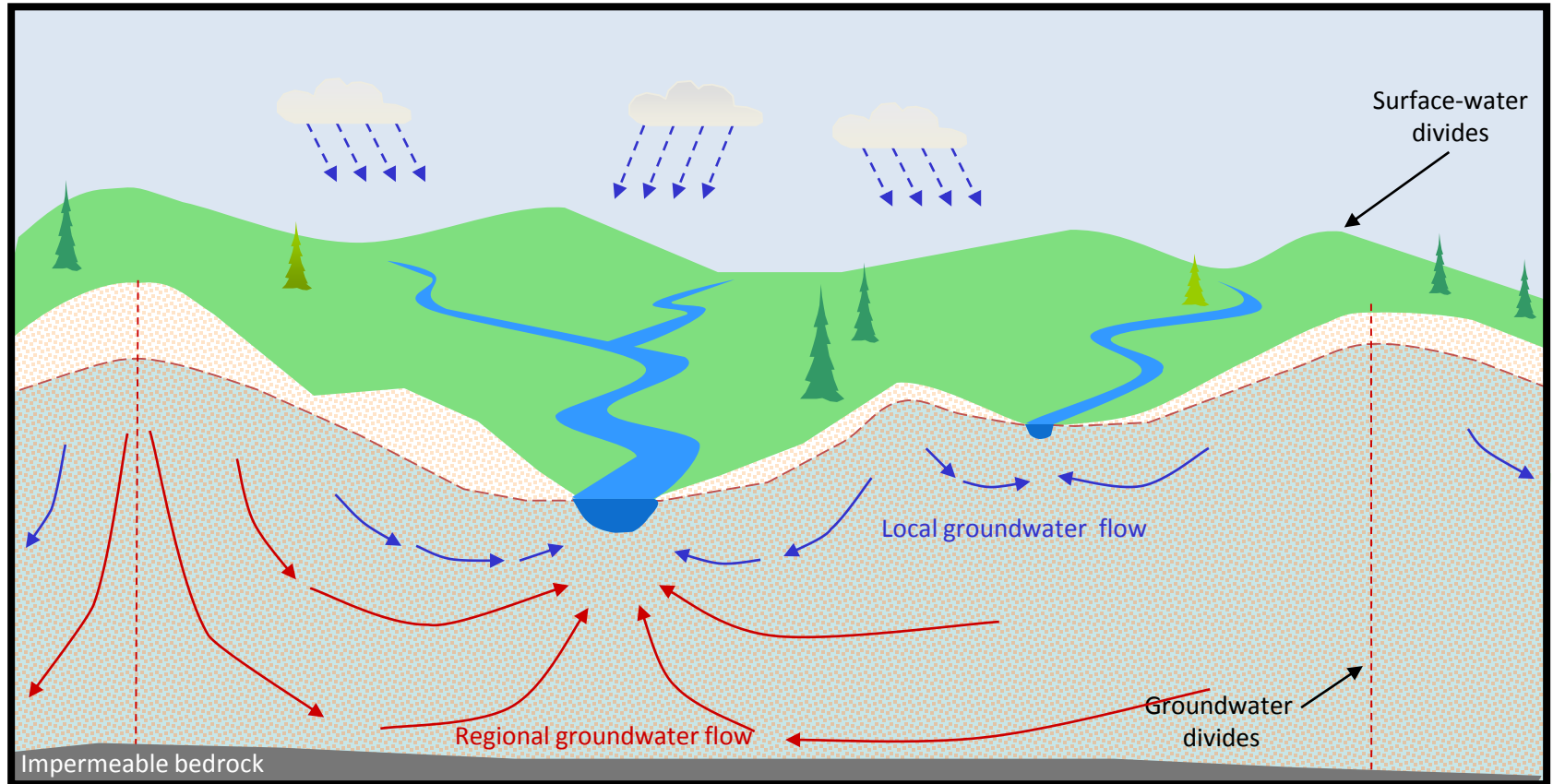
What happens when we have less rain?

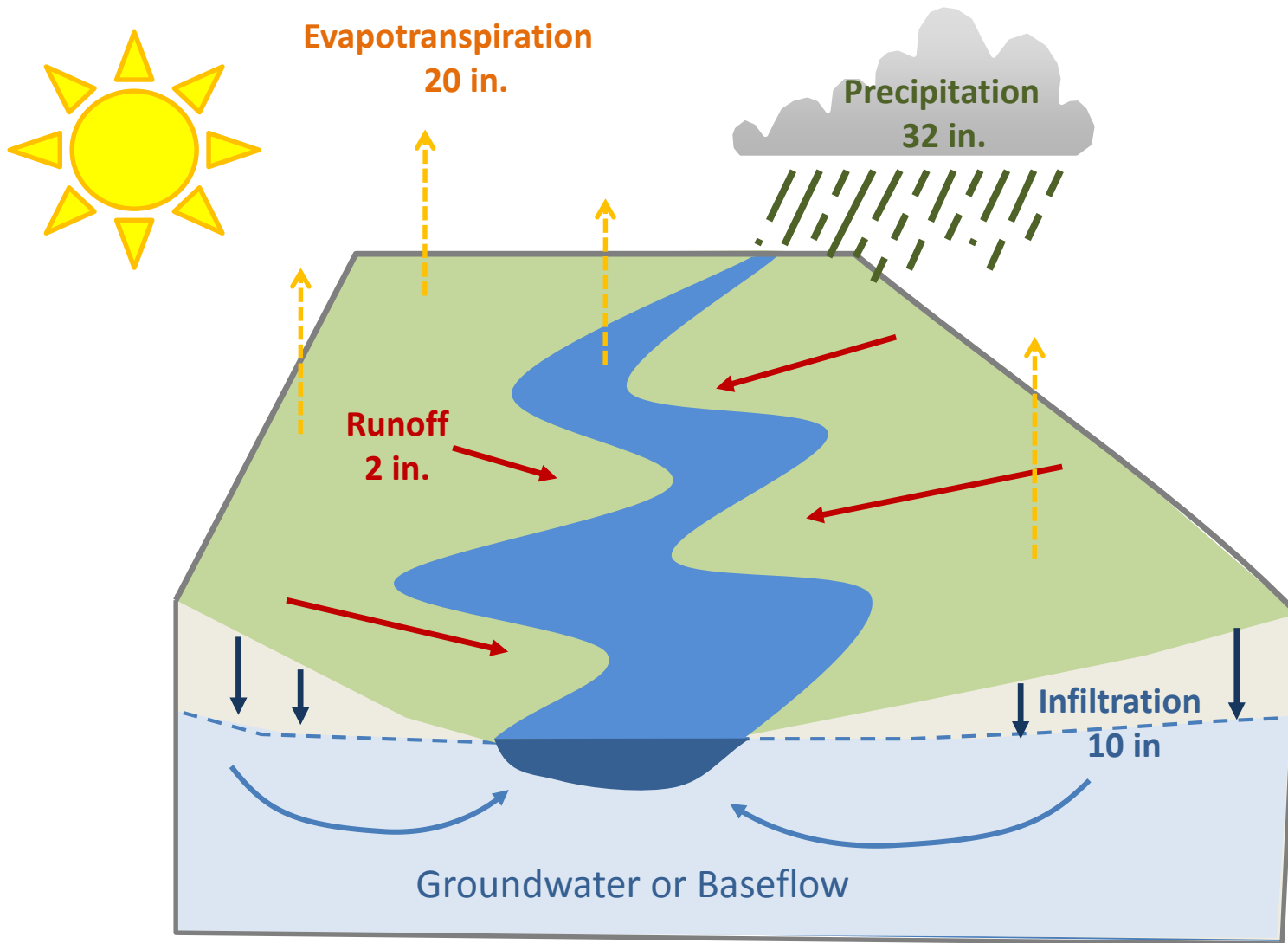


- Less infiltration
- Groundwater levels start to go down
- Less water in rivers, lakes and streams
 - *Seasonal and climatic implications*

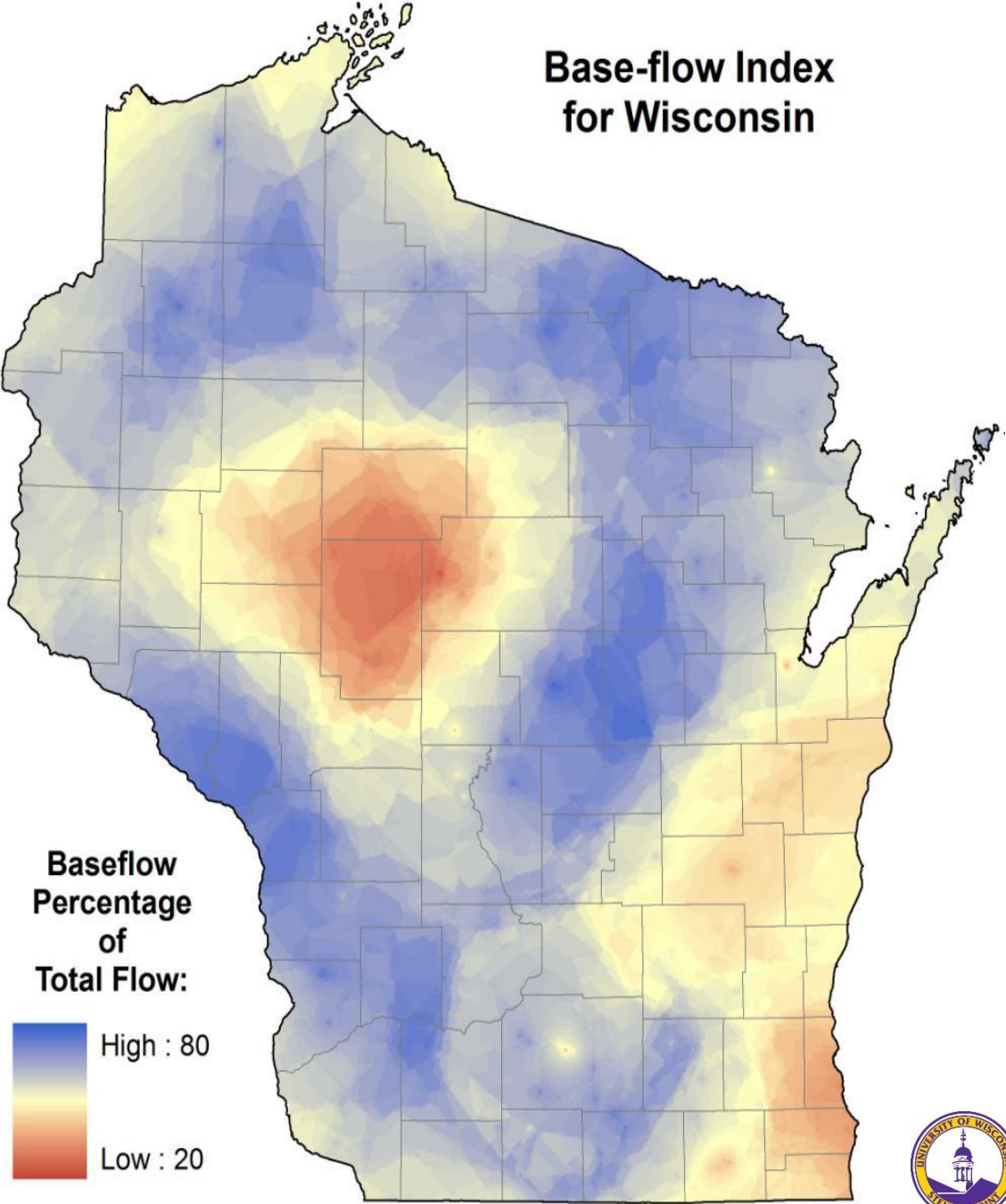


What happens when we decrease infiltration?

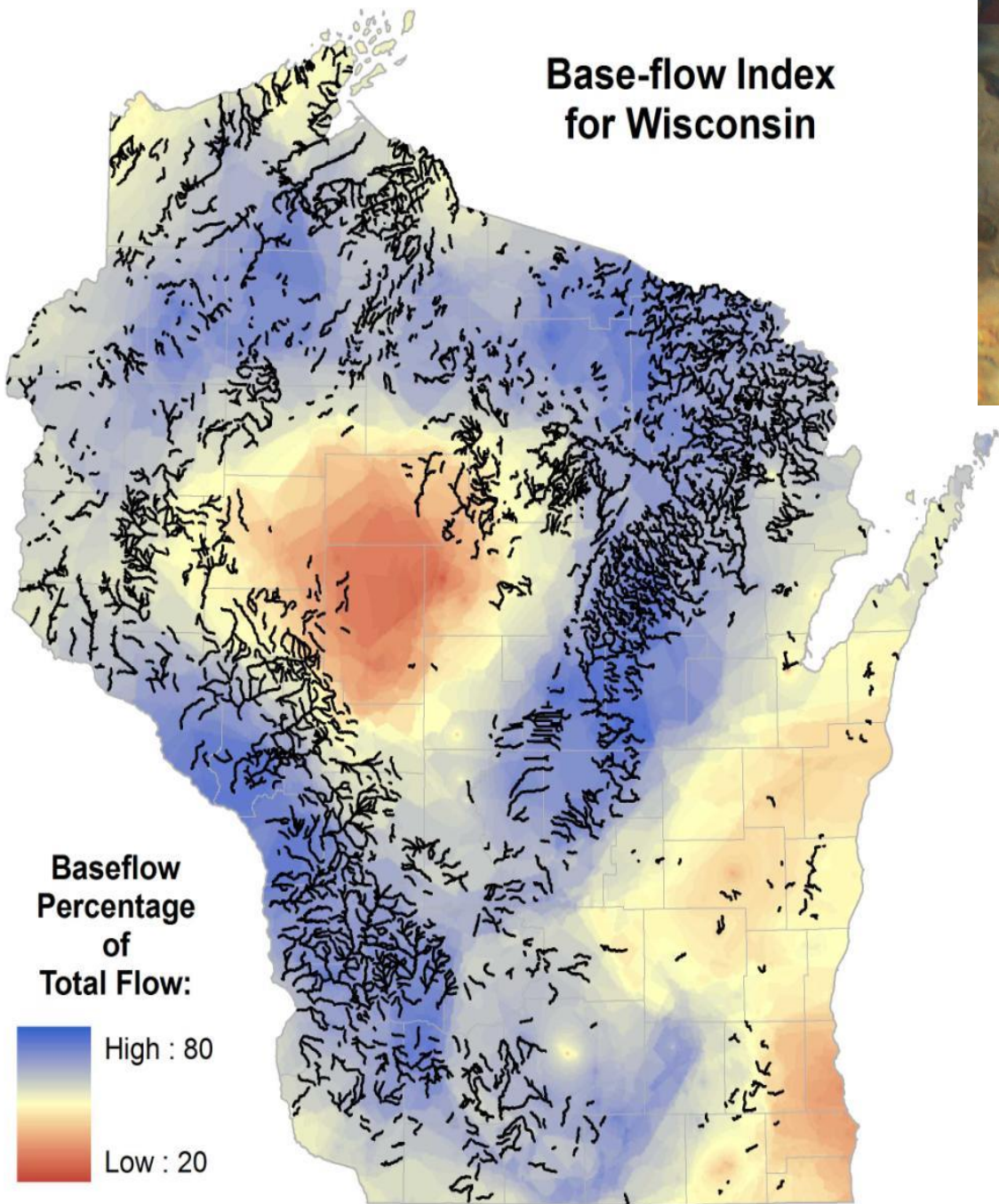




Base-flow Index for Wisconsin



Base-flow Index for Wisconsin



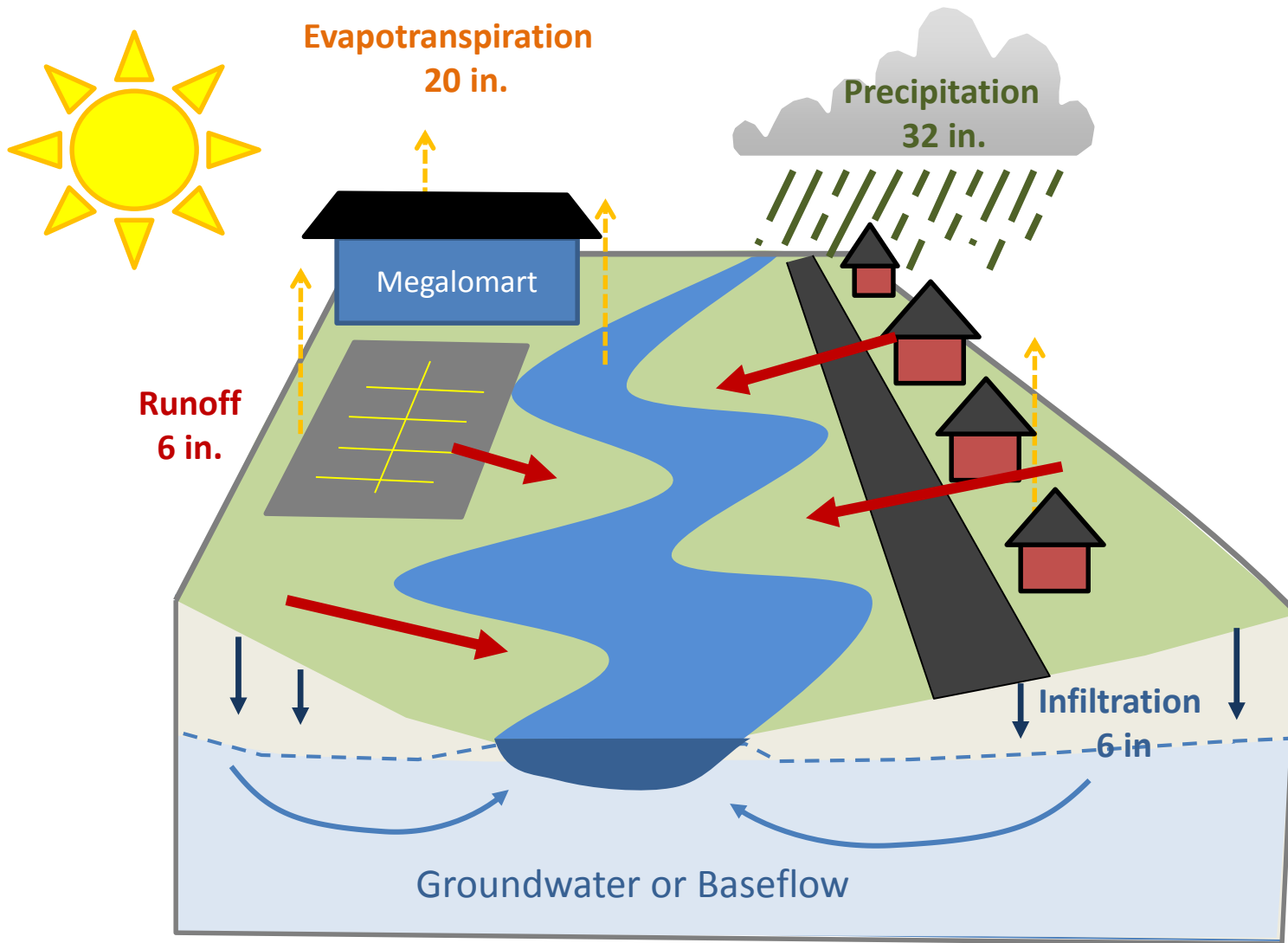
Baseflow
Percentage
of
Total Flow:



 Trout Stream

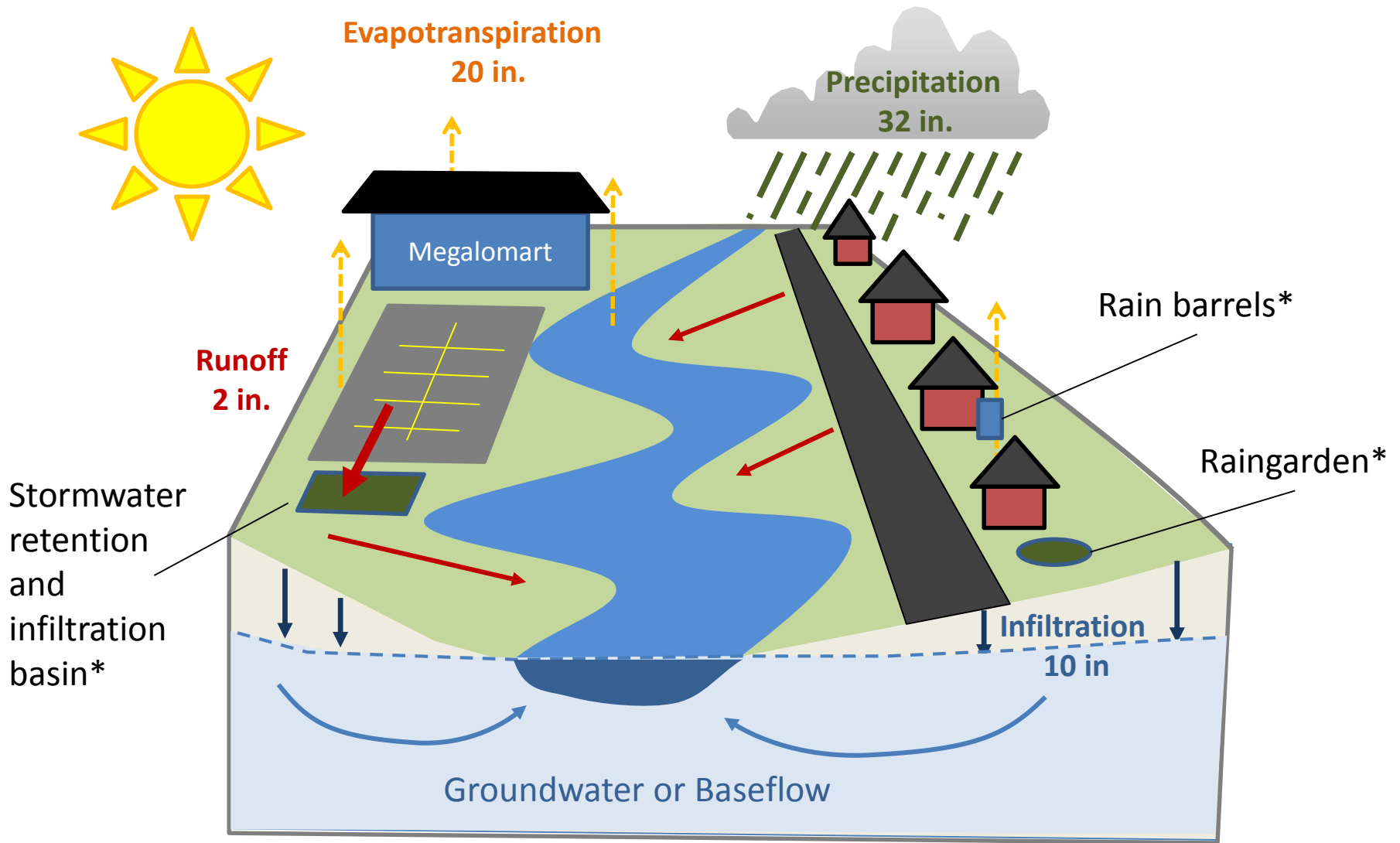


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Increase in impervious surfaces means more flooding and more transport of pollutants, sediment *and heat*.

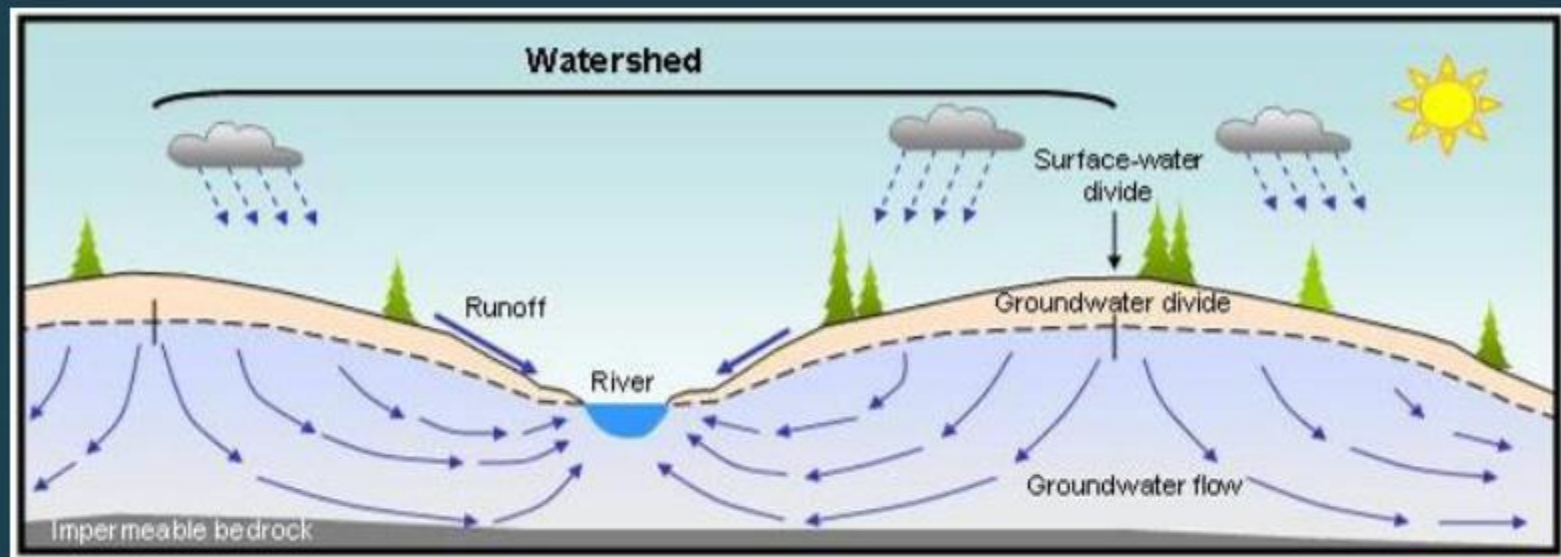




*All aimed at capturing storm water and releasing back into the environment slowly.



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



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.

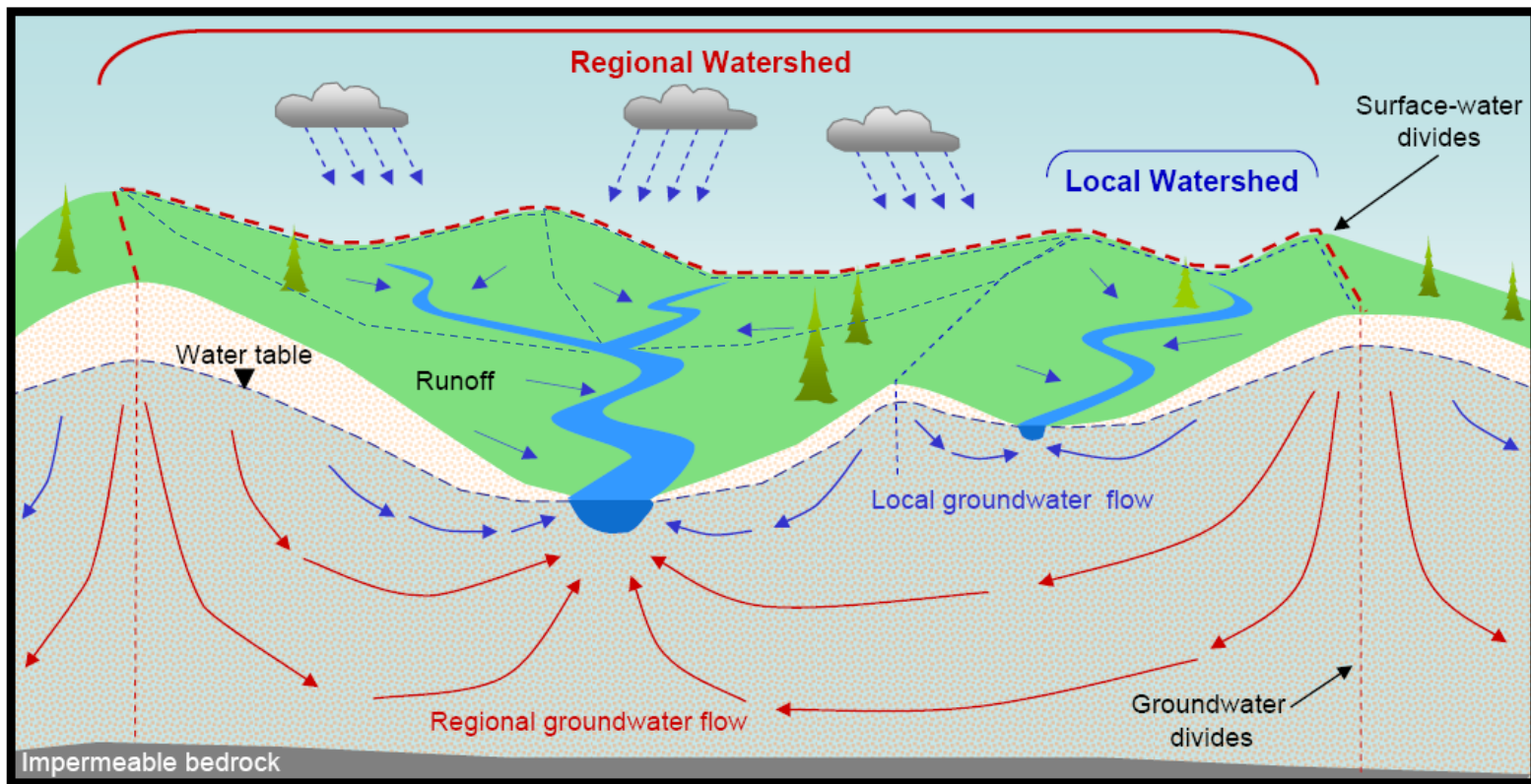
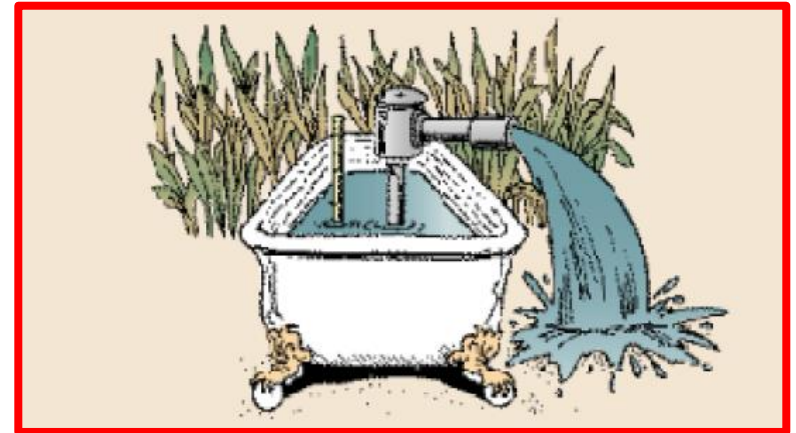
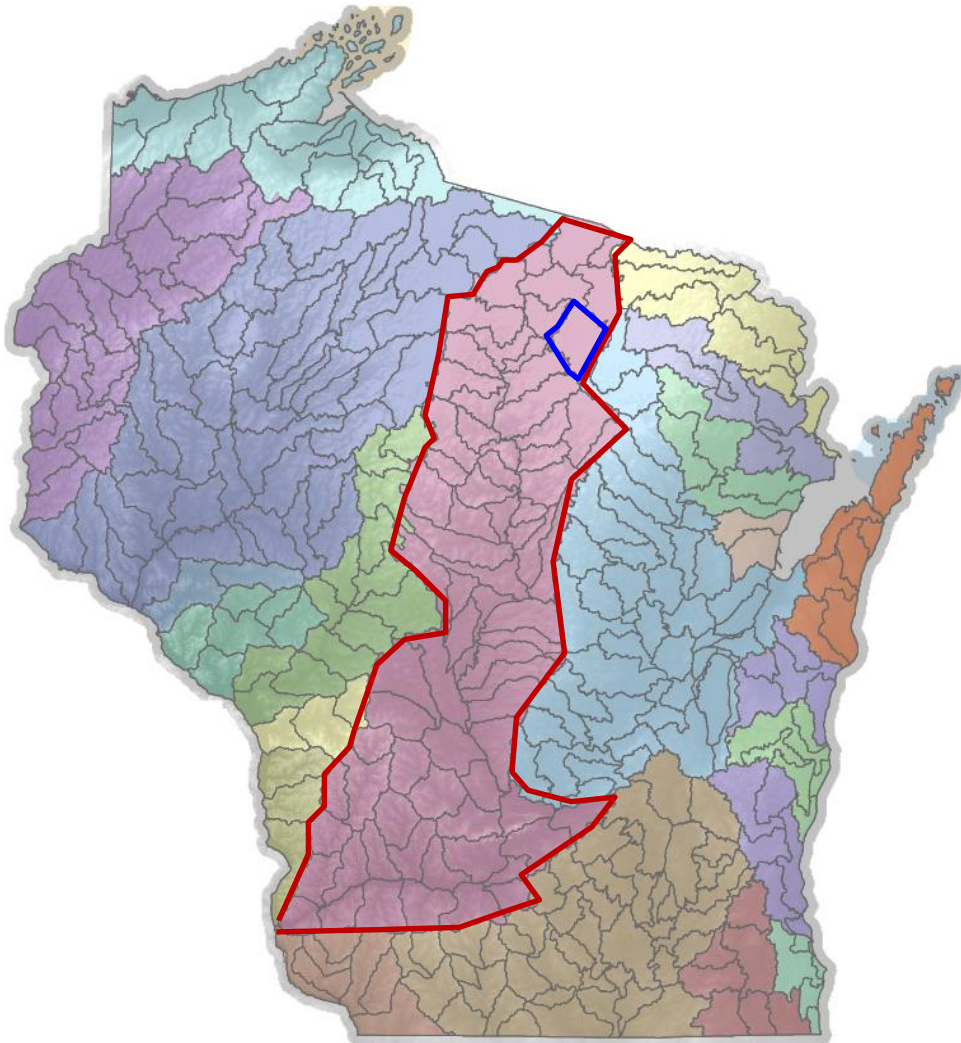


Figure by Kevin Masarik, CWSE



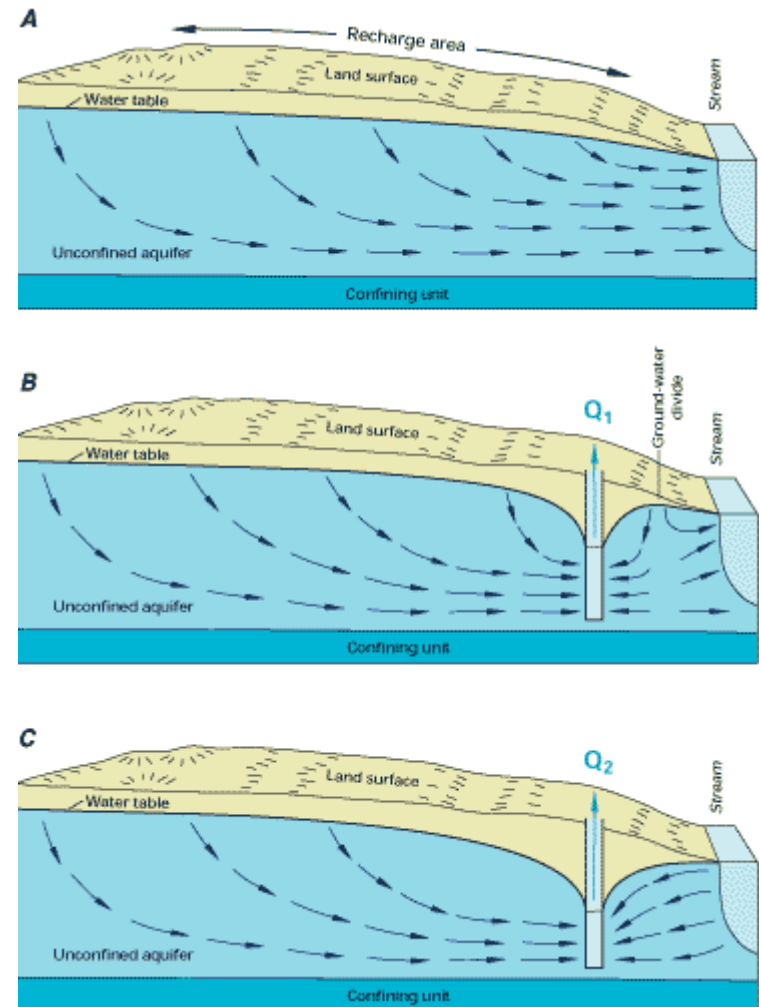
Groundwater Issues in Wisconsin



<http://pubs.usgs.gov/circ/circ1186/pdf/circ1186.pdf>

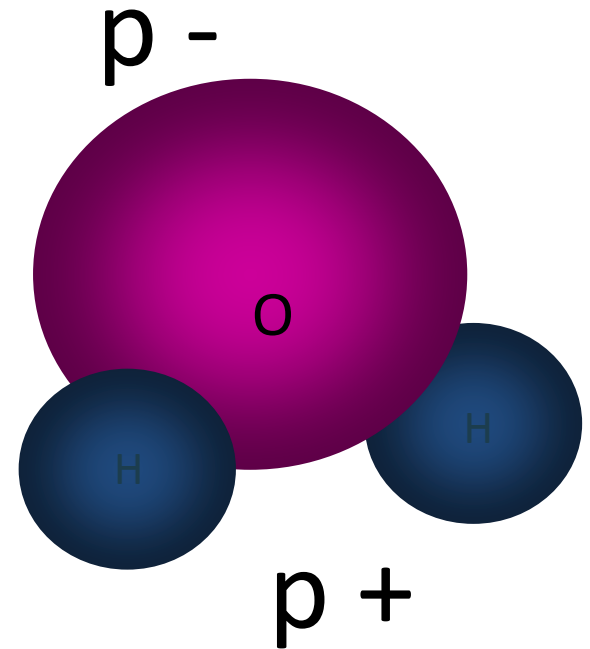
Water quantity issues in Wisconsin:

- 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.



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

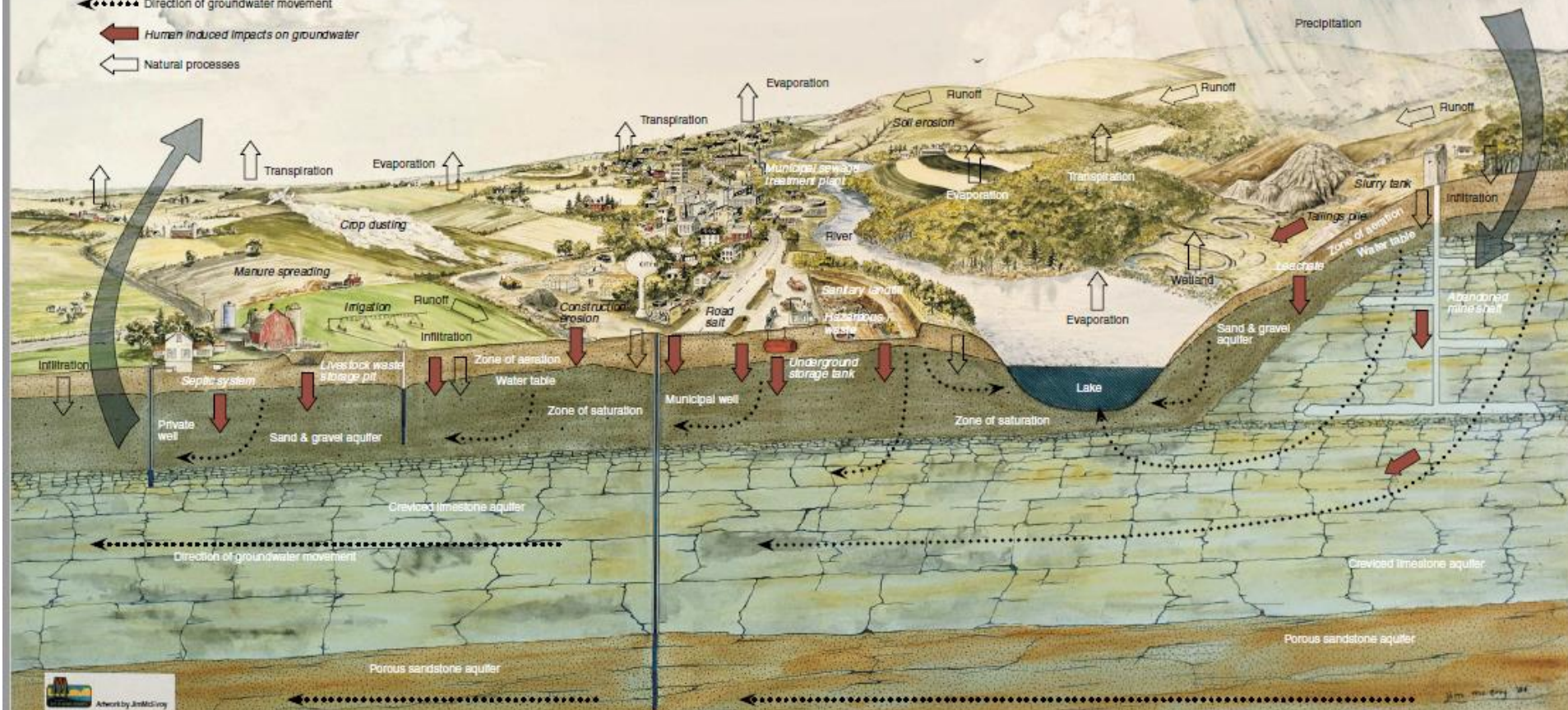


Groundwater and land use in the water cycle

←••••• Direction of groundwater movement

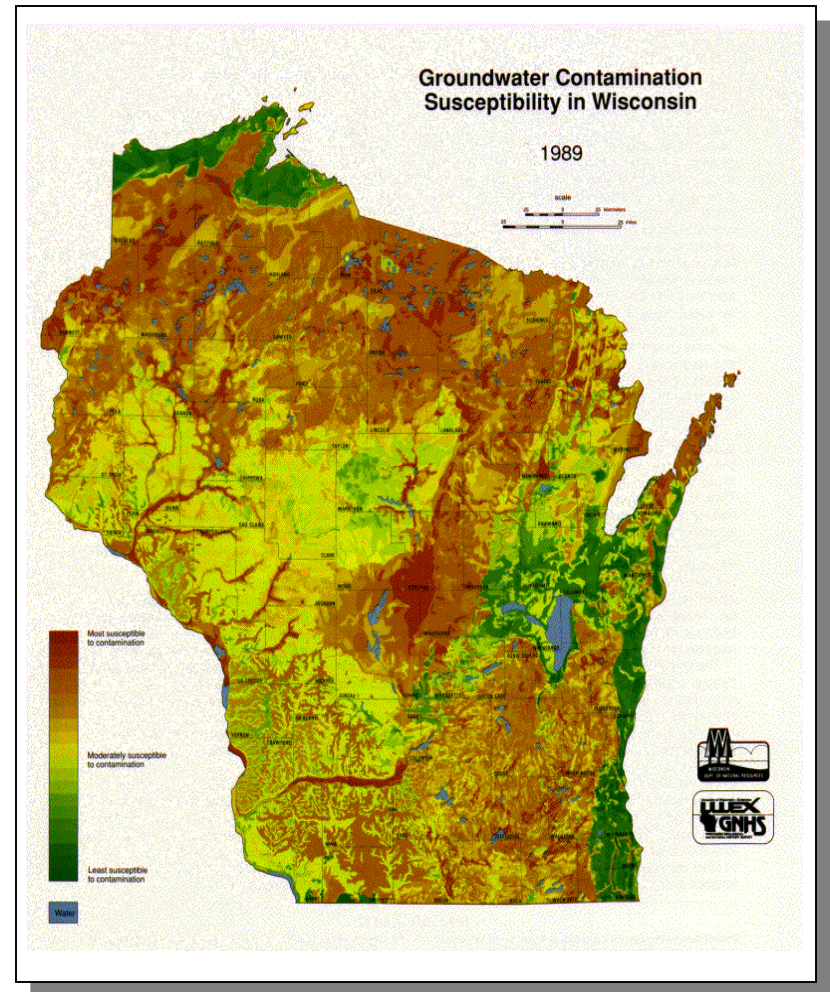
← Human induced impacts on groundwater

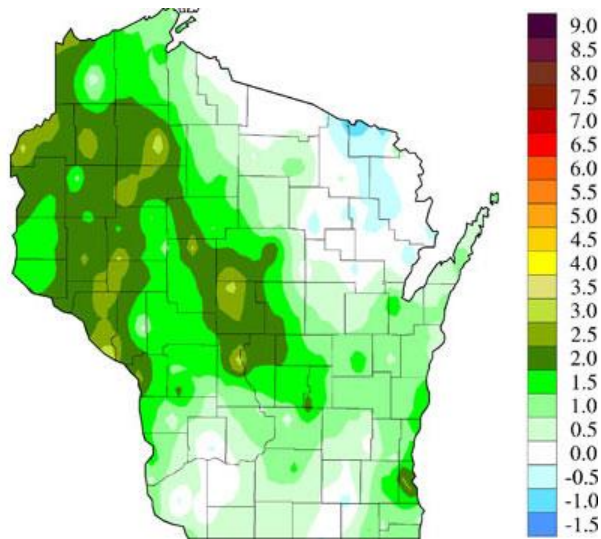
← Natural processes



Contamination Susceptibility

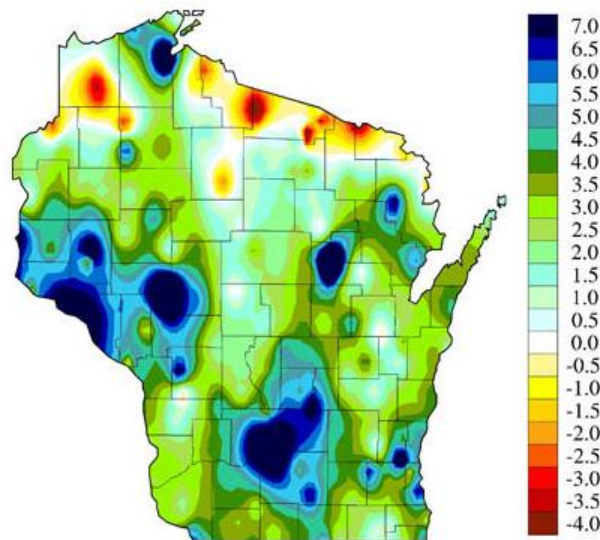
- Susceptibility is related to the type of soil and the local geology.
- Land-use ultimately determines if groundwater becomes contaminated from human activities.





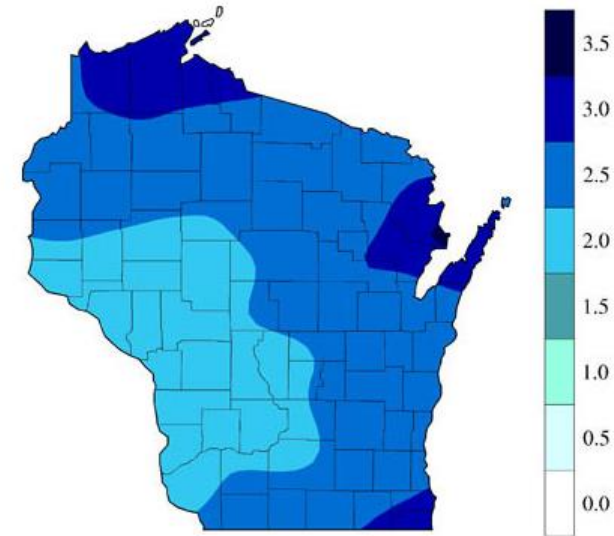
Change in Annual Average Temperature (°F) from 1950 to 2006

Except for northeastern Wisconsin, most of Wisconsin has warmed since 1950. Averaged across the state, the warming has been +1.1°F, with a peak warming of 2-2.5°F across northwest Wisconsin. Wisconsin is becoming "less cold", with the greatest warming during winter-spring and nighttime temperatures increasing more than daytime temperatures.



Change in Annual Average Precipitation (inches) from 1950 to 2006

From 1950 to 2006, Wisconsin as a whole has become wetter, with an increase in annual precipitation of 3.1 inches. This observed increase in annual precipitation has primarily occurred in southern and western Wisconsin, while northern Wisconsin has experienced some drying.



Projected Change in the Frequency of 2" Precipitation Events (days/decade) from 1980 to 2055

Typically, heavy precipitation events of at least two inches occur roughly 12 times per decade (once every 10 months) in southern Wisconsin and 7 times per decade (once every 17 months) in northern Wisconsin. Based on one emission scenario, by the mid-21st century, Wisconsin may receive 2-3 more of these extreme events per decade, or roughly a 25% increase in their frequency.