

# Water Quality Teaching Package 2012 Update

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Extension Water Quality





# Workshop Outline

## 1. Teaching Package overview:

- Resources included
- WQTP organization

## 2. New hands-on laboratory exercises:

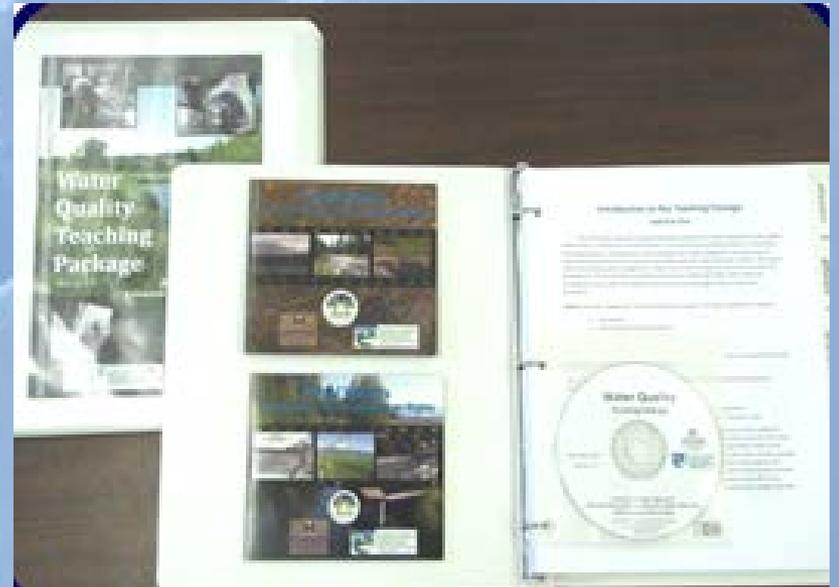
- Completed exercises & future ideas
- Exercise tour

## 3. Participant feedback:

- Input on exercise priorities & topics
- Stories from instructors implementing WQTP

# What is the WQTP?

- ◆ Developed by W. Adam Sigler
- ◆ Supports sophomore/junior surface water quality course
- ◆ Lessons, PowerPoints, demos, assignments & tests
- ◆ NEW hands-on lab exercises



# WQTP Lesson Topics

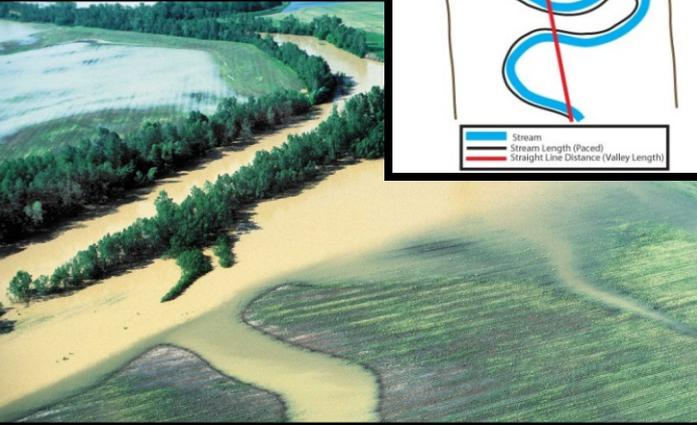
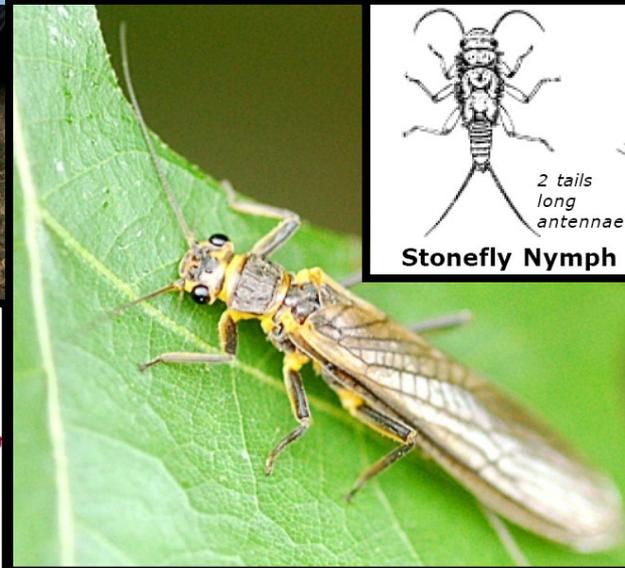
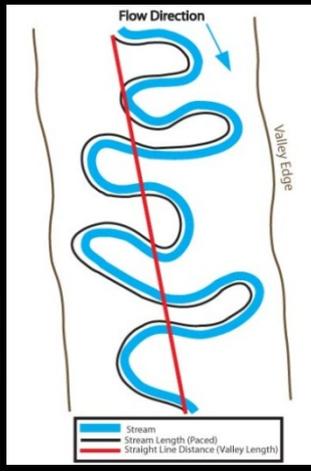
- 💧 Water Properties
- 💧 Water Law
- 💧 Sediment Transport
- 💧 Erosion & BMPs
- 💧 Nutrients
- 💧 Salinity
- 💧 Macroinvertebrates
- 💧 Waterborne Pathogens
- 💧 ...and more



# Physical

# Chemical

# Biological



Mississippi River Delta

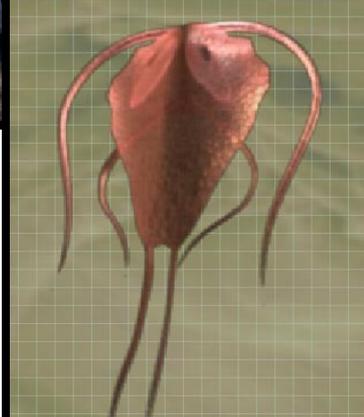
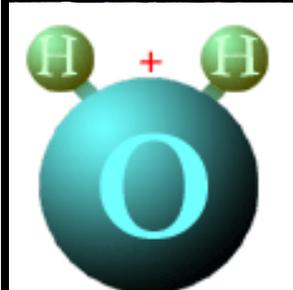
visualizingearth.ucsd.edu

### Periodic Table of the Elements

|   |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |   |    |    |    |    |    |    |    |    |    |    |    |    |    |    |
|---|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|----|----|----|----|----|----|----|----|----|----|----|----|----|----|
| 1 | 2  |    |    |    |    |    |    |    |    |    |    | 13 | 14 | 15 | 16 | 17 | 18 |    |    |    |    |   |    |    |    |    |    |    |    |    |    |    |    |    |    |    |
| 1 | H  | 2  |    |    |    |    |    |    |    |    |    |    | 3  | B  | C  | N  | O  | F  | Ne |    |    |   |    |    |    |    |    |    |    |    |    |    |    |    |    |    |
| 2 | Li | Be | 3  | 4  | 5  | 6  | 7  | 8  | 9  | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 |    |    |    |   |    |    |    |    |    |    |    |    |    |    |    |    |    |    |
| 3 | Na | Mg | Al | Si | P  | S  | Cl | Ar |    |    |    |    |    |    |    |    |    | K  | Ca | Sc | Ti | V | Cr | Mn | Fe | Co | Ni | Cu | Zn | Ga | Ge | As | Se | Br | Kr |    |
| 4 | K  | Ca | Sc | Ti | V  | Cr | Mn | Fe | Co | Ni | Cu | Zn | Ga | Ge | As | Se | Br | Kr | 1  | 2  | 3  | 4 | 5  | 6  | 7  | 8  | 9  | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 |
| 5 | Rb | Sr | Y  | Zr | Nb | Mo | Tc | Ru | Rh | Pd | Ag | Cd | In | Sn | Sb | Te | I  | Xe | 1  | 2  | 3  | 4 | 5  | 6  | 7  | 8  | 9  | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 |
| 6 | Cs | Ba | La | Ce | Pr | Nd | Pm | Sm | Eu | Gd | Tb | Dy | Ho | Er | Tm | Yb | Lu | 1  | 2  | 3  | 4  | 5 | 6  | 7  | 8  | 9  | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 |    |
| 7 | Fr | Ra | Ac | Th | Pa | U  | Np | Pu | A  | B  | C  | D  | E  | F  | G  | H  | I  | Xe | 1  | 2  | 3  | 4 | 5  | 6  | 7  | 8  | 9  | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 |

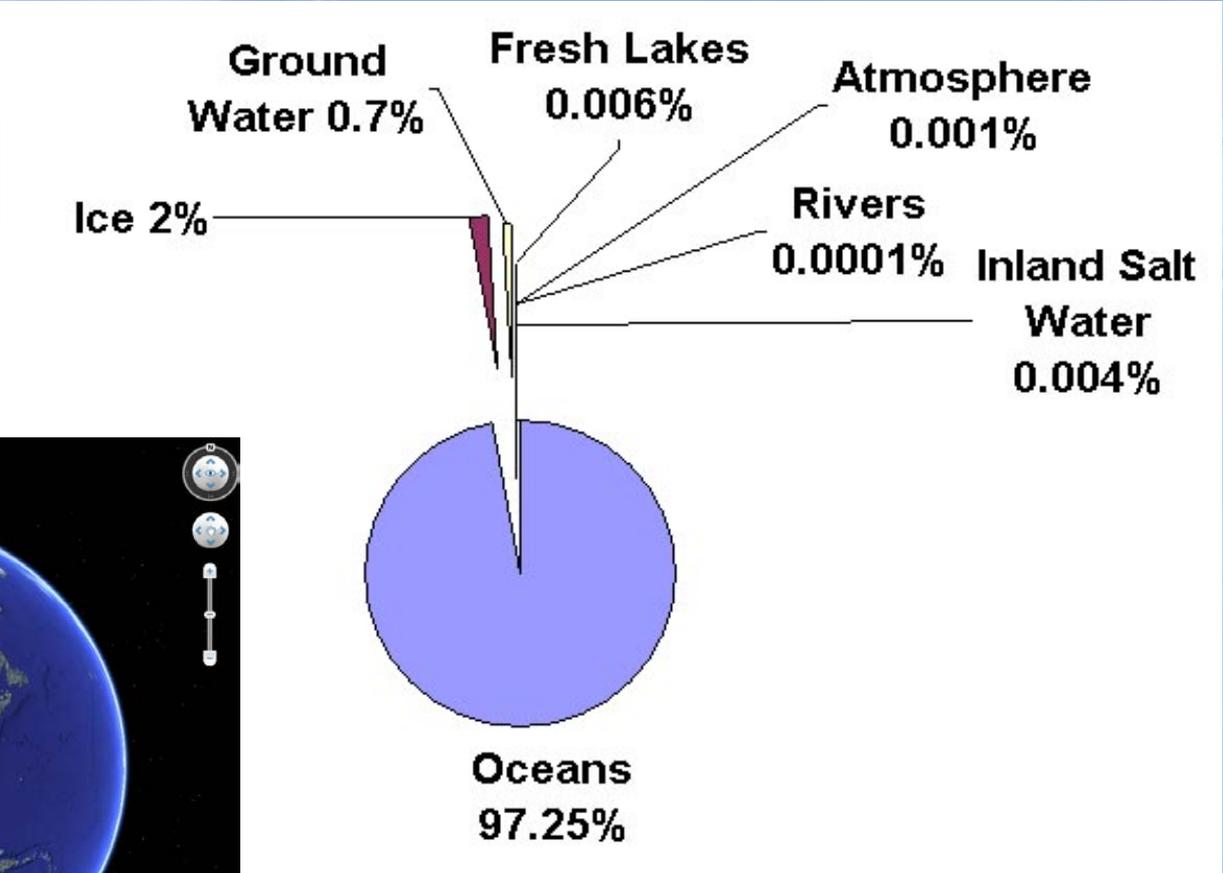
Atomic masses in parentheses are those of the most stable or common isotope.

Legend:   
 [Yellow] Alkali metals   
 [Orange] Alkaline earth metals   
 [Green] Transition metals   
 [Red] Lanthanide series   
 [Purple] Actinide series   
 [Blue] Poor metals   
 [Cyan] Nonmetals   
 [Pink] Noble gases   
 [Grey] Solid   
 [Light Blue] Liquid   
 [Light Green] Gas   
 [Light Purple] Synthetic



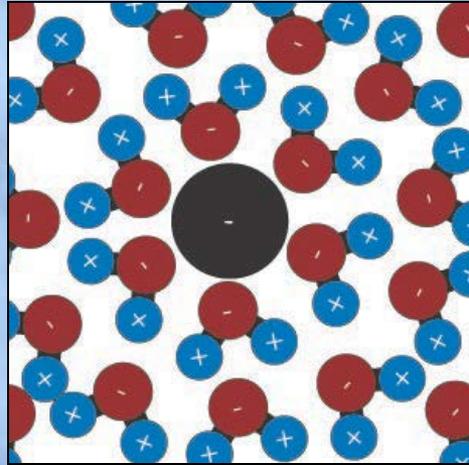
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# Earth's Water Distribution



# Solids

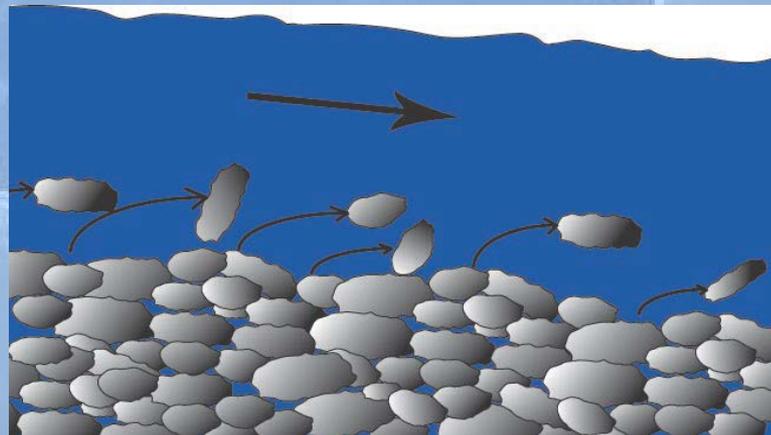
Dissolved Solids  
or Total Dissolved  
Solids (TDS)



Sediment  
Total Suspended Solids (TSS)



Bedload



# Why Bugs to Assess Stream Health?



# What's New?

## Lab Exercises!

- ◆ Teacher's Guide
- ◆ Teacher's Lab/Homework Key
- ◆ Lab Exercise Handout
- ◆ Homework Handout



# Hands-on Exercises

## 💧 3 Completed:

“Exploring the Relationship between Discharge and Salinity”

“Nutrient Limitation in Aquatic Systems: The Effects of N & P on Algal Growth”

“Comparing the Drivers of Diel Temperature Change in Aquatic Systems”

## 💧 Many additional ideas



# Tour of a Hands-on Exercise

## Teacher's Guide

### Modeling a Snowmelt Driven Stream: Exploring the Relationship between Discharge and Salinity

#### Lesson Overview

- In this lesson, you will create a simple groundwater/surface water model to illustrate the inverse relationship between salt concentration and discharge that exists in many streams and rivers.
- During low flow times of the year, high-salinity groundwater dominates stream flow. During spring runoff, however, low-salinity snow melt makes up a large component of stream flow. This results in an inverse relationship between the amount of stream flow (discharge) and the salinity of the stream.
- This concept can be demonstrated in a lab by creating a simple landscape model using a paint tray, sand, gravel, salt pieces, and fabric. Water is poured over the surface of the model and through the sand/salt base layer, and collected. Samples with differing salinity levels are produced by varying the proportion of water flowing through the base layer and over the surface.

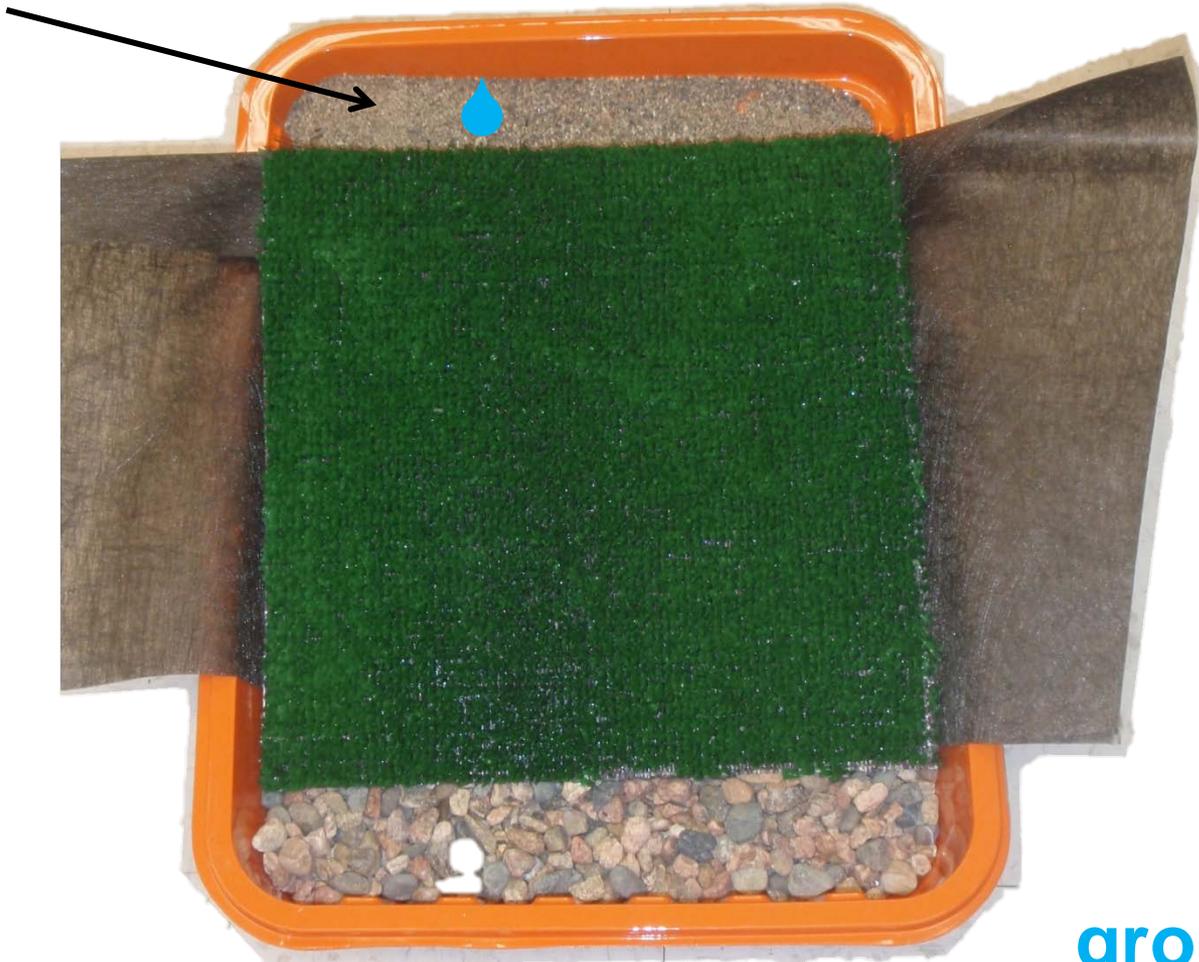
#### Background

# Discharge & Salinity Lab at Little Bighorn College



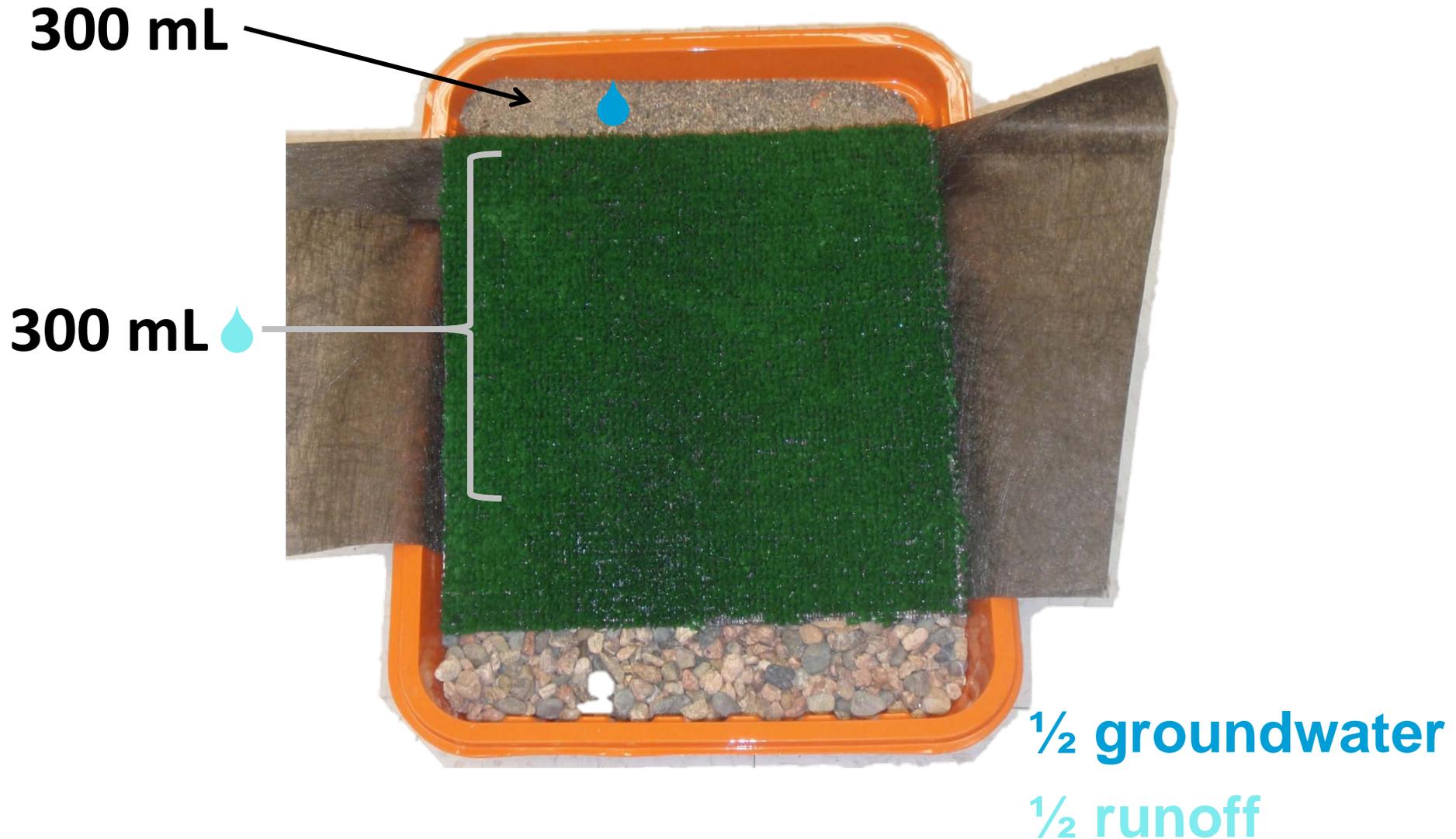
# Baseflow Scenario:

300 mL

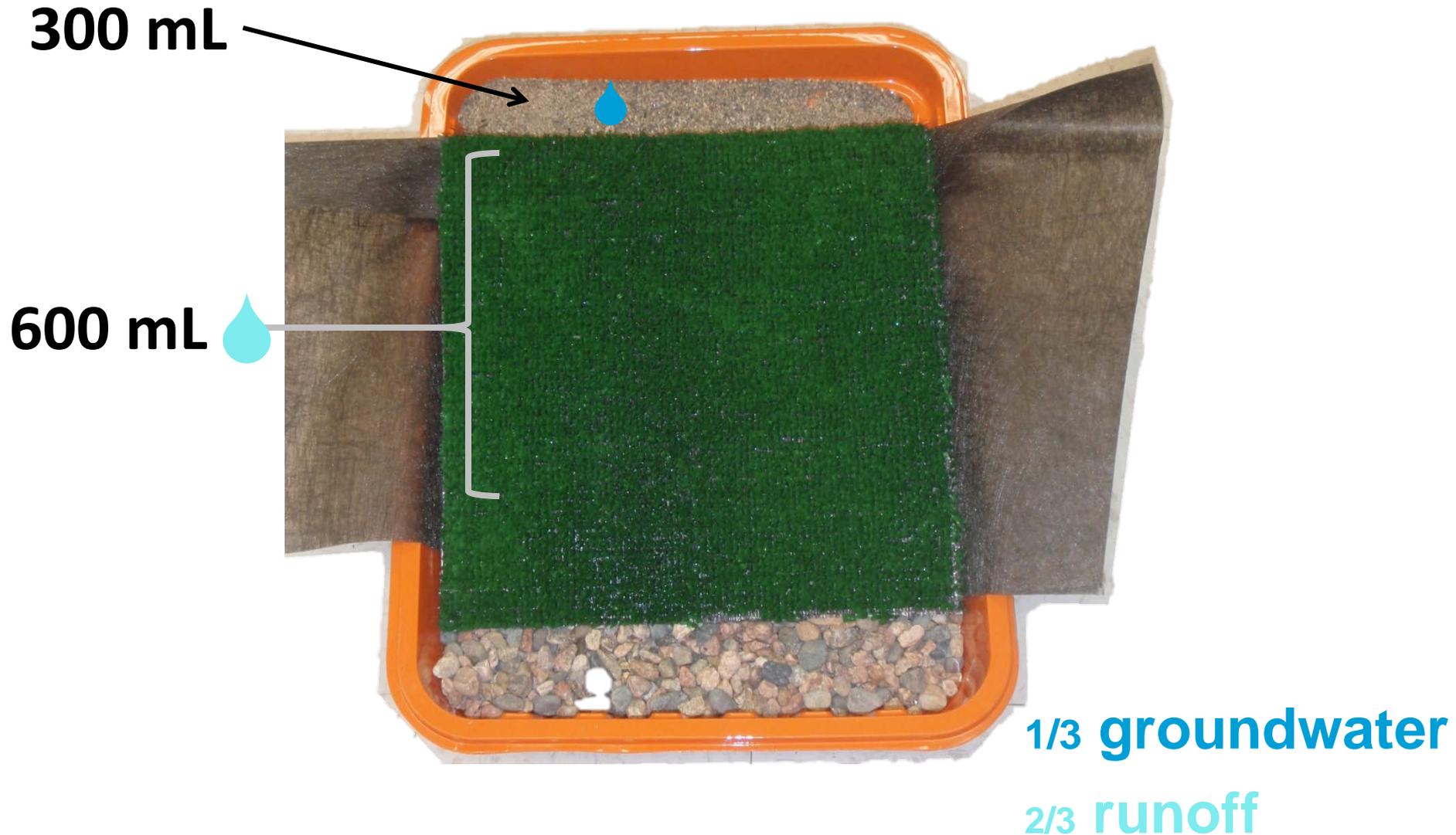


groundwater

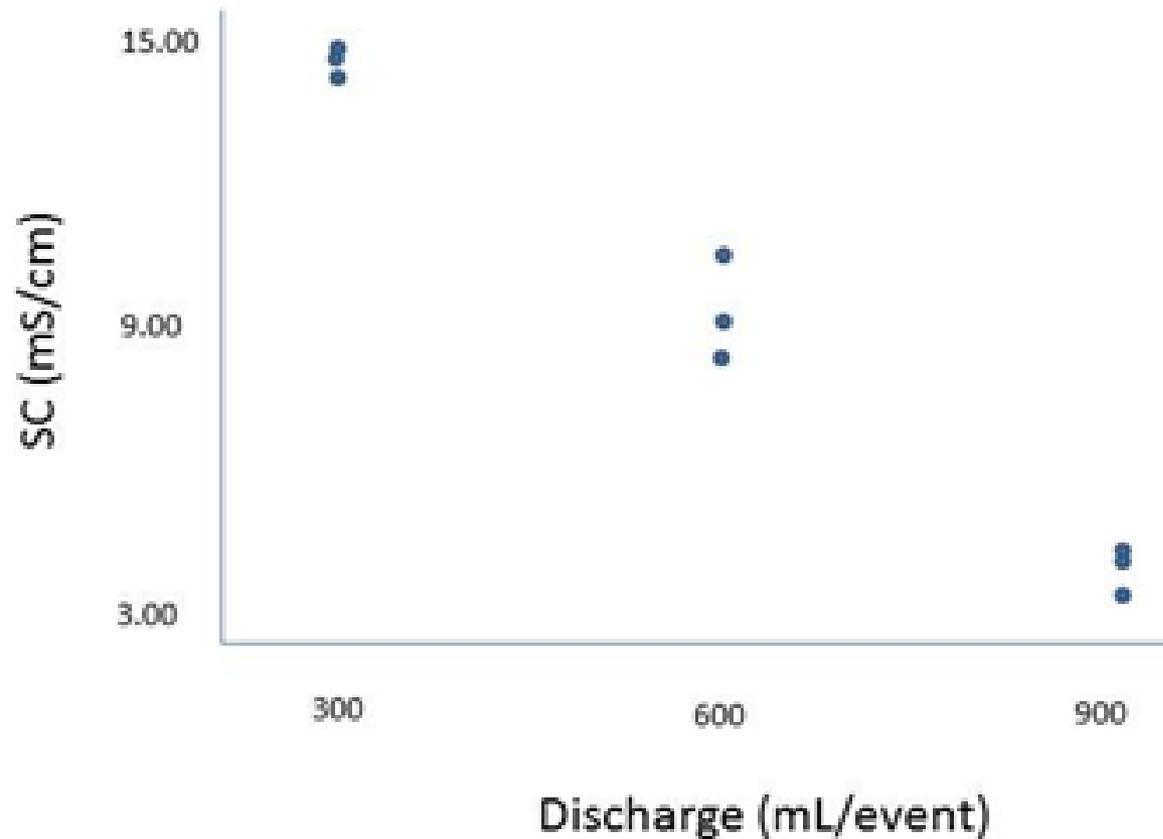
# Low Runoff Scenario:



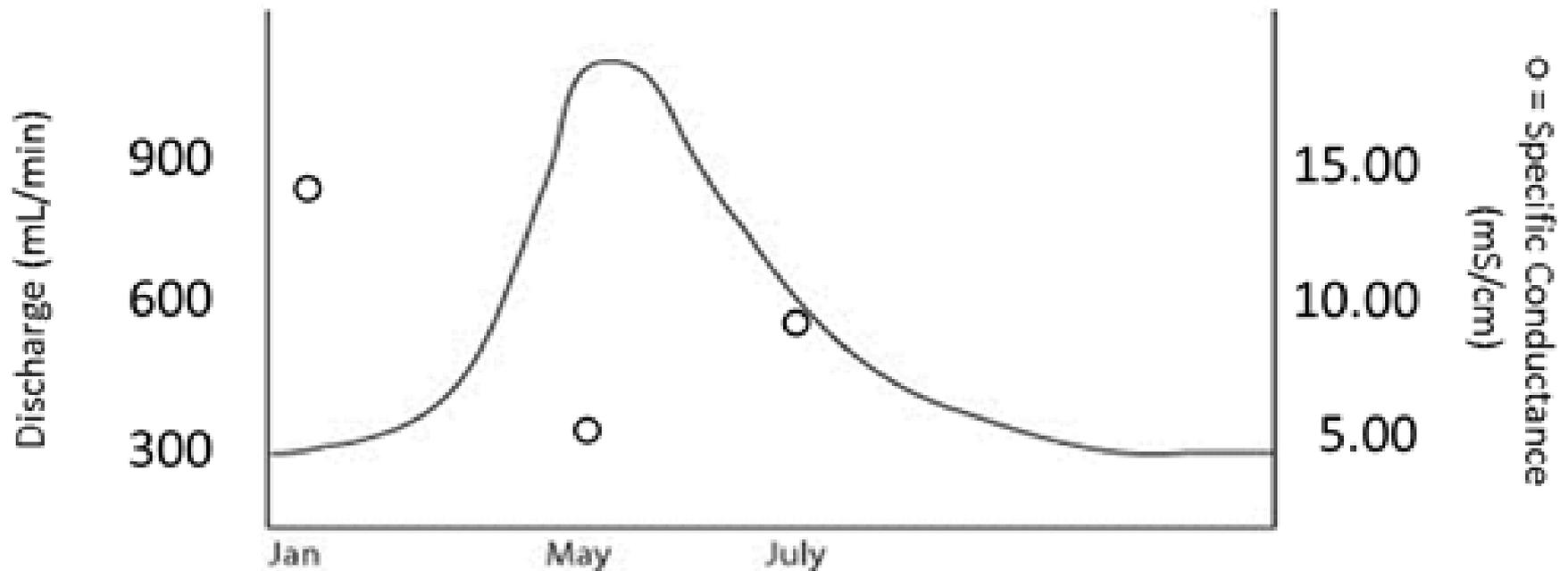
# High Runoff Scenario:



1. Label the axes (including the scale) on the graph below and sketch your lab results.
  - a. X axis = discharge
  - b. Y axis = specific conductance



2. The hydrograph below represents flow from your model watershed over a year. Label the secondary Y axis (right side) with a scale appropriate for the specific conductance reading averages from your data sheet, including appropriate units. Plot your data on the hydrograph.



# Input and Feedback

- 🔹 Level of interest in exercise ideas listed
- 🔹 Topics you'd like to see covered that aren't listed
- 🔹 Original ideas for exercises you'd like to see developed
- 🔹 Water-themed tribal stories that might complement WQTP lessons



# Thank You!

