WHAT GOES IN, MUST COME OUT
Water Flow of Utah Lake

TEACHER BACKGROUND:

Teach this lesson following lessons on the water cycle and circle graphs.

Utah Lake receives water from precipitation, rivers, streams, canals, and groundwater within the watershed. Water leaving Utah Lake flows out by way of the Jordan River, and into the Great Salt Lake.

The three largest tributaries of Utah Lake are the Provo River, Spanish Fork River, and Benjamin Slough. In addition to surface flows, groundwater is another significant source of inflow to Utah Lake. Groundwater enters the lake via three types of flow: freshwater springs; diffuse fresh seeps; and mineralized springs. The table and figure below summarizes the annual average inflow to Utah Lake from major surface water sources.

Table 1: Average Annual Inflow to Utah Lake (Streams/Tributaries)

Tributary	Average Annual Flow (acre feet/year)
Provo River	151,000
Spanish Fork River	99,700
Benjamin Slough	36,700
Mill Race Creek	33,500
Powell Slough	24,900
Hobble Creek	19,800
Mill Pond	12,100
Dry Creek (South of Provo Bay)	10,600
Spring Creek	8,800
White Lake Overflow to Goshen Bay	6,200
Big Dry Creek	6,000
American Fork River	5,900
Minnie Creek	3,900
Little Dry Creek	1,600
Dry Creek (Lehi)	900
TOTAL FLOW	**421,600**

Source: Utah Lake TMDL Study, 2007

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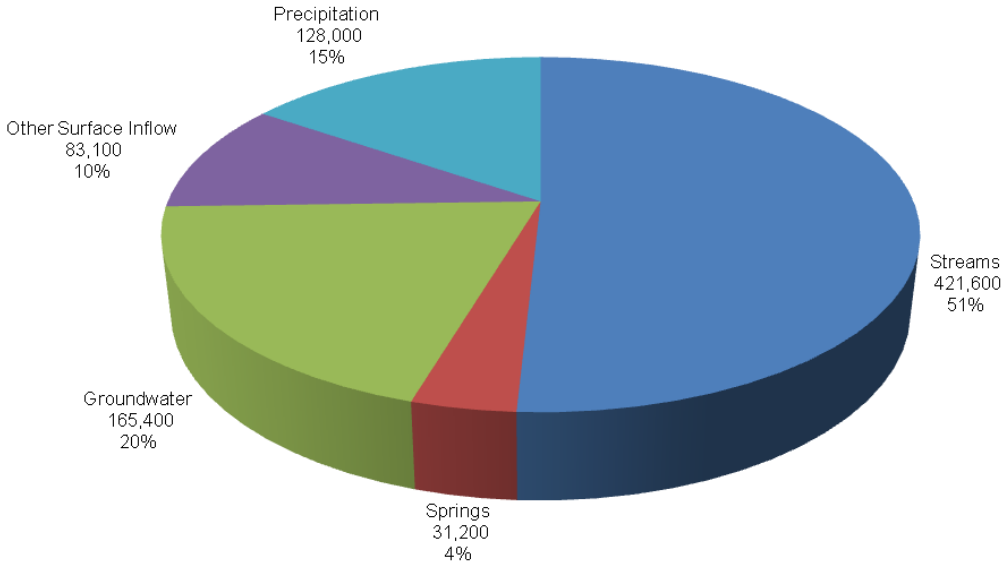
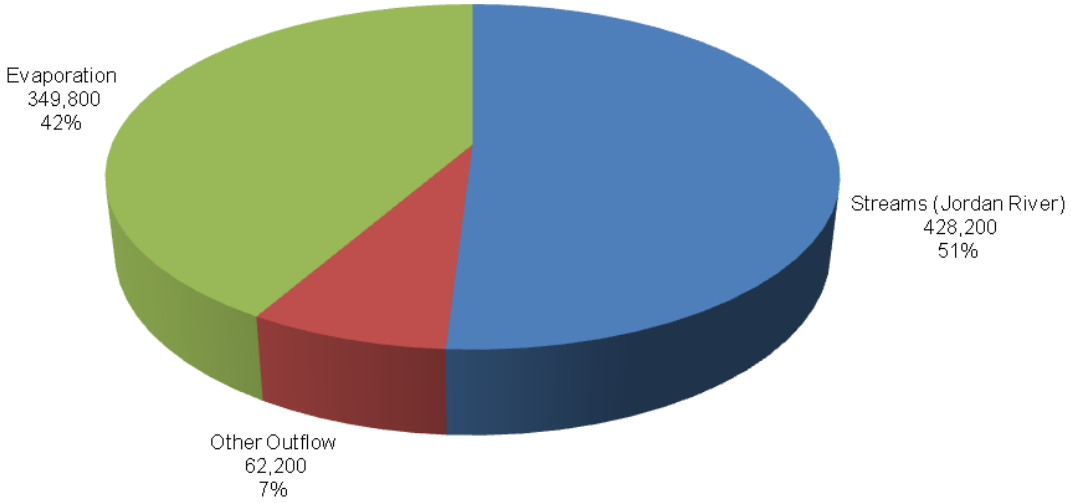
Figure 1: Inflow Water Budget for Utah Lake during the Period 1980-2003



Source: Utah Lake TMDL Study, 2007

Surface water outflow from Utah Lake occurs only to the Jordan River, located on the north end of the lake and averages 428,200 acre-feet per year, which is 139 billion gallons, or enough water to fill 2.3 million classrooms with water (an acre is the volume of water that covers one acre to a depth of one foot. It is equal to 325,851 gallons). Evaporation averages 349,800 acre-feet per year, which is 115 billion gallons, or enough water to fill 2.0 million classrooms with water. The figure below summarizes the annual average outflow from Utah Lake.

Figure 2: Outflow Water Budget for Utah Lake during the Period 1980-2003



Source: Utah Lake TMDL Study, 2007

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OBJECTIVE:

Students will be able to understand the relationship that Utah Lake has with the water cycle. They will learn about evaporation, precipitation, underground water, and springs. Students will make their own circle graph or pie chart, and label the parts using fractions or percents.

TEACHER MATERIALS:

- Computer
- Circle Graph Generator (If you have internet access, you can use this circle graph generator).
- Other possible ideas for generating a circle graph in the classroom
    - Excel
    - Drawing Paper (keep in mind you will be changing the data).
    - Other websites
- Pictures of Utah Lake (pgs. 6-8)
- Google Maps image of Utah Lake
- Clear glass of water

STUDENT MATERIALS:

- Colored Pencils/Crayons
- Protractor, Ruler
- Fractions Strips or Circles/or other fraction manipulatives

PROCEDURE:

Inflow of water from Utah Lake

1. Hold up a glass of water and ask students, “How did the water get into this glass?”
    - Follow with questions that will review what they know about the water cycle, such as “How does water get to the faucet?” “How did the water get to the wells?” Through questions, review ground water, precipitation, and accumulation in rivers and streams.

2. Show a picture or map of Utah Lake (pgs. 6-8) and ask the same questions that were just asked in the attention activity.
    - You may choose to make a T-Chart as a comparison between the glass and Utah Lake. Sources of input into Utah Lake should include precipitation,

streams, groundwater, water treatment facilities, and water from industrial use.

3. Using the website to create circle graphs, Excel, or a T-Chart, have the students make estimates for each of the inputs.
    - Discuss the fractions or percentages as you make the class graph.
    - Allow the students an opportunity to share inferences made with the different amounts. Make changes if the total does not add up to one whole. Save a copy of this chart or start a new one for the class to compare with the actual data later.

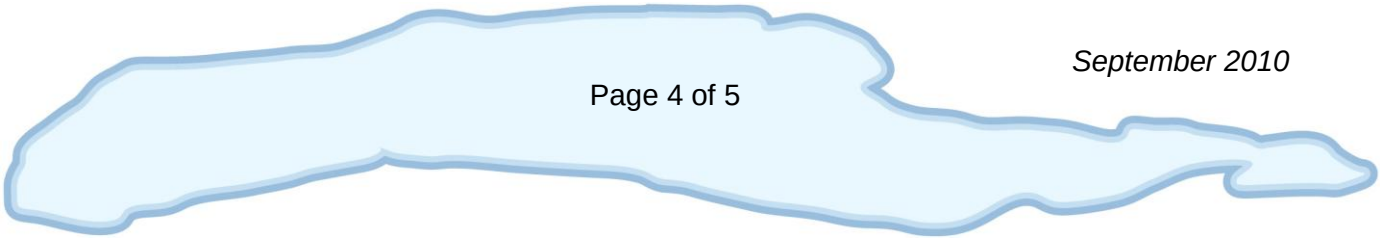
4. Hand out fraction strips or fraction circle manipulatives. Give the students the accurate data and have them create a graph. Round off the actual numbers to be fourth grade friendly. Combine the groundwater and spring inflow to be 1/4, streams inflow 1/2, precipitation 1/8, and other inflow 1/8.
    - You may choose to discuss the difference between the rounded off amounts and the actual amounts. Using info from the teacher background material, take the opportunity to discuss in-depth the inflow of water to Utah Lake.

Outflow of water from Utah Lake

1. Hold up an empty glass and ask students, “How could water have left this glass or where did it go?”
    - Follow with questions to review what they know about the water cycle and other uses of water such as “When you dump a glass of water down the sink where does it go?” Review ground water, evaporation, and accumulation in rivers, streams and lakes.
2. Show a picture or map of Utah Lake and ask this question “Where does the water in Utah Lake go?”
    - You may choose to make a T-Chart as a comparison between the glass and Utah Lake. Sources of output from Utah Lake should include evaporation, Jordan River, and irrigation (outflow).
3. Use fraction strips or fraction circle manipulatives. Give the students the accurate data and have them create a graph. Round off the actual numbers to be fourth grade friendly. Stream outflow (Jordan River) 1/2, other outflow (irrigation) 1/8, evaporation 3/8.
    - You may choose to discuss the difference between the rounded off amounts and the actual amounts. Using info from the teacher background material, take the opportunity to discuss the outflow of water from Utah Lake with more depth.

ASSESSMENT/EXTENSIONS:

- You may choose to reinforce protractor skills by measuring the angles on the graphs.



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ADDITIONAL REFERENCES:

- Virtual Utah Website
- Utah Conservation Data Center Interactive Map

STANDARDS ADDRESSED:

Math

Standard 1: Students will acquire number sense and perform operations with whole numbers, simple fractions, and decimals.

Objective 1: Demonstrate multiple ways to represent whole numbers and decimals, from hundredths to one million, and fractions.

Indicators:

a. Name and write a fraction to represent a portion of a unit whole, length, or set for halves, thirds, fourths, fifths, sixths, eighths, and tenths.

Standard 3: Students will understand attributes and properties of plane geometric objects and spatial relationships.

Objective 3: Visualize and identify geometric shapes after applying transformations.

Indicators:

b. Recognize that 90°, 180°, 270°, and 360° are associated, respectively, with 1/4, 1/2, 3/4, and full turns.

Standard 4: Students will describe relationships among units of measure, use appropriate measurement tools, and use formulas to find area measurements.

Objective 1: Describe relationships among units of measure for length, capacity, and weight, and determine measurements of angles using appropriate tools.

Indicators:

c. Recognize that angles are measured in degrees and develop benchmark angles (e.g., 45°, 60°, 120°) using 90° angles to estimate angle measurement.

d. Measure angles using a protractor or angle ruler.

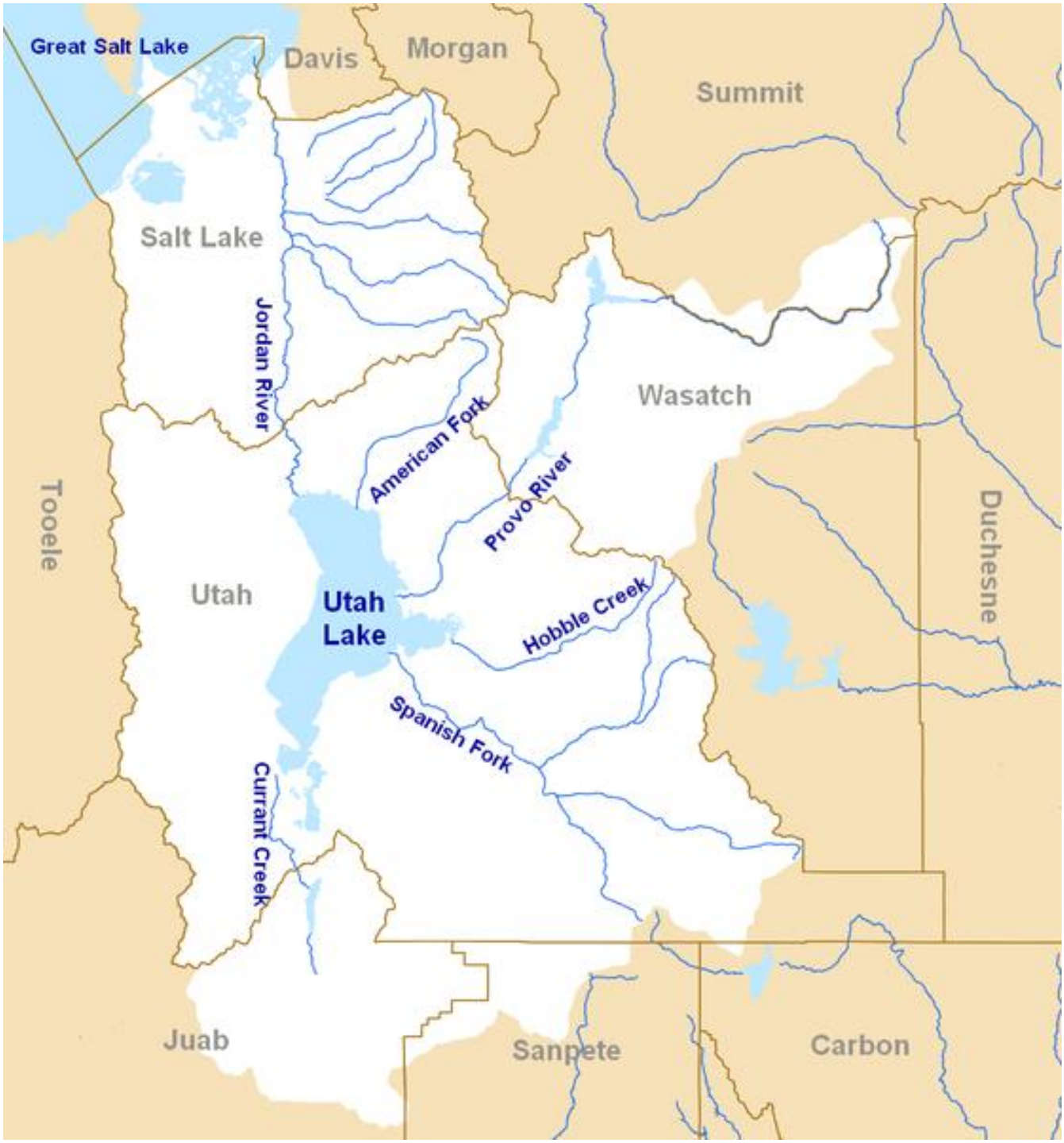
Standard 5: Students will interpret and organize collected data to make predictions, answer questions, and describe basic concepts of probability.

Objective 1: Collect, organize, and display data to answer questions.

Science

Standard 1: Students will understand the physical characteristics of Utah's wetlands, forests, and deserts and identify common organisms for each environment.

Objective 2: Describe the water cycle.


Great Salt Lake
Davis
Morgan
Summit
Salt Lake
Jordan River
Wasatch
American Fork
Provo River
Tooele
Duchesne
Utah
Utah Lake
Hobble Creek
Spanish Fork
Currant Creek
Juab
Sanpete
Carbon