

How Does Utah Lake Measure Up?

This lesson plan has been created as a resource for fourth grade teachers to teach their students the new core standards. It integrates math, social studies, and science standards in a meaningful and fun way. To see which specific standards are addressed, please refer to the list below.

OBJECTIVE:

Students will be able to identify Utah Lake as a wetland area. They will know its approximate size and depth, and be able to relate these measurements to things in their world.

STANDARDS ADDRESSED:

4th Grade Math

4.MD.3 Measurement and Data Standard 3

Apply the area and perimeter formulas for rectangles in real world and mathematical problems. *For example, find the width of a rectangular room given the area of the flooring and the length, by viewing the area formula as a multiplication equation with an unknown factor.*

4th Grade Science

Standard 5: Students will understand the physical characteristics of Utah's wetlands, forests, and deserts and identify common organisms for each environment.

Objective 1: Describe the physical characteristics of Utah's wetlands, forests, and deserts.

Indicators:

- a. Compare the physical characteristics (e.g., precipitation, temperature, and surface terrain) of Utah's wetlands, forests, and deserts.
- b. Describe Utah's wetlands (e.g., river, lake, stream, and marsh areas where water is a major feature of the environment) forests (e.g., oak, pine, aspen, juniper areas where trees are a major feature of the environment), and deserts (e.g., areas where the lack of water provided an environment where plants needing little water are a major feature of the environment).
- c. Locate examples of areas that have characteristics of wetlands, forests, or deserts in Utah.
- d. Based upon information gathered, classify areas of Utah generally identified as wetlands, forests, or deserts.
- e. Create models of wetlands, forests, and deserts.

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4th Grade Social Studies

Standard 1: Students will understand the relationship between the physical geography in Utah and human life.

Objective 1: Classify major physical geographic attributes of Utah.

Indicators:

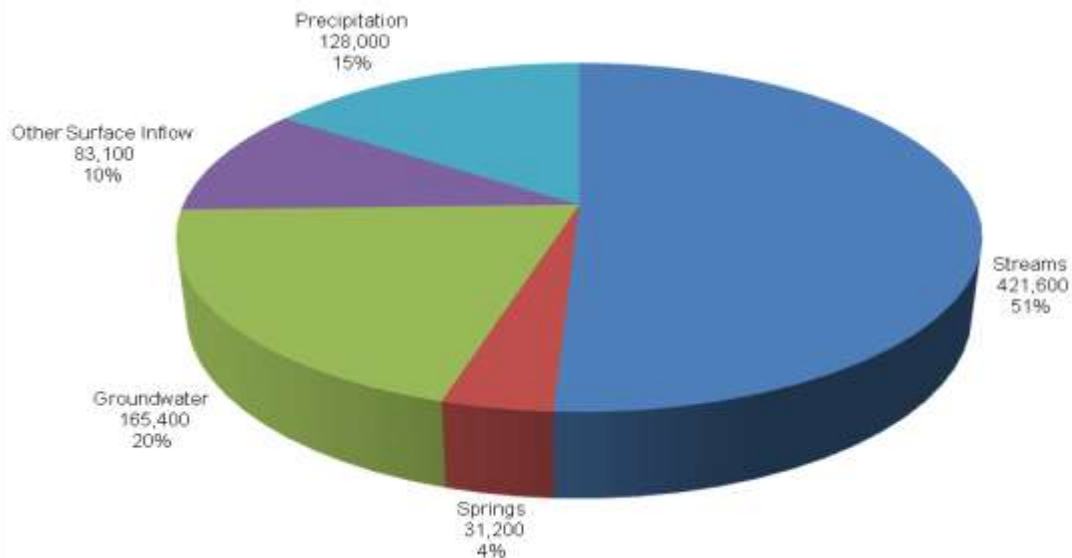
- a. Identify Utah's latitude, longitude, hemisphere, climate, natural resources, landforms, and regions using a variety of geographic tools.

TEACHER BACKGROUND:

Utah Lake is an impressive sight. Its beauty spans up to 24 miles in length and 13 miles in width. For generations the Lake has been a summer gathering place for families and friends to enjoy its vast, open water under the intense Utah sun. But for the states' early residents: Native Americans, Spanish explorers, trappers, and later the Mormon settlers, it was a treasured source of food. Millions of fish thrived. In fact, 13 species made their homes in the Lake, its inflowing tributaries, and the Jordan River outlet - all of which were valuable water sources for the fields the settlers planted. Utah Lake literally fostered the growth of the civilization in our state. Utah Lake, in essence, is a parent to us all.

Utah Lake encompasses approximately 150 square miles (95,000 acres) and when at normal full level, it contains over 870,000 acre-feet of water. This is 283 billion gallons, or enough water to fill 5 million classrooms! Lake inflow and outflow are depicted in Figures 1 and 2.

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



Source: Utah Lake TMDL Study, 2007

Utah Lake is located in Utah Valley at the eastern edge of the Basin and Range province, which extends from the Wasatch Range in the east to the Sierra Nevada range in the west. The Lake

June 2012

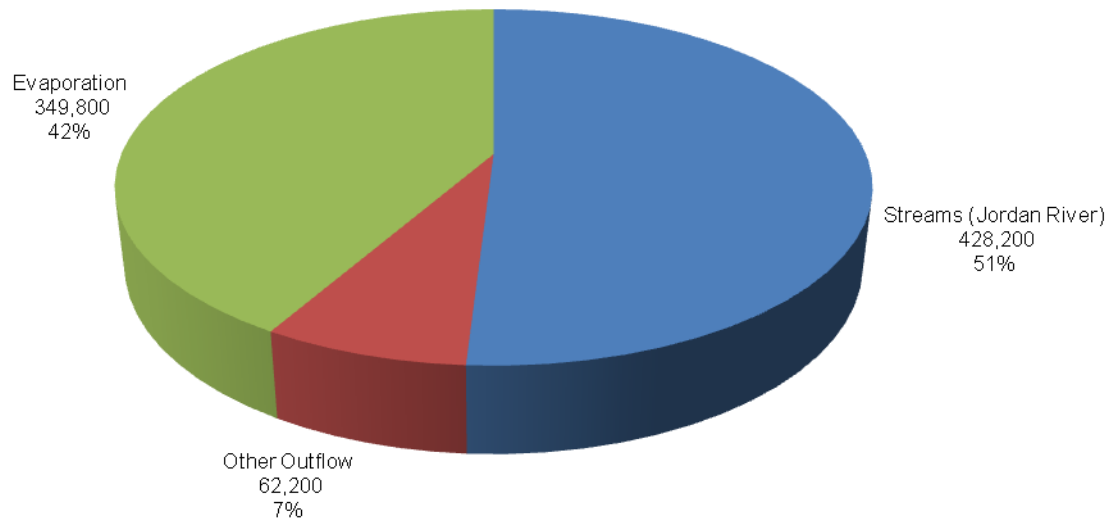
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is hypereutrophic, meaning it is very nutrient-rich and has high biological productivity, capable of supporting large amounts of plants, fish, and other animals.

Utah Lake is a natural lake controlled as a reservoir. Water is released at the head of the Jordan River. The water is primarily used for agriculture and mineral processing in Salt Lake County and is conveyed via a canal system.

The northwest portion of the Lake, Goshen Bay in the southwest and Provo Bay on the east, are all shallower than the rest of the Lake. During drought years, these shallow parts of the Lake bottom can be exposed. The bottom sediments are also different; the north end has more marlstone with little sediment, while the east and southern parts tend to have soft mud and loose sandy materials.

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



Source: Utah Lake TMDL Study, 2007

Factors affecting the Lake level both seasonally and over long-term cycles include both natural climate occurrences and water development activities. These consist of precipitation within the Utah Lake Drainage Basin; use of the Lake as a storage reservoir for irrigation and other purposes; evaporation; and upstream water use and imports.

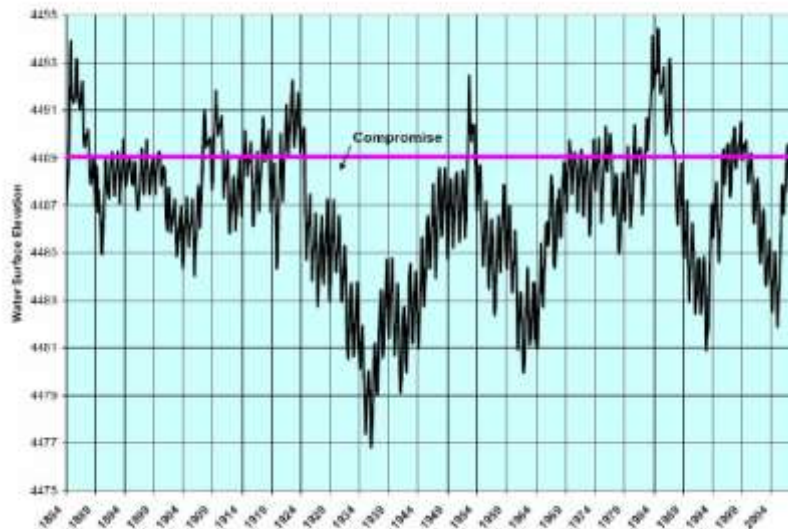
Figure 1.1 from the Utah Lake Water Level Fluctuation Study conducted by the Central Utah Water Conservancy District shows the historic levels of the Lake. Utah Lake is considered a semi-terminal Lake because approximately one-half of the water that enters the Lake leaves via surface flow and the remainder is lost through evaporation. Water lost through evaporation totals 115 billion gallons, which would fill two million classrooms with water.

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The Lake is operated under an agreement between Utah Lake water users and land owners to limit and reduce flooding around the Lake. The initial agreement was negotiated in 1885 and

Figure 1.1 — Historical Utah Lake Level — 1884-2006

Source: Utah Lake Water Level Fluctuation Study, Central Utah Water Conservancy District, 2007



modified in 1985. It is called the Utah Lake Compromise Agreement. When Utah Lake is above compromise elevation (4489.045 ft.), which can occur during the spring runoff, the control gates at the Jordan River outlet, are required to be fully opened, sending water down the Jordan River to the Great Salt Lake.

When the Lake reaches the compromise elevation of 4489.045 feet above sea level, the maximum Lake

depth is about 14 feet. Lake fluctuation varies during any given year from 3.5 to 5.0 feet depending on weather conditions and irrigation deliveries. Its average depth is 9 feet.

TEACHER MATERIALS:

- Review teacher background above
- *Utah Lake: Legacy* Video Clip—Chapter 1 ([YouTube Link](#)) ([UEN Link](#))
- Mystery Picture solution (pg. 8)
- Historical maps of Utah Lake (see link or pgs. 13-15)

STUDENT MATERIALS:

- Mystery Picture handout (pg. 6)
- Graph paper (pg. 7)
- Concentration Cards (pgs. 9-12)

PROCEDURE:

1. This lesson starts with a review of coordinates and mapping. With the mapping activity, students will recreate the shape of Utah Lake. After your students have done the graphing assignment, see if any of them recognize the shape of Utah Lake. Some facts to consider as you teach this lesson are below:

- The length of Utah Lake – 24 miles

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- The maximum width of Utah Lake -- 13 miles (includes Provo Bay)
 - The minimum width of the main body of Utah Lake – 5 miles
 - The average depth of Utah Lake – 9 feet
 - The area of Utah Lake – approximately 150 square miles
 - The perimeter of Utah Lake – approximately 70 miles
2. Show the *Utah Lake: Legacy*, Chapter 1 video clip or pictures of Utah Lake that you have found online.
 3. Review how to find area and perimeter.
 4. With the worksheet they have completed, have them compute the area and perimeter of Utah Lake (1 square equals approximately 1 mile [1=1]). After they have done this, compare their answers.
 - a. Will they all be the same? Why or why not?
 - b. Would Utah Lake's perimeter or shape look the same from year to year? Why or why not? (Utah Lake is shallow, particularly near the shoreline. As the Lake elevation rises or lowers, both the area and perimeter of the Lake changes -- increases as the elevation rises and decreases as the elevation lowers.)
 5. Compare the length of Utah Lake to the distance between Springville and Lehi.
 6. Compare the depth of the Lake with how high your classroom ceiling is or the height of a few students.
 7. Talk about the distance from your location to Utah Lake.
 8. Review the facts by playing concentration.

ASSESSMENT:

Use the student graph.

EXTENSIONS:

- The students will create a poster, which cites facts about Utah Lake.
- Consider having the students create a bookmark or trading cards that include the information they just learned about Utah Lake.
- Have the students use mapping websites like Google Maps or Google Earth to locate their city, Utah Lake, Utah Lake State Park, Bird Island, and other features on Utah Lake.



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- Graph the water levels from the graph in the Teacher Resources.
- Make a model of Utah Lake from clay.
- Create an 8' by 8' model of Utah on a large piece of material. Have students plot the location of Utah Lake and other points around the Lake.
- Have students locate the coordinates for Utah Lake State Park, or other destinations around Utah Lake.

ADDITIONAL REFERENCES:

- [Virtual Utah Website](#)
- [Utah Conservation Data Center Interactive Map](#)



Mystery Picture

1. Graph the coordinates.
2. Draw lines connecting the points after each is located.

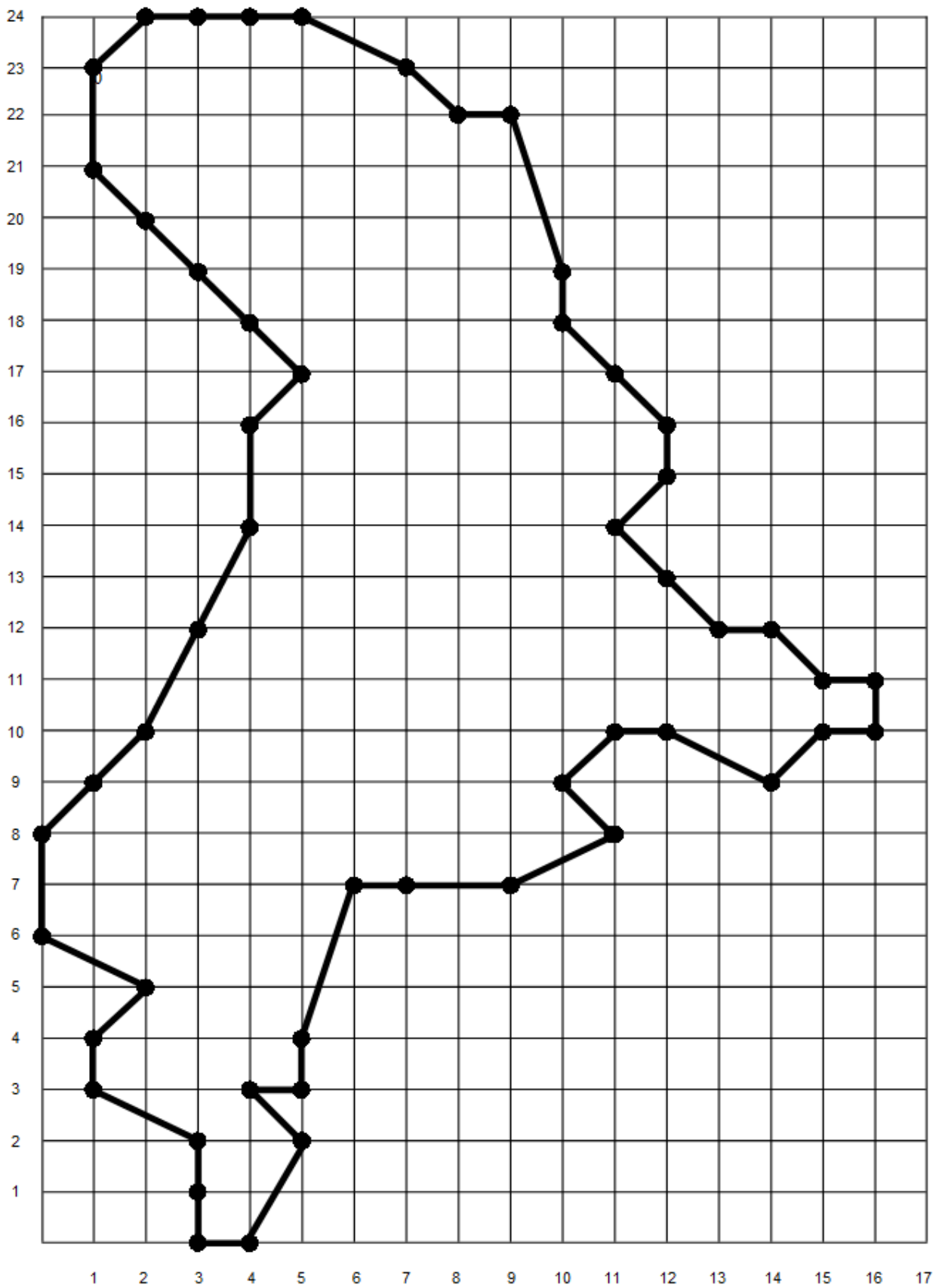
(3,0) (4,0) (5,2) (4,3) (5,3) (5,4) (6,7) (7,7) (9,7)
(11,8) (10,9) (11,10) (12,10) (14,9) (15,10)
(16,10) (16,11) (15,11) (14,12) (13,12) (12,13)
(11,14) (12,15) (12,16) (11,17) (10,18) (10,19)
(9,22) (8,22) (7,23) (5,24) (4,24) (3,24) (2,24)
(1,23) (1,21) (2,20) (3,19) (4,18) (5,17) (4,16)
(4,14) (3,12) (2,10) (1,9) (0,8) (0,6) (2,5) (1,4)
(1,3) (3,2) (3,1) (3,0)

Perimeter _____

Area _____

Picture is of _____

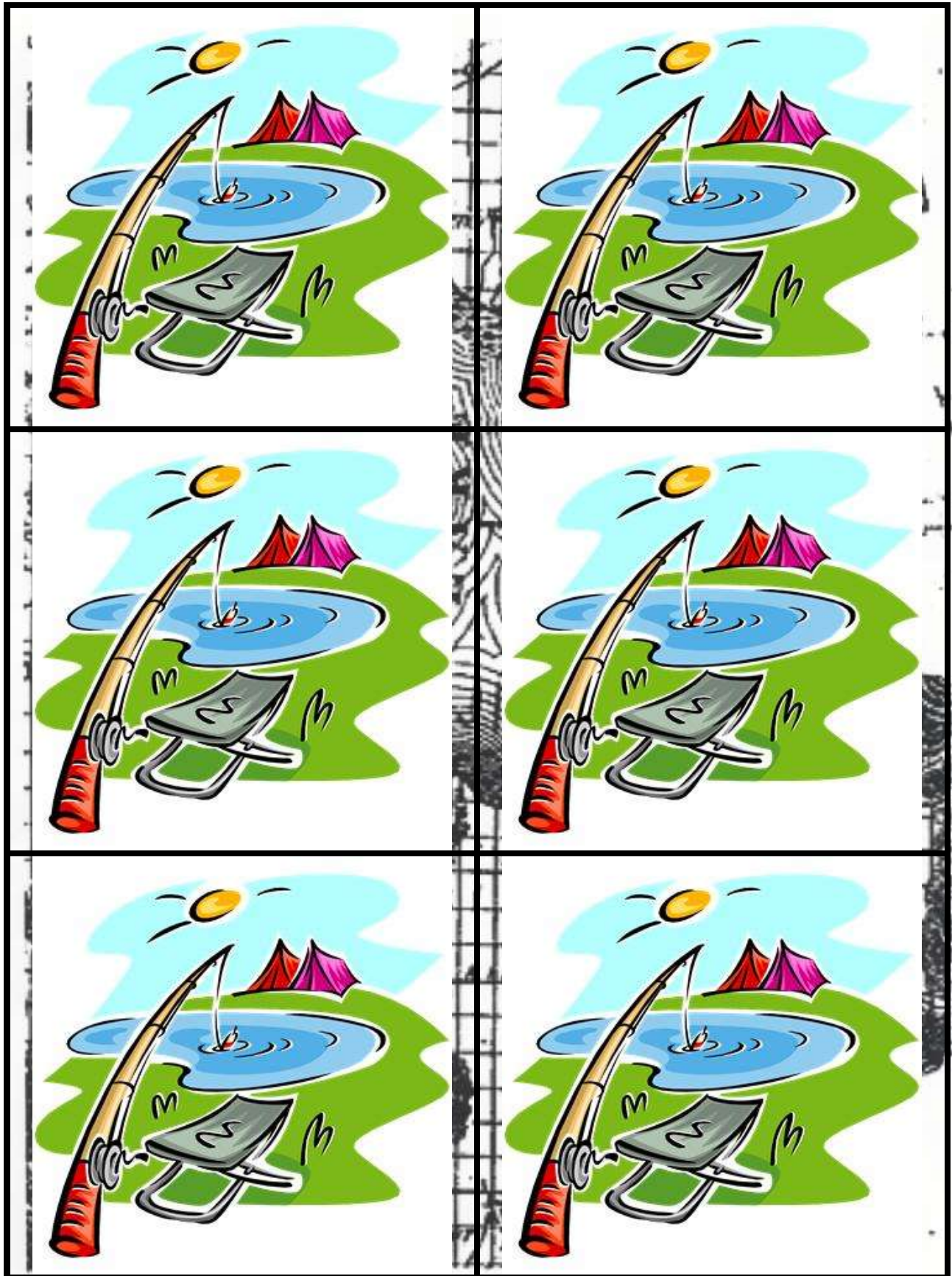
The students' graphs should look like this when completed.



Length of Utah Lake (North-South)	24 miles
Maximum width of Utah Lake	13 miles
Area of Utah Lake	150 square miles

<p>Perimeter of Utah Lake</p>	<p>70 miles</p>
<p>Average depth of Utah Lake</p>	<p>9 feet</p>
<p>Distance of Utah Lake from our school</p>	<p>_____ miles</p>

Minimum width of Utah Lake	5 miles
Approximate elevation of Utah Lake	4489 feet above sea level
Annual evaporation from Utah Lake	115 billion gallons



Optional cover sheet for the concentration cards.



MAP
Showing the extent of
SURVEYS
in the
TERRITORY of UTAH
1855

*Examined and approved
by the Secy of War 1854
By order JOHN W. BAYNE
of Do.*

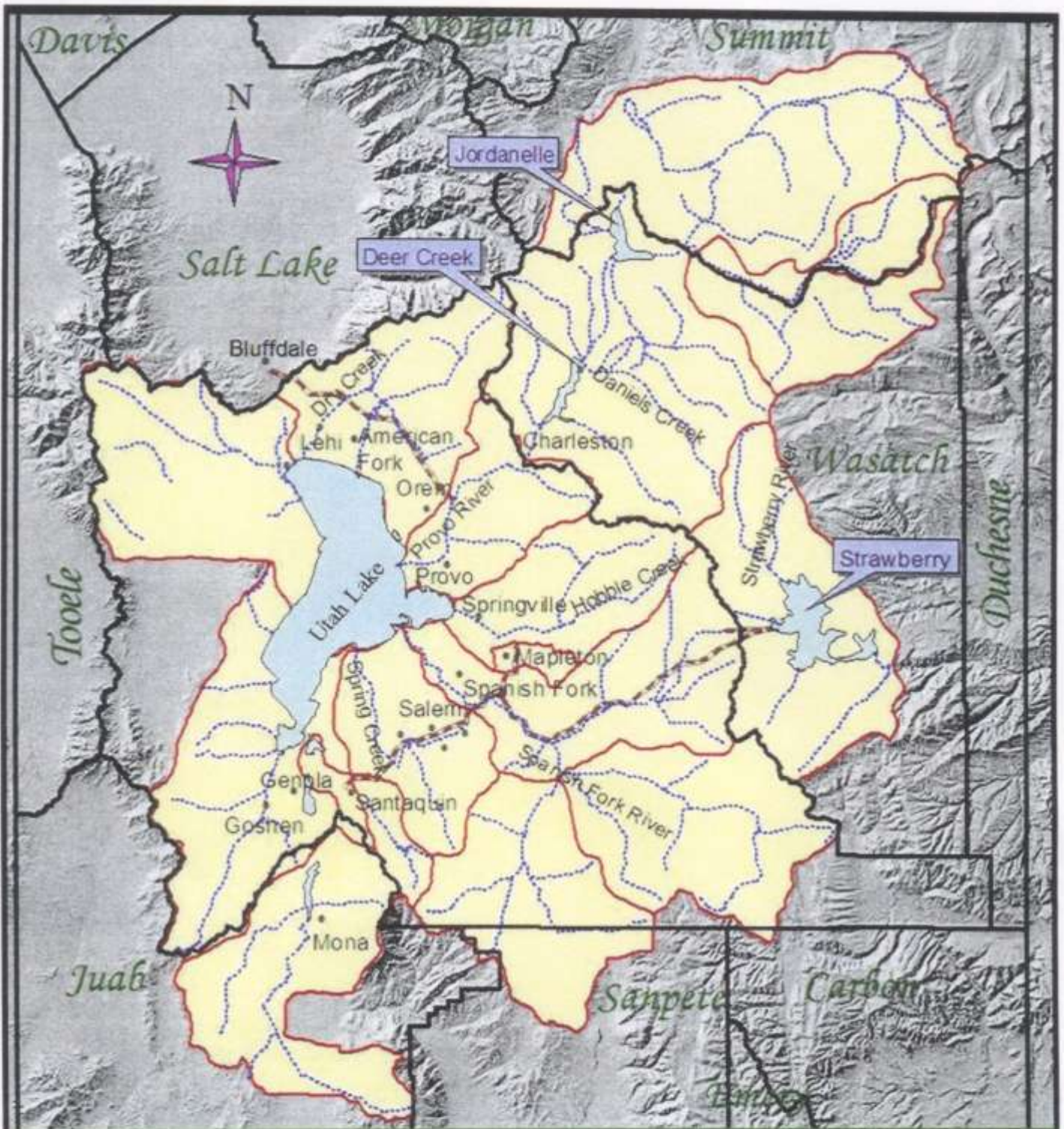


Figure 3.1 – Utah Lake and its drainage basin.

- Cities / Towns
- ▭ Counties Boundaries
- ▭ Lakes / Reservoirs
- ⚡ Reservoir Canals
- ▭ Utah Lake Watersheds
- ⚡ Main Streams