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## **Exploring Great Salt Lake Ecosystem**

### **Abstract**

Students will develop an understanding of Great Salt Lake as a unique, thriving, and diverse ecosystem. Student will have the opportunity to engage in an actual or a virtual field trip.

### **Grade 4**

#### **In-class Time**

- Introductory Lesson: 2-3 sessions, 30-40 minutes each.  
Research and Travel Brochure will take approximately one week to complete. Allow students two research sessions: one using the Internet, the other accessing information from school library or other sources. Travel brochures should be developed in two sessions: rough draft of research materials, final draft and assembly of travel brochure. Travel brochures should include maps, illustrations, as well as text.
- If a field trip is taken, additional day to develop task stations, day for field trip, as well as class time to evaluate field trip and tasks.
- Virtual Field Trip can be completed in one-two Internet sessions.

#### **Intended Learning Objectives**

- Students will learn how Great Salt Lake is a unique and diverse ecosystem.
- Students will have the opportunity to participate in a field trip to Antelope Island on Great Salt Lake or complete the Virtual Tour of Antelope Island using the Internet.
- Students will have the opportunity to develop tasks to be completed on the field trip or questions to research on the virtual tour.
- Students will integrate technology into their research by using the Internet, as well as library skills to develop brochures.
- Students will record field trip, whether actual or virtual, in science lab book or journal.
- Students will present research projects in the form of a travel brochure by posting hardcopies on classroom or school bulletin boards, posting on classroom or teacher web page, as well as video presentations, in the form of a travel commercial, at parent teacher conferences.

#### **Terminology**

Students will be required to include specific terms in travel brochures. The following terms will be included in weekly vocabulary/spelling lists:

Aquatic: pertaining to organisms that live in water

Brine shrimp: a small crustacean that lives in salt lakes and brine pools

Flyway: an established migration path of birds

Microorganism: organisms that cannot be seen with the unaided eye

Oolitic: small, rounded, light-colored sand

Organism: a living thing

Recede: to move back

Saline: relating to or containing salt

Terminal lake: a lake that has no outlet

## **Utah State Core Curriculum**

**Bench Mark:** Utah has diverse plant and animal life that is adapted to and interacts in areas that can be described as wetlands, forest, and deserts. The characteristics of the wetlands, forest, and deserts influence which plants and animals survive best there. Living and non-living things in these areas are classified based on physical features.

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

1. Objective 1: Describe the physical characteristics of Utah's wetlands, forest, and deserts.
  - Compare the physical characteristics of Utah's wetlands, forests, and deserts.
  - Describe Utah's wetlands, forest, and deserts.
  - Locate examples of areas that have characteristics of wetlands, forests or deserts.
2. Objective 2: Describe the common plants and animals found in Utah environments and how these organisms have adapted to the environments in which they live.
  - Cite examples of physical features that allow particular plants and animals to live in specific environments.
  - Describe some of the interactions between animals and plants of a given environments.

## **Background Information**

Great Salt Lake is a unique and thriving ecosystem. Many bird species are dependent upon this ecosystem for nesting, feeding, and migration. It is one of the largest migratory magnets in the west. The saline waters of Great Salt Lake support a diverse variety of aquatic organisms. These include bacteria, algae, brine shrimp, and brine flies. A causeway divides Great Salt Lake. The effect of the causeway can be seen in satellite photographs, brine shrimp populations, and a difference in saline levels between the north and south arms of the lake.

The shoreline Great Salt Lake changes dramatically as lake levels rise or fall even small amounts. These changes can be seen in satellite images captured over many years. Because Great Salt Lake is a terminal lake, it has no outlet; lake levels can be monitored and compared historically. Lake levels also affect salinity levels, which in turn have a direct effect on brine shrimp populations.

As an ecosystem, Great Salt Lake offers an opportunity to study a constantly changing environment that supports unique and diverse organisms from microscopic algae to the resident bison on Antelope Island.

Resources:

- <http://www.stateparks.utah.gov/visiting/visiting.htm>
- <http://www.engineering.usu.edu/uwrl/atlas/ch6/index.html>

## **Materials**

Utah Highway map, atlas, or class globe

Access to Internet as well as library research materials

Art materials for travel brochures

Student science journals

If chosen: video camera, player, and monitor

For actual field trip:

Protocols as required for field trip

Student journal for recording tasks

Materials for student developed tasks.

- These might include examination of soils, sand, and water with hand lenses or field microscopes.
- Soil and water testing equipment such as ph strips, nitrogen, dissolved oxygen, and salinity meters.
- Bird, animal, plant, and rock/mineral field identification books
- Video camera to record event
- Disposable cameras to record observations

#### Virtual Field Trip

- Access to Internet
- Student generated questions of interest about Great Salt Lake or Antelope Island
- Student journal

#### **Assessment of Prior Knowledge**

Students will be introduced to this unit through group-generated knowledge.

1. Divide the class into cooperative groups. Groups will have one minute to list 3 facts about Great Salt Lake on a sheet of paper. No names on the papers.
2. After one minute, groups switch papers. Give students another minute to add something to the new list. Repeat one more time.
3. Groups choose the most interesting fact on the paper that they have to share with the class. Post these lists on a bulletin board.
4. List potential vocabulary words on an overhead or white board.
5. Next, have students use class globe, atlas, or highway maps to locate Great Salt Lake.

Use the group generated information as a springboard for the travel brochures and field trip (actual or virtual).

#### **Procedures**

1. Students will research Great Salt Lake for background information. Students will use vocabulary words to guide this research: aquatic, brine shrimp, flyway, Oolitic, saline, and terminal lake.
2. Students will create a travel brochure about Great Salt Lake. Brochures must include information about animals, plants, and microorganisms that make the lake unique as well as pertinent and interesting historical and social issues.
3. Travel brochures should be part of a bulletin board or formal presentation.
4. Students may find information about Antelope Island State Park, located on Great Salt Lake at these web site: <http://www.stateparks.utah.gov/visiting/visiting.htm> or <http://www.engineering.usu.edu/uwrl/atlas/ch6/index.html> or <http://www.ugs.state.ut.us/sites.htm#gsl>
5. Extension: Students may choose to create a video commercial or Power Point presentation based upon the travel brochures. These could be used at parent teacher conferences or school open house to show case student work.

Optional Extension: Actual Field Trip:

6. Students will develop task stations to be completed will on the field trip. Tasks will be developed by the students based upon questions that arise during research for the travel

brochure. These stations should be based upon the interests of the students. Give the students broad topics for the development of the task stations. Students should access the Utah State Core Curriculum to help guide their task ideas. Suggested task could be: identifying rocks using hand lenses; identifying aquatic life; identifying plants; making observations on animal, insect, reptiles and bird species; setting up and using weather instruments; making observations on weather conditions and comparing these to other forecasts such as National Weather Service, news paper or television station predictions.

7. Students will complete the task stations while on the field trip.
8. In the event an actual field trip is not possible, a virtual field trip may be taken at: <http://www.colorado.edu/geography/virtdept/module/GSL/>
9. Students will develop questions to help guide the virtual trip.

### **Assessment**

- Students will be assessed on accuracy and thoroughness of information for the travel brochure as well as conventional writing standards. Brochure should be interesting, capturing the attention of the reader by attractive design components as well as information that might encourage one to consider a visit to Great Salt Lake.
- Students will be assessed on task jobs assigned for the field trip. Students will record all tasks in a formal journal to be evaluated for completeness and accuracy of information.
- Students may create a travel commercial, based upon the brochure, using video production. This should be assessed with the same standards used for the travel brochures. Students could also develop the brochure as a Power Point presentation further enhancing the technological component.

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### **Tracking weather patterns:**

How do weather patterns affect Great Salt Lake water levels?

#### **Abstract**

Students will monitor weather conditions in the location where they reside and at Great Salt Lake. Students will develop a database of weather information from which they will make historical comparisons, inferences, and predictions about Great Salt Lake as an ecosystem. This unit is intended to be a long-term project to be carried over from year to year with incoming fourth grade students adding to the database developed during the inquiry component.

#### **Grade 4**

#### **In-class Time**

Tracking Weather Patterns has the potential for a school year project. Minimum suggested time frame: one month.

#### **Weather Instruments:**

- 30-40 minute class session for researching basic instruments required for a weather station. Divide students into weather teams. Each team will be responsible for developing instruments chosen from this research for the class to build a basic weather station.
- 1.5 to 2 hour session for teams to construct weather instruments, weather station, and develop recording strategies.
- 10-15 minutes for daily weather observations, recording, charting and comparison. Responsibility will rotate among students working in weather teams.

#### **Researching Great Salt Lake:**

- One to two class sessions researching Great Salt Lake as an ecosystem, Great Salt Lake water levels, where to find reliable local and national weather forecasting information, as well as weather for Great Salt Lake.

#### **Intended Learning Objectives**

- Students will learn how Great Salt Lake is a unique and diverse ecosystem.
- Students will learn how to make and use weather instruments.
- Students will make detailed observations of the weather.
- Students will collect, compare, and analyze data so that they may make inferences and predictions about weather patterns and the effect on Great Salt Lake.
- Students will communicate the results of their research through weather journals, class bulletin board, video presentation for parent teacher conferences, as well as possible posting on the Internet via class, school or district web page. Students in Utah may participate in reporting weather through their teacher's web page on <http://www.uen.org>.

#### **Terminology**

Terms will be introduced as vocabulary words. Additional terms generated during research will be added to vocabulary/spelling list.

\*Specific terms will guide research on making and using weather instruments.

Aquatic: pertaining to organisms that live in water

\*Anemometer: an instrument to determine wind velocity (feet/minute)

\*Barometer: an instrument used to determine air pressure

Cardinal points: the main points on a directional compass: North, South, East, and West

Directional Compass: often called a navigational compass, uses the magnetic field of the Earth to determine direction of travel, such as north

Flyway: an established migration path of birds

Microorganism: organism that cannot be seen with the unaided eye

Organism: a living thing

Oolitic: small, rounded, light-colored sand

\*Psychrometer: an instrument used to measure humidity in the air

Recede: to move back

Saline: relating to or containing salt

Terminal lake: a lake that has no outlet

\*Wind vane: weather instrument used to determine direction the wind is coming *from*.

### **Utah State Core Curriculum**

**Science Bench Mark:** Weather describes conditions in the atmosphere at a certain place and time. Water, energy from the sun, and wind create a cycle of changing weather. The sun's energy warms the oceans and lands at Earth's surface, creating changes in the atmosphere that cause the weather. The temperature and movement of air can be observed and measured to determine the effect on cloud formation and precipitation. Recording weather observations provides data that can be used to predict future weather conditions and establish patterns over time. Weather affects many aspects of people lives.

#### **Standards/Objectives:**

Standard II: Students will understand that the elements of weather can be observed, measured, and recorded to make predictions and determine simple weather patterns.'

3. Objective 1: Observe, measure, and record the basic elements of weather.

- Observe, measure, and record data on the basic elements of weather over a period of time.

4. Objective 2: Interpret recorded weather data for simple patterns.

- Graph record data to show daily and seasonal patterns in weather.

5. Objective 3: Evaluate weather predictions bases upon observable data.

- Identify and use meteorological tools: rainfall gages, barometers, wind speed-direction, temperature.
- Predict weather and justify prediction with observable evidence.
- Evaluate the accuracy of student and professional weather forecasts.

Relate weather forecast accuracy to evidence or tools used to make the forecast.

### **Background Information**

Great Salt Lake is a unique and thriving ecosystem. Many bird species are dependent upon this ecosystem for nesting, feeding, and migration. It is one of the largest migratory magnets in the west. The saline waters of Great Salt Lake support a diverse variety of aquatic organisms.

These include bacteria, algae, brine shrimp, and brine flies. A causeway divides Great Salt Lake. The effect of the causeway can be seen in satellite photographs, brine shrimp populations, and a difference in saline levels between the north and south arms of the lake.

The lake itself has an impact on local weather. The “lake effect” is a process that increases precipitation in the area known as the Wasatch Front. This is the basin that holds Great Salt Lake. The lake is bounded on the east by the Wasatch Mountains, a part of the Rocky Mountain Range. Generally, weather enters this valley basin from the west. According to the Utah Geological Survey, “added moisture to the air due to evaporation from the lake’s surface, and atmospheric instability caused by the temperature contrast between the air and lake water” are the two factors that contribute to “lake effect”. Due to the high salinity levels of Great Salt Lake, the water never freezes. Cold dry air from the west comes into contact with the warmer water. The air picks up additional moisture from Great Salt Lake. This moisture-laden atmosphere comes into contact with colder temperatures of the valley, creating precipitation. Lake effect storms are known to drop significant amounts of precipitation in the valley and along the Wasatch Front.

Resources:

- <http://www.stateparks.utah.gov/visiting/visiting.htm>
- <http://www.engineering.usu.edu/uwrl/atlas/ch6/index.html>
- <http://www.ugs.state.ut.us/sites.htm#gsl>

### **Materials**

Access to Internet

Student journal

Classroom weather log: 3-ring binder with graph paper, lined paper, wind rose

Materials for weather instruments may include:

Soup cans	1-liter soda bottle	Thermometer
Protractors	Straw	Graph Paper
String	Tape	Carpentry tools
Ribbon	Compass	
Paper plates	Art supplies	

### **Assessment of Prior Knowledge**

Students will be introduced to this unit through group-generated knowledge.

1. Divide the class into cooperative groups. Groups will become the research teams for weather instruments. Teams have one minute to list 3 facts about Great Salt Lake on a sheet of paper. No names on the papers.
2. After one minute, groups switch papers. Give students another minute to add something to the new list. Repeat one more time.
3. Groups choose the most interesting fact on the paper that they have to share with the class. Post these lists on a bulletin board.
4. List potential vocabulary words on an overhead or white board.
5. Next, have students use class globe, atlas, and maps to locate Great Salt Lake.
6. Using the same technique to generate group knowledge about Great Salt Lake, ask, “What do you know about weather?”
7. Each group will report one interesting fact about weather to the class.
8. Use the group generated information as a springboard to guide research on weather and Great Salt Lake. This activity also allows any misconceptions to be addressed or included in research.

## **Procedures**

1. Students will develop a research project on the topic “How do weather patterns affect the lake level of Great Salt Lake?”
  - a. Students will develop a hypothesis based upon what they know about weather and what they know about Great Salt Lake. Students should research Great Salt Lake in order to have a broader base of knowledge for this hypothesis. See suggested web sites listed at the end of lesson.
  - b. Students could consider questions such as: What make a terminal lake different from other lakes? What is “lake effect”? Who/what is impacted by “lake effect”? Who/why/where is (are) lake level recorded? Who/what is affected when the levels of Great Salt Lake change? Why? Why might lake levels be tracked? Why are historical lake levels important?
2. Suggested guidance for a hypothesis: What affect does the weather have on Great Salt Lake? How do precipitation and temperature affect the levels of the lake from season to season? How does the current weather pattern and level of Great Salt Lake compare the historical information? Why does weather affect Great Salt Lake more than other inland lakes?
3. Student research should include information, both historical and current regarding lake levels, salinity, brine shrimp populations, animal, bird, plant populations, weather information as well as other related topics of interest to the students.
4. Students will research the best way to track weather and conditions around Great Salt Lake. This may be with personal observations, newspapers, organizations such National Weather Service, Friend’s of Great Salt Lake, National Parks Service, Division of Wildlife Services, NOAA (National Oceanic and Atmospheric Administration), local weather forecasting such as television stations, and Internet access to current weather data. See suggested web sites at end of lesson.
5. Students will construct a classroom weather station. Students will conduct research on which weather instruments are feasible for their classroom. This research is to include which instruments are usually found in weather stations, the purpose of the instrument, how the instrument works, and any direct purchase costs.  
Suggested Instruments: anemometer, wind vane, barometer, psychrometer, rain gauge, and basic thermometer (purchased)  
Suggested site for information about building a weather station are listed at the end of this lesson.
6. Students will research what materials can be generated by support of local businesses, families, and organizations, if needed. Then students will build the station as a class. Each weather team will be responsible for the construction and maintenance of one weather instrument. Student made weather instruments may include: directional wind vane, barometer, psychrometer, wind rose, rain gage, even a simple directional compass can be constructed.
7. Students will conduct, on-site daily weather observations and instrument recordings. These observations are to be recorded in a formal, classroom weather logbook as well as personal journals. The weather data is to be charted, with the data analyzed on a regular basis. Chart data using line graphs, data point graphs, bar graphs, and wind rose.
8. Students should be encouraged to make weather forecasts. Students should chart predictions and compare and contrast actual weather with forecast, both student and professional forecasts.

9. Students should access reliable weather sources, such as NOAA, National Weather Service, and local weather reporting stations, such as television, print news, or radio to compare their weather data with other sources.
10. Students will record daily weather information about Great Salt Lake. This information is to be recorded in a formal, classroom weather logbook. The weather data is to be charted, with the data analyzed on a regular basis. Chart data using line graphs, data point graphs, bar graphs, and wind rose.
11. Students can compare weather at Great Salt Lake with the weather the students are experiencing.
12. When the data collection portion of this project is complete, students will compare their hypothesis with the resulting data and draw a conclusion. Conclusions should be recorded in student journal.
13. Conclusions should be shared as a class with formal presentations by weather teams.
14. This project is intended to be carried over from year to year with incoming students continuing the research project, adding new data, analyzing the data, making inferences, as well as making predictions, and developing hypothesis about the question "How do weather patterns affect Great Salt Lake?"
15. This project should be driven by the interest of the students. It should not become burdensome. When interest wanes, the scope of the project can be reduced as long as the students have drawn a conclusion to the original question, "How do weather patterns affect Great Salt Lake?" as compared to the hypothesis first proposed by each weather team.

#### **Web Resources:**

1. Virtual Tour of Great Salt Lake:
  - <http://www.colorado.edu/geography/virtdept/module/GSL/index.html>
2. National Oceanic and Atmospheric Administration:
  - <http://www.nws.noaa.gov/sitemap.html>
3. Utah State Parks:
  - <http://www.stateparks.utah.gov/visiting/visiting.htm>
4. Great Salt Lake:
  - <http://ut.water.usgs.gov/>
  - <http://ut.water.usgs.gov/greatsaltlake/index.html>
    1. [http://waterdata.usgs.gov/ut/nwis/uv/?site\\_no=10010000&PARAMeter\\_cd=00065,00060,00010,72020](http://waterdata.usgs.gov/ut/nwis/uv/?site_no=10010000&PARAMeter_cd=00065,00060,00010,72020)
  - <http://www.engineering.usu.edu/uwrl/atlas/ch6/index.html>
5. Weather Websites:
  - National Oceanic and Atmospheric Administration: National Weather Service: <http://www.nws.noaa.gov/>
  - <http://www.engineering.usu.edu/uwrl/atlas/ch2/index.html>
6. Lake Effect:
  - [http://www.utahweather.org/UWC/lightning\\_precipitation/lake\\_effect\\_weather.html](http://www.utahweather.org/UWC/lightning_precipitation/lake_effect_weather.html)
  - Utah Geological Survey: <http://ugs.utah.gov/surveynotes/gladasked/gladhydr.htm>
7. Weather Station Websites:
  - Franklin Institute: <http://www.fi.edu/weather/todo/todo.html>
  - Miami Museum: Home page: <http://www.miamisci.org/>
  - Weather instruments: <http://www.miamisci.org/hurricane/weathertools.html>

### **Assessment**

- The class will assess weather station. Students will evaluate instruments, construction, accuracy, reliability, as well as suggested modifications to increase these parameters. Students will be encouraged to make modifications as needed during this unit.
- Informal assessment should be ongoing. Student progress with class weather log and personal logs should be reviewed weekly.
- Students will be assessed on accuracy and completeness of personal journals.
- Groups will be assessed on accuracy, consistency of data entry, and completeness of class weather log entries.
- Assessment will include student inferences and predictions based upon data gathered by the class, both on-site and from other resources for local and Great Salt Lake weather.
- Students' will self assess their ability to predict weather based upon observations and class weather station data.
- Journals will be assessed at the conclusion of unit. Students will compare hypothesis with data gather to draw a conclusion.

### **Conclusion**

This unit should include a formal conclusion. Students will compare hypothesis with actual data collected to draw conclusions. Students will be encouraged to evaluate inquiry for possible extensions or modifications for future students. Student recommendations will become a permanent part of the class weather log for future student reference.