

Wings & Water Wetlands Education Program Spring Pre-Tour Classroom Activities

The Nature Conservancy 



GREAT SALT LAKE
SHORELANDS
PRESERVE

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HOW TO USE THESE PRE-TOUR ACTIVITY PAGES

You should review and complete these pre-tour materials and activities approximately 1-2 weeks BEFORE you take your students on their Spring *Wings and Water* preserve tour.

The main topics you will cover in these pre-tour activities and materials are:

1. Wetlands are an important part of Utah.
2. Wetlands are connected to all parts of the water cycle.
3. Wetlands conditions are affected by our weather and climate.
4. Plants and animals in Great Salt Lake wetlands have fascinating adaptations that allow them to thrive there.
5. The Great Salt Lake Shorelands Preserve is a wetlands sanctuary where people can see and learn about healthy wetlands and their residents.

For each of these topics, we provide the following:

1. **Meeting the Standard**—explains which state core curriculum science standards correlate to each topic.
2. **Checkpoints for Teaching**—describes the concepts that should be incorporated into your lesson plan and that you should ensure students understand.
3. **Student Discovery Guide Activities**—in-class activities based on the Student Discovery Guide. Provided to you by The Nature Conservancy, the Discovery Guide serves as workbook and field guide with specific pages that correlate to the five pre-tour topics listed above.
4. **Background Information**—topic-specific information designed to help teachers prepare their lesson plans.
5. **Options for Further Activity**—other concepts and ideas for activities.
6. **Other Resources**—references for more information.
7. **Related Vocabulary**—a list of topical vocabulary that should be addressed in your lesson plan.

Please Remember: These in-class materials and activities are designed to enhance your students' wetlands education and *Wings & Water* tour experience. They have been designed to help you meet the state core curriculum standards for the study of wetlands and should work hand-in-hand with curriculum that you already have in place. As you plan your science curriculum for the year, please incorporate these topics and activities into your classroom studies as appropriate.

SPRING

PRE-Tour Topic #1: Wetlands

THEME: *Wetlands Are an Important Part of Utah.*

Checkpoints for Teaching

Below are the concepts your students should understand about wetlands before they take their SPRING preserve tour.

Preliminary Preserve Tour Information

- Use the upcoming Preserve tour to frame your introduction to wetlands and the *Wings and Water* study unit. Briefly describe the adventure that awaits students and explain that their upcoming science investigations will be preparing them for that experience.
- Introduce the students to the *Discovery Guide*.

Physical Characteristics of Wetlands

- Your students should help to construct and be able to recite a descriptive definition for *wetlands*.

Formation and Maintenance of Great Salt Lake Wetlands

Your students should understand:

- Conditions that form wetlands
- What conditions cause wetlands to remain or disappear.
- Reasons for wetlands being concentrated along the southern and eastern shores of the Great Salt Lake.

Important and Unique Features and Services of Wetlands

Your students should:

- Be aware that more than half of all wetlands that existed in the lower 48 states two hundred years ago have been destroyed, mostly because of our own ignorance about their value.
- Know that, depending on climate conditions, Utah is the first or second driest state in the nation (Utah was drier than Nevada during part of our most recent draught cycle), and yet the wetlands found at Great Salt Lake are among the most important in the world.

Meeting the Standard: This topic correlates to the following Utah state core curriculum standard for science:

STANDARD V. 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.

- Be able to describe at least five unique benefits that wetlands provide to people and wildlife.

Student Discovery Guide Activities

Use the Student Discovery Guide to review and assess learning from the checkpoints listed above. These activities correlate to pages of the Discovery Guide and Field Guide.

FRONT PAGE and INSIDE COVER

- Introduce your students to the *Student Discovery Guide* as the resource they will be using before, during and after their tour to the Preserve.
- Distribute a *Discovery Guide* to each student and browse through it with the students. Make note of how the guide is designed to be two resources in one—a student workbook and a field guide to wetlands plants & animals.
- Review the map of Great Salt Lake on the inside front cover. Make note of the wetlands found all along the eastern and southern parts of the lake, and of their destination at the Great Salt Lake Shorelands Preserve.
- Instruct the students to write their names in the space provided on the front cover of the *Discovery Guide*. Other information spaces beneath the name may be left blank for now.

PAGE 4 – WORLDS WITHIN WETLANDS

- Direct the students to page 4 to review what they learned about wetlands. Have them each complete the three questions on that page.
- Collect the *Discovery Guides* and store them for later use.

Support Materials

A full-page version of the map of Great Salt Lake and its wetlands and a full-page version of the wetlands illustration provided on Student Discovery Guide centerfold pages 18-19 are available for creating overhead transparencies or student worksheets. Download these materials on the Conservancy's web site:

www.nature.org/wingsandwater .

Related Vocabulary

Below is a list of important words and phrases associated with the entire *Wings & Water* study unit. Some are included only for purposes of pronunciation (such as the bird names), while others are more specific to 4th grade core topics. Words most relevant to *this* thematic section are shown in ALL CAPS. Your students should be familiar with them before their visit to the Preserve.

___ adaptation (<i>n</i>)	___ gas	___ PRESERVE (<i>n</i>)
___ algae	___ GROUNDWATER	___ producer
___ aquatic	___ HABITAT	___ salinity
___ avocet	___ HYDRIC SOIL	___ SEDIMENTS
___ camouflage	___ ibis	___ shelter
___ climate	___ IGNORANCE	___ shorebird
___ community	___ invertebrate	___ soil
___ condensation	___ liquid	___ solid
___ CONSERVATION	___ marsh	___ space
___ curlew	___ migration	___ trait
___ data	___ molt	___ transpiration
___ dirt	___ naturalist	___ uplands
___ ECOLOGY	___ phalarope	___ VEGETATION
___ ECOSYSTEM	___ photosynthesis	___ water cycle
___ elevation	___ plant	___ watershed
___ ENVIRONMENT	___ playa	___ weather
___ evaporation	___ plover	___ weed
___ food chain	___ pond	___ WETLAND
	___ precipitation	

Teacher Background Information

The background information below is designed to help you prepare your lesson plans on this topic. What we have provided is a starting point but it is not intended to dictate the extent of your lesson plans. Feel free to supplement this information to meet your educational goals.

Defining Wetlands

A descriptive definition of *wetlands* should include important physical characteristics, such as the presence of water, unique soils and indicator plants. One example of a definition that does this is:

Wetlands are ecosystems where water is found at least part of the year, with hydric soils and specially adapted plants.

To better grasp this definition, it may be useful to expand it into its three constituent parts:

1. *The soil is covered by water.* This causes the oxygen in the soil to be squeezed out.
2. *The soil is hydric.* This means the soil is so full of water that it doesn't contain the oxygen needed by most plants.

An opportunity exists here to introduce the *hydra-/hydri-/hydro* word prefix so common in our language. Derived from a form of the Greek, *hydor*, meaning "water," we have such words as *hydroplane*, *hydroelectric*, *hydraulic* and *dehydrated*.

3. *The plant life is adapted.* Wetlands plants have special adaptations to live in water. They are able to grow with very little oxygen, such as in hydric soils.

Formation & Maintenance of Great Salt Lake Wetlands

Principal conditions that form wetlands:

1. Climatic conditions that cause a reliable presence or reappearance of water at or near the surface.
2. An area sufficiently level for sediments to collect, soils to develop and plants to grow over time.

Conditions that cause wetlands to permanently or temporarily diminish or disappear can be natural or cultural (of human origin). Natural causes include climate change, catastrophic flooding and major earth movement (such as earthquakes or landslides). Cultural causes include water diversions or diking and the addition of fill materials for building projects. The loss of 51% of all wetlands in the continental US has been of human origin. Human changes are usually permanent.

Why are Great Salt Lake wetlands found where they are? Many of Great Salt Lake's abundant wetlands are located on the southern and eastern shores of the lake due to

three contributing circumstances (in order of importance):

1. Water from nearby mountains brings water and sediments in streams flowing down the slopes leading to the lake's southern and eastern shores.
2. Prevailing winds and wave action from the north and west bring various minerals and nutrients to the lake's southern and eastern shores.
3. Most industrial development and modifications of original wetlands has occurred in the more western portions of the lake, while most conservation efforts have focused on the southern and eastern shores.

These circumstances have been responsible for both the original formation and the continued maintenance of these wetlands.

Some Benefits From Wetlands (From Project SLICE, FRIENDS of Great Salt Lake.)

WILDLIFE HABITAT	Wetlands are among the most productive ecosystems in the world. Nationwide over 5,000 species of plants, 190 species of amphibians and 270 species of birds depend on wetlands for food, shelter and space.
WILDLIFE PROTECTION	Wetlands are important spawning and nursery areas for commercial and recreational fish and shellfish industries, as well as feeding, nesting and shelter zones for fish and migrant birds.
HUMAN ENRICHMENT	Wetlands provide beauty, recreation and solitude to many.
CLIMATE CONTROL	Many wetlands return over two-thirds of their annual water input to the atmosphere through transpiration, which acts to moderate temperatures and humidity in adjacent uplands.
CO ₂ COLLECTION	Wetlands store carbon within peat and soil, reducing the release of carbon dioxide into the atmosphere.
DECONTAMINATION	Wetlands clays and soils remove harmful phosphates, metals and agricultural runoff from surface and ground water. Wetland plants take up and use the nutrients and chemicals carried in collected sediments, which would otherwise contaminate rivers, lakes and groundwater supplies.
EROSION CONTROL	Water flowing into wetlands is spread out and slowed, making it less destructive. Plants also bind soil to help it stay in place.
FLOOD CONTROL	By causing waves and fast-moving water to slow down and spread out near large lakes and seacoasts, wetlands act as buffers to protect inland life and property.
GLOBAL CYCLING	Wetland processes play a planetary role in the cycling of carbon, nitrogen, phosphorus and sulfur, constantly transforming and releasing them into the atmosphere.
NUTRIENT RECYCLING	An abundance of decomposers continuously break down materials into nutrients used by plants, fish and invertebrates.
OXYGEN PRODUCTION	The abundance of aquatic and terrestrial plants in the world's wetlands contributes significantly to planetary oxygen.

RAIN MAKING	Dimethyl sulfide released from wetlands may act as a seed for cloud formation.
SILT REMOVAL	Wetlands capture sediments and debris that could otherwise threaten life downstream by filling in deep areas, covering eggs or clogging animals' gills. Studies show that some wetlands remove up to 90% of sediments passing through them.
SOIL CONSERVATION	Water flowing into the flat terrain and dense vegetation of wetlands loses speed, causing material eroded from upstream to accumulate for use by local plants and animals.
WATER STORAGE	Wetlands store precipitation and surface water like giant sponges, slowly releasing it into downstream habitats and groundwater. Researchers have discovered ground water recharge equal to 20% of a wetland's seasonal volume.

Options for Further Activity

Incorporate teaching from other aspects of fourth grade science that complements these wetlands studies by...

- Exploring the different kinds and locations of wetlands found in Utah.
- Comparing and contrasting physical characteristics of wetlands environments with those of forests and deserts.
- Introducing additional vocabulary words and their meanings from the list.

Other Resources

The following World Wide Web resources provide information and materials pertaining to wetland plants and animals, ecology and education from sources throughout the nation. Sites specific to other regions have been included because of their applicability to Utah wetlands.

Wetlands Plants (Colorado) at <http://waterknowledge.colostate.edu/plants.htm>

Websites and reference books about wetlands, plants and animals from the University School Nashville at <http://internal.usn.org/wetlands/reference.html>

Ecology references from Stratford Landing Elementary School (W. Virginia) at <http://www.fcps.k12.va.us/StratfordLandingES/Ecology/home.htm>

Wetlands Ecology (Wisconsin) at http://planning.lic.wisc.edu/Wetland%20Ecology/WLE_WetlandSpecies.htm

Wetlands Flora of the West (USGS) at <http://www.npwrc.usgs.gov/resource/plants/florawe/species.htm>

Wetlands Ecology, function and value at http://www.wetland.org/educ_wetlandinfo.htm

Utah Wetlands & Riparian Center (USU and U of U) at <http://www.utah.edu/uees/wrc/>

Utah Wetlands Education Program (UDWR) at <http://www.wildlife.utah.gov/wetlandsed/>

Utah Wetlands Interpretation Network (UWIN) at <http://www.utahwetlands.org/>

Wetlands Plants & Plant Communities (MN and WI, USGS) at
<http://www.npwrc.usgs.gov/resource/1998/mnplant/marsh.htm>

Wonders of Our Wetlands (publication download from *Deseret News*) at
<http://www.desnews.com/nie/tg>

SPRING

PRE-Tour Topic #2: The Water Cycle

THEME: *Wetlands Are Linked to All Parts of The Water Cycle.*

Checkpoints for Teaching

Below are the concepts your students should understand about the water cycle and watersheds before they take their SPRING preserve tour.

The Water Cycle

Your students should understand:

- That water can be found in any of three *states*, which we describe as either a *solid*, *liquid* or invisible *gas*.
- A definition for the *water cycle*.
- The role of *evaporation*, *condensation* and *precipitation* in the *water cycle*.
- That energy from *heat* causes water to change from one state to another, and that these changes are what allow water to move from one place to another, such as in streams, underground or through the air.

The Greater Salt Lake Watershed

Your students should be able to...

- Define a *watershed*.
- Identify the Great Salt Lake and the three main rivers in its watershed on a map.
- Explain how the Great Salt Lake Watershed links all three major Utah environments: forests, wetlands and deserts.

Relationships between the Water Cycle, a Watershed and Wetlands

Your students should understand that...

- Water flowing through a watershed is being replaced by water from the water cycle.
- Great Salt Lake wetlands depend on the watershed for all of its water.

Meeting the Standard: This topic correlates to the following Utah state core curriculum standard for science:

STANDARD I. Students will understand that water changes state as it moves through the water cycle.

Objective 1: Describe the relationship between heat energy, evaporation and condensation of water on Earth.

Objective 2: Describe the water cycle.

Student Discovery Guide Activities

Use the Student Discovery Guide to review and assess learning from the checkpoints listed above.

PAGE 5 - THE WATER CYCLE: A Never Ending Tour

- Return the previously introduced *Discovery Guides* to the students.
- Direct the students to page 5 to review some of what they have learned about the water cycle. Have them each color, label and diagram according to the directions.
- Here are some notes regarding the correct answers, beginning with the leftmost arrow and moving clockwise around the graphic:
 1. *Evaporation* is shown on the left emerging as vapor waves from the lake.
 2. *Condensation* is shown in the form of a pair of clouds near the sun.
 3. *Precipitation* is shown as rainfall from the largest cloud.
 4. *Runoff* is depicted as snowmelt running down the hill at the top right.
 5. *Infiltration* is indicated where runoff is percolating into the ground.
 6. A *Spring* is shown where streams of water emit from the ground.
 7. *Groundwater* is indicated by the arrow pointing to an underground aquifer.
 8. *Respiration* is represented by the deer standing near the small lake.
 9. *Transpiration* is represented by the trees at the lower left.
 10. A *River* is indicated near the center winding past some conifer trees.
- Collect the *Discovery Guides* and store them for later use.

Support Materials

A full-page version of the Water Cycle worksheet (page 5 of *Discovery Guide*) is available for download on the Conservancy's web site: www.nature.org/wingsandwater.

Related Vocabulary

Below is a list of important words and phrases associated with the entire *Wings and Water* study unit. Some are included only for purposes of pronunciation (such as the bird names), while others are more specific to 4th grade core topics. Words most relevant to *this* thematic section are shown in ALL CAPS. Your students should be familiar with them before their visit to the Preserve.

___ adaptation	___ GAS	___ preserve (<i>n</i>)
___ algae	___ groundwater	___ producer
___ aquatic	___ habitat	___ salinity
___ avocet	___ hydric soil	___ sediments
___ camouflage	___ ibis	___ shelter
___ climate	___ ignorance	___ shorebird
___ community	___ invertebrate	___ soil
___ CONDENSATION	___ LIQUID	___ SOLID
___ conservation	___ marsh	___ space
___ curlew	___ migration	___ trait
___ data	___ molt	___ TRANSPIRATION
___ dirt	___ naturalist	___ uplands
___ ecology	___ phalarope	___ vegetation
___ ecosystem	___ photosynthesis	___ WATER CYCLE
___ elevation	___ plant	___ watershed
___ ENVIRONMENT	___ playa	___ weather
___ EVAPORATION	___ plover	___ weed
___ food chain	___ pond	___ wetland
	___ PRECIPITATION	

Teacher Background Information

The background information below is designed to help you prepare your lesson plans on this topic. What we have provided is a starting point but it is not intended to dictate the extent of your lesson plans. Feel free to supplement this information to meet your educational goals.

The Water Cycle

A useful definition for the water cycle:

The endless movement of water through land, living things and the atmosphere.

Meteorologists have estimated that the average water molecule remains aloft—moving through the atmosphere as either gas or vapor—for six days. In some cases, this means that some molecules could circle the globe before returning to Earth!

On the other hand, our *lake effect* storms sometimes transform water from Great Salt Lake through stages of gas, cloud vapor and precipitation over just a few miles and in mere minutes or hours, falling as rain or snow on the foothills or at higher elevations.

Have your students blink their eyes or lick their lips. It is likely that their tears and saliva contain water that has traveled many times through the Earth's atmosphere and through countless plants and animals since the Earth began.

Watersheds

A useful definition for a watershed:

An area where all water drains to the same place.

(That place could be a river that is itself part of a larger watershed, or it could be a final destination in the form of a lake or a sea.)

All major watersheds consist of three parts, from beginning to end: mountains (or high ground), one or more rivers, and a lake or ocean.

All water flowing on the earth's surface or underground is part of a watershed. You cannot stand anywhere on Earth and *not* be in part of a watershed.

Watersheds come in all *scales*. At one extreme, you might stand in your driveway or school parking lot and observe snowmelt or rainfall flowing to a drain or gutter—*that* is a watershed. At the other extreme, view the Salt Lake Valley from an airplane or on a physical map and you can observe a major regional watershed system. An example of a continental watershed system would be the entire drainage area of the Mississippi River, from Minnesota to Louisiana. All small watersheds are parts of larger ones. Put another way, all major watersheds are composed of tens, hundreds or thousands of lesser watersheds. Land managers and ecologists tend to focus on larger watershed systems because of the many plant and animal interrelationships they contain.

Any one place in a watershed is affected by what happens higher up.

Understanding watersheds helps make sense of how the land and its ecosystems are involved in the water cycle, and reveals how different parts of an ecosystem—the

deserts, wetlands and forests of the Greater Salt Lake Ecosystem, for example—are all connected, despite their differences.

Great Salt Lake Watershed

All water flowing into Great Salt Lake and its wetlands is part of the *Great Salt Lake Watershed*.

The Great Salt Lake Watershed is unusual because it ends at a terminal lake rather than an ocean.

The Great Salt Lake Watershed links all *forest* environments in the Wasatch Mountains with all *desert* and *wetland* environments at Great Salt Lake.

Options for Further Activity

Incorporate teaching from other aspects of fourth grade science that complements these watershed and water cycle studies by...

- Arranging a visit to a water treatment plant.
- Comparing and contrasting relationships between the Greater Salt Lake Watershed and different habitats found in wetlands, forests and deserts.

For example, where different environments are located in the watershed, the states of water in each environment, how much water is usually found, how long and during which season water remains.

- Introducing additional vocabulary words and their meanings from the list.

Other Resources

Keep It Pure Watershed Activity Guide, from Salt Lake City Department of Public Utilities at http://www.slcgov.com/utilities/ud_watershed_education.htm.

Spring

PRE-Tour Topic #3: Weather and Climate

THEME: *Wetlands Are Modified By Our Weather and Climate.*

Checkpoints for Teaching

Below are the concepts your students should understand about weather and climate before they take their SPRING preserve tour.

Patterns of Weather, Trends in Climate

Your students should understand:

- The difference between *weather* and *climate*.
- That we can see a pattern to the weather in our region, such as in the amount of precipitation during different times of the year.
- That we can observe climate trends over years or decades, such as revealed by changes in annual precipitation.

Weather Variations Based On Elevation

- Your students should be able to explain how weather conditions are affected by elevation.

Weather Data

- Your students should be able to use graphed weather data to make correlations between precipitation and conditions such as stream flow, Great Salt Lake surface elevation and wetlands habitat.

Student Discovery Guide Activities

Use the Student Discovery Guide to review and assess learning from the checkpoints listed above.

PAGE 6 – WEATHER & CLIMATE: Patterns of Change

- Return *Discovery Guides* to the students.
- Direct the students to page 6 for a review of some of what they have learned about weather and climate. Have them each complete the graphing assignment and write answers to the questions given.

Meeting the Standard: This topic correlates to the following Utah state core curriculum standard for science:

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

Objective 2: Interpret recorded weather data for simple patterns.

- Correct answers for the Discovery Guide page 6 worksheet:
 1. 1986.
 2. 1963.
 3. The best answers are Precipitation and Evaporation. Other answers could be: rainfall, snowfall, temperature, and cloud cover.
 4. Several connections exist between Great Salt Lake and its wetlands:
 - a. The level of the lake helps determine where and how much water is in its wetlands.
 - b. The level of the lake alters or shifts the locations of shoreline, playa and nesting habitat.
 - c. The lake level changes the amount and distribution of salinity in wetlands, which benefits some species of birds and plants, and hinders others.

All such changes tend to impact various plant and animals differently.

5. When migratory birds return to a nesting or feeding location that has changed from the year before, they must seek a new location elsewhere along the lake that fills their needs.

Fortunately, Great Salt Lake is a large and dynamic system. So, while what had been an ideal spot one year may become unsatisfactory the next, it is also true that what had been unsatisfactory one year can become an oasis the next.

- Collect the *Discovery Guides* and store them for later use.

Support Materials

A full-page version of the Great Salt Lake graph featured on page 6 of the Discovery Guide is available for download on the Conservancy's web site:

www.nature.org/wingsandwater.

Related Vocabulary

Below is a list of important words and phrases associated with the entire *Wings & Water* study unit. Some are included only for purposes of pronunciation (such as the bird names), while others are more specific to 4th grade core topics. Words most relevant to *this* thematic section are shown in ALL CAPS. Your students should be familiar with them before their visit to the Preserve.

___ adaptation	___ gas	___ preserve (<i>n</i>)
___ algae	___ groundwater	___ producer
___ aquatic	___ habitat	___ salinity
___ avocet	___ hydric soil	___ sediments
___ camouflage	___ ibis	___ shelter
___ CLIMATE	___ ignorance	___ shorebird
___ community	___ invertebrate	___ soil
___ condensation	___ liquid	___ solid
___ conservation	___ marsh	___ space
___ curlew	___ migration	___ trait
___ DATA	___ molt	___ transpiration
___ dirt	___ naturalist	___ uplands
___ ecology	___ phalarope	___ vegetation
___ ecosystem	___ photosynthesis	___ water cycle
___ ELEVATION	___ plant	___ watershed
___ environment	___ playa	___ WEATHER
___ evaporation	___ plover	___ weed
___ food chain	___ pond	___ wetland
	___ PRECIPITATION	

Teacher Background Information

The background information below is designed to help you prepare your lesson plans on this topic. What we have provided is a starting point but it is not intended to dictate the extent of your lesson plans. Feel free to supplement this information to meet your educational goals.

Patterns of Weather, Trends in Climate

A useful distinction between weather and climate:

Weather is what is happening in the atmosphere at any particular time and place. We describe weather in terms of conditions measured as temperature, humidity, wind speed and direction, cloud cover and precipitation.

Climate is the average weather in a location, based on patterns revealed over a long period of time. For example, we say that a place that doesn't get much rain over many years has a "dry climate," and a place where it stays cold for most of the year would be said to have a "cold climate."

Weather changes hourly or daily. Climate changes over decades or centuries. We can sometimes experience dry weather in a wet climate or wet conditions in a dry climate: for example, a warm day in the arctic or showers in Death Valley.

Weather Variations Based on Elevation

It is generally true that at any given time the higher the elevation, the lower the temperature and the greater the likelihood of precipitation.

Temperature usually lowers with increased elevation because the density of air decreases (fewer air molecules), which results in the loss of heat energy from radiational cooling. Convection cooling also occurs as a result of more frequent wind and higher wind speeds at elevation. Winter inversions are an exception to this rule when high air pressure and our ring of mountains trap cold air in the lower valleys.

The relationship between temperature and elevation can often be observed in the form of a snow line along the gradient of the Oquirrh and Wasatch Ranges.

Precipitation tends to be higher with increased elevation because cooler air can hold less moisture than warmer air, and air is cooled as it is forced by winds and weather systems to rise up a mountainside.

The relationship between precipitation and elevation can be observed indirectly in (1) the transition of plant species between the lower valleys and the alpine regions, and (2) the greater frequency of clouds over the mountaintops.

Understanding the relationships between weather and elevation can also promote a greater understanding of why different plants and animals reside where they do, and how each plant and animal possesses a suite of adaptations specific to making a living where they do.

Weather Data

A direct correlation exists between regional precipitation and the surface elevation of Great Salt Lake. This correlation exists seasonally and annually. Seasonally, Great Salt Lake reveals a springtime high, usually at some time between April and June, and an autumn low, usually at some time between September and November. The lake's average surface elevation varies from year to year, based on climate trends.

There is a subsequent correlation between the surface elevation of Great Salt Lake and the conditions and locations of Great Salt Lake wetlands.

Options for Further Activity

Incorporate teaching from other aspects of 4th grade science that complements these weather & climate studies with...

- The use of a physical map to show and explain how the uplift of California's Sierra Nevada Mountains has resulted in westward moving Pacific Ocean moisture being captured as precipitation before it can reach Nevada and Utah. The dry climate of our two states is largely the result of this "cloud-wringing" effect.
- Additional graphing activities
- Extended weather studies and recordkeeping
- The introduction of additional vocabulary words and meanings from the list.

SPRING

PRE-Tour Topic #4: Adaptations

THEME: *Plants and Animals in the Great Salt Lake Wetlands Have Fascinating Adaptations that Allow Them to Thrive.*

Checkpoints for Teaching

Below are the concepts your students should understand about adaptations before they take their SPRING preserve tour.

Four Needs of All Life

- Your students should be able to explain that the four things that all living things must acquire in order to survive are *food, water, shelter* and *space*.

Adaptation versus Invention

Your students should be able to:

- Define a biological adaptation.
- Distinguish between a biological adaptation and an invention.
- Explain why different species have different adaptations.

Kinds of Adaptations

- Your students should be able to distinguish between *physical* and *behavioral* adaptations.

Plant and Animal Adaptations

Your students should be able to:

- Provide an example of both a physical and behavioral adaptation in a native plant species.
- Provide an example of both a physical and behavioral adaptation in a native animal species.

Meeting the Standard: This topic correlates to the following Utah state core curriculum standard for science:

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

Objective 2: Describe the common plants and animals found in Utah Environments and how these animals have adapted to the environment in which they live.

Student Discovery Guide Activities

If time permits, you might choose to use the *Student Discovery Guides* to review and assess learning from the Checkpoints outlined above.

PAGE 7 – ADAPTATIONS: Nature’s Problem-Solvers

- Return *Discovery Guides* to the students.
- Direct the students to page 7 for a review of adaptations. Have them each complete the page according to the directions given. (See Teacher Background section for ideas for correct answers.)
- Collect the *Discovery Guides* and store them for later use.

Support Materials

Detailed wetlands plant and animal fact sheets are available for your use. Download these materials on the Conservancy’s web site: www.nature.org/wingsandwater.

Related Vocabulary

Below is a list of important words and phrases associated with the entire *Wings & Water* study unit. Some are included only for purposes of pronunciation (such as the bird names), while others are more specific to 4th grade core topics. Words most relevant to *this* thematic section are shown in ALL CAPS. Your students should be familiar with them before their visit to the Preserve.

___ ADAPTATION	___ gas	___ preserve (<i>n</i>)
___ algae	___ groundwater	___ producer
___ aquatic	___ habitat	___ salinity
___ avocet	___ hydric soil	___ sediments
___ CAMOUFLAGE	___ ibis	___ SHELTER
___ climate	___ ignorance	___ shorebird
___ community	___ invertebrate	___ soil
___ condensation	___ liquid	___ solid
___ conservation	___ marsh	___ SPACE
___ curlew	___ migration	___ TRAIT
___ data	___ molt	___ transpiration
___ dirt	___ naturalist	___ uplands
___ ecology	___ phalarope	___ vegetation
___ ecosystem	___ photosynthesis	___ water cycle
___ elevation	___ plant	___ watershed
___ environment	___ playa	___ weather
___ evaporation	___ plover	___ weed
___ food chain	___ pond	___ wetland
	___ precipitation	

Teacher Background Information

The background information below is designed to help you prepare your lesson plans on this topic. What we have provided is a starting point but it is not intended to dictate the extent of your lesson plans. Feel free to supplement this information to meet your educational goals.

Four Needs of All Life

Most life on Earth can be assured of sunlight and an atmosphere, but there are four additional needs essential to survival that plants and animals must acquire in order to stay alive: Food, Water, Shelter and Space.

- *FOOD* is the source of nutrients for all life. For plants and algae, these nutrients come from soil and/or water. For animals, these nutrients come from other plants and animals.
- *WATER* in some form is needed for the bodily processes of all life forms.
- *SHELTER* is the means by which living things protect themselves from harm, from living and nonliving causes. Plants acquire shelter either from their own structural parts or from where they take root and grow. Animals find or build shelter for themselves. For some, the form or location of shelter changes through the year, and some animals, such as turtles and snails, carry some of their own shelter with them.
- *SPACE* is often synonymous with habitat, but may also include locations between two necessary habitats, as for migratory animals. All living things and their offspring need room to avoid direct competition with others, to be able to reproduce and to find food, water and shelter for themselves.

Adaptations versus Invention

A “trait” is a way that a plant or animal looks or acts. Biologists reserve the noun, “adaptation,” to describe survival traits that are passed on from parents to offspring. On the other hand, a tool or technique that helps us survive is an “invention.”

For example, large feet on a snowshoe hare or the large bill of a pelican are adaptations, because healthy offspring of these species will be born with these traits. Snowshoes or a lunch sack are inventions because, although they may similarly aid in survival, our offspring are not born with these as traits.

A useful definition of adaptation, then, might be:

Inherited traits that help a plant or animal survive.

Different species possess different adaptations because their survival needs are different. Where a species lives and how it obtains its energy (what it “eats”) causes it to be unique among all other species.

Put another way, adaptations are what help living things find the kinds of food, water, shelter and space they require.

Kinds of Adaptations

For simplicity, adaptations can be classified as either *physical* (parts of its body/how it looks) or *behavioral* (what it does/how it acts).

For example, our fingers and teeth or a bird's beak and feathers are all physical adaptations. Our ability to use tools and language or a bird's construction of a nest and singing are all behavioral adaptations.

Plant and Animal Adaptations

- Other examples of plant adaptations:

PHYSICAL: leaves, flowers, roots, stem, bark, branches, spines, seeds, taste, color

BEHAVIORAL: life cycle, growth, pollination, habitat, and seed distribution

- Other examples of animal adaptations:

PHYSICAL: legs, feet, ears, eyes, nose, mouth, teeth, body covering, claws, size

BEHAVIORAL: migration, shelter, habitat, metamorphosis, movement, feeding

Most classification systems depend on the various adaptive traits of plants and animals to help us distinguish one species from another.

Options for Further Activity

Incorporate teaching from other aspects of 4th grade science that complements these adaptations studies by...

- Introducing additional vocabulary words and their meanings from the list above.
- Assigning groups or individuals to research and present information about the adaptations of birds or other species likely to be seen at the Great Salt Lake Shorelands Preserve.

Spring

PRE-Tour Topic #5: Final Preparations

THEME: *The Great Salt Lake Shorelands Preserve is a Wetlands Sanctuary Where People Can See and Learn About Healthy Wetlands and their Residents.*

Checkpoints for Teaching

Below are the concepts your students should understand about the Great Salt Lake Shorelands Preserve and their upcoming field-trip before they take their Spring preserve tour.

The Preserve Visitor Center

Your students should be able to:

- Explain the purpose of the Great Salt Lake Shorelands Preserve.
- Describe the location of the Great Salt Lake Shorelands Preserve and its Visitor Center.

Tour Preparation

Each student should...

- List what s/he personally needs to bring for their Preserve field trip.
- Describe acceptable and unacceptable behaviors during the Preserve tour.
- Explain something s/he knows about the Great Salt Lake.
- Describe two things s/he expects to see or learn about during the Preserve tour.
- Write two questions about the Great Salt Lake wetlands that s/he hopes to answer during the Preserve tour.

Student Discovery Guide Activities

Use the Student Discovery Guide to review and assess learning from the checkpoints listed above. These activities correlate to pages 2, 3 and 16 of the Discovery Guide and all pages of the Field Guide. Here are steps to follow:

PAGE 2 – OUR VISIT to the Great Salt Lake Shorelands Preserve

- Return the *Discovery Guides* to the students. Emphasize how this booklet is their personal tool for getting the most from their upcoming Preserve tour.
- Direct the students to page 2 and the section, “My Field Trip Checklist.” Have them affirm their understanding by checking each item on the list.

- Direct the students to the “Wills & Won’ts” section on page 2. Have them verify their agreement with these guidelines by checking each item on the list. An extra space is provided for an optional addition to the list.

PAGE 3 – THINKING AHEAD

- Preview page 3 with the students. Instruct them to silently and individually complete the sections, “I Think I Know” and “My LFT’s.”

PAGE 16 – MAP of the Great Salt Lake Shorelands Preserve Visitor Center

- Review the map of Great Salt Lake on the inside cover, and the detail map of the Preserve Visitor Center on page 16.
- If you haven’t already done so, assign a Tour Group (Pod) letter and name to each student (see the Teacher Welcome Letter for more information). Have them write this information on the front cover of the Discovery Guide in the space provided.

FIELD GUIDE - OVERVIEW

- Preview the Field Guide section at the opposite end of their *Discovery Guide*. Conduct an overview and explain the value of Field Guide pages 1 through 16.
- Collect the *Discovery Guides* and store them for redistribution at the Preserve

Support Materials

Detailed wetland plant and animal fact sheets as well as a full-page version of the Great Salt Lake map for use in preparing overhead transparencies or for handouts are available for download on the Conservancy’s web site: www.nature.org/wingsandwater .

Related Vocabulary

Below is a list of important words and phrases associated with the entire *Wings & Water* study unit. Some are included only for purposes of pronunciation (such as the bird names), while others are more specific to 4th grade core topics. Words most relevant to *this* thematic section are shown in ALL CAPS. Your students should be familiar with them before their visit to the Preserve.

___ adaptation	___ gas	___ preserve (<i>n</i>)
___ ALGAE	___ groundwater	___ producer
___ AQUATIC	___ habitat	___ SALINITY
___ AVOCET	___ hydric soil	___ sediments
___ camouflage	___ IBIS	___ shelter
___ climate	___ ignorance	___ SHOREBIRD
___ community	___ INVERTEBRATE	___ soil
___ condensation	___ liquid	___ solid
___ conservation	___ marsh	___ space
___ CURLEW	___ MIGRATION	___ trait
___ data	___ MOLT	___ transpiration
___ dirt	___ NATURALIST	___ uplands
___ ecology	___ PHALAROPE	___ vegetation
___ ecosystem	___ photosynthesis	___ water cycle
___ elevation	___ plant	___ watershed
___ environment	___ playa	___ weather
___ evaporation	___ PLOVER	___ weed
___ food chain	___ pond	___ wetland
	___ precipitation	

Teacher Background Information

The background information below is designed to help you prepare your lesson plans on this topic. What we have provided is a starting point but it is not intended to dictate the extent of your lesson plans. Feel free to supplement this information to meet your educational goals.

The Preserve Visitor Center

For background information about The Nature Conservancy and its Great Salt Lake Shorelands Preserve and Visitor Center go to www.nature.org/wingsandwater and the inside front cover of the Student Discovery Guide.

Tour Preparations

Information about tour pod and team names and assignments can be found in the welcome letter that arrived with your Discovery Guides or at [www.nature.org/wingsandwater/Tour Policies and Requirements](http://www.nature.org/wingsandwater/Tour_Policies_and_Requirements)

Related Vocabulary

In the following list, Avocet, Curlew, Ibis, Phalarope and Plover are included as vocabulary words mainly for pronunciation. These are all bird species that will be explored and discussed by the students during the Preserve tour.

Avocet is pronounced AAV-uh-set. The first syllable rhymes with “have.”

Curlew has the hard “K” sound: KUR-loo.

Ibis is pronounced with a hard “I”: EYE-bis.

Phalarope is pronounced FAAL-uh-rope. The first syllable rhymes with “pal.”

Plover rhymes with *clover*. (Or may also rhyme with “hover” or “lover.”)

Illustrations of these birds may be found in the Field Guide portion of the Student Discovery Guide.

Options for Further Activity

- Introduce additional vocabulary words and their meanings from the list below.
- Assign word game pages 8 and 9. (Answer keys can be found under Support Materials at www.nature.org/wingsandwater .)

Complete Pre-Tour Vocabulary Review

Words in ALL-CAPS below summarize the vocabulary that should be introduced by the end of this pre-tour unit and before your Spring tour. (Words shown in lower case will be introduced as part of the Preserve tour or during post-tour classroom activities.)

___ ADAPTATION	___ GAS	___ PRESERVE (<i>n</i>)
___ ALGAE	___ GROUNDWATER	___ producer
___ AQUATIC	___ HABITAT	___ SALINITY
___ AVOCET	___ HYDRIC SOIL	___ SEDIMENTS
___ CAMOUFLAGE	___ IBIS	___ SHELTER
___ CLIMATE	___ IGNORANCE	___ SHOREBIRD
___ community	___ INVERTEBRATE	___ soil
___ CONDENSATION	___ LIQUID	___ SOLID
___ CONSERVATION	___ marsh	___ SPACE
___ CURLEW	___ MIGRATION	___ TRAIT
___ data	___ MOLT	___ TRANSPIRATION
___ dirt	___ NATURALIST	___ uplands
___ ECOLOGY	___ PHALAROPE	___ VEGETATION
___ ECOSYSTEM	___ photosynthesis	___ WATER CYCLE
___ elevation	___ plant	___ watershed
___ ENVIRONMENT	___ playa	___ WEATHER
___ EVAPORATION	___ PLOVER	___ weed
___ food chain	___ pond	___ WETLAND
	___ PRECIPITATION	