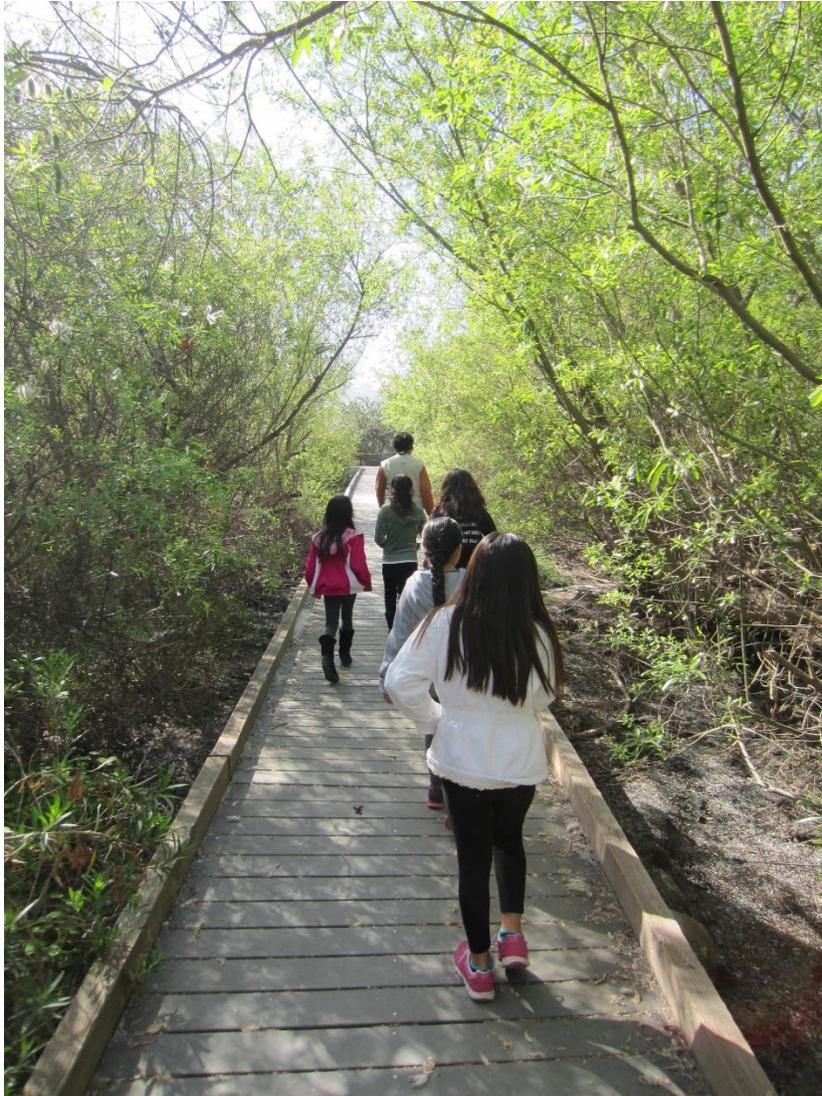




*San Elijo Lagoon* CONSERVANCY  
*Connecting communities. Protecting nature.*



## **Naturalist Playbook for School Programs**

**Fall 2016**



**San Elijo Lagoon CONSERVANCY**  
*Connecting communities. Protecting nature.*

# **Naturalist Playbook for School Programs**

## **Tips & Techniques**

FALL 2016

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## Purpose of This Document

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**Introduction** This section describes the purpose of *Naturalist Playbook for School Programs – Tips & Techniques* and provides emergency contact information.

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**Purpose** This document serves as a key reference for the San Elijo Lagoon Conservancy (SELC) Naturalist Training for School Programs.

It introduces naturalists to:

- Program goals and objectives
  - Components of a school tour
  - Roles and responsibilities before, during, and after a tour
  - Dress code and rules for the trail
  - Activities and discussion points for each themed walk
- 

**Emergency contact information**

In case of an emergency, contact one of the following:

- SELC Education Office: (760) 436-3944, Ext. 701 or 702
  - Tara Fuad, SELC Education Director: (858) 414-6187
  - Elayna Flanders, Education Coordinator: (760) 518-1165
  - San Diego County Department of Parks & Recreation: (760) 634-3026
  - After hours, call Supervising Park Ranger, Rusty Rodes: (760) 745-4379
  - For emergencies requiring law enforcement or medical care, dial 911
- 

**Audience** The intended audience for this document includes:

- SELC Naturalists-in-training
  - SELC Certified Naturalists
  - SELC Board of Directors
- 

**References** Additional resources are available for naturalist education. Among them are:

- *Docent Reference Manual*, September 2014 – Contains articles on San Elijo Lagoon geology, ecology & watersheds, plants, animals, and Native American (Kumeyaay) history
- SELC website downloadable resources:
  - Teacher guides
  - Animal guide
  - Docent Manual
  - Plant guide

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## PART I

### NATURALIST PROGRAM OVERVIEW

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**Description**

Part I provides an overview of the SELC Naturalist Program and describes naturalist responsibilities in the context of a school tour.

<b>Topic</b>	<b>See Page</b>
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## SELC Mission, Vision, Core Values

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**Overview** This section describes the mission, vision, and core values of San Elijo Lagoon Conservancy.

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**Mission** San Elijo Lagoon Conservancy protects and restores the resources of San Elijo Lagoon Ecological Reserve, its watershed, and related ecosystems for the benefit of current and future generations.

To further this mission, the Conservancy:

- engages and educates the community about the value of the reserve in order to promote ecological literacy and environmental responsibility
  - conducts scientific research to advance restoration planning and conservation science
  - designs and implements ecological management plans
  - manages and acquires land and easements; and
  - collaborates with the community, organizations, and government agencies.
- 

**Vision** San Elijo Lagoon Conservancy will be a guiding model for the stewardship of wetlands.

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**Core values** San Elijo Lagoon Conservancy demonstrates an ongoing commitment to these core values:

- Environmental Stewardship
  - Scientific Integrity
  - Education
  - Innovation
  - Collaboration
  - Ethical Leadership & Practices
-

## SELC Education Program

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<b>Overview</b>	This section describes SELC Education goals, history, and vision.
<b>Education program goals</b>	In support of the SELC mission, the goal of SELC Education moving into the future is to: <i>Connect, educate and engage the community to act to ensure the health and wellbeing of their watershed.</i>
<b>Learning strands</b>	Six learning strands, or themes, will drive the selection of SELC Education program content and instructional strategies. SELC Education audiences will (will be): <ol style="list-style-type: none"><li>1. Connect to Nature</li><li>2. Watershed &amp; Wetlands Literate</li><li>3. Recognize Nature Relevancy</li><li>4. Confident &amp; Skilled</li><li>5. Take Action (Personal)</li><li>6. Take Action (Group)</li></ol>
<b>History</b>	Established in 1987, the SELC Education Program currently serves students from around San Diego County. It includes northern coastal communities as well as the cities of Vista, Carlsbad, Escondido, Del Mar, Rancho Santa Fe, and the city of San Diego. In 2015, with the help of naturalists, the school education program was able to serve over 3,000 individuals with nearly two-thirds of the students coming from underserved communities.
<b>Our Living Watershed</b>	<p>In 2009, the Conservancy designed and implemented a unique program – “Our Living Watershed: Teaching Scientific Literacy in San Elijo Lagoon Ecological Reserve” – that provides field trip opportunities for three consecutive years to students in grades 3, 4, and 5 at five partner Title I schools in Escondido.</p> <p>For some students who visit as third graders, it is their first trip to the coast. When they return as 5th graders, in the third year of the program, there is a sense of ownership and pride about being connected to the coastal resources, and knowing that they can help make a difference in protecting these sensitive ecosystems.</p>

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## SELC Education Program, *continued*

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### The vision

Over the next five years, SELC Education has decided to:

- expand the focus on its signature “Our Living Watershed” program (sequential annual visits for grades 3 to 5 students within the Escondido Creek Watershed) balancing representation from the upper watershed cities of Escondido and San Marcos with the coastal/near-coastal communities of Encinitas, Rancho Santa Fe, and Solana Beach
  - refocus and modify the current education programs, materials and trainings based on the new education goal and set of learning strands with a focus on conservation (action-oriented) education for students from kindergarten through college, teachers and educators, adult and family visitors, and naturalists
  - develop and offer new action-oriented, multi-experience programs for students in middle school, high school and college to build self-efficacy and conservation skills
  - build and maintain relationships in diverse communities to ensure SELC Education meets the needs of those served
  - evaluate and refine programs, materials and trainings to ensure delivery is of the highest quality and desired outcomes are met.
- 

### Conservation education

[Conservation](#) is defined in the Britannica Junior Encyclopedia as...

*the protection of things found in nature. It requires the sensible use of all Earth's natural resources: water, soil, minerals, wildlife, and forests. People who care about conservation try to preserve natural resources so they will still be around in the future. They also try to keep the environment clean and healthy.*

Conservation education within the SELC education program provides students a pathway that ensures they:

- connect to nature
- become watershed and wetlands literate
- recognize nature’s relevance to their lives
- become confident and skilled in protecting nature and using natural resources wisely.

Visit the [SELC Education](#) website for wetlands and watershed Teacher’s Guides.

---

## Roles and Responsibilities

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**Overview** This section describes recommended practices for complying with standards that support San Elijo Lagoon Conservancy’s strategic direction. Relevant roles and responsibilities are included.

---

**Dress code** At the completion of naturalist training, each graduate will receive a uniform which includes Conservancy:

- polo shirt
- name tag
- baseball cap\*

Naturalists are expected to wear the **shirt and name tag** while leading walks to establish their authority and distinguish them from parent chaperones.

**\*Note:** Naturalists may wear a hat of their choice if they desire better UV protection.

---

**Key roles** Three roles are essential to the success of the school program and are described in the sections that follow. They are:

- Lead Naturalist
- Naturalist
- Chaperone

Each program requires that there be a Lead Naturalist.  
A group of 10 people requires a Lead Naturalist and a Chaperone.  
Additional naturalists must be added for groups greater than ten people.

---

**Naturalist** Primary responsibilities for naturalists are:

- Set up themed program props along the trail
- Agree in advance the starting direction for each naturalist’s walk to ensure that multiple groups are evenly distributed throughout the site
- Support Lead Naturalist during Welcome and Introduction by:
  - sitting quietly off to the side so as not to distract from the speaker
  - assisting in prop management
  - keeping an eye on students to help focus their attention on the Lead (Some naturalists like to sit among the students to keep them attentive.)
- Help with name tag distribution, if needed

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## Roles and Responsibilities, *continued*

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- Lead naturalist** One naturalist will be designated “Lead Naturalist” for every tour. Their primary responsibilities are:
- Greet teachers, students, and chaperones as they exit the bus or cars and direct them to where they will sit for the Welcome and Introduction.
  - Welcome the group
  - Introduce self and other participating naturalists
  - Provide a brief introduction to the lagoon
  - Introduce the program theme
  - Provide basic safety tips
  - Make sure students have name tags. (Teachers are asked in advance to provide name tags. If they forgot, there is a supply in the Education Shed.)
  - Ask teachers to split students into smaller groups of 10 or less (Teachers are asked to do this in advance, but sometimes it’s handled at the last minute.)
  - Make sure at least one parent chaperone or teacher accompanies each group.
  - Conduct Tour Review and wrap up

**Note:** If the program does not take place at the Nature Center, the Lead Naturalist is responsible for getting the props to the designated trailhead. They may bring the props themselves or arrange for one of the other docents to bring them.

---

- Chaperone** Every effort is made to ensure that each naturalist has no more than 10 students and that there is at least one parent chaperone assisting during the walk.\*

It’s a good practice for naturalists to introduce themselves to chaperones and ask them to do the following:

- remain at the back of the group and stay on the trail
- re-direct any students who might be losing focus.

**\*Note:** On the rare occasion that a naturalist does not have a chaperone in the group, they should ensure that they are always within view of another naturalist group in case they need assistance.

---

- Signing up for a walk** Naturalists must use the SELC online calendar at [www.calendar.SanElijo.org](http://www.calendar.SanElijo.org) to sign up for a walk.
-

## Components of a Tour

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**Overview** Each school tour begins with a brief Welcome and Introduction and ends with a Tour Review and Wrap-up. This section describes typical components found in a tour.

---

**Location logistics** Program logistics vary as shown below, based on the starting point for the tour:

- **Nature Center** – Each program begins with a “General Welcome” and “Themed Walk Introduction” in the Lagoon Launch Pad. Stations with interactive props are set up in advance by the naturalists at designated locations along the trail.  
**Note:** Maps of lagoon locations and trailheads are provided in the Appendix.
- **Rios Avenue Trailhead** – Each program begins with a “General Welcome” and “Themed Walk Introduction” at the outdoor amphitheater. Props are limited at this location and should be carried by each individual naturalist.
- **Santa Carina Trailhead** – Each program begins with a “General Welcome” and “Themed Walk Introduction” along the roadside. Make sure students aren’t facing the sun. Props are limited at this location and should be carried by each individual naturalist.

---

**Arrival and set up** The following are best practices for naturalist arrival and set up:

1. All naturalists are expected to arrive at least **30 MINUTES** prior to the walk start time to allow adequate time for prop set up and trail scouting
2. Use the dolly in the shed to transport heavy material (Naturalists with physical limitations should let others know if they need assistance!)
3. Make sure “Education Program in Progress” cards are clearly visible
4. Agree upon direction for each naturalist-led tour to avoid doubling up at stations

---

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## Components of a Tour, *continued*

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### Logistics

Meet the bus, greet the teacher and welcome the students to the lagoon.

- **Backpacks.** Have students leave backpacks on the bus, unless they are planning to eat at the Nature Center after the program. In that case, ask a Ranger to please open the garage so they can be stored there for the duration of the program.
- **Name tags.** If students need name tags, ask the teacher to make them during the Introduction but to NOT put them on until after the introduction is finished.
- **Dividing into groups.** Tell the teacher how many groups will be needed so they can re-group during introduction if necessary.

**Walk around the outside of Lagoon Launch Pad to give students an opportunity to view the lagoon before assembling for the Introduction**

---

### Group introduction

The Lead Naturalist greets the group and kicks off the program by doing the following:

- General Welcome\* - Page 20 - Gives the big picture (**2 minutes**)
- Themed Walk Introduction (**10 minutes**)
- Presents “Rules for the Trail” - Page 21 – (**2 minutes**)
- Divides students into small groups and assigns docents

**Note:** Tell the teacher what time the groups will return. **Do NOT ask the teacher what time to return.** Only make adjustments if the school is extremely late and the naturalists can’t stay past a certain time or if the teacher insists on returning at an earlier time than the program would typically allow.

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## Components of a Tour, *continued*

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### Small group walks

Each naturalist is assigned a group of 10 or fewer students. Small group walks are a mix of participating in station activities, exploring nature, and sharing observations and thoughts. A positive experience and student engagement are the primary objectives!

Walks typically take from 70 to 90 minutes. The following best practices will be observed during a tour:

- Agree upon the direction each naturalist will take in advance
  - Stay within the recommended time for each station activity
  - Establish a specific time to return to the Lagoon Launch Pad or other starting location for program wrap-up.
  - Naturalists introduce themselves to their chaperones and remind them of their role
  - Start with an ice breaker
  - Incorporate watershed and wetlands in every walk
  - Conduct small group wrap-up before joining full group. (See below.)
- 

### Small group wrap-up

Before you join the other classmates, take a moment to wrap up your morning walk with your students who have probably grown comfortable with you at this point. Engage them to share their experiences by asking a few questions. Depending on program and age, a few questions are suggested below. Or come up with your own based on the theme or the experience you had with the students.

- *What are some interesting things about anything we learned today?*
- *How might you describe what you did on the hike with someone else?*
- *What are some questions you have about organisms or anything else we saw?*
- *Where are places near your home where you could explore nature in this way?*
- *What's one thing each of us can do help protect our watershed and places like the San Elijo Lagoon?*

**In closing, thank the students for being such good naturalists or observers of nature and mention how much you enjoyed sharing your love of nature with them.**

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## Components of a Tour, *continued*

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### Large group wrap-up

Return to the Lagoon Launch Pad or starting location at the agreed-upon time for program wrap-up.

The Lead Naturalist will:

- Thank students, teachers, and chaperones and encourage them to return to the lagoon with their friends and families. Let them know that admission is FREE and that it is open every day from 9 to 5, except for Christmas Day.
- Announce upcoming events, such as Family Discovery Days or Sunday Fun Days. Upcoming events list will be stored in same drawer as shed key.
- **Important:** If there are a lot of parent volunteers, make a pitch for them to become Conservancy members. Hand out membership brochures (located in the Nature Center) to those who are interested.
- Hand responsibility for the students back to their teachers.\*

\***Note:** Teachers may take students into the Nature Center or offer a bathroom break before returning to the vehicles for departure.)

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## Components of a Tour, *continued*

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### **Inventory management**

After wrap-up:

- Naturalists will gather up props from the trail, including their pockets and backpacks
  - Lead naturalist will take inventory to ensure all materials have been returned
  - After inventory is completed, all items will be returned to the proper shelf or designated storage location in the shed.
- 

### **De-brief and lessons learned**

It is recommended that naturalists spend 10 to 15 minutes sharing experiences and lessons learned. Send suggestions or concerns regarding the program to the Education Director.

---

### **Program cancellation**

A program may be cancelled due to weather or a request by the school. In most cases, the decision about whether or not to cancel may not be made until the morning of the scheduled walk.

If the walk is cancelled, naturalists will receive an email by 8:00 a.m. on the morning of the walk. If no email is received, naturalists should assume the walk will take place.

---

## Frequently Asked Questions

**Overview** This section provides questions frequently asked by naturalists in the education program with corresponding answers.

Question	Answer
What if the students don't arrive with name tags?	Name tags and markers are stored in a Tupperware container in the shed. Bring them out with the props to be prepared.
What do I do if I end up with an unmanageable student?	Ask for assistance from the parent volunteer. If this is not effective, ask the parent volunteer to bring the student to the group with the teacher.
What if a child has to go to the bathroom?	This is discouraged, but if the child is desperate, ask the parent volunteer to take the child to the restroom and return promptly to rejoin the group. If you are at a trailhead without a restroom, ask the parent to find a private place to go outdoors. Try to keep it low key because once the other students are tuned in, you will have 10 students who desperately need to go to the bathroom.
What if students bring cameras or smartphones?	This is OK, but it can be distracting, especially for those who don't have a device. Tell the child you are glad she is interested in taking pictures, and that you will pick special spots along the trail when she is allowed to use her camera or smartphone . Then allow for 3 or 4 opportunities.
Where is the key to the Education Shed?	It is kept in the far right drawer behind the desk in the Nature Center. It has two keys, one to open the gate and the other to open the shed.
What if I show up at a station and it is occupied?	Be creative! Refer to "Stories, Tales, and Tidbits for the Trail" for ideas. It's always good to have a few tricks in your back pocket (See "Ideas for Props"), kids love them.

## Are You Watershed Literate?

### Can you define watershed and wetland?

- A watershed is an area where rain and other water are “shed” from the land into a common waterway, such as a creek, lake, lagoon, or ocean.
- A watershed connects freshwater sources to the sea, creating and interconnecting a variety of habitats along the way.
- A watershed connects the communities and towns we all share.
- One local watershed is the Escondido Creek Watershed. The creek begins in the mountains (east of Lake Wohlford) and flows through creeks, drains, and groundwater (underground) for 26 miles to the ocean.
- A wetland is a habitat within a watershed that’s covered with water for some or all of the year. It’s a transition zone between dry land and a waterway, such as a pond, **marsh**, bay, or lagoon.
- An estuary is a place where salt water and fresh water mix creating brackish (salty-fresh) water. The San Elijo Lagoon is a wetland and an estuary. It’s the “drain” or final exit of the water of the Escondido Creek Watershed into the ocean.

### Do you know that watersheds support a diversity of habitats and an abundance of life?

- The diverse habitats within a watershed lead to a diversity of plant and animal species.
  - The main habitats of the Escondido Creek Watershed include **chaparral**, **coastal sage scrub**, **riparian**, freshwater marshes, saltwater marshes, water channels, mudflats, oak woodlands, and grasslands.
  - The major types of animals are birds, fishes, reptiles, invertebrates, and mammals.
  - The San Elijo Lagoon Conservancy has more than 400 plant species and 300 bird species.

### Can you name the many different functions of watersheds and wetlands habitats?

- Watersheds provide food and nesting habitat for both resident and migrating birds.
- Wetlands filter and clean water before it reaches the ocean.
- Wetlands store water and prevent flooding.
- Estuaries serve as nurseries for many marine animals.
- Watersheds and wetlands are places for people to enjoy.

### Can you describe human impacts on watersheds and wetlands habitats?

- Water flowing to the ocean is disrupted by dams, highways, train tracks, and development.
- Pollution upstream flows downstream and affects habitats all along the way.
- Pollution (such as fertilizers, trash, insecticides, and oil) affects the plants, animals, and people that live in the watershed.
- People research and monitor watersheds and wetlands to ensure that they’re healthy.
- People work to conserve watersheds by restoring habitats.

**You’re watershed literate when you know that we all live in a watershed and that your watershed’s health indicates the health of your local environment.**



## PART II

# THEMED WALKS

---

**Description**

This section contains detailed guidelines for conducting themed walks for the San Elijo Lagoon Conservancy School Programs.

Topic	See Page
General Welcome	20
Themed Walks Overview	22
THEME: Exploring Habitats	25
THEME: Adaptations	45
THEME: Food Chains and Food Webs	67
THEME: The Kumeyaay	87
THEME: Rhythms of Wetlands	105
THEME: Watershed and Water Resources	123
THEME: Watershed Biodiversity	143

---

## General Welcome

---

**IMPORTANT!** A general “Welcome to San Elijo Lagoon” is given by the Lead Naturalist to the full group *before* a specific theme is introduced. This section contains a suggested script for welcoming groups, to be used for all programs.

---

**Duration** 2 minutes

---

**General Welcome**

*Good morning and welcome to San Elijo Lagoon Ecological Reserve. My name is \_\_\_\_\_ and I am a naturalist. [Optional: Add something personal, such as why you chose to be a naturalist, why you think the reserve is special, or a special experience you’ve had. This helps the kids connect with you, and helps put both yourself and others at ease.]*

**Introduce other naturalists who will be leading the kids on a hike.**

*I work with the San Elijo Lagoon Conservancy, an organization that helps protect the lagoon and all the plants and animals that live here. The Conservancy teaches people like me to be nature guides so we can help everyone understand the importance of protecting these kinds of places.*

*On your short walk from the bus to this seating area, did you get a chance to look around? If not, take a moment to look around. Look all around and take in your surroundings (**Point towards lagoon and open space.**). Now, turn to the person next to you and discuss how this place is different or similar to your playground at school? **Ask a few students to share what they discussed.***

I have been calling this place a lagoon, but it is also called a wetland because as you will see on our hike, a lot of the area is wet! It is also called an estuary, where freshwater from rivers mixes with salt water. Those are a lot of names for just one place. Maybe this place has a lot of names because it is so special. During the program today, I invite/challenge you to gather information/facts/ideas to help me answer what makes this place so special. [At end of walk, pose this question so students leave with some of the highlights that were meaningful to them].

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*continued on the next page*

## General Welcome, continued

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### **Introductions for themed walks**

After completing the 2 minute “General Welcome”, the Lead Naturalist will introduce the themed walk for that day’s program. Specific instructions for “Themed Walk Introduction” are provided at the beginning of each of the following theme sections:

- Exploring Habitats
  - Adaptations
  - Food Chains and Food Webs
  - The Kumeyaay
  - Rhythms of Wetlands
  - Watersheds and Water Resources
  - Watershed Biodiversity
- 

### **Rules for the trail**

Naturalists will communicate the following ground rules at the beginning of the walk:

1. Stay on the trail
  2. Stay behind the naturalist
  3. Leave everything as is
  4. Walk quietly
  5. Look for signs of wildlife
- 

### **Essential props for every walk**

The following props should be included for every walk:

- Binoculars (Refer to the activity description, “Binoculars,” on page 55.)
  - Hand lenses (Refer to the activity description for “Magnifying Lenses” on page 34.)
  - Naturalist survival kit (photo books)
-

## Themed Walks Overview

### School programs

The table below lists seven themed walks or programs currently offered by SELC naturalists. The sections that follow offer detailed descriptions of each program.

Title	Level	Theme	Typical Location
Exploring Habitats	K-2	In order to survive, all living things need a place to live – a habitat, or home that provides food, water, air/oxygen, shelter, and space.	Nature Center
Adaptations	3	Plants and animals have many different adaptations that allow them to survive.	Nature Center
Food Chains and Food Webs	4	Food chains and food webs	Rios Trailhead
The Kumeyaay	3-5	The Kumeyaay lived for thousands of years in the San Elijo Lagoon region. The natural resources of the area provided them with everything they needed.	Nature Center, or Designated Trailhead
Rhythms of Wetlands	3-5	Coastal wetlands are endangered, dynamic ecosystems that change with tides and seasons, and provide important functions to many living organisms, including humans.	Nature Center
Watersheds and Water Resources	5	Freshwater is important to all living organisms. The lagoon helps clean the water that passes through it and provides many additional functions that are beneficial to both animals and humans.	Nature Center
Watershed Biodiversity	6-8	The overall goal of this program is to connect middle-school students with their local watershed and get them involved in conservation actions to protect it.	Field trip with multiple locations along watershed

## Themed Walks Overview, *continued*

---

### Section components

Each themed walk section contains the following components:

- Theme Overview
  - Themed Walk Introduction
  - Conclusion (to be conducted with small groups)
  - Talking Points
  - Station Activities
  - Vocabulary
- 

### Key

Guidelines for station and trail activities use the following typographical conventions when providing direction to docents:

*Black Italics* = Words spoken by docents

**Black Bold** = Actions performed by docents

Arial = Answers

Black Roman = General descriptions, narration

---





## THEME: Exploring Habitats

**Overview** This section was developed to complement the teacher’s guide, *Exploring Habitats*.

**Objectives** It is expected that visitors who participate in the themed walk will be able to:

- Explain what a habitat is and what it provides
- Explain some of the differences among the plants and animals in the different habitats around the Nature Center.
- Describe how different plants and animals meet their needs for survival
- Understand how trash can harm animals and provide specific examples of how we can all help keep our schools and neighborhoods litter-free.

**Duration** Allow the following lengths of time for themed walk components:

- General Welcome – 2 minutes
- Themed Walk Introduction – 10 minutes
- Safety Rules – 2 minutes
- Hike – 1 hour 15 minutes
- Individual wrap-up – 5 to 7 minutes
- Group wrap-up – 2 minutes

**Stations** The stations listed below may be included in the “Exploring Habitats” walk.

Title	Location	Materials	Priority
Themed Walk Introduction	Lagoon Launch Pad	Habitat name cards, animals (fish, duck, crab, duck, raccoon); picture of Belding’s Savannah sparrow	Required
Icebreaker	Naturalist’s Choice	Begin the walk with one of the icebreakers found on pages 156 to 161.	Required
Keeping Litter Out of the Environment	Throughout walk, along the trail	Trash collecting bag, samples of trash, photos of animals harmed by trash	Required
Magnifying Lenses	Naturalist’s Choice	Magnifying lenses	Recommended

*continued on next page*



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## THEME: Exploring Habitats, *continued*

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**Table: Stations, *continued***

<b>Title</b>	<b>Location</b>	<b>Materials</b>	<b>Priority</b>
Mystery Box	Belding's Overlook and Lemonade Junction	Select one: Mystery Box #1 Mystery Box #2	Recommended
Tracks and Scat	Warbler Point	Scat/track activity board; 5 laminated cards – pictures on one side and clues on the other	Recommended
Sound Game	Diving Duck Channel or Mullet Overlook	Film canisters; survival kit photos (optional)	Recommended
Mudflat Habitat	Lagoon Launch Pad	Fiddler crab tub and accompanying cards	Optional
Sensory Bag	Heron View Deck	Sensory bag of familiar household objects and objects from nature	Optional

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## Themed Walk Introduction

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<b>Overview</b>	This section describes how to introduce the program, “Exploring Habitats”, to students.
<b>Location</b>	Lagoon Launch Pad
<b>Materials</b>	Habitat board, animals (fish, duck, crab, duck, raccoon), picture of Belding’s Savannah sparrow, small wooden house

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**Begin with General Welcome on page 20.** *Welcome to the San Elijo Lagoon. How is this place different or similar to your playground at school?*

### **Introduction**

*What do you call the place where you live? **Hold up small wooden house.** A home. How might our homes be different? House, apartment, condo, large, small. People call the place where they live a home. What do we call the area where a plant or other types of animals live? Habitat How does the wetland habitat differ from your home?*

*What does your home provide for you? **Take answers and guide children toward these words:** Food, water, space, shelter, air. Air is needed to breathe. What body part do we use to get air? lungs What do some animals have instead of lungs for breathing? gills*

*All living things need a healthy habitat, a safe place to live. That place is very special because it provides everything a plant or animal needs to survive. At San Elijo Lagoon we have lots of habitats and today we are going to talk about 4 different types of habitats. Can anyone describe some of the different habitats we might see today?*

**Desired answers:** At this point focus more on descriptions such as wooded, water, etc. Specific examples can be mentioned if it seems appropriate. Riparian, water channel, salt marsh, and mudflat

**Have one or two children hold the board that has the four habitat pictures.** *Why can’t all animals live in the same habitat?*

*Animals and plants have special needs that limit the habitats in which they can live. Let’s think about these animals and where they might live at the lagoon. **Show animals: duck, fish, raccoon, crab, and photo of Belding’s Savannah sparrow. Hand them to 5 children who are asked to come up front. Note: Use habitat board with photos to prompt them.***

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*Continued on next page*



## Themed Walk Introduction, *continued*

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### **Activity**

*Now we are going to think for one minute without talking and see if we can match each animal to one of these habitats. When you think you can do it, raise your hand.*

**After lots of hands are in the air, call on children to identify one animal and have him/her tell which habitat type they think it lives in. Ask the children to raise their hand if they agree. Yeah!!**

Water Channels = fish or duck

Mudflat = crab

Salt Marsh = duck, endangered Belding's Savannah sparrow (use picture)

Riparian = raccoon, duck

**Praise the students when they finish the activity.** *Can anyone think of any other kinds of animals that might live in these habitats? Accept any reasonable answers.*

*Today on our hike we are going to look at these 4 habitats and discover how many animals and plants live together and share a home.*

*Before we divide into small groups, let's review some safety rules.*

**Discuss "Rules for the Trail", page 21.**

**Have the teacher divide students into smaller groups in preparation for the walk.**

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## Conclusion

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### Small group wrap-up

Refer to the description of the small group wrap-up activity in “Components of a Tour” on page 13. In addition, conclude the walk by selecting from the following wrap-up ideas:

- *Describe some of the habitats we saw on our walk today.*
  - *Describe an animal you saw. Tell us about its habitat.*
  - **Have the children form a circle.** *If you were a wetland animal, where would you like to live? Why?*
  - *Discuss with the person next to you some ways you can help keep trash from harming the animals in the lagoon.*
- 

### Large group wrap-up

Refer to the description of the large group wrap-up activity in “Components of a Tour” on page 14.

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## Talking Points

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**Overview**

Look for opportunities to engage students in lively discussions at various points along the trail, using ideas presented in this section.

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**Become a detective!**

At the beginning of the walk, prompt students for answers. What must you do to be a good detective?

- Use four senses (No tasting)
  - Walk quietly and be observant
  - Ask questions
- 

**Spiders**

Spiders live in different types of habitats. Show that not all spiders build webs, like the green lynx. The funnel spider creates a funnel-shaped web that traps insects. The trapdoor spider digs a hole underground with a “trapdoor” that allows them to snag unsuspecting prey passing by. Fun fact: A trapdoor spider is in the same family as a tarantula, kind of like cousins!

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**Water Channels**

- Look for jumping fish. Why do you think they jump?
  - Look for birds. What are they doing? Searching for food, resting, preening, nest-building. Ask students to describe color, beak, feet, depending on what is visible
- 

**Salt Marsh**

- Look for narrow trails or “runways” through pickleweed – who made them?
  - Belding’s Savannah Sparrow (Endangered) – lives in pickleweed
  - Light-footed Ridgway’s Rail likes the tall grasses called cordgrass; look for a bird that looks like a chicken with a long bill
  - Raccoons, skunks, rabbits
- 

**Mudflats**

- Who lives in the mud? Fiddler crabs, Horn snails, worms, goby (fish)  
In winter, observe the many different kinds of ducks and shorebirds feeding on the mudflats. Try to compare size and bills, and guess what they might be eating.
  - In spring, observe fiddler crabs found in mudflats. Male has one large claw to scare predators and to attract a mate. They eat bits of algae and decaying marsh plants, and dig holes in mud. Before high tide, the crabs retreat into burrows and plug up the opening with sand pellets to keep water out
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## Talking Points, *continued*

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### Riparian scrub

- **Scat.** Animal poop! Who does it belong to and how can we tell?
  - **Tracks.** Who do they belong to? (Consider staging track prior to walk)
  - **Flattened grass.** Did an animal sleep there last night?
  - **Red galls on willow.** A nursery providing food and shelter for sawfly larvae
  - **Chewed plant parts.** Who do you think had this plant for dinner?
  - **Bird Nests.** Can you see any? Are they on the ground, or in the trees?
  - **Common yellowthroat.** Secretive warbler that likes marshy or bushy vegetation near water. Let's listen for the gentle *wichety wichety wichety* song.
  - **Raccoons.** Will hide out in the woodlands near the wetland. Let's see if we can find trails disappearing into the riparian forest. Who do you think made those trails?
  - **Woodpecker.** Can you find a tree that the woodpecker might like? Why is it important to keep dead trees' 'snags' in the lagoon?
- 

### Coastal sage scrub

- This is another habitat found at the reserve. Although this is not covered in Teacher Guide, if kids can handle more information, discuss some of the species dependent on this habitat: Fence lizards, California Gnatcatcher, trapdoor spider, coyote, etc.
  - Home to California Gnatcatcher, an endangered species. Why is it endangered? Loss of habitat - point to surrounding houses. Can you hear the meowing sound? That's the gnatcatcher asking us to help protect his habitat.
- 

### Things to look for

- Holes in the ground - Who made them? Snakes, gophers, insects?
  - Examples of spiders who make webs: orb weavers (*Argiope*) or funnel spiders.
  - Some spiders don't make webs at all, like trapdoor and green lynx.
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## Station: Keeping Litter Out of the Environment

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<b>Purpose</b>	To be aware of how litter can harm animals and to learn specific actions we can take to keep our communities litter-free.
<b>Location</b>	Introduce during ice-breaker and continue throughout the walk. Follow-up during wrap-up.
<b>Duration</b>	Throughout the walk
<b>Materials / Props</b>	Trash collecting bags, samples of various types of trash, pictures of animals harmed by trash

---

### **Preparation and Set-up**

**Prior to the walk, place varied samples of trash into collecting bag.**

### **Introduction**

**During the ice-breaker, point out the naturalist’s trash collecting bag. Ask students to help pick up any trash on trails and place it in bag during the walk.**

**Note: During the walk, secretly drop litter in plain view while students are distracted, allowing them to “find” the trash and put it in the collecting bag. Suggested times for dropping trash: while students are using binoculars or hand lenses, or during sighting of jumping fish or overhead flyer.**

### **Activity**

**Note: Only use photos of animals affected by trash to third graders and older.**

**Show students pictures of animals harmed by trash. Ask students what is happening in each of the photos. *Why do you think it is important not to litter.* Animals are not adapted to eating or living with trash, so littering can seriously harm them.**



## Station: Keeping Litter Out of the Environment, *continued*

### **Activity,** *continued*

#### **Walk & Talk Questions:**

See discussion routines at: <http://beetlesproject.org/resources/for-field-instructors/>

This could be incorporated after one of your trash droppings.

*What's your favorite animal? Where does it live? What does it eat?*

*Have you seen trash in places it doesn't belong? If yes, where?*

*How does trash get into the environment?*

*How does trash harm animals?*

*What can you do to help keep our neighborhoods litter-free?*

#### **Conclusion / Wrap-up**

**Thank the students for picking up the trash and talk about how it is also important to keep their schoolyards and communities litter-free.**

*If you see litter on the ground what will you do?*

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## Station: Magnifying Lenses

**Purpose** To hone the students’ observation skills through the use of magnifying lenses.

**Location** Naturalist’s choice along the trail

**Duration** Varies

**Materials / Props** Magnifying Lenses

**Note:** We are encouraging the use of lenses in all of our programs. After students are familiar with how to use the lenses, guide them by focusing on Theme-appropriate questions.

### **Introduction**

**Show the children the lenses.**

*How can magnifying lenses help you learn about nature? These magnifying lenses are great to have on our walk because many things in nature are difficult to see with our unaided eyes. They help us see details we might otherwise miss.*

### **Activity**

**1. Pass out the lenses and instruct students to do the following:**

- a. Hold your thumb out and look at it through the magnifying lens
- b. Now keep your thumb still and move the magnifying lens away from your thumb.
- c. What happened? How did your thumb change? What did you see? Did it get bigger or smaller?

**2. Suggested things to observe on a walk using the lenses:**

- a. Salt crystals on salt grass
- b. Inside of a gall
- c. Insect
- d. Soil
- e. Leaves
- f. Spittle bug
- g. Plants
- h. Decomposing logs and leaves

**3. Collect lenses after observation so they don’t become a distraction.**

*continued on next page*



## Station: Magnifying Lenses, *continued*

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### **Conclusion / Wrap-up**

*What were some details you could see with the lenses that you couldn't see before? Magnifying lenses give us a chance to have an even better look at amazing details in nature that we might miss with our eyes alone. Does anyone know other tools that help us to do this? microscope, binoculars*

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## Station: Mystery Box

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**Purpose** Hone observation skills by determining what the object is, what habitat it might be found in, and what its role is in that habitat. Habitats include: mudflats, coastal sage scrub, salt marsh, riparian scrub, and water channels.

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**Location / Duration** Belding's Overlook and Lemonade Junction / 5 minutes

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**Materials / Props** Box filled with natural objects

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### **Introduction**

*What kinds of animals live in the lagoon? In this Mystery Box there are some objects found in several of the habitats at this lagoon. We are going to use our sense of sight and touch to try to determine what each object is, its role in the lagoon, and where it might be found.*

### **Activity**

**There are two boxes to avoid back-up. You are only expected to visit one. The mystery boxes contain objects found at the lagoon, such as: snake skin, owl pellets and bone remains, rabbit scat, fiddler crab claw, shells, deer pelt, nests, etc. Keep no more than 5-6 objects in each box. Objects found in the boxes are subject to change. Below are some examples of how to introduce the objects to the students.**

**When introducing objects, break students into groups of 2 or 3. Hand each group an object from the box. Then allow students 2-3 minutes to discuss among their groups. *What do you notice, what do you wonder, what does it remind you of?* (See Beetles Project reference on page 161 for a more detailed description of this technique.) Once students have had time to discuss, ask each group to share back their thoughts. Once everyone has shared, guide an open discussion that focuses more specifically on the specific animal and habitat. Add a fun fact!**

**First Object: Deer Pelt. Take turns touching it. *What animal do you think this came from? Please describe it. How does it help the deer?*** Colors camouflage the deer, keeps it warm, very soft. *Where might we find deer in the lagoon?* Marsh areas on the other side of I-5 or riparian woodland.

**Fun Fact:** *Every spring, male mule deer grow a brand-new set of antlers, each one larger than the last.*

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*continued on next page*



## Station: Mystery Box, *continued*

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**Second Object: Hummingbird nest.** *Can you guess what very small bird would build a nest like this? Hummingbird. What is it made of? Plant material, lichen, spider webs*

*Where would you find the nest? Hidden in bushes*

**Fun Fact:** *Hummingbirds are the only birds known to fly backwards – how cool is that?!*

**Third Object: California Horn Snail.** *Describe the object. Hard, pointy, sharp*

*Where is it found? Mudflats. Few birds eat the horn snail. Why? Hard shell protects them. Retreats into its shell and shuts its “door” or operculum with mucus.*

**Fun Fact:** *Horn snails have tongues that are rough like files and are used to scrape the mud in search of rotting plants and animals (detritus).*

**Additional Objects:** Choose 1 to 2 more from the box. Objects are replaced with others from time to time. Continue questioning students in the same manner as above.

### **Conclusion / Wrap-up**

*We can learn much by observing objects we find from various habitats at San Elijo Lagoon. Think about some other objects we might put in the box for other students.*

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## Station: Tracks and Scat

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**Purpose** Students will understand that by using their observation skills and learning what to look for, nature provides us with many clues about where animals live or pass through different habitats.

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**Location** Warbler Point

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**Duration** 10 minutes

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**Materials / Props** Scat/track activity board; 5 laminated cards (Bobcat, opossum, skunk, raccoon, coyote) – pictures on one side, clues on back.

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### **Introduction**

*What are some of the signs that animals leave that let us know they are/were here? **Consider asking students to pair share for 1-2 minutes before sharing back, provide prompts if needed.** Tracks, scat, trails, pellets, nibbles leaves, exit holes in bark, etc. *In this activity, we are going to focus specifically on tracks (animal footprints) and scat (animal poop!) of animals that live in the lagoon.**

*I have a board here with tracks for five different animals (mammals) that may live in the lagoon or just pass through a habitat in the lagoon. I also have rubber models on the board that represent the scat of these animals.*

*Let's review, can anyone tell me what is scat is? Animal poop. Did you know there is a special word for insect poop? It's called frass. Let's all repeat that fun new word: FRASS!*

*We're going to play a matching game. I'm going to show you a picture of an animal and read some clues to you about that animal. Your job is to figure out which track and/or scat belongs to that animal.*

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*continued on next page*



## Station: Tracks and Scat, *continued*

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### **Activity**

Have the students sit (“criss cross applesauce”) facing you. This seems to quiet them and gets them ready to listen to you.

1. Show a picture to the group of students
2. Read some the clues on the back of the card or provide own clues based on appearance of track and scat board.
3. Ask the students to tell you which track/scat belong to the animal on the card, and have them explain what clues helped them arrive at their answer. Allow time and encourage them to share their thoughts with a partner.

Have several students give their ideas for an answer to the picture before telling them the correct answer.

4. Follow steps 1, 2, 3 for the remaining animal pictures.

### **Conclusion / Wrap-up**

*Animal tracks/scat can help a naturalist identify an animal, observe where the animal lives and what it eats as well as its overall health. Finding animal tracks on the trail is a good way to discover which animals (mammals) live or visit the different habitats. What organisms do you think live here that you are not seeing? Why are we not seeing many of the larger animals during our hike? Many are nocturnal*

### **Fun Facts:**

*Raccoon: Can run up to 15mph*

*Bobcat: Bobcat tracks look like your cat's paw prints—except twice as large*

*Skunk: A skunk can store 5 or 6 shots of spray, each accurate to about 6 ½ feet.*

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## Station: Sound Game

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**Purpose** Hone listening skills and understand that wildlife survival can depend on a keen sense of hearing.

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**Location** Mullet Overlook

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**Duration** 5 to 10 minutes

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**Materials / Props** Film canisters, survival kit photos (optional)

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### **Introduction**

*This activity demonstrates the importance of having very good hearing. Birds seem to recognize each other's calls and sounds as if they are checking in with each other, just like we do. When one calls, and another immediately replies, it sounds like one is saying, "Are you there?" and the other is replying, "I'm here!" They also use their voices to warn each other of danger. What might that danger be? Predators are nearby.*

*Animal ears are sometimes shaped so they can hear extremely well. Turn to your partner and see if you can name some animals that have good hearing. **Allow at least 1 minute for students to discuss. Then ask students to share what kinds of animals they came up with.** Coyotes, deer; rabbits, and owls.*

**If naturalists carry pictures of animals, they may consider showing them here.**

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*continued on next page*



## Station: Sound Game, *continued*

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### **Activity**

*Let's play a game to see how well you can distinguish sounds that are the same. Containers in this bag are filled with objects to create different sounds. For each container, there is another container that matches its sound. I will hand each of you a container and, by shaking and listening, you will try to find a partner who has the same sound.*

**It is important that all the students hold the containers the same way. Demonstrate how you need to have two fingers on top and your thumb on the bottom when holding and shaking the container.**

*When you think you have found a match, come verify it with me. Do not open the containers. **Note: The key is on the bottom or top of the containers. Match 1-A, 2-B, etc.***

### **Conclusion / Wrap-up**

*What are some advantages for animals with acute (really good) hearing?*

Finding food, capturing prey, and hearing warnings of danger.

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## Station: Mudflat Habitat

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<b>Purpose</b>	To observe how a mudflat provides habitat for a variety of species
<b>Location</b>	Lagoon Launch Pad
<b>Duration</b>	10 to 15 minutes
<b>Materials / Props</b>	Plastic tub, plastic crabs, plastic beads, picture of fiddler crab, fish, California horned snail

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**Preparation: Before beginning the activity below, fill tub with 2 containers of water.**

### **Introduction**

*Because it is hard to see the mudflats from the trail, we are going to observe this model to take a closer look at what kinds of animals live in the mudflats.*

### **Activity**

- 1. Ask students to observe the mudflat ‘habitat’ and describe what they see.** They should notice male and female crabs, mudflats, burrows, ‘ocean’, other mudflat species.
- 2. Can someone tell me why a male fiddler crab has one claw that is so much bigger than the other?** They wave the big claw to attract a female to their burrow or to defend their territory.
- 3. Ask a student to tip the tub so that the water reaches up to the shore and covers the fiddler crabs.** *Where do you think the fiddler crabs go when water covers the mudflats?* Burrows, or crabs crawl to higher ground.
- 4. Can you think of any animals that might visit the mudflat for a snack or tasty meal?** Turn to your partner to discuss. Birds, raccoons, weasels

### **Conclusion / Wrap-up**

*Mudflats are part of our wetlands, and wetlands provide a home or habitat for many plants and animals. If the lagoon loses the mudflats, how would that affect the animals that live there, and the ones that visit? Ask students to turn to their partner to discuss, then share with group. If it is late spring, try to point out fiddler crabs on mudflats waving their claws. Otherwise, the California horn snails are always reliable.*

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## Station: Sensory Bag

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<b>Purpose</b>	To help students understand how animals and humans rely on the sense of touch to survive.
<b>Location</b>	Heron View Deck
<b>Duration</b>	5 to 10 minutes
<b>Materials / Props</b>	Opaque bag filled with 5 to 7 familiar household objects and nature objects. (toothbrush, comb, rock, ball, shell, etc.)

---

### **Introduction**

*We are going to explore our sense of touch, which is one of our five senses. Who can tell me another one of our senses? **Repeat until all are mentioned.** Sight, Hearing, Touch, Smell, Taste*

*How do we use these senses in our everyday lives? **Accept all answers and prompt for sense of touch if no one mentions it.** Turn to the person next to you and discuss how senses are important and necessary for animal survival? What are some special body parts that help make animal senses better or sharper? Antennae for moths, more than 2 eyes for spiders, uneven ears of owls, etc.*

### **Activity**

*We use our sense of touch every day and many animals in the lagoon do as well. For example, a raccoon, which is nocturnal, has very delicate feet and uses his sense of touch to help identify items that he cannot see but he can feel in the water or mud as he looks for food.*

*We are going to try something similar with this game using a bag full of items we all know. For instance, if I had a banana in my bag, what do you think it would feel like? Well, I don't have a banana, but let's see how good you are at guessing what I do have.*

**Ask the students to sit in a circle.**

*I am going to hold the bag and each of you will have 10 seconds to feel inside the bag. Don't mention out loud the name of what you think you can feel. At the end of the game we will empty the bag so you can see how many items you were able to guess correctly.*

### **Conclusion / Wrap-up**

*Many animals, like the raccoon, use their sense of touch as a way to survive and adapt in different habitats. As humans, we rely a lot on our sense of sight, but we can also learn and explore using our sense of touch.*



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## Vocabulary

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**Introduction** The table below provides vocabulary that is relevant for the themed walk, “Exploring Habitats.”

<b>Term</b>	<b>Definition</b>
<b>Burrow</b>	A hole or tunnel dug by a small animal (noun); the act of an animal digging a hole or tunnel (verb)
<b>Eggs</b>	Produced by a female from which young develop, emerge or hatch
<b>Diurnal</b>	Active during daytime
<b>Habitat</b>	The place where an animal or plant lives and can meet their needs for survival (air, food, water, and shelter)
<b>Lagoon</b>	A body of water cut off from another larger body of water by sand, coral, or reef
<b>Larvae</b>	The newly hatched, earliest stages of any type of animal that goes through transformations as it develops; looks and acts different than the adult animal
<b>Life cycle</b>	The complete history of an animal or plant from the start (e.g., seeds or eggs) to adult or mature stage
<b>Molt</b>	The act of shedding an old shell to make room for the growth of a new and larger one
<b>Nocturnal</b>	Active at night
<b>Observe</b>	To notice, sense or perceive something
<b>Observation</b>	The findings from noticing and paying close attention
<b>Reproduce</b>	To have offspring or produce more of the same kind of individuals
<b>Senses</b>	The five faculties by which humans and animals perceive stimuli originating from outside or inside the body (sight, smell, hearing, taste, and touch)
<b>Survive</b>	To continue to live through hardships; to remain alive
<b>Wetland</b>	An area that is covered by water during all or some part of the year

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## THEME: Adaptations

**Overview** This section was developed to complement the teacher’s guide, *Adaptations: Secrets to Survival*.

**Objectives** It is expected that visitors who participate in the themed walk will leave with an:

- appreciation of the unique plants and animals of San Elijo Reserve
- understanding of what adaptations are
- awareness of some of the unique adaptations that help plants and animals survive
- understanding that trash can harm animals and everyone is responsible to help keep our watersheds litter-free.

**Duration** Allow the following lengths of time for themed walk components:

- Welcome – 2 minutes
- Themed Walk Introduction – 10 minutes
- Safety Rules – 2 minutes
- Hike – 1 hour 30 minutes
- Individual wrap-up – 5 to 7 minutes
- Group wrap-up – 2 minutes

**Stations** The stations listed below may be included in the “Adaptations” themed walk. Assemble the necessary materials in advance.

Title	Location	Materials	Priority
Themed Walk Introduction	Lagoon Launch Pad	Taxidermy Great Horned Owl from Nature Center	Required
Icebreaker	Naturalist’s Choice	Begin the walk with one of the icebreakers found on pages 156 to 161.	Required
Keeping Litter Out of the Environment (See page 32)	Throughout walk, along the trail	Trash collecting bag, samples of trash, photos of animals harmed by eating	Required
Permanent Watershed Model	Watershed Model	Spray bottles, sponge to be placed in “wetland”	Required
Binoculars	Pickleweed Point	Binoculars	Required

*continued on next page*

## THEME: Adaptations, *continued*

**Table: Stations, *continued***

Title	Location	Materials	Priority
Skull Box	<ol style="list-style-type: none"> <li>Mullet Overlook</li> <li>Naturalist's choice</li> </ol>	<ol style="list-style-type: none"> <li>Skull box, pictures of animals that match skulls</li> <li>Optional: additional smaller box for second location</li> </ol>	Recommended
Wingspan	Heron View Deck	bag with bird pictures; wingspan board	Recommended
Busy Beak	Diving Duck Channel	Bird pictures and a variety of foods, chopsticks, tweezers, straw, strainer, nut cracker	Optional
Leaf Detectives	Lemonade Junction	Board with leaf photos and descriptive words; 7 or 8 freshly-gathered leaves collected and placed in separate bags to be shared by all naturalists choosing to visit station	Optional

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## Themed Walk Introduction

<b>Overview</b>	This section describes how to introduce the program, “Adaptations”, to students.
<b>Location</b>	Lagoon Launch Pad
<b>Duration</b>	10 minutes
<b>Materials / Props</b>	Taxidermy specimen from Nature Center: Great Horned Owl

**Begin with General Welcome on page 20.** *Welcome to the San Elijo Lagoon. How is this place different or similar to your playground at school?*

### **Introduction**

*Today we are going to focus on the **adaptations** that help plants and animals survive in their environment. A human adaptation is to walk upright rather than on all fours. **Do a mini imitation.** A rabbit has long ears (**Make gesture.**) for hearing and staying cool. Or a rabbit might “freeze” so a predator doesn’t see him. **Stop suddenly in place and stare straight out to get kids’ attention. Hopefully being a little silly right off the bat and offering very obvious and simple examples will put the students at ease.***

*What are some other unique adaptations of humans? Accept all answers and if necessary, provide hints using hand gestures to get students to come up with the following two adaptations.*

- *Opposable thumbs – Touch your thumb to each finger, one at a time. Without an opposable thumb, holding food; buttoning a shirt; writing with a pencil; or eating an ice cream cone would be very difficult. **Ask students to try and tie their shoes without using their thumbs. If time is limited, an alternative might be,** “Tuck your thumb into your palm. Now imagine buttoning a shirt or writing with a pencil. Can you think of other activities that would be difficult to do without using your thumb? Accept a couple answers.*
- *Communication by talking – Many species use sounds and gestures to communicate. Can you look angry, happy or sad? Can you laugh or growl? (**Have students do these actions one at a time.**) Lots of animals can communicate feelings, but how would you describe the color yellow without talking?*

*Can anyone give me other examples of plant or animal adaptations that help them survive in their habitat? Accept 2 or 3 answers. Let students know that they can share additional examples with their walk leader and to be on the lookout for new adaptations they hadn’t thought of before.*

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*continued on next page*

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## Themed Walk Introduction, *continued*

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### **Activity**

**Bring taxidermy specimen from the Nature Center: Great Horned Owl.**

**Take a moment to allow students to look at owl. Ask everyone to think in their head without talking for one minute what they think are some of the owl's adaptations. Walk around slowly so every child gets an up close look of the owl.**

*Now that you have had some time to think, turn to the person next to you to share what you think are some of the owl's adaptations.*

*Who would like to share an adaptation?* Accept 2-3 answers: Feathers, eyes, feet, wings, beak

**Depending on students responses, use general follow questions below.**

*What do you notice?* large eyes, sharp claws and beak, etc.

*How would that help the owl survive?* grab and tear apart prey, night vision, flight, warmth

**If appropriate, incorporate one fun fact below, save others for the trail.**

**Fun Fact:** *Silent flight: The owl has very soft feathers and serrated wing edges (Show photo or drawing.) that allow silent flight. How would this adaptation help the owl hunt? Demonstrate sneaking up by walking on tip toes.*

**Fun fact:** *With its powerful legs, an owl can drag prey to up to 3 times its weight. That would be like you taking off flying carrying your mom or dad.*

**Fun fact:** *The owl can turn its head almost all the way around (270 degrees. A full circle would be 360 degrees).*

*These and other special adaptations have allowed animals to live in all parts of the world with extremely different climates and temperatures. Today we will look at some of the adaptations of animals and plants that live in San Elijo Lagoon.*

*Before we divide into small groups, let's review some safety rules.*

**Discuss "Rules for the Trail", page 21.**

**Have the teacher divide the students into smaller groups in preparation for the walk.**

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## Conclusion

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### **Small group wrap-up**

Refer to the description of the small group wrap-up activity in “Components of a Tour” on page 13. In addition, the following questions may be used to promote discussion along the trail or during wrap-up.

- What helps an organism survive in its habitat? Adaptations
- Why would an osprey (or any water dependent bird that you saw on your hike) need to live near water? Eats fish, algae, crustaceans
- Compare an adaptation of an animal that lives in the wetlands marsh to one that lives on land (scales vs. fur, webbed feet vs. toes)
- How would you adapt if...
  - part of your house was covered with water each day (burrow into the mud)
  - you ran out of water for months at a time (sagebrush)
  - twice a day your drinking water became extremely salty (Pickleweed)
  - you used up all the food in your refrigerator (migrate)
  - birds with sharp claws wanted to eat you? (hide underground)
- If you were an animal that lived in the wild, what kinds of adaptations would you want to have? Why?
- We’ve learned that trash and pollution are harmful to plants and animals throughout the watershed and in the lagoon. Discuss with the person next to you some ways you can help keep the environment clean.

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### **Large group wrap-up**

Refer to the description of the large group wrap-up activity in “Components of a Tour” on page 14.

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## Talking Points

**Overview** Along the walk, try to weave in adaptations and the importance of keeping our environment clean as frequently as possible. This section provides examples of adaptations that may be seen along the trail.

**Salt Marsh Adaptations** The table below describes how plants and animals have adapted to life in a salt marsh where salt concentrations are high due to ocean water brought in by the tides.

Type	Organism	Adaptation
PLANT	Pickleweed*	Can tolerate high salt concentrations in water even though high salt concentrations are usually toxic to plants. Plant collects salt in new growth tips and discards it when concentrations become too high. Called a <i>salt accumulator</i> .
	Saltgrass and Salt-cedar	Excrete salt. You can see/feel the salt on the leaves.
ANIMAL	Diving Ducks vs Dabbling Ducks*	Diving ducks' feet are set far back on their body, so they are good underwater swimmers. Dabbling ducks' feet are more centrally located, are not good underwater swimmers, and often feed with head down and bottom up. <i>Do you think dabblers and divers eat the same food? Let's observe and see if we can find one of each.</i>
	Shorebirds	Have different sized bills for probing at varying depths to eat different organisms. Can you tell who has the longest/shortest bill?
	Ospreys	Grab fish with their talons (feet) and tear apart their food before swallowing it
	Snowy Egrets*	Have a long bill to catch food and yellow feet to lure fish
	Fish	Have gills that allow them to breathe under water
	Mullet*	Jumps out of the water, but no one knows why
	Fiddler Crabs*	Males wave large claw for protection and to attract mate; burrow into mud to avoid predators; have hard shells
	California Horn Snail*	Sign of a healthy estuary. Feast on dead material; have a special "door" (operculum) that closes shell to keep its body from drying out

\*Examples used in Adapt Teacher Guide. Consider prompting students as they might have talked about that animal/plant in the classroom.

*continued on next page*

## Talking Points, *continued*

**Riparian Adaptations** Riparian means “relating to or located on the banks of a natural watercourse (e.g., river or stream).” Plants and animals in riparian regions have adjusted to the low salt content and would not be able to survive in areas of high salt concentration (i.e., ocean or brackish water). The table below describes how plants and animals have adapted to life in a riparian habitat.

Type	Organism	Adaptation
<b>PLANT</b>	Willows*	Adapted to moist, wet soils and roots can be covered in water during floods
<b>ANIMAL</b>	Mammals	Rabbits, raccoons, and coyote use the brush to hide in (behavioral adaptation)
	Raccoons*	Like wooded areas near water; but are generalists and have adapted to all kinds of environments, including your backyard. <i>What do you think they are looking for when they hang around your house?</i> Trash.
	Woodpeckers	Have two toes forward and two toes back to allow them to climb. <i>Can you find a tree that a woodpecker might like? What might it like about the tree?</i> Snag along boardwalk
	Sawflies	Related to wasps and bees. Place their eggs on the leaves of a willow tree and secrete a chemical that causes the leaf to grow abnormally, creating the red galls that provide food and shelter to the emerging larvae.

\*Examples used in Adapt Teacher Guide.

**Upland Adaptations** The table below describes how plants and animals have adapted to life in an upland habitat, where water is scarce.

Type	Organism	Adaptation
<b>PLANT</b>	California Sagebrush*	Has soft, grayish-green needle-shaped leaves and a shallow root system. Light leaves help reflect heat from sun. Small leaves help the plant conserve water and shallow roots allow the plant to quickly absorb water.
	Lemonade Berry*	Thick, waxy leaves
	Prickly Pear*	Waxy pads (flattened stems) store water; spines (modified leaves) help protect it from predators and water loss

*continued on next page*

## Talking Points, *continued*

**Table: Upland Adaptations, *continued***

Type	Organism	Adaptation
<b>ANIMAL</b>	Snakes and Lizards	Scales to protect body, hold water and protect them from the sun
	Snakes*	Expandable jaw that allows it to prey on large animals
	Fence Lizard*	Well camouflaged; blue belly of the males helps attract a mate; tail drops off when threatened and then grows back shorter and stubbier
	Cottontail Rabbit*	Fur to keep warm; big back legs and feet for jumping; freezes in place or hops in zig zag to confuse prey
	Coyote*	Adapted to all kinds of habitats; found in every state in the United States except Hawaii.
	Honeybees*	Stingers with venom to protect themselves; wings to fly
	Spiders	Unique body parts allow them to make silk used to build webs that trap insects for food
	Insects	Generally extremely adaptable. Protective shell, small, some can fly
	Spittle Bug	Nymph creates a frothy excretion that: <ul style="list-style-type: none"> <li>▪ hides it from predators &amp; parasites</li> <li>▪ insulates against heat and cold</li> <li>▪ prevents it from drying out</li> <li>▪ has an acrid taste that deters predators</li> </ul>
	Darkling Beetle	Emits foul-smelling black fluid for protection
	Harlequin Bug	Mimicry – bold coloration in nature is often a sign that an organism is toxic. The harlequin bug isn't toxic, but they fool predators and deter them with their foul taste.

\*Examples used in Adapt Teacher Guide.

## Station: Permanent Watershed Model

**Purpose** To show how upstream water flows downstream, connecting inland communities to the lagoon and ocean. To demonstrate how wetland soils and plants absorb and slow down the flow of water, catching pollutants before the water reaches the ocean.

**Location** Watershed Model (Behind the Nature Center)

**Duration** 10 minutes

**Materials / Props** Spray bottles, watering can, industrial sponge to be placed in “wetland”

### **Preparation**

**Fill spray bottles with water.**

### **Introduction**

**Allow students to walk around the model and explore on their own before you start asking questions. After students have an opportunity to observe the model, ask them what they think they are looking at. Allow students to describe what they are seeing. Prompt them if needed:** *What do green bumps, white areas, grooves, etc. represent? (Mountains, rivers, cities, etc.). Why do we have a model, what does it show us?*

**Discuss what a model is, like a ‘model’ airplane.** *We are looking at a smaller version of our watershed, which is 26 miles long (~460 football fields). For example, if you drove from the lagoon to Lake Wohlford (point to two areas) it would take about an hour.*

**Trace with your finger from the Lake Wohlford to the ocean asking students to describe some of the areas you pass through on the way, pointing out their school (if they are in the watershed), and the location of the Nature Center.**

### **Activity**

*I called this a model of a “watershed”, Let’s quickly review what a watershed is: An area where rain and other water is ‘shed’ or directed from the land into a common waterway, on our case, the lagoon and ocean.*

*continued on next page*

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## Station: Permanent Watershed Model, *continued*

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*When it rains in the mountains or people wash their cars in Escondido, where do you think all of that run-off water is going to end up? In lagoon and ocean. Does water flow uphill or downhill? Why? Gravity. Landforms slope downhill and gravity pulls water towards the ocean.*

*Ok, if we all agree that water flows down from the mountains to the ocean, following the path of creeks and streams, what kinds of things might be carried down with in water? Fertilizer, insecticides, oil, trash, sediment. **Make sure to keep this discussion age appropriate. For the younger students you may simply stick to trash.** How do you think cities and roads affect water flow and water quality?*

**Place sponge right over our lagoon.** *You are going to help me create a rainstorm so we can actually see how water flows in our model watershed. **Group students around the mountains of the watershed and hand out water bottles. Assure that everyone will get a chance to make it rain.***

**Before they start ‘making it rain’, ask students to predict how and where the water will flow if it rains in the mountains.**

*“OK. Start the rainstorm! Spray over the mountains, rivers, lakes, and city of Escondido.*

**While students are spraying, encourage them to observe the FLOW of water as it slowly makes its way down to our lagoon.** *How might trash or pollution upstream affect the lagoon and ocean?*

### **Conclusion / Wrap-up**

**As soon as the lagoon fills up, have students STOP spraying and collect the water bottles. Have them gather around the lagoon to observe how the sponge has filled up.**

*Our lagoon acts like a sponge to slow down water flow. This helps prevent flooding, filters out many of the pollutants, and cleans the water that ends up in the ocean.*

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## Station: Binoculars

**Purpose** To provide an opportunity for students to learn how to use binoculars and gain an understanding of why they are used.

**Location** Pickleweed Point

**Duration** 10 minutes

**Materials / Props** Binoculars

### **Introduction**

*This activity will allow you to use binoculars to see some of the plants and animals that are not directly in front of us. Why do we use them? They are used to magnify whatever we are trying to see, especially if objects are too far away for us to see clearly with our own eyes. Binoculars can make it possible to view animals and scenery you may have never noticed otherwise. Before I hand out the binoculars, I will demonstrate how to use them.*

### **Activity**

*Unwrap the strap and put it around your neck to keep the binoculars from dropping to the ground. Notice there is a lens for each eye. Put the binoculars up to your eyes. If you see two circles, gently roll them in, like this until you see one picture. **Docent models desired behavior while talking.***

*Everyone's vision is a little different so you may need to adjust the binoculars.*

1. *Close your left eye and slowly turn the eyepiece on the end of the right barrel until you can see clearly with your right eye.*
2. *Now open both eyes. If the view is blurry, turn the wheel in the center of the binoculars to the right or left until you see clearly.*

**Give each child a pair of binoculars. Remind them to place the strap around their neck first.**

- *Focus on a bird or something large, such as a fence post. Then try smaller objects.*
- *One tip is to find something with your eyes first. Without taking your eyes off whatever you are looking at, move your binoculars up to your eyes. Then focus the binoculars to see clear details.*
- *Please ask for help if your view seems blurry or you cannot find what you are trying to see.*

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## Station: Binoculars, *continued*

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**Additional examples of observations students can make with their binoculars. Adapt additional questions to complement each program (optional):**

- *Count the number of birds you can find*
- *How many different species do you think you are looking at?*
- *Does anyone see any crabs or other organisms on mudflats?*
- *Can you see anything that doesn't belong? How do you think it got there?"*
- *Are the birds you observed the same or different? Why do you think that?*
- *Can you tell the color of the bill/feet/feathers of that bird?*

**When you are finished with the activity, ask the students to carefully take off their binoculars, wrap the strap around the center, and hand them to you one at a time.**

### **Conclusion / Wrap-up**

*Does anyone want to share what they could see?*

*I hope everyone enjoyed using these binoculars. Scientists use binoculars to study animal behaviors at far away distances without disturbing them in their habitats.*

*Some birds can see very far without using anything but their own eyes.*

*Can you name some birds that have very keen eyesight? Owls, hawks, eagles, pelicans, osprey*

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## Station: Skull Box

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**Purpose** To gain an understanding of the unique and interesting adaptations different animals have by observing a variety of animal skulls.

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**Location** Mullet Overlook or Naturalist's Choice

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**Duration** 10 minutes

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**Materials / Props** 1. Skull box, pictures of animals that match skulls  
2. Optional: additional smaller box for second location (Naturalist's Choice)

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### **Introduction**

*I'm going to show you a very special box with animal skulls inside. We are going to observe these skulls to learn about the adaptations of different animals.*

**Before beginning the activity, make sure students know the definition of an animal skull.**

*What is a skull?* The skeleton of an animal's head

### **Activity**

- 1. Open box and show a skull. Ask:** *What kind of animal do you think this skull belongs to? Bird, mammal, or reptile?*  
**Have several students share their thoughts and explain why.**
- 2. Have students share with the person next to them what they notice about the skull. Give students time to think and encourage them to be specific. Share with the group.**
- 3. Show a picture of the animal that matches skull.**
- 4. Hand skull to a quiet, attentive student.**  
**(If you are not comfortable having students handle skulls, skip this step.)**
- 5. Repeat steps 1-4 with 3 to 4 skulls as time allows. The following suggested skulls have pictures to go with the animal and adaptation fun facts are listed on the back: coyote, raccoon, rattlesnake, great blue heron, osprey, duck, and owl.**

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## Station: Skull Box, *continued*

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6. After 3 to 4 skulls have been displayed, pair students in groups of 2 to 3 to discuss what makes their skull unique from the others. The following questions may be used to spark group discussion:
  - a. *How are the bird beaks the same? How are they different?*
  - b. *How is each bird beak adapted for finding food?*  
Spearing, tearing, scooping, sucking nectar, filtering with comb-like structures (duck)
  - c. *Can you guess what the animal might eat based on the skull? What are some clues?*  
Teeth and sharp bills might suggest meat-eating animals. Length and size of bill
7. **Ask students to share their skull's unique adaptations with the group. Students then hand you the skulls one by one as you return them safely to the box.**

### **Conclusion / Wrap-up**

*Animals have different structural adaptations in order to survive in their environments.*

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## Station: Wingspan

<b>Purpose</b>	To gain an appreciation of how a bird’s wingspan is an adaptation that helps it survive. Become aware of several lagoon bird species.
<b>Location</b>	Heron View Deck
<b>Duration</b>	10 minutes
<b>Materials / Props</b>	Bag with pictures of birds; wingspan board

### **Introduction**

*I’m going to show you some pictures of birds that can be found in the San Elijo Lagoon. I would like you to notice the wingspan for each of the birds I show you.*

**Before beginning the activity, make sure students know the definition of a bird’s wingspan.**

The wings of a bird when they are outstretched.

### **Activity**

- 1. Have students line up with their backs to the fence opposite the wingspan board.**
- 2. Call each student, one at a time, to come to the wingspan board; place their back against the board and stretch out their arms.**
- 3. Naturalist can help the students line up their fingers at the beginning edge of the board.**
- 4. Naturalist can tell the student which bird’s wingspan their arm span matches. This is an opportunity for the rest of the students to show motivation and encouragement by clapping for each other.**
- 5. (Optional) Hand the picture of the bird the student’s arm span matches (from the orange bag) to the student to hold.**
- 6. Have students stand together in groups with the bird’s picture that matches their arm span.**
- 7. After all students have measured their arm span and are grouped with their bird picture, this is a good opportunity for parents/chaperones to photograph the students.**

### **Conclusion / Wrap-up**

**Questions to ask the students while they are in their “bird groups”:**

- *What do you notice about a bird’s wingspan compared to the rest of its body?*  
Students should notice that a bird’s wingspan is much longer than its body.
- *What do you notice about your arm span compared to the rest of your body?*  
Students should notice that their arm span is about the same as their height.
- *Why do birds have different wingspans?*  
Accept all reasonable answers (migration, foraging, soaring, gliding, hunting, etc.)

**Collect the bird pictures and return them to the bag**

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## Station: Busy Beak

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<b>Purpose</b>	To understand that beak shape is an adaptation that allows birds to access different food sources and reduces competition among bird species for food.
<b>Location</b>	Diving Duck Channel
<b>Duration</b>	10 minutes
<b>Materials / Props</b>	Bird pictures with adaptation clues, food items (flower, insect, crab, seeds, rat) chopsticks, tweezers, straw, nut cracker, raptor beak

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### **Introduction**

*Birds have many adaptations they use to survive. Can you think of any adaptations that birds have? Wings, beak, feathers, etc. In this activity we are going to be learning about different kinds of bird beaks and how each one is uniquely adapted to capture a specific type of food.*

*Let's think about all the different ways birds use their beaks. Turn to the person next to you and see how many ways you can think of. Have students share answers with the group. Get food, drink water, preening feathers, courtship display, gathering nesting material, feeding babies, protection, pecking holes in trees, probing in mud, digging in soil, holding a tool, etc.*

*So birds use their beaks for all kinds of things, a little like the way we use our hands. One important thing you mentioned is that birds use their beaks to get food. Can someone name something that a bird eats? Who can name another? **Go around the group and see how many different foods the children can name.** Seeds, worms, insects, fruit, nectar, lizards, squirrels, snakes, rabbits, crab, fish, frogs, etc.*

*So birds eat all kinds of different food. I wonder what this might tell us about the different shapes and sizes of birds' beaks. Can anyone tell me why birds don't all have the same shape and size of beak? They would all be competing for the same food.*

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*continued on next page*

## Station: Busy Beak, *continued*

### **Activity**

*Let's see if we can figure out how the shape of a bird's beak causes it to eat a particular type of food. Students may have a partner or work alone for this activity.*

- 1. The naturalist spreads out food items (flower, insect, crab, seed, rat) in a small open area.**
- 2. Each pair of students is then given a picture of a bird. (Clues are written on the back.)**

Bird	Description	Food
<b>Anna's Hummingbird</b>	<ul style="list-style-type: none"> <li>My long, hollow beak protects my tongue that is curled up inside my beak.</li> <li>I can eat up to twice my body weight every day!</li> <li>My tongue is used to lap up nectar from my food source.</li> </ul>	Flower (nectar)
<b>Black Phoebe</b>	<ul style="list-style-type: none"> <li>I have a small, short, pointed beak I use for picking up tiny moving food items from leaves, twigs, or water.</li> <li>I can catch my food and eat while in flight.</li> <li>I have stiff, whisker-like feathers around my bill to help gather food while I fly.</li> </ul>	Insect
<b>Marbled Godwit</b>	<ul style="list-style-type: none"> <li>I am a large shorebird with a long, slightly upturned bill.</li> <li>I probe for food in shallow water and soft mud.</li> <li>I like use my long bill to reach deep into holes to get my food.</li> </ul>	Crab
<b>House Finch</b>	<ul style="list-style-type: none"> <li>My bill is short and strong.</li> <li>I am often seen in the lagoon, as well as in your backyard.</li> <li>I use my strong bill to break open my food.</li> </ul>	Seeds
<b>Red Tailed Hawk</b>	<ul style="list-style-type: none"> <li>My bill is sharp and hooked at the end.</li> <li>I have sharp talons on my feet to help catch my food.</li> <li>I use my beak to tear apart meat.</li> </ul>	Rat

- 3. As a pair, they discuss the beak type and choose the foods they think the bird eats and why that is their choice. (The food remains on the ground where the naturalist has placed it. The students do not pick it up.)**
- 4. Give the students 2 to 3 minutes to observe, discuss and decide on the food.**
- 5. Each pair then shares their bird name and why they think it eats the food/foods they have chosen.**

*continued on next page*

## **Station: Busy Beak, *continued***

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**If time permits, children can:**

- 1. Use chopsticks to pretend they have a long probing beak and attempt to pick up food. (Pass out chopsticks. They can try to pick up small pebbles, leaves, sticks.)**
- 2. Discuss whether their bird's beak resembles any of the tools: chopsticks, tweezers, straw, nut cracker, raptor beak.**

### **Conclusion / Wrap-up**

*Discuss with your partner what you think might happen if all birds had the same type of beak? They would all be competing for the same food. How would trash/and or pollution in the lagoon affect the survival of birds that live here? They could eat it and get sick, or become trapped in trash hindering their ability to eat or move.*

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## Station: Leaf Detectives

<b>Purpose</b>	To observe a variety of leaves and gain an understanding that plants, just like animals, have many adaptations that help them survive.
<b>Location</b>	Lemonade Junction
<b>Duration</b>	10 minutes
<b>Materials / Props</b>	Board with descriptive words and photos of leaves; freshly-collected leaves from 7 to 8 plants placed in separate plastic bags; magnifying glasses (See page 34 for instructions on use.)

### **Preparation and Set-up**

**Prior to the walk, collect leaves from 7 to 8 plants and place them in separate plastic bags.**

**Note: It is recommended that you have 2 or 3 leaves from the same plant in each bag, but the children will just remove one from the bag for the activity.**

### **Introduction**

**The naturalist asks students a few questions about plants such as:**

1. *Plants just like animals have adaptations that help them survive. Can anyone tell us about a special plant or leaf adaptation?*
2. *Why do you think plant leaves are different colors, shapes, and sizes?*
3. *Why are plants important to people and other animals?*

**Note: If students are having trouble answering encourage them to discuss the question with the person next to them.**

### **Activity**

**This activity can be done individually or with a partner.** *You are going to look at a leaf and think of as many words as you can to describe it. (Discuss the difference between an observation and an opinion.)The leaf might have some very special adaptations and I want you to use your senses to help you think about what the leaf's adaptation might be. Let's review our major senses. Who can name them? Try to use as many as you can when thinking about how to describe your leaf. You may wish to prime them with some descriptive words, depending on the age or ability level of the children.*

Conserves water: Size, color, waxy, hairy, rubbery.

Prevents animals from eating: Smelly, serrated (rough edges), prickly.

*continued on next page*

## Station: Leaf Detectives, *continued*

### Observation (2 to 3 minutes):

*I'm going to give each team a bag that contains leaves from a plant. You will remove only one leaf from the bag. Look carefully at your leaf and share your observations with your partner. (If you are working individually during this activity, study your leaf silently for a moment.) Teams should step a few feet from each other during the observation-partner-discussion part of the activity.*

**Each pair then introduces their leaf to the entire group using their descriptive words.**

### Sharing:

**Each child or pair takes a turn to describe and comment on their leaf.**

1. *Share something you observed about your leaf with the group.*
2. *Place your leaf on the board in the square you think best describes your leaf's adaptations*

*Does everyone agree with the placement of the leaves?*

*Would anyone have placed any of the leaves in a different square? Why?*

**Some leaves may fit into one or more categories. Placing the leaves on the board in this manner shows the huge diversity of leaf adaptations.**

**Next turn the board over, showing the photographs. Students can find the name of their plant by recognizing the leaves in the photo.**

*If you were a plant, what adaptation would you choose for your leaves? What would you name yourself if you were a plant? We don't have a spiny plant here, but can anyone think of one?*

**Place the leaves back in the individual bags and leave them for the next group.**

**Table: Plant Board Key**

Plant	Descriptions
Bladderpod	hairy, light green, pointy at both ends, fat in middle, 3 together
Lemonade Berry	thick, waxy, bright green, rounded, veiny, leathery
Mulefat	bright green, sticky, toothy edges, long, thin
Pickleweed	round, bumpy, green, reddish, thick, pickle shape
Sagebrush	grey, smelly, hairy, light green, feather-like
Toyon	dark green on top, lighter bottom; oblong, toothy edges, pointy tip
White Sage	smelly, sticky, soft, hairy, grey color, round tips, powdery
Willow	long, narrow, underside lighter color, smooth, wider middle, pointy tip

### **Conclusion**

*Plants, like animals, have adaptations that help them to survive in their environment.*

## Vocabulary

**Introduction** The table below provides vocabulary that is relevant for the themed walk, “Adaptations.”

Term	Definition
<b>Adaptation</b>	A physical structure or body part and/or a behavior that enables an organism to survive in its environment
<b>Behavior</b>	The way an organism acts in a certain situation
<b>Camouflage</b>	Body coloration that helps an organism blend with surroundings
<b>Environment</b>	All the living and non-living things that surround and affect an organism
<b>Freshwater</b>	Defined as having a low salt concentration — usually less than 1%.
<b>Generalist</b>	A species able to survive in a wide variety of environmental conditions
<b>Habitat</b>	A specific type of environment inhabited by particular animal and/or plant species; the place where an animal or plant lives
<b>Lagoon</b>	A body of water cut off from another larger body of water by sand, coral, or reef
<b>Organism</b>	A living thing, such as an animal, plant, or fungus
<b>Predator</b>	Any animal that hunts and eats <b>prey</b> animals
<b>Prey</b>	Animals eaten by other animals
<b>Reproduce</b>	To have offspring or produce more of the same kinds of individuals
<b>Riparian</b>	Relating to or located on the banks of a natural watercourse (e.g., river or stream)
<b>Salt marsh</b>	A type of wetland habitat growing in or near salt water
<b>Specialist</b>	A species able to survive in only a narrow range of environmental conditions
<b>Species</b>	A group of the same type of living things that can mate and produce other living things of the same kind
<b>Structure</b>	A complex part of a living thing, such as a hand or mouth or tree roots
<b>Survive</b>	To continue to live through hardships; to remain alive
<b>Upland</b>	Area of land that’s higher than the surroundings, such as hills
<b>Wetland</b>	An area that is covered by water during all or some part of the year



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## THEME: Food Chains and Food Webs

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**Overview** This section was developed to complement the teacher’s guide, *Food Chains and Food Webs*.

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**Objectives** It is expected that visitors who participate in the themed walk will leave with the ability to:

- describe the living and non-living components of the environment;
- demonstrate that all organisms need energy and matter to live and grow;
- explain the role of producers, consumers, and decomposers in the food chain.
- understand how plastics effect the food chain, and how to help protect the environment.

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**Duration** Allow the following lengths of time for themed walk components:

- Welcome – 2 minutes
- Themed Walk Introduction – 10 minutes
- Safety Rules – 2 minutes
- Hike – 1 hour 45 minutes
- Small group wrap-up – 5 to 7 minutes
- Large group wrap-up – 2 minutes

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**Stations** The stations listed below may be included in the “Food Chains and Food Webs” walk.

**Note:** The walk typically takes place at Rios Avenue and stations are not usually set up. Plan to carry the selected stations in a backpack or tote. The Beetles Project Walk and Talk technique is a good way to help students get back to trailhead or lift their spirits if they begin to drag or get hungry! See suggested questions in Talking Points.

Title	Location	Materials	Priority
Themed Walk Introduction	Rios Amphitheater	Props to show food chain (sun-plant-rabbit-owl-raccoon-insect) and accompanying vocabulary words: Producer, Consumer, Decomposer	Required
Icebreaker	Naturalist’s Choice	Begin the walk with one of the icebreakers found on pages 156 to 161.	Required

## THEME: Food Chains and Food Webs, *continued*

**Table: Stations, *continued***

<b>Title</b>	<b>Location</b>	<b>Materials</b>	<b>Priority</b>
Plastics	First bench	Water column board with plastic items already placed on it, velcro animals (common dolphin, sea otter, giant Pacific octopus, western gull, Forster's tern), 3 laminated pictures	Required
Magnifying Lenses (See page 34)	Naturalist's Choice	Magnifying lenses	Recommended
Magnet and Soil	Sandy spots along trail	Corks with magnets attached, paper plates	Recommended
Owl Pellets	Naturalist's Choice	Owl pellets – whole and pieces; owl photo	Recommended
Trash and Decomposition	Naturalist's Choice	Set of cards, 5 with trash, 5 with numbers for time to decompose	Recommended
It's All Connected	Naturalist's Choice	String of yarn, magnifying lenses, sifters, white paper	Optional

## Themed Walk Introduction

<b>Overview</b>	This section describes how to introduce the program, “Food Chains and Food Webs,” to students.
<b>Location</b>	Rios Avenue Amphitheater
<b>Materials</b>	Sun (yellow tennis ball); signs for Producer, Consumer, Decomposer; plants (plastic ivy or pick your own); animals to show a food chain – one per category

**Begin with General Welcome on page 20.** *Welcome to the San Elijo Lagoon. How is this place different or similar to your playground at school?*

### **Introduction**

*Raise your hand if you ate any food yesterday. What did you eat?*

**For each answer ask the student if the food item is a plant or an animal.**

*Why did you eat food yesterday?*

**Take answers. Typical answers are “I was hungry,” so prompt with: Why were you hungry?**

*Body needed energy. Your body needed energy so you could play, grow, hike, run, etc.*

*How do plants and animals get their energy? Discuss with the person next to you. Ask a couple students to share with group.*

*Let’s talk about where all that energy comes from and how living things get it.*

### **Activity**

*What do you think is the major source of energy on our planet?*

**Hold up the sun. Pick a child to come up front and hold the sun.**

*What do plants eat? How do they get the food they need? Everyone together, how do plants make their food? Photosynthesis*

*Through photosynthesis plants use energy from the sun, carbon dioxide from air, and water and chemicals from the soil to make their own food.*

*Plants make their own food, so we call them producers. Let’s all say it together, plants are producers!*

**Pick two students volunteers, one holds the Producer card, the other holds the plant. Stand the student holding the plant next to the sun.**

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## Themed Walk Introduction, *continued*

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*We just learned that plants can use the sun to make their own food. What must people and animals do to get food? They must eat either a plant or another animal. Because they eat other plants and animals, they are called consumers. They consume which means “to eat.”*

**Pick a child to come up and hold the Consumer sign.**

*Can you think of an animal that only eats plants that might live at San Elijo Lagoon?*

**Take answers and pick a student to come up and stand next to the plant while holding the rabbit.** *Our animal (rabbit) gets energy from eating plants.*

*Some animals only eat other animals. Can you think of an animal that eats other animals that might live here at San Elijo Lagoon? **Take answers and pick a student to come up and stand next to the rabbit while holding the owl.** The owl gets energy from eating another animal.*

*Some animals eat both plants and animals. Can you think of an animal that eats plants and animals that might live here at San Elijo Lagoon? **Pick a student to come up and stand next to the owl, while holding the raccoon.** So the raccoon gets energy not only from eating berries or seeds, but also other animals and insects.*

*Let’s review: We have the sun that gives energy to the plants, and the plants provide energy for animals. What do we call this movement of energy? Right, a food chain!  
But we’re not done yet! There’s one more important part of the food chain.*

*Plants and animals don’t live forever. There are some animals and other organisms that eat dead plants or animals. Do you know what we call them? Decomposers. **Pick a student to come up and hold the Decomposer sign.** Do you know who or what those decomposers might be? **Take answers. Pick a child to come up and hold the decomposer (insect).**  
We remember decomposers by remembering 3 letters: FBI. That stands for the three types of decomposers: Fungi, Bacteria, Insects. Decomposers are a special type of consumer. They are the recyclers of the world, returning nutrients to the soil to be used again by new plants.*

**Review students forming the food chain of sun-plant-rabbit-owl-raccoon-insect and Producers-Consumers-Decomposers.**

*We are looking at a simple food chain. Are there many different kinds of food chains found in nature? Can anyone tell me what we call several food chains that are connected?*

Food Web.

*Today when we are hiking we may be able to observe several food chains in action. Before we divide into small groups, let’s review some safety rules.*

**Discuss “Rules for the Trail” on page 21.**

**The teacher will divide the students into smaller groups in preparation for the walk.**

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## Conclusion

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### **Small group wrap-up**

Refer to the description of the small group wrap-up activity in “Components of a Tour” on page 13. In addition, conclude the walk by selecting from the following wrap-up ideas:

- *Moving, growing, and eating all require a source of energy. Where do plants get their energy? Where do animals get their energy?*
- *We saw food chains in action, what producers or consumers did you see?*  
**Let kids share what they saw. For the consumers, ask if they know what it eats.**
- *Living organisms all have the same basic needs and depend on non-living things for survival. energy, nutrients, air, shelter, and water*
- *Why are decomposers (FBI – Fungi, Bacteria, Insects) important?*
- *Did anyone see anything that didn’t belong in nature?*
- *You learned about how plastics can affect the food chain. What are some things you can do to help protect the environment?*  
Pick up litter, recycle, reuse, refuse!

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### **Large group wrap-up**

Refer to the description of the large group wrap-up activity in “Components of a Tour” on page 14.

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## Talking Points

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**Overview** Look for opportunities to engage students in lively discussions at various points along the trail, using ideas presented in this section.

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**Walk & Talk questions**  
(beetlesproject.org)

- Find as many ways you can that you and your partner are connected. Music, sports, interests, hobbies, favorite foods, people you know?
  - Who lives here? Look around. What organisms do you see? What organisms do you think live here that you're not seeing?
  - Discuss as many ways as you can think of that organisms in this ecosystem might be connected to each other.
  - Look at that stump/tree. Discuss as many ways as you can think of that other organisms might use that stump/tree to survive.
  - How do you think the ground here might be different if there were not decomposers?
- 

**General discussion points**

- The following concepts may be used to trigger discussions:
- All organisms need energy to survive. The ultimate source of energy is the sun.
  - All life depends upon living (biotic) and non-living (abiotic) things.
  - Living organisms depend on one another and on their environment for survival.
  - In a food chain, energy flows from the sun to producers (plants), to consumers (animals), and ends with decomposers.
  - Plants are primary producers because they produce their own food.
  - Consumers must depend on plants or other consumers to get the energy they need.
  - A food chain shows transfer of food from one living thing to another.
  - Breaks in a food chain affect life in both directions from the break.
  - A food web is many interconnected food chains.
  - Everything in nature is recycled and reused.
- 

*continued on next page*

## Talking Points, *continued*

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**Eat or  
Be Eaten**

As you come across different animals (insects, lizards, birds) discuss what they might eat and what might eat them. If appropriate, introduce vocabulary words: herbivores, carnivores, and omnivores.

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**Lizards**

*You are likely to see lizards. What is their role in the ecosystem?* Food for birds, bats, raccoons, and snakes. **Discuss what would happen if all the lizards were wiped out. How would that affect the food chain?**

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**Insects**

*What role do insects play in the food chain?*  
Food source for many birds, bats, and spiders. Also, Nature's recyclers. They turn dead plants and animals back into soil which makes nutrients available for growing plants.

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**Recycling  
dead animals**

*What happens to animals that die in nature? Are they buried, put into the trash?* No, nature is able to recycle them by decomposing them.

*Fungi, bacteria, insects, along with birds such as crows and ravens – they all have a role in helping to break down the animal and return it back to the soil as nutrients. These nutrients enrich the soil and enable all plants to grow.*

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*continued on next page*

## Talking Points, *continued*

### Links in the food chain

The table below provides some examples of who eats what in the lagoon.

Species	GETS ENERGY FROM/EATS ...	IS EATEN OR KILLED BY ...
Algae	Photosynthesis	California horn snail, fiddler crab
Pickleweed	Photosynthesis	Belding's Savannah Sparrow
Fiddler Crab	Algae, dead animals	Ridgway's (Clapper) Rail, Egrets and Herons
Light-footed Ridgway's Rail	Crabs, snails, worms, aquatic insects	Coyote, raccoon, hawks
Black Phoebe	Insects	Cooper's Hawk, Sharp-shinned Hawk
California Horn Snail	Algae	Very hard shell – difficult to eat
Mallard	Aquatic vegetation and invertebrates	Raccoons, opossum, peregrine falcon
Topsmelt	Algae	Great Blue Heron
Fence Lizard	Insects	King snakes, striped racers, alligator lizard, hawks, raccoons
Mullet	Plankton, invertebrates	Sea lions, Osprey
California Killifish	Insects, worms, larvae of other fish	Great Blue Heron, Snowy Egret
Osprey	Fish (Mullet)	Great horned owl (eats nestlings and occasionally adults)
Red-tailed Hawk	Small rodents, rabbits, snakes, lizards	Humans through pollution and habitat destruction
Raccoon	Fish, crabs, rodents, birds, bird eggs, plant material, household garbage	Bobcats, Mountain Lions, coyotes, humans
Coyote	Mice, rats insects, rabbits	Humans, cars

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## Station: Plastics

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**Purpose** Learn that plastics never decompose, and many plastics end up in the ocean. Plastics have different densities, and are found throughout the water column, from the surface to the bottom of the ocean, affecting sea life throughout. Understand why it is important to avoid using plastics, when possible.

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**Location** First Bench

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**Duration** 10 minutes

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**Materials / Props** Water column board with plastic items already placed on it, velcro attached animals (common dolphin, sea otter, giant Pacific octopus, western gull, Forster's tern), 3 laminated pictures

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### **Introduction**

**Scatter plastic items on the trail in front of the activity board. When students arrive at the activity ask them if they notice anything out of place?** trash, plastic, etc. **Show students a decomposing leaf and ask them what is happening to the leaf,** It's decomposing. **Explain how insects and other tiny organisms, some of which we can't see eat the leaf, and turn it back to soil and nutrients for the plants. Pick up the water bottle with small pieces of plastic in it.** *We have been learning about decomposers, can anyone tell me what decomposes (or eats?) plastics? NOTHING, Plastic doesn't biodegrade – it will remain in the environment forever! But it does photodegrade – that means the sun can break it down into smaller and smaller pieces, but it never fully decomposes. What do you think would happen if we left all of this plastic here on the trail? Accept all reasonable answers.*

*What would happen if there was a big rain storm?* Items might get washed into the ocean. *Unfortunately a lot of plastic ends up in our oceans. Show picture with trash covering surface of ocean. How would you feel if the entire ocean looked like this?*

*Let's pretend there is a big rainstorm and all these pieces of plastic get washed into the ocean (point to the water column board). Let's find out together where the plastic ends up and what animals in the ocean are affected by these plastics.*

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*continued on next page*

## Station: Plastics, *continued*

### **Activity**

#### **Plastic in the Water Column Board:**

Ask for 5 volunteers to pick up one piece of plastic and place it onto the activity board.

Tell students to make sure at least one piece of plastic ends up on the surface (top), pelagic (middle), and benthic (bottom).

Ask student where in the ocean are plastics found, Everywhere!

Next ask for 5 volunteers to place the marine animals on the board. (Start with surface feeders, and move down to middle feeders and then to bottom feeders as shown in chart below.)

Type of Ocean Feeder		
Surface Feeder (top)	Pelagic Feeder (middle)	Benthic Feeder (bottom)
<ul style="list-style-type: none"> <li>▪ Western Gull</li> <li>▪ Forester's Tern</li> </ul>	<ul style="list-style-type: none"> <li>▪ Common Dolphin</li> </ul>	<ul style="list-style-type: none"> <li>▪ Giant Pacific Octopus</li> <li>▪ Sea Otter</li> </ul>

*These are just some animals that you might find in our ocean. Looking at this board who can tell me what animals are affected by plastics in the ocean? All of them!*

*Marine animals often mistake plastic for food. **Demonstrate using a plastic grocery bag and how it looks like a jellyfish in the ocean.** If you were a sea turtle swimming through the ocean what do you think this bag might look like? A jellyfish! **Show comparison photo of the bag & jellyfish.***

*If you were an animal in the ocean what do you think a straw might look like? A worm! **Show comparison photo of the worm and slurpee straw.***

***Lastly, show the photo of the bird with plastic in its stomach.** Can anyone tell me what this bird ate? Plastic! What is happening to this bird's body? It's decomposing. How about the items inside the bird? Plastics never fully decompose.*

*continued on next page*

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## Station: Plastics, *continued*

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### **Conclusion / Wrap-up**

Questions/Comments	Answers
Who can remind us what eats plastics for food?	Nothing
How long does it take for plastics to fully decompose?	It never decomposes because nothing eats it.
What oceanic animals are affected by plastics in their environments? Explain.	All of them!
Who can name a plastic item that is used every day.	Examples: milk jug, straw, water bottle
What are some things that you can do to help minimize the amount of plastics ending up in our oceans?	Recycle, reuse (plastic water bottles), buy items that can be reused (bags, water bottles) or not use at all (straws).

*Thank you for learning about the harm plastic in the environment is causing. The environment is counting on you to make a difference by reducing, reusing, and not using plastics when possible.*

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## Station: Magnet and Soil

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**Purpose** Soil is made up of living (biotic) and non-living (abiotic) materials. Both are important for plant growth. Students will identify an important abiotic nutrient in the soil (iron).

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**Location** Dry, sandy location along the trail

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**Duration** 10 minutes

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**Materials / Props** Corks with magnets attached, paper plates, sample soil, if needed

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### **Introduction**

*Look around. What are some living and non-living parts of the habitats you see?*

*Why are the non-living parts of a habitat important to the living parts?*

*What food do plants need in addition to the energy of the sun?*

*Just like us, plants need nutrients to grow and survive. For example, iron is an important nutrient for humans, when we don't get enough iron, we can feel tired and weak. Plants need it as well for growth and reproduction (making seeds). Plants get iron from the soil. When we eat plants or animals, we get the iron we need to survive. We are going to do an activity to see if we can find some iron in this soil.*

### **Activity**

**1. Split the students into pairs and give each child a cork with a magnet attached.**

*There is a magnet at the end of the cork. What do you think will happen if the magnet touches pieces of iron?*

The iron will be drawn to the magnet and stick to it.

**2. Give each child a paper plate.**

**3. Put a small amount of soil on top of each paper plate.**

*I want you to put your magnet underneath the paper plate and move it around under all of the soil. What is happening?* The iron filings are attracted to the magnet and move in response to the movements of the magnet. The rest of the soil is not moved by the magnet. **Have students in pairs comparing their iron filing action.**

**4. If someone does not have iron filings in their soil sample, distribute more soil to those who need it.** *How do plants actually use these small iron pieces?* The iron gets dissolved into the water and the plants take it up through their roots.

**5. Review quickly** *Iron is in every living cell and both plants and animals depend on it to survive.*

**6. Collect materials.**

## Station: Magnet and Soil, *continued*

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### **Conclusion / Wrap-up**

*Soil is made up of living things (biotic) and non-living things like iron which is abiotic. Soil provides nutrients that both plants and animals need to grow and survive.*

**Note: It is best to use soil from the trail, but if the soil is wet, the activity will not work. Your activity kit should include a small container with soil to be used as back up if needed.**

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## Station: Owl Pellets

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**Purpose** To learn the eating habits of birds of prey and where they fit in the food web.

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**Location** Docent's choice

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**Duration** 5 to 10 minutes

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**Materials / Props** Whole owl pellet, dissected pellet inside magnifying box, photo of owl coughing up pellet

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### **Activity**

**Walk along the trail and stop before the planted owl pellet (or discretely drop from your pocket). Let's look at this. Can anyone tell me what it is? Accept all reasonable answers. Depending on responses, prompt deeper exploration with the following questions:**

- *I wonder what owls eat?*
- *Why do owls form a pellet?*
- *What do the pellets remind you of?*

*Let's take a closer look at a pellet. What do you notice about the outside? Point out the fur and hair that coats the outside and makes it feel smooth.*

*I wonder what's inside. Should we take a look? Before you look, have students make predictions. Have students observe the dissected pellet in the magnifying box. Make sure each student gets to see the bones. What are those pieces? What animal do you think those pieces came from?*

### **Conclusion**

*Since they don't have teeth, owls generally swallow their prey whole or in large pieces, but they cannot digest hair, fur or bones. So after a night of hunting and eating, the owl will cough up one or two pellets. We can investigate what kinds of animals the owl is eating by looking at the bones we find inside the pellet.*

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## Station: Trash and Decomposition

<b>Purpose</b>	To learn how long certain materials take to decompose in our environment and why it's important to recycle or avoid using plastics when possible.
<b>Location / Duration</b>	Docent's choice / 10 minutes
<b>Materials / Props</b>	Two sets of cards: 5 with pictures of trash and 5 with number indicating length of time to decompose

### **Introduction**

*What happens to a leaf when it falls off a tree? If possible, carry a partially decomposed leaf in your pocket. Turn to the person next to you and discuss for one minute. Ask a couple students to share their thoughts.* It eventually decomposes. **Make sure all students understand what decompose means and what causes plants to decompose** (Fungus, Bacteria, Insect).

**Ask students to turn to the person next to them with how long they think the different materials take to decompose.** *For example, a newspaper? An aluminum can? A plastic bag? A plastic bag?* **Ask students to share some of their guesses with group.**

### **Activity**

*I have some pictures of items we use every day. Even though most of these items can be recycled, many end up in landfills or even in our neighborhoods and the lagoon. We are going to play a little game that will teach us how long different materials take to decompose.*

*I have 2 sets of cards: 5 cards have pictures of trash and the other 5 are the matching puzzle piece showing the length of time it takes for that material to decompose.*

**Hand out the 10 cards randomly. If there are fewer than 10 students, hand out to parent volunteers or even take one for yourself.**

**Students now walk around and find their matching puzzle partner.**

*When you find your partner, stand next to each other.*

**Once all have found their matching partner, have each pair in turn say the material and the length of time for decomposition (recommended order):**

Paper = 3 months

Plastic bag = 15 years

Aluminum can = 100 years

Plastic bottle = 450 years

Styrofoam = Never

## Station: Trash and Decomposition, *continued*

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### **Conclusion / Wrap-up**

#### **Discuss how we can use our resources wisely.**

- *The benefit of aluminum over plastic is that aluminum can be recycled over and over and can be turned back into another aluminum can within 3 months.*
  - *Aluminum and glass bottles can be recycled indefinitely.*
  - *Plastic can be recycled, but usually only once. (Example: a plastic bottle to carpet or playground equipment)*
  - *There are no decomposers to break down plastic! Plastic photodegrades into tiny pieces, but never fully breaks down.*
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## Station: It's All Connected

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<b>Purpose</b>	Learn how everything is connected by observing living (biotic) and non-living (abiotic) components of our ecosystem.
<b>Location</b>	Docent's choice
<b>Duration</b>	10 minutes
<b>Materials / Props</b>	3 to 4 six-foot strings of yarn, magnifying lenses, sifters, white paper

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### **Introduction**

*There are many different living and non-living things in the lagoon that depend on each other for survival. Look around you and see if you can find two things that share a connection. For example, these two plants need sunlight to survive. Turn to the person next to you and share your observations. Ask students to share their findings with the group.*

### **Activity**

**Have students form groups of 2 to 3. Give each group a string, magnifying lenses, sifters, and a sheet of white paper. Ask each group to find a spot along the trail and form a small circle on the ground with their string. Allow students about 5 minutes to view what kinds of living and non-living things they observe within the circle on the ground. Also, have them imagine the circle reaching all the way up to the sky.**

**Possible findings could be:**

**Biotic Factors (living)**

- **Producer = plants, flowers**
- **Consumer = birds, insects**
- **Decomposer = worms, insects**

**Abiotic Factors (non-living)**

**Soil, air, sunlight**

**Challenge students to take a closer look at the soil and see if they can describe it by telling what the soil is made up of (leaf matter, different color grains, dead insects, etc.) Point out the mix of biotic and abiotic.**

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*continued on next page*

## Station: It's All Connected, *continued*

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**Have students share what they observed in their circle – first in their small group and then with larger group.** *How are the things you noticed dependent upon one another? How were they connected? How is this part of a food chain?*

### **Conclusion/Wrap-up**

*Plants and animals benefit from each other in different ways as part of food chains. Living and non-living things have important connections needed for growth and survival of living things.*

**Extension: If there is a bush nearby (buckwheat is suggested), have students hold their sheet of paper under the bush and give it a little shake. Allow them some time to explore what lands on their paper, and compare it to what they found in earlier activity.**

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## Vocabulary

**Introduction** The table below provides vocabulary that is relevant for the themed walk, “Food Chains and Food Webs.”

Term	Definition
<b>Abiotic</b>	Non-living components of an ecosystem; something that was never alive
<b>Algae</b>	Photosynthetic organisms, ranging in size from giant kelp to microscopic phytoplankton. They serve as food for many animals including those in the lagoon (Plural = algae; singular = alga)
<b>Bacteria</b>	Microscopic, single-celled organisms that serve many ecological roles, some harmful and some helpful, including breaking down organic matter (e.g., dead leaves) and releasing nutrients into the environment (Plural = bacteria; singular = bacterium)
<b>Biotic</b>	Living components of an ecosystem, such as the plants and animals
<b>Carnivore</b>	An animal that eats only other animals (e.g., hawk or lizard)
<b>Coastal Sage Scrub</b>	A habitat growing on drier coastal slopes that consists of drought-resistant shrubs and other plants
<b>Component</b>	A part of something; a smaller part of a larger entity or system
<b>Consumer</b>	An animal that gets its energy by eating other plants or animals
<b>Decomposer</b>	A living thing (organism) that breaks down the remains of dead organisms (e.g., some insects, crabs, fungi, or bacteria)
<b>Ecosystem</b>	All the living and non-living things that interact in an area
<b>Energy</b>	The capacity to be active, or, as defined in physics, to do work
<b>Food Chain</b>	The path of food energy in an ecosystem from sunlight to plants to animals
<b>Food Web</b>	A system of interconnected food chains
<b>Fungi</b>	A group of organisms, including mushrooms, yeast, and mold, which feeds on living and dead organic matter or material (Plural = fungi; singular = fungus)
<b>Habitat</b>	A specific type of environment inhabited by particular animal and plant species
<b>Herbivore</b>	An animal that eats only plants (e.g., rabbit or deer)
<b>Lagoon</b>	A body of water cut off from another larger body of water by sand, coral or reef
<b>Nutrient</b>	A substance that living things need to live and grow
<b>Omnivore</b>	An animal that can eat both plants and animals (e.g., skunk, raccoon, chicken, or human)
<b>Organism</b>	An individual animal, plant, or single cell life form
<b>Photosynthesis</b>	The process by which a plant makes its food from sunlight

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## Vocabulary, *continued*

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**Table:** Vocabulary, *continued*

<b>Term</b>	<b>Definition</b>
<b>Phytoplankton</b>	Plankton that are plants or are photosynthetic
<b>Producer</b>	An organism that makes its own food using energy usually from sunlight
<b>Riparian</b>	A type of wetland near or along the banks of a river, stream or lake
<b>Salt marsh</b>	A type of wetland habitat growing in or near salt water
<b>Species</b>	A group of the same type of living things that can mate and produce other living things of the same kind
<b>Wetland</b>	An area that is covered by water during all or some part of the year

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## THEME: The Kumeyaay

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**Overview** The Kumeyaay lived for thousands of years in the San Elijo Lagoon region. The natural resources of the area provided them with everything they needed. This section was developed to complement the teacher's guide, *Kumeyaay*.

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**Objectives** It is expected that visitors who participate in the themed walk will be able to describe the following about the Kumeyaay people:

- How they lived
- How they obtained their food, clothing, tools, medicine and the other things they needed
- What plants, animals, and other resources found around San Elijo Lagoon were especially important to them
- Understand that modern day objects, like plastics, never decompose and by using fewer plastics we are helping protect our watershed.

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**Duration** Allow the following lengths of time for themed walk components:

- Welcome – 2 minutes
- Themed Walk Introduction – 10 minutes
- Safety Rules – 2 minutes
- Hike – 1 hour, 30 minutes
- Individual wrap-up – 5 to 7 minutes
- Group Wrap-up – 2 minutes

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**Materials / Props** All materials are stored in the shed and many are in Tupperware containers. Pick a maximum of 5 to 7 items to talk about. Among the materials available are:

- Kumeyaay baskets, yucca fiber carrying sack, and pottery olla
- examples of acorns, berries, shellfish and other food
- Kumeyaay willow bark skirt, deerskin loincloth and rabbit skin
- examples of some Kumeyaay stone, antler, or wood tools
- bow, quiver and arrows; rabbit stick; digging stick; rabbit skin
- gourd rattle used for music and dancing
- mortar and pestle (metate and mano)
- clear jar with plastic trash
- decomposition puzzles
- yucca leaves or visit yucca plant

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*Continued on next page*

## The Kumeyaay, *continued*

**Stations** The stations listed below may be included in the “Kumeyaay” walk. Assemble the necessary materials in advance.

Title	Location	Materials	Priority
Themed Walk Introduction	Lagoon Launch Pad OR Designated Trailhead	Kumeyaay Tupperware bin including loose artifacts and blanket to place artifacts on*	Required
Icebreaker	Naturalist’s Choice	Begin the walk with one of the icebreakers found on pages 156 to 161.	Required
Trash and Decomposition (See page 81)	Naturalist’s Choice	Set of cards, 5 with trash, 5 with numbers for time to decompose	Required
Magnifying Lenses (See page 34)	Naturalist’s Choice	Magnifying lenses	Recommended
Kumeyaay Plant Uses	Naturalist’s Choice	Set of 10 nametags with problem sentences	Recommended
Kumeyaay Stick & Dice	Naturalist’s Choice	4 to 5 rocks with hieroglyphics 10 counting sticks	Recommended
Mystery Bag	Naturalist’s Choice	5 to 6 small modern day objects placed in a bag	Optional
Resource Bag	Naturalist’s Choice	5 to 6 lagoon objects placed in a bag	Optional

\*Note: It’s fun to take out the mortar and pestle and allow students to grind acorns. Make sure to collect some acorns ahead of time or ask Rangers if they have any to share. Take the smallest mortar when going to Santa Carina.

## Themed Walk Introduction

<b>Overview</b>	This section describes how to introduce the program, “Kumeyaay”, to students.
<b>Location</b>	Lagoon Launch Pad or Designated Trailhead
<b>Duration</b>	10 to 15 minutes
<b>Materials / Props</b>	Kumeyaay Tupperware bin, including loose artifacts and blanket to place artifacts on

**Begin with General Welcome on page 20.** *Welcome to the San Elijo Lagoon. How is this place different or similar to your playground at school?*

### **Introduction**

**Introduce the Kumeyaay Program.** *Haawka! (HOW-ka). That means “hello” in the Kumeyaay language. Have the class repeat the word. Today’s topic is about the local Native Americans called the Kumeyaay and how they lived off this land we call the San Elijo Lagoon. I’d like you to imagine this wetland area the way it was over five hundred years ago. There were no roads or houses or stores like you see here today. There was no metal, no plastic, no paper, no TV or radio, no computers, no cars or airplanes.*

*Think about it: The Kumeyaay had to deal with the same needs that we do today: food, clothing, medicine for pain and infection, and trash build-up. If you lived here thousands of years ago, you wouldn’t have had stores like Target where you could just buy whatever you needed. What would you eat? Remember you cannot just order pizza when you are tired and hungry. What would you wear? What would you use to make a house? What kinds of tools would you use? (Accept one or two answers)*

*So where did all the tools, food and shelters come from? Take answers. Everything the Kumeyaay people needed for their food, clothing, shelter, medicine, and tools – all their resources – came from the land, water, plants, animals, and rocks. Some of those resources were available here and others were obtained by traveling to the mountain or desert areas or trading with other Native American groups.*

*Today on your walk you are going to see some of the different resources that can be found at the lagoon. We are going to talk about how some of those plants, animals, and rocks were used by the Kumeyaay to live.*

*Continued on next page*

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## Themed Walk Introduction, *continued*

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### **Activity**

*Before we go on our walk, we'd like to show you some special items that were made by the Kumeyaay people.*

### **Kumeyaay Visuals**

*First, I will need a girl to volunteer. **Bring her up front and ask her name.** The women and girls wore a skirt like this made of pounded willow bark strips. **Show the skirt.** Like most Kumeyaay women and girls, \_\_\_\_\_ will spend a lot of her time transporting fresh water, gathering plant materials, collecting shellfish (like clams and oysters), and preparing them all for cooking. She will need something to carry them in during her gathering trips. The women and girls made these containers. **Give the girl a basket to hold and a net carrying sack with a basket cap. Show the baskets, acorns, pottery olla, etc.** Time permitting, describe the methods of transforming acorns into acorn meal and into shawii.*

*Now I need a boy to volunteer. **Bring him up front and get his name.** The boys and men sometimes wore a loincloth like this one with a belt to hold all their important tools. **Hold up the loincloth and show how a tool like a stone knife could be attached to the belt.***

*Boys learned to hunt with the men from an early age. \_\_\_\_\_ will need a bow and arrow to go hunting for deer. **Show.** They used a rabbit stick like this to throw at the rabbits and other rodents. **Show.** What do you think they could do with the rabbits they caught? **Ask for ideas.** Yes, they used them for food and also for the rabbit skins that they sewed into beautiful blankets.*

*For their gatherings, the Kumeyaay played music, sang and danced. **Show and play the gourd rattle.***

**NOTE: Be sure to include a few statements that are present tense. There are groups of Kumeyaay (especially in Baja California) who continue to live in the traditional ways today and continue to use resources in the manner described below.**

*On our hike, we will learn about the different ways the Kumeyaay used the plants and animals in the lagoon. Before we divide into small groups, let's review some safety rules.*

**Discuss "Rules for the Trail" on page 21.**

**Have the teacher divide up the students into smaller groups in preparation for the walk.**

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## Inventory of Items for the Kumeyaay Program

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**Overview** There are a lot of items available to support the Kumeyaay program. Naturalists are not expected to use all of them. Pick a maximum of 5 to 7 items to talk about during the Introduction. Others can be covered along the trail.

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**Inventory** The following items are stored in the bin:

- Willow skirt
- Willow basket
- Acorns
- Rabbit skin
- Rattle
- Tools
- Loincloth
- Flute
- Plastic midden
- White sage bundle
- Sets of Kumeyaay cards
- Shells
- Yucca rope
- Torrey Pine hand broom
- Wild cucumber seeds
- Arrowhead
- Olla in yucca sac
- Willow sandal

- Sensory Bag containing: dice, string/twine, comb, aspirin bottle, stone, quarter, rubber band, button, toy lizard, sea shell, acorn, cork
- Kumeyaay Plant Users: set of 10 name tags with problem statements

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The following inventory items don't fit in the bin:

- Bow and arrow
  - Rabbit stick
  - Blanket to place items if program is at Santa Carina
  - Mortar and Pestle
-

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## Conclusion

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### Small group wrap-up

Refer to the description of the small group wrap-up activity in “Components of a Tour” on page 13. In addition, conclude the walk by selecting from the following wrap-up ideas:

- *What are some San Elijo Lagoon plants and animals that the Kumeyaay ate?*
  - *What did the Kumeyaay use to build shelter?*
  - *Name a plant that was used by the Kumeyaay for medicine and tell how it was used. What did the Kumeyaay use for pain relief?*
  - *Do you think you could live off the land like the Kumeyaay did? What is one thing you might do to help you survive?*
- 

### Large group wrap-up

#### **Show the canister with all the plastic trash.**

*How many of you saw sea shells on the ground? What were the shells telling us about the Kumeyaay? What they ate. Turn to the person next to you and discuss how our trash is similar or different from the Kumeyaay’s trash middens? Kumeyaay middens are full of shells and other biodegradable materials. Ours are filled with lots of plastic among other things. Why does plastic stick around for so long? It never fully decomposes. What do we need to do with our plastic trash to keep the animals in the lagoon safe? Recycle, reuse and refuse whenever you can. Always pick up litter when you see it.*

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### If you have more time...

If there is extra time, naturalists may:

- read a Kumeyaay legend story
  - (at the Nature Center) take the group to the upper deck to see the views and talk about the wetlands
-

## Talking Points

<b>Overview</b>	Look for opportunities to engage students in lively discussions at various points along the trail, using ideas presented in this section.
<b>General discussion points</b>	<p>Along the walk, try to weave in lagoon resources used by the Kumeyaay as frequently as possible. Make sure to cover at least 5 important resource examples that will be addressed in the wrap-up session. When you see middens, ask students why the shells are there. What do they notice about the soil around the shells? (It is darker.) Have them feel the soil as it is often a little greasy. Also take note of any trash.</p> <p>Of course, if an osprey flies over or some other fabulous nature-related item is brought to the group's attention, it is OK to go off-topic briefly. Always try to draw the topic back to the Kumeyaay resources whenever possible.</p>
<b>At the Nature Center</b>	If there is time, go into the Nature Center to see the Kumeyaay-related exhibits and show the group the wetlands map and where they are on the overall map. (Geography Content Standards are covered in third and fifth grade.)
<b>Kumeyaay resources</b>	Descriptions of Kumeyaay resources are provided in the tables that follow, grouped by ecological zone.

**Table: Kumeyaay Resources from the Salt Marsh**

Resource	Description
Birds	Ducks, geese, and shorebirds: <ul style="list-style-type: none"> <li>▪ Good source of meat</li> <li>▪ Hunted using traps or large nets made out of woven yucca fibers</li> <li>▪ Wore feathers of various birds to dress up for singing and dancing</li> </ul>
Pickleweed	<ul style="list-style-type: none"> <li>▪ Plant can accumulate large amounts of salt</li> <li>▪ Used by Kumeyaay to season food just like people today</li> <li>▪ Tastes like pickles</li> </ul>
Salt Grass	Grass beaten with baskets to collect the salt for seasoning food
Shellfish, crabs, fish	<ul style="list-style-type: none"> <li>▪ Good source of protein</li> <li>▪ Fish caught with yucca fiber fishing nets or lines with abalone shell hooks</li> <li>▪ Boats for fishing made using the reeds and rushes of the salt marsh and riparian areas</li> </ul>
Spiny rush (Juncus)	<ul style="list-style-type: none"> <li>▪ Long, sharp reeds that were split and used in making baskets</li> <li>▪ The sharp ends could be used as needles or tools</li> </ul>

## Talking Points, *continued*

**Table: Kumeyaay Resources from the Freshwater Riparian Areas**

Resource	Description
Cattail	Young roots and shoots used for food (taste a little like potato). Long leaves used as thatching for the Kumeyaay houses and for mats. The soft seed heads were used to pad a baby's cradleboard (like a diaper).
Cobblestones	Creek beds have lots of special rounded rocks called cobblestones. These were used as manos (handstones) to grind acorns or other seeds into a meal. The mano was used with a larger, flat or basin-shaped bottom stone called a metate. The cobblestones could also be struck by other rocks and fashioned into cutting or hammering tools.
Cottonwood trees	Cottonwood trees had good lumber for building shade structures called ramadas. The wood was also used to make tools or for firewood.
Dark clay	Dark clay was used to make pottery storage containers or ollas.
Fresh water	Collected in pottery ollas for transport and storage
Insects	Riparian areas are good sources of insects. The Kumeyaay sometimes ate cooked grubs or larvae, or the adult insects.
Mammals	Mammals like raccoons, rabbits and woodrats often live near the fresh water. Deer came to the creeks to drink. This was a good place for hunting them for meat and for the hides.
Willow trees	Willow trees had many uses. Branches could be bent and were used for the frame of the house, or ' <b>ewaa</b> . The inner bark was soaked in water and pounded into soft strips for use as a woman's skirt. Leaves and bark were chewed as a pain reliever. Young branches were woven into baskets to store acorns, berries or seeds.

**Table: Kumeyaay Resources from the Upland Areas**

Resource	Description
Agave	The leaves were soaked and pounded and used for fiber for sandals, rope and other uses. The agave stalks were roasted in pits and eaten. (They taste a little like pineapple).
Black Sage	Leaves ( <b>Have them smell them.</b> ) used as a seasoning. Seeds were ground and eaten.
Buckwheat	Leaves were brewed into a tea to treat headaches and stomach aches. Soaked flowers used as a soothing eye wash.

*continued on next page*

## Talking Points, *continued*

**Table: Kumeyaay Resources from the Upland Areas, *continued***

Resource	Description
California Sagebrush / White Sage	<b>(Have them feel the leaves and smell their fingers)</b> Used to cover the human scent prior to hunting (like a deodorant). Sagebrush was good as a repellent for fleas and mosquitoes. White Sage was also burned in ceremonies and used in a tea to fight chest colds and coughs.
Coyote Bush a.k.a. coyote brush	Used as a broom and for toothbrushes
Berries	Elderberry, Toyon, and Lemonade Berry bushes were useful as a source of delicious berries and colorful dyes. The Elderberry branches were also made into flutes.
Mohave Yucca	Mohave Yucca had many uses for the Kumeyaay. They soaked and pounded the leaves to extract the strong fibers, and made them into cord, rope, fishing line, nets, sandals, and many other uses. They ate the young flowers and fruits. They used the ground root to make a good soapy shampoo.
Prickly Pear Cactus	Young pads and fruits were eaten. The spines were used as needles or for tattooing.
Wild Cucumber	Although not useful as food, the Wild Cucumber had many uses for the Kumeyaay: <ul style="list-style-type: none"> <li>▪ The mature black seeds were used as necklaces or in baby rattles</li> <li>▪ The oil from the seeds was considered a remedy for baldness and was used as a base for paints</li> <li>▪ The root of the plant contains chemicals that coat the fish's gills and stop it from getting oxygen. The root was ground and thrown into the creeks and lagoons and the stunned fish were easily scooped up into baskets for dinner.</li> </ul>

**Contributor:** Kathy Dickey, SELC Naturalist

## Station: Kumeyaay Plant Uses

**Purpose** Learn how to meet your everyday needs with native plants of the lagoon.

**Location** Beginning of walk and/or throughout the walk

**Duration** Ongoing

**Materials / Props** Set of 10 name tags with problem statements

### **Introduction**

*What do you do when your stomach hurts? If you are hungry what do you eat? Where does your food come from? If you lived at the lagoon 500 years ago what would you have eaten or used to fix your stomach ache? The Kumeyaay people relied on plants to meet their everyday needs: food shelter, medicines, clothing and more.*

### **Activity**

*I am going to give each of you a name tag with a problem on it. Each problem can be fixed using native plants of the lagoon. Throughout the walk today we will be discussing different plants. If you think the plant we are observing could help solve a problem please let everyone know.*

<b>Problem</b>	<b>Plant Used</b>
Ohhh, my stomach hurts!	Buckwheat or monkey flower
Sniff, sniff. I have a cold.	Sagebrush, white sage, elderberry
I'm hungry. What's there to eat?	Prickly pear, elderberries, toyon berries, cattail, yucca, or agave
I need something to store my food in.	Spiny rush basket or willow basket
I need a new house.	Willow, cottonwood, or cattail
I'm thirsty and need something to drink.	Lemonade berry (soaked in water)
Yow! A black widow spider bit me!!!	Dodder growing on buckwheat
I have a headache.	Willow
Ouch! I cut myself.	Sagebrush or toyon
Time to brush my teeth	Coyote brush

*continued on next page*

## Station: Kumeyaay Plant Uses, *continued*

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### **Questions to ask while walking**

*Why is it important to identify plants? Some are dangerous, edible, cure illnesses*

*What kinds of things do we look for when identifying plants? Color, size, texture, leaves, smell*

**Once the plant for a student's need has been identified, collect the name tag.**

### **Conclusion/Wrap-up**

**Ask students to share what plant helped them meet their need.**

*Do you think it was easier or harder for the Kumeyaay to meet their needs (illness, gather food, build a home) than it is today? Explain why. Earth provides us with so many things that we need and use every day. Let's all remember the importance of protecting our planet.*

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## Station: Kumeyaay Stick & Dice

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<b>Purpose</b>	To gain an understanding that the Kumeyaay played games very similar to our board games. Learn a game that the Kumeyaay used to play.
<b>Location</b>	Shady spot along the trail (Naturalist's choice)
<b>Duration</b>	10 minutes
<b>Materials / Props</b>	4 to 5 rocks with hieroglyphics 10 counting sticks

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### **Introduction**

*Who has toys or games that you like to play with at home? Who can tell me where your toys and games come from? Where do you think the Kumeyaay got their toys and games?*

They didn't get to go to the toy store. They had to make their toys from items they collected in nature.

*We are going to play a game that was played by the Kumeyaay with items they would have collected right here in the lagoon. These are also items you can find in your own backyards.*

### **Activity**

**Have the children sit in a circle and place all the sticks in the center. Children take turns rolling the dice (rocks) and collecting the appropriate number of sticks.**

- 1. Players alternate throwing dice**
- 2. When all counter sticks are taken from the pile, players take sticks from each other.**
- 3. Winner is the person who ends up with all the sticks, after everyone has had at least two turns, or until a predetermined time.**

### **Scoring:**

**2 up or 2 down = 1 counter stick**

**4 up or 4 down = 2 counter sticks**

**Any other combination = 0 sticks**

### **Conclusion / Wrap-up**

*Does this game remind you of any of the games you might play today? If you enjoyed it, you can make your own set and teach your family and friends how to play.*

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## Station: Mystery Bag

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<b>Purpose</b>	Learn what materials the Kumeyaay used in place of modern day objects and understand how the Kumeyaay used their resources wisely.
<b>Location</b>	Naturalist's Choice
<b>Duration</b>	10 minutes
<b>Materials / Props</b>	Sensory objects placed in bag. See list of suggested objects in table below.

---

### **Introduction**

*If the Kumeyaay only used materials found in nature, did you ever wonder how they brushed their teeth, tied their shoe, or treated a cold or a fever? The Kumeyaay had the same needs as we have today, and were able to meet all their needs from objects found in nature, many of which we will see today.*

### **Activity**

**Pair students in teams of two, ask one student to reach into the bag and pull out an object. Don't let anyone see what your object is! Allow 1-2 minutes for teams to observe their object and discuss its purpose, and think about what the Kumeyaay might have used in its place. Have students share their object and related resource with the group.**

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## Station: Mystery Bag, *continued*

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**Table: Suggested items for the Kumeyaay Mystery Bag**

Object	Related Kumeyaay Resource
Dice	Kumeyaay played a similar game called Stick Dice using marked stones as dice and sticks as counters.
String/twine	Fiber was obtained from mohave yucca and agave found in the upland areas and pounded to make cord and rope.
Comb or toothbrush	Plants such as coyote bush were used to make brooms, toothbrushes, and possible hair brushes.
Aspirin Bottle	Leaves and bark of willow trees found in the riparian areas were chewed to relieve headaches and pain. Today we know that the ingredients of aspirin are found in willow bark.
25 cent coin	The Kumeyaay did not use coins or money but traded resources such as salt (obtained from salt grass and pickleweed in the salt marsh) among other tribes.

### **Conclusion**

*The Kumeyaay had the same needs that we do today: food, clothing, medicine for pain and infection, trash build-up and found ways to live off the land using minimal resources. What are some of differences between the Kumeyaay's resources and the ones we use today? If relevant, bring in plastics and how it has replaced many natural objects and how it impacts the environment. What are the benefits and disadvantages of using plastic? It is important for us to remember not to be wasteful and protect vital resources.*

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## Station: Resource Bag

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<b>Purpose</b>	Learn the many ways the Kumeyaay used the resources of the Lagoon.
<b>Location</b>	Naturalist's Choice
<b>Duration</b>	10 minutes
<b>Materials / Props</b>	Lagoon objects placed in bag. See list of suggested objects in table below.

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### **Introduction**

*The Kumeyaay were excellent naturalists. They cared for our planet even while using just about everything in nature to help meet their needs. I have some items that I'm going to have you examine in just a moment.*

### **Activity**

**Pair students in teams of two. Take items out of bag and hand each pair of students an item. Take a moment to observe your item with your partner and think about the many ways it might have been used by the Kumeyaay. Once students have had at least 1-2 minutes to discuss among themselves, ask students to share the different ways they think their object was used by the Kumeyaay.**

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## Station: Resource Bag, *continued*

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**Table: Suggested items for the Kumeyaay Sensory Bag**

Object	Kumeyaay Uses
Stone	Large cobblestones were an important resource used to make manos (hand stones) to grind acorns and seeds, smaller stones were used to sharpen arrows.
Toy Lizard	Lizards are an important part of the food chain eaten by birds and many mammals in the lagoon, all important food sources for the Kumeyaay. The Kumeyaay sometimes even cooked and ate lizards.
Sea Shell	Shellfish and crabs were an important source of protein and were used for trade among other tribes living further inland.
Acorn	Acorns were the most important source of food from plants for the Kumeyaay.
Plant	Kumeyaay people relied on plants to meet their everyday needs: food, shelter, medicines, clothing and more.
Stick	Larger sticks were used to hunt rabbits and build homes, smaller ones were used for playing “board” games.

### **Conclusion**

*The Kumeyaay were familiar with the plants and animals of the lagoon, and they used this knowledge to help meet their everyday needs. Can you think of why it might be helpful for you to become familiar with some of the plants and animals of the Reserve? To avoid poisonous plants or animals, protect sensitive or endangered ones, remove invasive ones, attract birds and butterflies to home garden, etc.*

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## Vocabulary

**Introduction** The table below provides vocabulary that is relevant for the themed walk, “The Kumeyaay.”

Term	Definition
<b>Archaeology</b>	The scientific study of past cultures by looking very carefully at what has been left behind (the material remains or artifacts), such as tools, fireplaces or middens
<b>‘Ewaa</b>	A dome-shaped home
<b>Haawka</b>	(HOW-ka) Hello!
<b>Mano</b>	A hand-held stone for grinding nuts, seeds or grains
<b>Metate</b>	A flat stone or one with a slight depression (like a shallow bowl) for holding nuts, seeds or grains
<b>Midden</b>	An ancient trash mound; a place where prehistoric people tossed trash, such as shells or animal bones
<b>Natural resources</b>	Materials supplied by nature that aid or help someone live
<b>Olla</b>	A Spanish word for a pot with a wide bottom and a small neck used for food storage by the Kumeyaay
<b>Shawii</b>	A thick mush made from acorn flour
<b>Wetlands</b>	An area of land that is regularly wet or flooded



## THEME: Rhythms of Wetlands

**Overview** This section was developed to complement the teacher’s guide, *Rhythms of Wetlands*.

**Objectives** It is expected that visitors who participate in this program leave with the ability to:

- Describe coastal wetland characteristics
- Understand how the lagoon changes with the tides, seasons and wildlife migrations
- Appreciate the importance of wetlands to wildlife and humans
- Identify what individual students can do to help protect the health of the few wetlands that remain.

**Duration** Allow the following lengths of time for themed walk components:

- Welcome – 2 minutes
- Themed Walk Introduction – 10 minutes
- Safety Rules – 2 minutes
- Hike – 1 hour, 45 minutes
- Small group wrap-up – 5 to 7 minutes
- Large group wrap-up – 2 minutes

**Stations** The stations listed below may be included in the “Rhythms of Wetlands” walk.

Title	Location	Materials	Priority
Themed Walk Introduction	Lagoon Launch Pad	Wetland/Development cards, wetland cards from teacher’s guide	Required
Icebreaker	Naturalist’s Choice	Begin the walk with one of the icebreakers found on pages 156 to 161.	Required
Water Conservation	Lagoon Launch Pad	Set of 5 water jugs, plates, and containers of soil	Required
Permanent Watershed Model (See page 53)	Watershed Model	Spray bottles, sponge to be placed in “wetland”	Required
Migration	Pickleweed Point	Binoculars (Instructions on page 55)	Required

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**Theme: Rhythms of Wetlands, *continued***

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Title	Location	Materials	Priority
Magnifying Lenses (See page 34)	Naturalist's Choice	Magnifying Lenses	Recommended
Tides	Diving Duck Channel	Moon (inflated), bird photo cards (Snowy Egret and Osprey)	Recommended
Wetland Metaphors	Heron View Deck or Warbler Point	Bag with metaphor objects	Optional

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## Themed Walk Introduction

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**Overview** This section describes how to introduce the program, “Rhythms of Wetlands”, to students.

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**Location** Lagoon Launch Pad

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**Materials** Wetland/Development cards

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**Begin with General Welcome on page 20.** *Welcome to the San Elijo Lagoon. How is this place different or similar to your playground at school?*

### **Themed Walk Introduction**

*Why do you think we call the lagoon a wetland? A large part of it is covered with water most of the time. Turn to the person next to you and discuss whether you think the amount of water in the lagoon stays the same all the time or changes and why. It is always changing. Have you ever been to the beach and had to move your towel so the waves wouldn't get it wet? Sometimes while you are at the beach, the tide is getting higher, enough to get a towel wet.*

*On today's hike we will talk about why the tide is always changing, determine whether the tide is coming in or going out, and we'll discuss how that affects the different animals that live in the lagoon.*

### **Activity**

*The San Elijo Lagoon is called a Reserve because it is special and protected. Do you know why this area is protected? It's a home or resting place for many animals and birds who could not survive easily without it.*

*Just a few hundred years ago there were many wetlands along our California coast. Now nine out of ten have disappeared. Let's take a closer look at what happened to all of our wetlands, as more and more people moved into our beautiful state.*

**Invite 10 volunteers to the front. Hand them each a card with the Lagoon facing the audience. Make sure the person who has the lagoon on both sides is at the end of the line and will reveal her card last.**

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*Continued on next page*

## Themed Walk Introduction, *continued*

### **Activity**, *continued*

Ask each student who is holding a card to step forward one by one, state what the picture is on the back of the card and have him/her turn the card around.

**Continue until all ten cards have been flipped around.** *What has happened to our wetlands? Indicate the one card that has a wetland on it represents the 10% of remaining wetlands in SoCal.*

**Make sure to emphasize that development isn't always bad, as we enjoy and depend on what the cards revealed, but that it is important to find a balance, and to protect the few remaining wetlands.**

*During your walk, we will learn the many ways both humans and wildlife benefit from the wetlands.*

*With most of our Wetlands gone it is very important for each of us to help keep the few remaining ones, like San Elijo Lagoon, healthy. As we walk around our precious wetland, I want each of you to think of at least one specific thing you can do to help keep this Lagoon clean and healthy.*

*Before we divide into small groups, let's review some safety rules.*

**Discuss "Rules for the Trail" on page 21.**

**The teacher will divide students into smaller groups in preparation for the walk.**

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## Conclusion

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### **Small group wrap-up**

Refer to the description of the small group wrap-up activity in “Components of a Tour” on page 13.

*On today’s walk we discussed where the water in the Lagoon comes from, where it goes, and how the water level is changed by the ocean tides. We viewed some of the birds who live or visit here and we discussed some ways the Lagoon is important to both wildlife and us.*

Conclude the walk by selecting from the following wrap-up ideas:

- *Why it is so important to protect this lagoon and the other remaining wetlands along our coast?*
- *What are some of the things that our wetland provides to the birds, fish and other wildlife that live or visit here?*
- *Why do some birds migrate long distances to visit our lagoon in the winter?*
- *What does our lagoon offer these migrating birds?*
- *What are some of the things you can do every day to help keep our lagoon clean and healthy?*

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### **Large group wrap-up**

Refer to the description of the large group wrap-up activity in “Components of a Tour” on page 14.

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## Talking Points

<b>Overview</b>	Look for opportunities to engage students in lively discussions at various points along the trail, using ideas presented in this section.
<b>General discussion points</b>	Allow the kids to explore, observe, and note the uniqueness of the lagoon and how animals and humans benefit from its many functions. Note uniqueness of the season, and the effects of tides.
<b>Lagoon formation</b>	<p>Find a location where you have a good view of the lagoon. Roof top at Nature Center is good, or Mullet Overlook.</p> <ul style="list-style-type: none"> <li>▪ How was the lagoon formed? Look at elevated terrain surrounding the lagoon, and explain how a river carved it. The wetland originally was a bay, but over time sediment filled the lagoon, converting it from a bay to a wetland.</li> <li>▪ What shapes the lagoon? Ocean tides, sedimentation, erosion, runoff, wind, rain, human development all affect the shape. Talk about the importance of keeping the mouth of the lagoon open and how the lagoon is connected to and dependent upon ocean tides.</li> <li>▪ Where did all this water in our lagoon come from? Rain, snow, rivers, creeks, ocean tides, storm drains, sprinklers, etc.</li> <li>▪ What do we call the mixture of salt and fresh water that makes up the water in our lagoon? (Brackish)</li> </ul>
<b>Brief history of lagoon</b>	<ul style="list-style-type: none"> <li>▪ Used by a duck hunting club</li> <li>▪ Used as a sewer treatment plant</li> <li>▪ Used as trash dump by people</li> <li>▪ Prevented from becoming a housing development or a SeaWorld-type park by local citizens.</li> <li>▪ Co-owned and managed by County, State, and the Conservancy working together to preserve, enhance and protect the lagoon (for older groups only).</li> </ul>

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## Talking Points, *continued*

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### **Effect of tides on the lagoon**

- What are tides? The rise and fall of sea level or ocean's surface under the gravitational pull of the moon (predominantly) and the sun. Each day there will be 2 high tides and 2 low tides.
- Watch the movement of the water. Which way is it streaming? (be sure to observe a submerged item (kelp is good) – surface ripples may only reflect wind)
- Look at the mudflats and banks of the lagoon. Are there any mudflats exposed? Is the wet area high or low on the mudflat?
- The importance of tides for lagoon health:
  - regulates water temperature, prevents excessive heating
  - prevents loss of oxygen at night
  - prevents build up of detritus and pollutants (get washed out with tides)
  - Creates mudflat habitat, an important food source for shorebirds. Pickleweed cannot grow when covered with water more than 30% of the time.
  - mixes the layers of water, moving nutrients and oxygen around
  - Facilitates the exchange of marine and freshwater populations (many estuarine organisms cannot tolerate the extreme conditions that occur in non-tidal marshes)
- Which tide is more favorable for ducks? For shorebirds? Fish? What do birds and fish do to stay in the best water depth? What about animals on the bottom, such as crabs?

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### **Key functions of wetlands**

- Water being filtered on the way to the ocean (Where does it come from? Storm drains, runoff, people's lawns).
- Creating habitat for many animals (point out a nest, an animal trail going through the woods, scat, insects, diversity of birds, etc.)
- Breeding ground and/or habitat for commercially valuable fish and shellfish (Halibut, turbot, flounder, crabs, oysters, clams, shrimp).
- Food source for resident, migrating, and wintering birds. Where is all the food? Think of the mudflats as a buffet – we can't see most of the food, but the mudflats are stocked with all kinds of treats in the form of worms, crabs, fish, insect larvae, and detritus.

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## Talking Points, *continued*

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### Seasons and bird migration

- Each season of the year looks different at the lagoon. The water levels, plants and animals may all change over the course of a year. In particular, San Elijo Lagoon is an important habitat for birds.
- Discuss the Pacific Flyway and the seasonal migration of birds. Some types of birds stay here all year, but many do not. Some visit for just a day or a week or a few months. The lagoon is a safe place for them to rest, eat and congregate before they resume their migration.
- **Winter.** Cool, rainy. Storms add a lot of fresh water to the lagoon from creeks and runoff from the hillsides. This time of year brings early flowering plants and an abundance of migrating ducks and shorebirds.
- **Spring.** Cool, cloudy. Many migratory birds can be seen flying north to their feeding and nesting grounds. Some birds come to the lagoon to nest. Flowering plants attract an abundance of hummingbirds and insects.
- **Summer.** Warm, sunny, dry. The quietest time of the year at the lagoon for birds and flowering plants. Some plants at the lagoon dry up, lose their leaves and become dormant, storing valuable water in their root systems.
- **Fall.** Warm, dry. Water levels are usually at their low point. Many plants remain dormant until the rains return.

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### General Observations

- Compare different habitats of the lagoon – salt marsh, coastal sage scrub, riparian areas. Do the plants in these different plant communities look the same? Discuss adaptation of salt marsh plants vs. coastal sage plants. How do both these plant communities compare to riparian?
  - How are the birds that feed in the mudflats different from the birds that live in the trees or bushes around the lagoon? (Adaptations: webbed feet vs. perching feet, long legs vs. shorter legs, different types of bills).
  - Observe feeding habits of different shorebirds. How can so many birds feed side by side? (They aren't all eating the same food).
  - Some of the endangered species that rely on these habitats are Belding's Savannah sparrow and Light-footed Ridgway's Rail (salt marsh), Least Bell's vireo (riparian), California gnatcatcher (sage scrub).
  - Diversity of plant communities allows for diversity of animals
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## Station: Water Conservation

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<b>Purpose</b>	To learn the importance of conserving water and that each of us can make a difference in water conservation.
<b>Location</b>	Lagoon Launch Pad
<b>Duration</b>	10 minutes
<b>Materials / Props</b>	10 pitchers, 5 plates, 5 washing tubs, 5 scoops, 5 containers with dirt

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### **Preparation and Set-up**

**Set up five stations. At each station have two full water jugs, one plate, one container of dirt, and one tub. To make plate dirty, wet the plate and place one small scoop of dirt on the surface. Place plate in tub.**

### **Introduction**

*Let's see a show of hands of who has to do the dishes at home. It might seem kind of silly, but you are going to get to wash some dishes here. For those of you who are experienced dish washers, this will be an easy task.*

### **Activity**

- 1. Set up five stations. At each station have two full water jugs, one plate, one container of dirt, and one tub. To make plates dirty, wet the plate and place one small scoop of dirt on surface. Place plates in tub.**
- 2. Divide students into groups of two or more for each station.**
- 3. Students will complete two rounds. For the first round give students little to no instruction on how to clean their plates using the first pitcher. Holding their plates over the tubs, have students carefully wash all the dirt from their plates.**
- 4. For each group observe the amount of water used.**

*Let's see how you all did. These plates look really clean! How much water did you use to wash your plates? **Go through each group and compare how much water was used.***

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## Station: Water Conservation, *continued*

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*We live on a water planet, but water is precious and limited. Why? Most water is in the ocean, so it is saline, or too salty for us to use. Other sources of water are locked up in glaciers, or underground and not available to us. Does anyone remember how much freshwater is actually available to us for use? Not very much (3%). Can you imagine a day without water? What do you do every day that requires fresh water? Drink, keep things clean, grow our food, etc.*

*Who thinks they could wash their plate using less water? Let's try this activity again and see which group can use the least amount of water to wash their plate.*

- 1. Before getting started, ask each group discuss how they could use as little water as possible from the second pitcher (They could use their hands, the dirty water in the buckets, leaves off the ground, etc.).**
- 2. Make it a competition. The groups that use less water the second time win.**
- 3. Have students complete the second round. Afterwards have each group discuss their techniques for minimal water use.**

**Have students pour dirty water over plants and explain that the plants will use the water to grow and survive. We are able to dump this water on the plants because the dirt in it is natural. If we had chemicals in the water from something like dish soap, it would not be good for the plants because they are not adapted to consuming these unnatural chemicals. Ask one student from each group to refill their water jugs for the next group (using the water spigot on drinking fountain).**

### **Conclusion / Wrap-up**

**Discuss the importance of conserving water.**

*Why is it important to conserve water? So there is enough water for all living organisms on this planet. What are ways that each of us can conserve water? Taking shorter showers, turning off water when you brush your teeth, and using less water to wash your dishes, etc. Turn to the person next to you and tell them one thing you will do every day to use less water, and one thing you will do to help keep the environment clean?*

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## Station: Migration (supplement to binocular station)

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<b>Purpose</b>	Gain an understanding of why some birds migrate to the lagoon while some birds live here all year round. With the use of binoculars, identify both migratory and resident birds, as well as the habitats and foods they prefer.
<b>Location</b>	Pickleweed Point
<b>Duration</b>	15 to 20 minutes
<b>Materials / Props</b>	Binoculars, bird identification book  Picture board (or individual photos) of common SEL migratory and resident birds (For example, <b>Resident:</b> mallard, snowy egret, black phoebe, Belding's savannah sparrow, and double-crested cormorant; <b>Migrating:</b> whimbrel, willet, godwit, bufflehead, American widgeon).

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### **Introduction**

*Our lagoon serves as a home or resting place to many birds throughout the year. Some of the birds make our lagoon home throughout the year while others travel thousands of miles to spend their winters here. We call this long journey migration.*

*Turn to the person next to you and discuss why you think migrating birds fly thousands of miles from places like Alaska and Canada to spend their winters here, flying back when winter is over? It gets too cold and food not available to them in winter if they stay.*

### **Activity**

*We are going to review how to use binoculars to see birds near and far in our lagoon, identify their species, and decide if they are resident or migrating.*

**Pass out binoculars and review how-to-use instructions on page 55.**

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*continued on next page*

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## Station: Migration, *continued*

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**After everyone in the groups has demonstrated they can use their binoculars, organize the group into pairs.**

*Now, using our binoculars, we are ready to make some observations. Working together with your partner observe as many different birds as you can over the next five minutes. Once you locate a bird observe their beak, legs, size, color and try to guess what they might eat. Next look at the poster of resident and migrating birds on the bench, and try determine if they are always here (resident), or just visiting (migrant).*

**Each pair reports back to the group about their observations.** If students did not observe any birds have them discuss why and look for other organisms (fish, crabs, horned snails, etc.)

### **Conclusion**

*We learned that some birds travel really long distances to the lagoon. Turn to your partner and discuss what might happen if the birds arrived next year and the lagoon had been turned into an airport. Might look for another wetland, die. We learned that there are not that many wetlands left so it is important for us to protect the few remaining.*

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## Station: Tides

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**Purpose** To understand the rise and fall of the tides and how they influence different species of the lagoon.

**Note:** It is important to check the tide in advance. Use tide booklet provided or ShralpTide App.

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**Location** Diving Duck Channel

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**Duration** 5 to 10 minutes

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**Materials / Props** Moon (blow-up ball), laminated tidal animal sheets, specimens in jars

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### **Introduction**

*The look of the lagoon changes throughout each day with the rhythm of the tides. Look out across the lagoon and observe the water. Turn to the person next to you and discuss what you see. **Have students look at the mudflats and banks of the lagoon. Prompt them with the following questions:** Are there any mudflats exposed? Is the wet area high or low on the mudflat? Look closely and tell your partner what direction you think the water is moving. Why do you think that? **Ask a few students to share what they think with the entire group.***

*The water is always moving, either into the lagoon and away from the ocean or out to the ocean and away from the lagoon. **Ask students to point to where they think the ocean is to make sure they know.***

*What makes the water move? The tide. The tide makes the water level rise or fall. When there is a low tide, the water level falls and more mudflats are exposed. When there is a high tide, the water level rises and the mudflats disappear under water. There are two high tides and two low tides every day, so the water is constantly moving in and out of the lagoon.*

### **Activity**

*We are going to learn about how the tide works by pretending you are all the ocean water on earth. **Have the children stand in a circle and then link arms. Pretend this ball is the moon that you see in the sky. Does the real moon move at all? How does it move? Hold up the moon (beach ball) and turn it to display the moon.***

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## Station: Tides, *continued*

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*The tides are influenced by the gravitational pull of the sun and mostly the moon. For our demonstration today, we'll just look at the moon. As the earth rotates the moon travels through the sky and exerts a pull on the ocean water causing it to bulge. **Circle the children and have them all lean towards the moon as it passes near them and then go back to their original position as it moves away.***

*If the moon is here on this side of the "ocean" (our circle of students) where is all of the water leaning? So where do you think high tide is? Where do you think low tide is? **Stop walking so you can point out high and low tides. Repeat this step a few times around the circle while sharing the information below.***

*What is the force that the moon uses to pull the water? Gravity The Earth also has gravity, which pulls the water down, just like it keeps us on earth and prevents us from floating through the air. The Earth is much larger than the moon so it has much more gravitational force or pull than the moon. That is why the water only lifts and moves a little when the moon moves, producing tidal changes.*

*Rising tides bring in plants, algae and animals from the ocean, which serve as food for lagoon inhabitants. Falling tides can flush out these and other organisms. The tides help new water flow in and out of the lagoon, helping keep the area clean and healthy.*

*Tides also affect the feeding times of birds. Some birds feed on food they find in relatively deep water, some in very shallow water and some in the mudflats near the water,*

**Pass out pictures of an Osprey, Mallard Duck, Willet and Snowy Egret to each pair of students and have them discuss when the bird might prefer to feed - at low tide, high tide or any tide. (You can give hints as to what each bird prefers to eat.) Additional questions for pair sharing:**

- *What kinds of food do you think is available in the water? (fish, plankton and algae)*
- *What kinds of food are available in the mudflats?(crabs, worms, snails)*
- *What physical features do birds feeding in the mudflats need to capture their food?*

**Have each pair share with the group what they conclude.**

### **Conclusion / Wrap-up**

*The lagoon experiences changing water levels during high and low tide. The plants and animals that live in the salt marsh are adapted to these changing conditions. The tides help new water flow in and out of the lagoon, helping keep the area clean and healthy. Tides are extremely important for helping keep the lagoon healthy and clean. Turn to the person next to you and share one thing you could do to help keep the lagoon clean.*

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## Station: Wetland Metaphors

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**Purpose** To understand the many different functions of wetlands and the important role they play in benefitting both wildlife and humans.

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**Location** Heron View Deck

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**Duration** 10 minutes

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**Materials / Props** Bag with metaphor objects

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### **Introduction**

*I have a bag here filled with objects. Each one is serving as a metaphor, or a suggestion of a particular wetland function.*

### **Before you continue, make sure students know the meaning of a metaphor.**

(comparison between two unlike things that have something important in common)

### **Give examples:**

1. *The sun is a blanket. We are comparing the sun to a blanket; they both help keep us warm.*
2. *The wetland is a sponge. We are comparing a wetland to a sponge, they both absorb water.*

### **Activity**

*In just a minute I am going to hand each team of two an object from my bag. Think hard about what your object has in common with the wetland. You will be asked to share your ideas with the rest of the group*

**Take out one object at a time and hand it to each pair of students in your group.**

**One by one, ask each pair of students to name the object and explain how the object could represent what a wetland is or does.**

*When I call on you, please name the object and what function it represents.*

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*continued on next page*

## Station: Wetland Metaphors, *continued*

### **Activity,** *continued*

You may consider modeling one of the harder objects (cereal box) to get things started. The table below shows a suggested list, but additional objects may be added as desired.

#	Object	Value of Wetlands
1	Cereal box	Provides nutrient-rich food for wildlife and humans
2	Crib	Provides a nursery that shelters, protects, and feeds young wildlife
3	Pillow	Provides a resting place for migratory birds
4	Sponge	Absorbs excess water caused by runoff (prevents flooding)
5	Strainer	Strains and filters debris from runoff water
6	Whisk	Mixes nutrients and oxygen into water and mixes fresh and salt water
7	Wooden house	Provides a home for wildlife
8	Zoo	Habitat for diverse wildlife

### **Conclusion / Wrap-up**

*Humans and wildlife benefit from the many functions wetlands provide.*

**Recap some of the functions listed above to reiterate the importance of protecting our wetlands and keeping them clean. Turn to the person next to you and discuss how this area might be different if the wetland was not protected.**

## Vocabulary

**Introduction** The table below provides vocabulary that is relevant for the themed walk, “Rhythms of Wetlands.”

Term	Definition
<b>Algae</b>	Tiny, sometimes microscopic, plant-like organisms that serve as food for many animals, including those in the lagoon (plural, algae; singular, alga)
<b>Brackish</b>	A mixture of fresh water and salt water
<b>Ecosystem</b>	All the living and nonliving things that interact in an area
<b>Environment</b>	Everything living and nonliving that surrounds and affects an organism
<b>Estuary</b>	A place where fresh water from rivers meets salt water from the ocean
<b>Gravitational</b>	Pertaining to gravity, that is, the force of attraction between masses, such as the gravitational pull of Earth on the moon or the moon on the Earth
<b>Habitat</b>	A specific type of environment inhabited by a particular organism
<b>Invertebrate</b>	An animal without a backbone or vertebral column
<b>Lagoon</b>	A body of water cut off from another larger body of water by sand, coral or reef
<b>Marsh, fresh</b>	A type of wetland with grassy or grass-like vegetation dominating
<b>Marsh, salt</b>	A type of wetland with low lying salt-tolerant pickleweed dominating
<b>Migrant</b>	An animal that lives in different places, moving (often with the seasons) from one region to another; one that migrates
<b>Migratory</b>	Migrating from place to place, such as a migratory bird
<b>Mudflat</b>	An area of mud and other fine sediment (see definition below) that’s part of a coastal wetland, which is often exposed during low tides and covered during high tides
<b>Resident</b>	An animal that lives in the same place throughout the year
<b>Riparian</b>	A type of wetland near or along the banks of a river, stream or lake
<b>Sediment</b>	Sand, particles of rock, bits of soil and remains of once-living things that can move with a fluid and are eventually deposited
<b>Species</b>	A group of the same type of living things that can mate and produce with other living things of the same kind
<b>Tidal</b>	Of or relating to tides
<b>Tides</b>	The periodic rise and fall of sea level or ocean’s surface under the gravitational pull of the moon (predominantly) and the sun
<b>Upland</b>	Area of land that’s higher than the surroundings, such as hills
<b>Wetland</b>	An area that is covered by water during all or some part of the year



## THEME: Watersheds and Water Resources

**Introduction** This section was developed to complement the teacher’s guide, *Watersheds and Water Resources*.

**Objectives** It is expected that visitors who participate in the themed walk will leave with an:

- awareness of how precious fresh water is.
- awareness that the lagoon helps clean the water that flows through it, and provides many other functions, including habitats for wildlife.
- understanding of their own role in keeping the water that flows to the San Elijo Lagoon and Pacific Ocean clean.
- understanding that water is a limited resource and the importance of not being wasteful when using water.

**Duration** Allow the following lengths of time for themed walk components:

- Welcome – 2 minutes
- Themed Walk Introduction – 10 minutes
- Safety Rules – 2 minutes
- Hike – 1 hour 45 minutes
- Small group wrap-up – 5 to 7 minutes
- Large group wrap-up – 2 minutes

**Stations** The stations listed below may be included in the “Watersheds and Water Resources” walk.

Title	Location	Materials	Priority
Themed Walk Introduction	Lagoon Launch Pad	Watershed bin: globe, gallon jug, ½ cup, eye dropper, items for From Stream to Sea.	Required
Icebreaker	Naturalist’s Choice	Begin the walk with one of the icebreakers found on pages 156 to 161.	Required
Water Conservation (See page 113)	Lagoon Launch Pad	Set of 5 water jugs, plates and containers of soil	Required
Permanent Watershed Model (See page 53)	Watershed Model	Spray bottles, sponge to be placed in “wetland”	Required

*Continued on next page*

## Watersheds and Water Resources, *continued*

**Table: Watersheds & Water Resources, *continued***

Title	Location	Materials	Priority
Binoculars (See page 55)	Pickleweed Point	Binoculars	Required
Storm Drain	Parking lot or street	No materials needed	Recommended
Microscope	Nature Center Upper Deck	Four microscopes, slides, penny (in envelope in pocket of one of the scopes), “What you can’t see” poster, water sample containing plankton	Recommended
What’s in the Water?	Raccoon Bridge	Net, bucket, three pie tins, magnifying lenses, pictures of phytoplankton and zooplankton	Recommended
Run-off Race	Dabbling Duck Den	Run-off race boards; 2 empty Tupperware containers; 2 containers filled with water, sediment and plant material; container for clean water, 3 sedimentation bottles	Recommended
Wetland Metaphors (See page 119)	Heron View Deck	Metaphor Bag filled with objects such as sponge, soap, binoculars, bird house, etc.	Optional
Torrey Pine	Any Torrey Pine on outer loop trail	Small water-filled spray bottle; Torrey Pine needle groups and a pine cone (gathered at the tree); Torrey Pine seeds (optional, available in the shed)	Optional

## Themed Walk Introduction

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<b>Overview</b>	This section describes how to introduce the program, “Watersheds and Water Resources,” to students.
<b>Location</b>	Lagoon Launch Pad
<b>Materials</b>	Globe, gallon jug, eye dropper, teaspoon, watershed cups, watershed location signs, watering can, filter, liquid soap, and set-up description

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**Begin with General Welcome on page 20.** *Welcome to the San Elijo Lagoon. How is this place different or similar to your playground at school?*

### **Introduction**

*On today’s hike we are going to talk about how important it is for us to both conserve the water we use and to help keep the water that flows into our lagoon and ocean clean for the plants and animals that need it to survive.*

### **Conserving Water Activity**

**Hold up the globe.** *What does the blue color represent? Water. If most of our earth is covered by water, why is the water we use so precious? Accept all reasonable answers. Most water on our planet is in the ocean, so it is too salty for us to use. A lot of the fresh water is locked up in glaciers, or underground and not available to us.*

*Let’s demonstrate how little freshwater is available to us compared to all the water on our planet.*

**Hold up the full jug of water.** *This jug of water represents all the water on our planet. Use eye dropper to squeeze out 7 drops onto a teaspoon. Hold up the teaspoon and show students, then turnover and let water drip on ground. Those 7 drops represents the freshwater that is available to us relative to all the water we have on the planet. .*

*As we just demonstrated, even though we live on a water planet (Point to globe again.), there is very little freshwater that is actually available to us. Since there is so little usable water and especially because we are living through a draught with very little rain, it is important for us to conserve it. In a fun activity later, we will talk about things you can do every day to conserve water.*

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*continued on next page*

## Themed Walk Introduction, *continued*

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### **Watershed Activity**

*Now let's talk about water in our lagoon and where it comes from. Can anyone tell me if the water in the San Elijo Lagoon is fresh water or salt water? It is both.*

*Where does the salt water come from? The ocean.*

*Where does the fresh water come from? Lakes, streams, run-off from rain, watering lawns, washing cars, etc.*

*All the area that eventually drains water into our Lagoon is called the **Escondido Creek Watershed**. Let's take a look at the Escondido Creek Watershed, where some of you may live, and see how water is connected throughout it as it drains and flows to our lagoon.*

**Call up 6 volunteers. Have each student hold a cup and matching watershed location sign in the respective order.** Lake Wohlford #1, Dixon Lake #2, Escondido #3, Elfin Forest #4, San Elijo Lagoon #5, Ocean #6.

*What is happening in the first picture of Lake Wohlford? It's raining on the mountains. Should I make it rain? YES!*

**Pour water into Student #1's cup from the watering can. Fill it about  $\frac{3}{4}$  full (so it doesn't spill as items are added down the line). The cup should cloud up with the dirt & trash.**

*Where do you think the dirt came from? It is sediment being washed down by the rain.*

**Next, instruct Student #1 to pour the dirty water from Cup #1, Lake Wohlford, into the cup held by Student #2. Water has flowed to Dixon Lake. Sediment and trash has washed down from Lake Wohlford into Dixon Lake.**

**Have Student #2 pour what is in Cup #2, Dixon Lake, into the cup held by Student #3. The water has flowed to Escondido and has picked up more pieces of plastic or trash. How did the plastic/trash get there?**

**Have Student #3 pour what is in Cup #3, Escondido, into the cup held by Student #4. The water has reached Elfin Forest. Here, there are trees overhead and people enjoying the nature trails. As Escondido Creek bubbles along, what has the water picked up this time? Grass, leaves, and trash.**

**Have Student #4 pour what is in Cup #4, Elfin Forest, into the cup held by Student #5. This is San Elijo Lagoon. Here we can see a little fish. What might happen to this fish now that there is trash in the water?**

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*continued on next page*

## Themed Walk Introduction, *continued*

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**Pour some liquid soap into Cup #5, San Elijo Lagoon.** *I'm pouring some pollution into the Lagoon. Turn to the person next to you and discuss how oil and soap might get washed into the watershed? How might this affect organisms in the water?*

*We already know that some of the water in the lagoon comes from the ocean tides. Let's add some water from the ocean to the lagoon.*

**Pour some water from the ocean bowl into Cup #5, San Elijo Lagoon.**

**Hold a small strainer under Cup #5, instruct student to pour Cup #5 through the strainer into Cup #6 (make sure some trash items are poured around the strainer into the ocean. Finally, the water that started at Lake Wohlford has reached the ocean. Ask volunteers 5 & 6 to share what items they see in the ocean & strainer.** Dirt, trash, plastic, plant matter, and a fish. *Turn to the person next to you and discuss why I placed a strainer in between the lagoon and the ocean. The lagoon acts as a filter to filter out pollutants before entering the ocean.*

### **Conclusion/Wrap-up**

*What are some ways we can prevent these pollutants from getting into our watershed, into our lagoon, and into the ocean? Today on our walk we will talk more about how water travels from the mountains, lakes, streams, and city streets to our lagoon and ocean; about the things that happen along the way; and how we can help keep the water clean.*

**Discuss “Rules for the Trail”, page 21.**

**Have the teacher divide students into smaller groups in preparation for the walk.**

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## Conclusion

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### **Small group wrap-up**

Refer to the description of the small group wrap-up activity in “Components of a Tour” on page 13.

Select from the following questions and ideas to trigger discussion:

- What did you learn about where the water in the lagoon comes from?
- Why is it important to keep the water in the lagoon clean?
- Turn to the person next to you and share what you can do to help protect the watershed and keep our water clean.
- What are some ways you can conserve water at home?

Thank the students for coming and encourage them to come back. Remind them that we are all responsible for keeping our waters clean and we can all do our part to help make a difference.

**Challenge students do one thing every day to conserve water.**

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### **Large group wrap-up**

Refer to the description of the large group wrap-up activity in “Components of a Tour” on page 14.

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## Station: Storm Drain

<b>Purpose</b>	To increase awareness of storm drains and the importance of keeping pollutants from entering them.
<b>Location</b>	Storm drain in parking lot or large culvert drain outside parking lot
<b>Duration</b>	10 minutes
<b>Materials / Props</b>	None

### **Walk and Talk Questions**

As you approach the storm drain, use the “[Walk & Talk](http://beetlesproject.org)” technique (beetlesproject.org). Suggested questions to pose on the way to the storm drain:

- *What are some ways you use water at home?* Drink, brush teeth, shower, wash car
- *Can you think of other ways water is used that benefit you even if you don't use the water yourself?* generating electricity, watering crops
- *Where does the water we use at home come from?* local reservoirs, Colorado River, Northern California
- *Where does the water you use go after it leaves your home?* Sewer
- *Where does the water from washing your car or watering your lawn go?* into the storm drain

**Once you arrive at the storm drain, ask students to share something they discussed.**

### **Introduction/Activity**

**Point to the storm drain and pose the following questions:**

- *Does anyone know what this is?* Storm Drain.
- *Have you seen them in your neighborhood, or near your school? Turn to the person next to you and discuss what storm drains are used for?* Built to collect water so streets do not flood.
- *What do you think might get carried?* Rainwater, dirt, trash, oil and pet waste.
- *Where does it end up?* Flows to the wetland and out to the ocean.

*continued on next page*

## Station: Storm Drain, *continued*

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**Continue to observe other things besides water that might flow to the wetland from the storm drain and how it got there. Explain that the water that flows into the storm drain, unlike our sewer system, is not filtered or cleaned in any way before it reaches the lagoon.**

### **Conclusion**

*Why do you think it is important to keep the area around the storm drain clean? Pollution gets washed to the lagoon and ocean*

*Turn to the person next to you and discuss something you could do at home or at school to prevent pollution from reaching our storm drains. Not litter, pick up trash, educate others about where storm drain water goes*

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## Station: Microscope

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**Purpose** To learn about some microorganisms that live in the water, and just like us, depend on clean water to survive.

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**Location** Classroom

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**Duration** 10 minutes

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**Materials** Four microscopes, slides, penny (in envelope in pocket of one of the scopes), “What you can’t see” poster, water sample containing plankton

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### **Introduction**

*As we have learned, the lagoon helps clean the water that flows through it and also provides nutrients for the plants and animals that live in it. Turn to the person next to you and discuss how the lagoon helps keep the water clean. Filters and absorbs pollutants. There are many tiny organisms living in the water that we cannot see with our unaided eyes or even with a magnifying lens. Some of these organisms are tiny **plants**, called **phytoplankton**, and some are tiny **animals**, called **zooplankton**. We are going to use microscopes to look at some of these organisms. Raise your hand if you have ever used a microscope before. OK. Good.*

*Before we get started, I need you to follow a few rules. The microscopes are all set for you to use. **Please do not touch them.** You will be looking at the organisms on a little piece of glass called a slide. **Please do not touch the slide.** To help you remember this, you will put one hand behind your back and use the other hand to close one eye. You look in the microscope with only one eye. Any questions about that? OK. Great.*

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*Continued on next page*

## Station: Microscope, *continued*

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### **Activity**

*Before you look at the organisms I'm going to have you look at a penny. Who thinks they know exactly what a penny looks like? OK, we'll see!*

- 1. Have students line up behind the first scope with the penny.** *I want you to first look at the penny and then move along and look at the other slides. When you have seen all the slides, have a look at the posters and you may quietly compare them to what you saw. Any questions? OK. Let's go! Remember we don't touch the scope or the slide.*
- 2. Each student looks at the penny and moves along to the next scope. As students finish, they may look at the poster display of phytoplankton and zooplankton and quietly discuss what they saw in the slides.\***

**Engage students with the following questions by having them pair share with the person next to them.**

- 1. What did you see on the penny? Were you surprised? Abraham Lincoln*
- 2. What are some ways these organisms use water? They live in it, and use the currents to drift and move.*
- 3. What role do these organisms play in the ecosystem, or why should we care whether or not they exist if they are so tiny? Essential component of aquatic food chain. Did you know some whales feed exclusively on these tiny organisms? But many fish and birds feed on them as well.*
- 4. What might happen to microorganisms if the water is polluted, or too muddy? Threaten survival.*
- 5. Does the microorganism remind you of anything?*

**\*Note: The slides and the samples on the poster have been stained with color to make it easier to see the organisms.**

### **Conclusion / Wrap-up**

*Things we cannot see with our unaided eye such as phytoplankton and zooplankton are an important source of food for animals that live in the lagoon. They also help keep the water of the lagoon clean by eating tiny pollution particles. Turn to the person next to you and discuss what might happen if there were a lot of pollution in the water? Microorganisms will die leading to increased pollution and decrease of other animals.*

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## Station: What's in the Water?

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**Purpose** To demonstrate one way scientists collect microscopic organisms from the water and to instill the understanding that there are many organisms in the water that we cannot see, but they tell us a lot about the health of the ecosystem.

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**Location** Raccoon Bridge

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**Duration** 10 to 15 minutes

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**Materials / Props** Demonstration Net (Tie to bridge), bucket, three pie tins, magnifying lenses, pictures of phytoplankton and zooplankton

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### **Introduction**

*I am going to show you an object. Who can tell me what it might be used for?*

**Accept any reasonable answers.** *It is a net that scientists use to collect microscopic organisms from the water. There are many ways to check the health of the wetland. This is a way to monitor the water by studying the organism we cannot see. The captured water is released into a container and taken to the lab. Samples are put onto microscope slides and then studied to determine what is in the water. Turn to the person next to you and discuss what you think we can learn by studying water? Who lives there, pollutants, etc.*

*What are some animals that live in the water? Fish, rays, slugs, etc. Why can't we see all the organisms that inhabit the water channel? Some are too small to see. Does anyone know what plankton is? **Show photos of zooplankton and phytoplankton.** What are some tools that we might use to help us detect organisms in the water? Microscopes, hand lenses.*

*Let's look at the water. Describe what you see to your partner. Murky, shallow, fish, etc. What might cause the water to be muddy? Runoff, tidal movement, rain storm. Does it matter to the animals if the water is muddy or clear? Why, how might that affect them? Phytoplankton are plants, so they need the sunlight to photosynthesize. Many other animals are filter feeders with gills that could get clogged with sediment.*

*We are going to collect a water sample and observe the water using magnifying lenses. **Make a connection to the microscope activity. If the students have not yet been to the station, mention that they will get a chance to see tiny organisms through a microscope. If they have already been to the station, ask them if they remember how they had to use a microscope to see the tiny organisms on the slides. Turn to the person next to you and discuss what kinds of things you might be able to see in the water without using a microscope. Have groups share. They will now observe and discover for themselves.***

## Station: What's in the Water? *continued*

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### **Activity**

*Can anyone tell me why we would want to know what is in the water? One reason would be to keep records so that if harmful organisms appear, appropriate action can be taken. This way we know the water is safe for all the animals and plants that live in it or drink it. **Hang the bucket over the bridge to demonstrate how biologists might scoop water to take samples to see what is in the water. Typically, scientists will collect samples from a boat by dragging the net behind.***

*Okay, let's do an experiment! We're going to actually look at the water with magnifying lenses and observe what we see. Maybe we can even catch a fish or a crab!*

**Collect water in the bucket and pour into the three pie tins. Set the tins on the dirt just south of the bridge and split students into three groups. Have students get down on their knees and observe the water with their eyes before giving them magnifying lenses to look for signs of life.**

### **Conclusion / Wrap-up**

*Discuss in your group what you observed in the water sample. Would it look different under a microscope? Explain. Were your original predictions correct? **Have each sub-group share with the entire group.** Some of the very small plants and animals in the water that you can't see with your naked eye can give us clues about the health of the water.*

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## Station: Run-off Race

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<b>Purpose</b>	The purpose of this activity is to help students understand how wetlands help remove sediments and pollutants from run-off water before it reaches the lagoon and ocean.
<b>Location</b>	Dabbling Duck Den
<b>Duration</b>	10 minutes
<b>Materials</b>	Run-off race boards (one vegetated, one bare), 2 empty Tupperware containers, 2 water containers with sediment and plant material, water container with clean water, and 3 sedimentation bottles

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### **Introduction**

*We are going to do an activity that will demonstrate what happens to run-off water using different types of surfaces, a hard surface like a paved road and a vegetated surface. Runoff water is water that doesn't soak into the soil, but rather runs off the land into storm drains, creeks, rivers, etc.*

**Note: Two activities are provided below for “Station: Run-off Race.” If there isn't enough time to do both, it is recommended that you do Activity #1.**

### **Activity #1 (recommended)**

*We are going to do an experiment to compare the impact of how two different surfaces affect water flow and water quality.*

- 1. Look at the two boards. What is the difference between them?  
One is plain and one is covered with grass and plants.*
- 2. What do you think the two boards represent in real hillsides or areas?  
The plain one might represent a road, while the other one would have planted grass or shrubs.*
- 3. I have two containers here that represent run-off water filled with sediments, plant materials, and pollutants.*

**At this time choose two attentive students to come and stand behind the bench and face the rest of the group.**

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*continued on next page*

## Station: Run-off Race, *continued*

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4. *In just a minute, I am going to give \_\_\_\_\_ and \_\_\_\_\_ (Name the two students you chose.) a sediment filled container and I am going to ask them to SLOWLY pour the run-off down each ramp.*
5. *Turn to the person next to you and discuss what you think is going to happen? The water will just slide quickly down the plain ramp, while the vegetated ramp will slow the water and catch a lot of the sediments.*
6. *What prediction can you make about the condition of the water at the bottom of each ramp? The water at the bottom of the vegetated ramp will be cleaner. The other one will stay the same.*
7. *Let's all watch carefully to see if our predictions are accurate.*

**Hand the two students behind the bench the sediment-filled containers. Remind them to slowly pour about half of their containers down each ramp. Once water has been poured, have students evaluate the water quality at the bottom of each ramp.**

*Which water is cleaner? Is that what you expected to happen? Why?  
How would the cloudy/polluted water affect some of the lagoon plants or animals?  
What can we do to keep pollutants out of the run-off water in our watershed?*

**NOTE: Pour water back into containers for next group.**

### **Activity #2 (optional)**

*Let's observe how different pollutants and sediments settle in the water. Pretend that we live on top of those hills across the lagoon. Those hills are part of the Escondido Creek Watershed. We wake up one morning and it is raining very hard. Water is pouring off of our house and running down the street like a stream. The ground has absorbed so much water that it cannot hold any more. Does anyone know what we call the water running down the street? Run-off water Where will that flow eventually go? Streams, creeks, down culverts, along curbs and into the lagoon before reaching the ocean If there is debris, trash, plastic bags, oil from cars, any pollutants in the run-off water what happens to it? Eventually it flows into the lagoon*

*What happens to the water when it enters the lagoon? Slows down and spreads out into the water channels. When it slows down many of the pollutants settle out or sink to the bottom of the channel along with the soil, sand, and mud. We call that sediment. What happens to the trash that was carried along by the rushing water? Who suffers if the pollutants make it to the lagoon and settle to the bottom? Does all trash weigh the same? Does a plastic bag weigh the same as a rock or dead leaf? So which items/particles do you think will settle out first? Larger, smaller, lighter or heavier? Let's find out!*

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## Station: Run-off Race, *continued*

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Split students into three groups, hand each group a bottle filled with water and sediments (mixture of sand, small rocks, sticks, mud, etc.) Instruct each group to shake their bottle and discuss what is happening. Prompt students with the following discussion questions:

- *Which items/particles do you think will settle out first? Larger, smaller, lighter or heavier?*
- *How about the trash pieces, does all trash weigh the same? Does a plastic piece weigh the same as a rock or dead leaf?*
- *Who suffers if the pollutants make it to the lagoon and settle to the bottom?*

### **Conclusion / Wrap-up**

*Look over across the lagoon at the hillside. See all of those homes? Think about when those people wash their cars with soap or fertilize their lawns and then water them.*

*Now think about that water coming down the hill and through our wetland and out into the ocean!*

*What would happen if this area was all paved over?*

The run-off water and its pollutants would go straight into the ocean.

*How does this lagoon help keep our ocean clean?*

Our lagoon helps filter out sediments and pollutants from run-off water before it reaches the ocean.

*Yes, our wetland is a filter that helps keep our oceans clean!*

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## Station: Torrey Pine

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<b>Purpose</b>	To encourage students to use their observation skills and to gain an understanding of a unique adaptation that allows the Torrey Pine tree to live in areas with low rainfall.
<b>Location</b>	Any of the large Torrey Pines on the Outer Loop Trail
<b>Duration</b>	5 to 10 minutes
<b>Materials / Props</b>	Small, water-filled spray bottle; Torrey Pine needle groups and a pine cone (gathered at the tree); Torrey Pine seeds (optional, available in shed)

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As you approach the Torrey Pine, use the “[Walk & Talk](http://beetlesproject.org)” technique (beetlesproject.org).  
Suggested questions:

- *Do you have a favorite tree? If yes, describe it.*
- *Why are trees important? Provide food, homes, shade, paper, oxygen*
- *Who lives in trees? Birds, insects, mammals*
- *What do trees need to survive? Sun, soil air, water*
- *How do trees get their water? ground, roots, rain*

### **Introduction**

*Take a close look at this tree. What do you notice? bark, leaves, color, texture, size, etc.  
This is a very rare Torrey Pine that only grows in two places in the worlds: here in north San Diego County near the ocean and on an island off the coast of Santa Barbara. It is endangered and there are only a few thousand trees left in these places.*

*Because San Diego doesn't get very much rain, this tree has a special adaptation that allows it to capture the little water we do get. Let's see how it does that.*

### **Activity**

*What is the difference between the temperatures/weather near the ocean and the temperatures/weather of inland communities like Escondido (if the students are from there)? It's cooler and often times foggy. Let's see how fog provides the Torrey Pine with water to “drink.”*

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*continued on next page*

## Station: Torrey Pine, *continued*

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**Hand out a needle group, called a fascicle (FA-sicle), to each pair of students.**

*How many needles do you see on each group? Five. Did you know that very few pine trees have 5 needles in a group? Typically you will have only 3 or 4 needles, so that is one way to help you identify the Torrey Pine tree and compare it with pines in your yard or neighborhood. Look closely. What do you notice about each needle shape? Key observations: long, triangular, groove down the sides of the needle. What do you think might happen if water in the foggy ocean air would land on these needles? Take answers. We are going to do a little experiment to find out!*

**Hold a fascicle in your fingers for the students to see, and then spray a mist to thoroughly cover all the needles.** *What do you see happening? The needles are collecting the water mist and drops are forming and running down the grooves of the needles. Where would these water drops fall? To the ground below the tree where the roots are. The needles are an adaptation of the Torrey Pine that enables it to get water to its roots all year round. You could think of the needles being like a tube that carries the water from the air to the roots.*

**Have the students grasp the fascicle in one hand and, holding their fingers together on the other hand, run them from the bottom to the top of the needles pressing the needles together as they do.** *As you can see and feel, the needles actually fit together perfectly to form a tube or cylinder. This is part of the adaptation that makes sure the water from the air (fog) gets all the way to the bottom of the needle group.*

### **Conclusion / Wrap-up**

*Torrey Pine, a rare and unique native tree has adapted to live in an environment without much water. What did you learn earlier about how much fresh water is available to us? Not much, most is salt or trapped in glaciers or underground. Since there is not much water available it is extremely important to conserve water and keep the little fresh water we have available clean. Turn to the person next to you and tell them one thing you will do every day to use less water, and one thing you will do to help keep the environment clean?*

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## Vocabulary

**Introduction** The table below provides vocabulary that is relevant for the themed walk, “Watersheds and Water Resources.”

<b>Term</b>	<b>Definition</b>
<b>Aqueduct</b>	A large channel or pipe that carries water over a long distance
<b>Decompose</b>	The process of breaking down the remains of dead organisms into simpler forms of matter, to decay or rot
<b>Delta</b>	A landform usually near the mouth of a river where soil or sediment is deposited making a broad, shallow fan-shaped area
<b>Environment</b>	All the living and non-living things that surround and affect an organism
<b>Erosion</b>	The process by which wind, water, or other means wears away land
<b>Estuary</b>	A place where fresh water from rivers meets salt water from the ocean
<b>Fertilizer</b>	Organic or inorganic material added to soil to supply nutrients for plant growth
<b>Freshwater marsh</b>	A type of wetland in or near fresh water where mostly grassy or grass-like plants grow
<b>Habitat</b>	A specific type of environment inhabited by particular animal and/or plant species; a place where an animal or plant lives
<b>Invertebrate</b>	An animal without a backbone or vertebral column
<b>Lagoon</b>	A body of water cut off from another larger body of water by sand, coral, or reef
<b>Mudflat</b>	An area of mud and other fine sediment that’s part of a coastal wetland, which is often exposed during low tides and covered during high tides
<b>Nutrient</b>	A substance that living things need to live and grow
<b>Organism</b>	A living thing, such as an animal, plant, alga, bacterium, or fungus
<b>Pesticide</b>	A substance used to kill harmful or undesirable plants or animals
<b>Pollutant</b>	Something, such as chemicals or garbage, that pollutes
<b>Pollution</b>	A substance, usually produced by humans, that causes harm to a natural environment. Pollution comes from a variety of sources, which can be easy or difficult to pinpoint. If the source is known, such as a power plant, it is called point source pollution. If the source is unknown, such as runoff from streets or fields, it is called non-point source pollution.
<b>Reservoir</b>	A place where something is collected and stored, in this case, water in an artificial lake

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## Vocabulary, *continued*

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Term	Definition
<b>Riparian</b>	A type of wetland habitat near or along the banks of a river, stream, or lake
<b>Salt Marsh</b>	A type of wetland dominated by low-lying salt-tolerant pickleweed
<b>Sediment</b>	Sand, particles of rock, bits of soil, and remains of once-living organisms that move with a fluid and are eventually deposited
<b>Species</b>	A group of the same type of living organisms that can mate and produce (reproduce) other living organisms of the same kind
<b>Watershed</b>	An area of land that drains rain falling onto it or water running through it into a common body of water, such as a creek or stream; which flows into a larger body of water, such as a river, lake, or estuary, and eventually flows to the ocean
<b>Wetland</b>	An area that is covered by water during all or some part of the year

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## THEME: Watershed Biodiversity

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**Introduction** This section was developed to complement the teacher’s guide, *Watershed Biodiversity*. The program is structured around an all-day field trip to three locations within the watershed. The overall goal is to connect middle-school students with their local watershed and get them involved in conservation actions to protect it.

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**Objectives** It is expected that visitors who participate in the program will:

- understand that they live in a watershed, what it is, how it works, and its relevance to their lives
- connect to and appreciate their watershed
- explore and experience the biodiversity of a watershed through observations
- assess the health of the watershed and understand watershed ecosystem service
- commit to watershed conservation and encourage others to do the same.

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**Materials, all sites** Site-specific material will be listed in the appropriate section within this chapter. The following materials will be used at all sites on the field trip:

- student notebooks
- student worksheets (included in student notebooks – Bring extra!)

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**Making observations** Every good scientist is a good observer. Students will be asked to describe what they see using words, drawings, and photos. At every stop they will enter field notes in their student worksheet. These may include the following:

- Animals: what kind? how many? where were they? behavior?
- Plants: location? in bloom? adaptations?
- Water: color, movement, fresh, salty, source
- Human impacts: trash, erosion, sound, housing roads, trails, other

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## **THEME: Watershed Biodiversity, *continued***

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### **Schedule**

Three stops are included in the field trip, as shown in the table below.

<b>#</b>	<b>Duration*</b>	<b>Location</b>
Stop 1	8:30 to 9:00am	Harmony/Howard Street Bridge
Stop 2	9:15 to 11:00am	Elfin Forest
Stop 3	11:45 to 1:30pm	San Elijo Lagoon Nature Center

\*The times shown above are approximate. Exact times will be communicated prior to each walk. Stop 3 includes a 30 minute lunch break.

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## Stop 1: Harmony/Howard Street Bridge

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**Purpose** Students will learn that the cement-lined draining ditch used to be a creek that was channelized because of concerns of flooding. They will understand that pollutants from nearby homes, schools and businesses can get washed into storm drains and pollute our creeks and streams.

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**Duration** 8:30 to 9:00am

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**Materials / Props** gloves, trash bags, hand sanitizer, orange vests, pictures of animals and plastic trash

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### **Introduction**

**Interesting background for Naturalist:** The cementing and burying of creeks in the name of flood control began in large scale with the federal Flood Control Act of 1938. From the 1940's to the early 1970's, over 34,240 miles of creeks and streams throughout US were channelized using federal funds. It is estimated that an additional 200,000 miles of creeks and streams were channelized using funds from states, counties, and towns.

**Engage students when they get off the bus with a quick icebreaker (See Yarn Toss on page 157).**

### **Activity**

**Explain that they are going to walk slowly across the bridge and need to observe closely everything in the channel below them (the bridge is very noisy and it's hard to hear so hold off on any discussion until you reach the other side).**

**Once you get to the other side, ask a few questions:**

*Has anyone seen this cement channel before?*

*Where does it start, where does it go?*

*Where does water come from? **Point out drainage pipe discharge. Ask students if they know what it is. What happens when it rains?***

**Walk onto bike path**

*Why was culvert built, advantage and disadvantages?*

*Where does trash come from?*

*How is it that plants can grow there?*

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## Stop 1: Harmony/Howard Street Bridge, *continued*

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*What kind of habitat does the cement channel provide?  
Walk down the bike path and make observations*

**Have students sit along path and make journal entries.**

**Break students in three groups of 10 to share their observations addressing above questions as well as ones below.**

*Where the trash is coming from and where it is headed?*

*Why is there wildlife in this area, how might they be affected by pollutants?*

**Give the students trash bags and gloves and ask them to pick up trash on the walk back to the street. Before throwing the trash out, observe how much was collected in such a short period of time. What did you find? Describe the most dominant kind of trash (cigarette butts, plastics, paper?). What does this tell us? How can we prevent trash from reaching our waterway?**

**Do not cross the street but have students look across street to other side and ask students how habitats are different on each side of the bridge.**

**Remind students that they will be visiting this same creek a few miles downstream and will be asked to compare how the two locations are similar/different.**

**Throw away the trash and head back to bus.**

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## Stop 2: Elfin Forest

<b>Purpose</b>	To gain an appreciation of the diversity of the Escondido Creek watershed through a semi-rigorous hike. To become familiar with some of the macroinvertebrates (small animals) that live in creeks and streams and learn how their diversity and numbers provide information about water quality.
<b>Duration</b>	9:15 to 11:00am
<b>Materials / Props</b>	ice cube trays, pipettes, pictures of invertebrates, 2 small tables, microscopes, large hand lenses, pie tins painted white

Arrive at Elfin Forest and offer bathroom break and then split students into two groups. One group goes on hike while other one participates in water macro-invertebrate study.

**Typically a Ranger from the Elfin Forest will welcome the students and give a brief introduction. This will be set up in advance by SELC staff.**

**Discuss “Rules for the Trail,” found on page 21.**

Group 1: Hike the Botanical Trail (~45 minutes). While going uphill, use the Walk and Talk technique. Review Instructor Guide at: <http://beetlesproject.org/resources/for-field-instructors/walk-and-talk/>. See page 11 of beetles project for cheat sheet. Suggested Walk and Talk questions:

- Who lives here? Look around. What organisms do you see? What organisms do you think live here that you’re not seeing?
- Discuss as many ways as you can think of that organisms in this ecosystem might be connected with each other?
- What do you think organisms would need to survive in this ecosystem?
- How do you think the ground here might be different if there were no decomposers?
- And don’t forget to ask questions on the spot depending on what you see and what the students are showing interest in?
- Compare two sides of hill, what are some of the differences that you notice, what might be causing those differences?
- How are the plant communities different between lowland and uplands? What factors cause these differences?

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## Stop 2: Elfin Forest, *continued*

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Potential discussion points from Elfin Forest Botanical Guide:

- Chaparral (#2 on guide)
  - Describe and discuss how it is different from Coastal Sage Scrub (CSS). Ask students if they can tell when they are entering another habitat. How did they know? What is different/similar?
- Riparian (#4)
  - Have students discuss with each other how it is different from Chaparral and CSS. Then share with the group
- Which Way is North (#13)
  - Observe the difference between N and S facing slopes
- Of All the Gall! (#22)
  - Challenge students to find a gall, make observations and hypothesize what might be inside
- Inside the Watershed (somewhere at the top)
  - Observe surrounding hills and how water might flow. *Where does it ultimately end up? What might affect water quality along the way?*

**Group #2:** Investigate macro-invertebrates (rock hopping spot). Provide brief overview about how macro-invertebrates provide clues to the health of freshwater streams. Follow Discovery Swap protocol: <http://beetlesproject.org/resources/for-field-instructors/discovery-swap-2/>  
Try not to give out too much information so students can make discoveries on their own.

### Most common macroinvertebrates at Elfin Forest

1. **Mayfly:** exoskeleton, paddle-like gills alongside of abdomen, 3 distinctive “tails”, looks like grasshopper.
2. **Blackfly:** no exoskeleton, suction cup on rear end, can produce a silk thread from its mouth, uses fan structures on head for feeding.
3. **Damselfly:** very large, exoskeleton, extendable mouthpart.
4. **Caddisfly:** no exoskeleton, hair-like gills, look like caterpillars, have a pair of hooks at the base of their abdomen.
5. **Dragonfly:** very large, look cricket-like, exoskeleton, extendable mouthpart.
6. **Scud:** Crustacean, see-through body, metallic-like eyes, looks like a shrimp.
7. **Planarian:** looks like worm with triangle head, can re-grow body parts including their head, two black dots for eyes.

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## Stop 2: Elfin Forest, *continued*

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### Wrap-up discussion:

- What role do these species play in the food chain?
  - What are the stages of life of blackflies and mayflies? (i.e. egg, larva, adult)
  - How are these macroinvertebrates indicators of water quality? Blackflies have the highest tolerance to survive in polluted waters. Caddisflies are indicators of good water quality, mayflies are in between.
  - What might be some pollutants in the water that we can't see?
  - How would speed of water affect water quality? Living organisms?
-

## Stop 3: San Elijo Lagoon

**Purpose** To gain an appreciation of the many ecosystem services wetlands provide.

**Duration** 11:45am to 1:00pm

*Welcome to the San Elijo Lagoon. How do you think this place is different or similar to the other two places we visited today?*

### **Introduction**

Show pictures of the lagoon and watershed.

### **Large Group Activity – What Happened to All of Our Wetlands?** (5 minutes)

**Select 10 volunteers and line them up so everyone can see them. Hand them each a card with the Lagoon facing out. Make sure last person has the picture with the lagoon on both sides. Ask students to one by one turn their card over and state what happened to “their” lagoon.** (Parking lot, housing development, marina, etc.).

The activity provides specific examples of what happened to all of our wetlands and helps students visualize what it means to say we’ve lost 90% of our wetlands in the last 200 years.

### **Small Group Activities** (Allow about 10 minutes for each activity.)

**Divide students into three groups in preparation for the walk.** Naturalists will guide students in the activities shown in the table below.

Title	Materials	Description
<b>Watershed Model</b>	Spray bottles, sponge to be placed in “wetland”	Point out the route students took that day. Emphasize how the wetland cleans water before it enters the ocean and prevent flood control. (See page 53.)
<b>Binoculars &amp; Bird monitoring</b>	Binoculars, pictures of endangered species placed in binoculars bin	Location: Pickleweed Point. Observe different kinds of birds. Discuss numbers, adaptations, behaviors. Emphasize importance of migratory paths and winter homes for birds. Point out that wetlands also are a place that humans enjoy. Show pictures of endangered Ridgway’s Rail and Belding’s Savannah Sparrow. Provide students hints about where they might be found. (See page 55.)

*continued on next page*

## Stop 3: San Elijo Lagoon, *continued*

**Table:** Activities, *continued*

Title	Materials	Description
<b>Wetland Metaphors</b>	Metaphor bags placed in 2 locations	Location: Naturalist’s Choice. See description on page 119. Allow time for open exploration, observation and questions.
<b>Plant Field Activity</b>	Sample specimens, Tupperware, hand lenses, pictures of plants with fun facts	Location: Naturalist’s Choice. See description below.

### Plant Field Activity

**Objective:** To become familiar with some common salt marsh plants and learn the adaptation that allows them to survive in salt water.

Collect the following plants in advance for observation and place them in three different Tupperware bins:

1. Pickleweed - accumulator
2. Salty Susan - excluder
3. Salt Grass - excreter

Split students into groups of 2 or 3 and hand them samples of each of the plants

Introduce topic by asking what happens if we eat something salty? We get thirsty (or dehydrated) and need to get a drink of water. Plants that grow in the salt marsh have special adaptations that allow them to live in salty or saline water.

*At this station we are going to observe some salt marsh plants and see if we can describe what we are seeing. Look closely, use your hand lenses. Make observations and discuss with your partner. Students might need prompting: What does it look like? Does it have a cactus- or succulent-like appearance? Can you see any salt crystals on the stems?*

**Have students share their observations with the group.**

Explain to students that there are three different ways plants have adapted to salt water. *I’m going to give you some clues about the plants you have in front of you, and I want to see if you can tell me which plant I am describing.*

*continued on next page*

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## Stop 3: San Elijo Lagoon, *continued*

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Some plants are **Excreters** – which means they push the salts out through tiny pores. If you saw salt crystals on your plant, please raise your hand. Give everyone a chance to look. Others are

**accumulators** – these plants are jointed like the joints on your finger and have modified leaves that will collect salt, and eventually turn red and fall off. The third type of adaptation are

**excluders** – these plants have a special kind of wall that allows them to suck up water and leave the salt behind. If you could eat one of these plants, what do you think it would taste like? (Salty). *Who would like to taste pickleweed? Another name for this plant is sea beans, and they are sometimes sold in farmer's markets for as much as \$12.00/lb to be sprinkled on salads.*

After this plant activity, we will take a quick look at some coastal sage scrub plants, like lemonadeberry and coastal sagebrush. **Ask students to think about what allows these plants to live in environments with very little water** (waxy leaves, tiny leaves, shallow roots, light-colored leaves). Take this opportunity to tie abiotic and biotic concepts.

### **Conclusion/Wrap-up**

Field trip Summary with general overview questions asked of entire group.

- *What differences did you notice in the habitats throughout the day?*
  - *If you were a scientist studying a watershed, what kind of research and monitoring would you do to learn about the health of the watershed.*
  - *Why are watersheds/wetlands important to protect?*
  - *How have humans impacted the Escondido Creek Watershed?*
  - *What kinds of things can we all do to help take care of the watershed in which we live?*
-

## Vocabulary

**Introduction** The table below provides vocabulary that is relevant for the program, “Watershed Biodiversity.”

Term	Definition
<b>Aqueduct</b>	A large channel or pipe that carries water over a long distance
<b>Biodiversity</b>	The number and variety of organisms (plants, animals, and others) found within a specified geographic region
<b>Brackish Water</b>	Water that has more salinity than fresh water, but not as much as seawater
<b>Culvert</b>	A drainage or channel, such as a flood control channel, that crosses under a road or railway
<b>Dam</b>	A barrier built to obstruct the flow of water, especially one of earth or masonry built across a stream or river
<b>Ecosystem</b>	All the living and nonliving things that interact in an area; within each ecosystem is one or more habitats (Think of an ecosystem as a town or city and habitats as the neighborhoods.)
<b>Ecosystem Services</b>	The benefits that ecosystems provide humans from: fresh air, clean water, and food; to breaking down waste and building soils; to beauty, recreation, comfort and inspiration
<b>Endangered/ threatened species</b>	At risk or in danger of becoming extinct
<b>Estuary</b>	A partially enclosed body of water along the coast where fresh water from rivers and creeks meets and mixes with salt water from the ocean
<b>Groundwater</b>	Water that is in underground streams or aquifers
<b>Habitat</b>	A specific type of environment where particular animal and/or plant species live; a home
<b>Halophyte</b>	A plant adapted to living in a salty environment
<b>Headwaters</b>	The beginning or source of a large stream or river
<b>Macroinvertebrate</b>	An organism that lacks a spine and is large enough to be seen with the naked eye. Examples: mayfly, damselfly, scud, flatworm
<b>Monitoring</b>	Observing and/or measuring a biological condition or function
<b>Pollution</b>	A substance (pollutant), often produced by humans, that causes harm to a natural environment; pollution sources are either easy to pinpoint (point source pollution) or difficult to pinpoint (non-point source pollution)
<b>Reservoir</b>	An artificial lake that is used to store a large supply of water for use in people’s homes, in businesses, etc.

*continued on next page*

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## Vocabulary, *continued*

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**Table: Vocabulary, *continued***

Term	Definition
<b>Riparian</b>	A type of wetland near or along the banks of a river, stream or lake; a streamside or riverside habitat
<b>Runoff</b>	Water from rain or snow or irrigation that flows over the surface of the ground into streams
<b>Salt Marsh</b>	A type of coastal wetland flooded and drained regularly by saltwater tides
<b>Storm Drain</b>	A system designed to drain excess rain and ground water from impervious surfaces such as paved streets, parking lots, sidewalks, and roofs; intended to cope with the large amounts of water that appear in times of heavy rain or flooding
<b>Watershed</b>	An area of land that drains the rain falling onto it (or water flowing through it) into a common body of water. For example, a creek or stream flows into a larger body of water, such as a river or lake, which eventually flows into an estuary and out to the ocean
<b>Wetland</b>	An area that is covered by water during all or some part of the year

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## PART III

### Icebreakers

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**Description**

An icebreaker is a simple activity that enables naturalists to get to know their visiting students and students to get to know their naturalist and each other a little better. The activities provided in this section are short, fun, and require little or no organization. They may be used at any time during a walk.

Topic	See Page
Icebreaker: Leaf	156
Icebreaker: Yarn Toss	157
Icebreaker: Marble	158
Icebreaker: Nature Object	159
Icebreaker: Charades	160
Icebreaker: I Notice, I Wonder, It Reminds Me Of...	161

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## Icebreaker: Leaf

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**Purpose** To hone the students' observation skills. Also, serves as a good icebreaker for all ages.

---

**Location / Duration** Naturalist's Choice / 5 minutes

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**Materials / Props** 10 to 12 leaves from the same plant placed in a paper bag

---

**Preparation:** Collect 10 to 12 leaves from the same plant and place them in a paper bag.

### **Introduction**

*I'm going to hand each of you a leaf that has been collected from the same plant. Just like your finger print, each leaf is different and identifiable from one another. I'll give you a few minutes to examine your leaf in detail. Study it closely and look for any signs that might make your leaf unique.*

### **Activity**

- 1. Ask students to sit in a circle on the ground.**
- 2. Hand each student one leaf. Allow them a minute or so to observe their leaf in detail.**
- 3. Then collect all the leaves and return them to the paper bag.**
- 4. Give the bag a little shake and empty the bag of leaves into the middle of the circle.**
- 5. Ask students to identify which leaf was originally theirs.**
- 6. Then ask them to briefly describe how they know it is the correct leaf.**

### **Conclusion / Wrap-up**

*By being aware of our surroundings and using our observation skills, we can learn a lot about nature. During our hike, let's use the same observation skills we used in this activity to see what we can learn about nature.*

**Alternate activity:** Collect leaves from different plants rather than the same plant. Consider using similar plants like acacia, mulefat, and willow and after students have identified their leaf, ask them to group leaves by species and have them explain how they made their decisions.

## Icebreaker: Yarn Toss

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**Purpose** To put students at ease, and to get them thinking and excited about what they might see and/or learn during the field trip.

---

**Location / Duration** Naturalist's Choice / 5 to 10 minutes

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**Materials / Props** Ball of yarn

---

### **Introduction**

*I'd like you to stand in a circle so you can all see each other. I'm going to hand this ball of yarn to one of you, and after you answer my question, I'd like you to hold on to the string like this (demonstrate), and gently toss the yarn to one of your classmates who hasn't answered the question yet.*

### **Activity**

**Depending on program ask one of the following questions, or make up one of your own.**

**General or for younger students:** *Name an animal that that you hope to see today.*

**Adapt:** *Name an adaptation that you have, or wish you had.*

**Food Chain:** *Name a plant or animal that is part of the San Elijo Lagoon food web.*

**Watersheds:** *What are some pollutants that get into our waterways? Or, what things can each of us do to help protect our waterways?*

### **Conclusion**

**Once everyone has had a chance to answer the question and the students are all interconnected with the yarn, bring in the program theme. The design the students create with the yarn can represent reserve or watershed. Some example wrap up comments might include:**

*There are many different animals that live in the Reserve and call this place home. Adaptations allow many different kinds of plants and animals to live in the same place because it helps avoid competition. The plants and animals in the Reserve are dependent on one another for survival. Pollutants can move throughout the watershed, from upstream to downstream, by traveling through rivers, creeks, and storm drains.*

## Icebreaker: Marble

---

**Purpose** To help students deepen their understanding of our precious earth, and think about what they can do to protect it.

---

**Location / Duration** Naturalist's Choice / 5 to 10 minutes

---

**Materials / Props** Picture of earth from space, blue marble

---

### **Introduction**

*I'm going to show you a picture that you will probably recognize. I want you to just look at the picture for a few minutes, until I say stop. Don't say anything, just look at it and see what thoughts come to your mind while you are looking at it.*

### **Activity**

#### **Hold up picture of Earth from space.**

**Ask:** *What is this? How do you know? How was this picture taken? What do you notice? Does it remind you of anything?*

*So this is Earth. This is our home, everyone's home, where we all live.*

*One of our astronauts, James Irwin, saw earth from space said this when he looked at Earth.*

*"As we got farther and farther away it diminished in size. Finally it shrank to the size of a marble, the most beautiful marble you can imagine. That beautiful, warm, living object looked so fragile, so delicate, that if you touched it with a finger it would crumble and fall apart."*

#### **Hold up your marble to the light and share it with the children.**

*"I think this marble does look like our earth..." This is our home and we do not have anywhere else to go to live so we need to protect our earth—the oceans and the land and the air we breathe. Turn to your partner and share one thing you could do to protect our oceans or land.*

#### **Ask students to share what their partner said**

### **Conclusion**

*Today as we walk each of you will get a chance to hold the marble. I want you to hold it, protect it, and keep it safe while you have it, just like we will try to keep our earth safe.*

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## Icebreaker: Nature Object

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**Purpose** This activity may be used with any themed walk. Encourage students to use their sense of touch, sight, and smell as a tool to learn about the natural world.

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**Location / Duration** Naturalist's Choice / 5 minutes

---

**Materials / Props** Natural objects in paper bag; such as leaf, rock, stick, berry, shell, bone (There are some bags in the shed, or create your own.)

---

**Preparation:** Collect items with various textures that would be found in the lagoon and place them in a paper bag. Examples might include leaves, rocks, stick, berries, shell, bone, seed pod, thistle, snake skin, feather, owl pellet, nest.

### **Introduction**

*We are going to play a game using first your sense of touch and then your sense of sight and maybe even smell to describe different items you would find in nature. Can anyone give me an example of an adjective or describing word? (Any acceptable answers) **If they are quiet, prompt them with common adjectives that they might use like rough, smooth, soft, scratchy, etc.***

### **Activity**

- 1. Ask students to sit in a circle on the ground. If you have enough items for each child, ask them to put their hands behind their backs. If you don't have enough items, select a few students who are sitting quietly to put their hands behind their backs.**
- 2. Explain that you are going to hand each of them an object from nature and that you want them to feel each object and think of words to describe it. Once the students have had time to touch and think, go around the circle asking each student to use a word to describe the object they felt.**
- 3. Once everyone has had a moment to share, ask the students to place the object in front of them. A discussion can follow about what they think the object is, where it came from, and what its role in nature is.**

A leaf may be shelter, food, or bedding in a nest. A shell was someone's home, a feather kept a bird warm, a seed provided food for an animal or might turn into a new plant.

### **Conclusion / Wrap-up**

*By using our observation skills, we can learn a lot about our natural world. What senses did we not use during this activity? (Taste and sound and maybe smell)*

**Remind students that during the hike they should be using their sense of sight, smell, and sound. However, students must ask before using the sense of touch and never taste anything unless asked to do so.**

## Icebreaker: Charades

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**Purpose** To explore the many different ways we depend upon and enjoy water.

---

**Location / Duration** Naturalist's Choice / 5 minutes

---

**Materials / Props** None necessary, or use water cards

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### **Introduction**

*We are going to play a little game of charades. Before we get started, I'd like each of you to think to yourself (no talking) about how you used water today (directly or indirectly).*

### **Activity**

- 1. Pair students up and have them act out (no talking!) with a partner different ways they used water that day.** shower, drink, brush teeth, wash hands
- 2. Have them switch partners and share again.**
- 3. Ask students to share some of the examples their partner acted out. Were Partner #1's choices the same or different from Partner #2?**
- 4. Next: Ask students other ways water might be used or enjoyed.**  
surfing, fishing, watering plants
- 5. Repeat steps 2 and 3.**

### **Conclusion**

*Water is a precious resource that all living organisms depend on for survival. It's important to care for our water by keeping it clean and using it wisely.*

**Note:** An alternate approach would be to have students describe the activities by talking to each other, rather than acting them out.

---

## Icebreaker: I Notice, I Wonder, It Reminds Me Of...

---

**Purpose** To help students develop a mindset of curiosity and provide them with language tools to actively and directly engage with the natural world.

---

**Location / Duration** Naturalist’s Choice / 5 to 7 minutes

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**Materials / Props** Optional, but recommended: interesting small natural objects each student can pick up, small collection cups, hand lenses  
**Download full teacher’s guide from [Beetles Project website](#).**

---

### **Making Observations (I notice...)**

1. Ask each student to pick up the same type of natural object, such as a specific type of leaf, then stand in a circle.
2. Define observation and introduce the first prompt: “I notice...”
  - I know I’m making an observation when I begin a sentence with “I Notice,” and then describe what I can observe using my senses (sight, touch, smell, hearing, taste – but please don’t taste anything unless you are told you can.)
  - **Example:** “I notice this is yellowish-green in color, oval-shaped and about the size of my thumb, it’s rough in some places and smooth in others...”
3. Ask students to partner up with someone standing next to them. Give them 1 minute to make observations about their object out loud, taking turns with their partner. After a minute, call for everyone’s attention.
4. Call on a few students to share observations with the whole group, beginning their sentence with “I notice.” If students are stating opinions or making identifications, gently point this out and ask them to make a concrete observation instead.

### **Asking Questions (I wonder...)**

Introduce asking questions with the second prompt: “I wonder.” Tell students to use the sentence starter, “I wonder” with their partners and to ask as many questions out loud as possible. Follow the same steps as before.

### **Making Connections (It reminds me of...)**

Students will practice making connections to things they already know. This can be something the object looks like, an experience it makes them remember, or some information they know about it. **Examples:** This leaf reminds me of the lines on the palm of my hand. This leaf reminds me of the time I collected leaves at my grandmother’s house.

## Icebreaker: I Notice, I Wonder, It Reminds Me Of..., *continued*

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### **Wrap-up**

**Help students think about how much they can discover in nature.** Ask them to look at their leaves/objects. Point out how much they learned in a short time about one leaf! Then invite them to look around at how much more there is to discover in nature.

**Explain that they'll look for anything they find interesting in nature, then make observations, ask questions, and make connections out loud.** Tell them to hold onto the mindset they now have, and to get ready to use it more. They'll look for anything they find interesting, then use the observation routine they just learned.

**Note:** Some students may be quiet or shy. Opportunities to use the routine in small groups, pairs, or individually encourage more sharing from students who might be reluctant to speak in front of the whole group.

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## PART IV

### INTERPRETIVE TIPS & TECHNIQUES

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**Description**

A good interpreter leads people into new and fascinating worlds they may never have entered before!

The naturalists of San Elijo Lagoon have assembled some of their tried-and-true tips & techniques for achieving excellence as interpretive nature guides. This section of the playbook contains their favorites.

Topic	See Page
Tips for Leading Nature Walks	164
Using Questions Effectively	166
Ideas for Props	169
Stories, Tales, and Tidbits for the Trail	170

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## Tips for Leading Nature Walks

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### Online resources

Click on [Beetles Project](http://beetlesproject.org) (beetlesproject.org) to discover three types of resources for field instructors: Student activity guides, how-to videos for select student activities, and additional instructor support materials.

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### Best practices

1. **Smile.** Be friendly and approachable.
  2. **Get to know your participants.** Having a sense of their prior knowledge will help you set the stage.
  3. **Engage their senses.** Stop to smell a buckwheat flower; listen to insect hum; watch the wing beats of a bird as it flies overhead.
  4. **Set expectations.** Tell participants where you'll be going; how far it is; and how long it will take.
  5. **Keep visitors comfortable.** Be especially observant of wind and sun in their faces.
  6. **Use teachable moments.** If an osprey dives for a fish in view of the group, stop discussing Pickleweed and focus on the action!
  7. **Speak loud enough for everyone to hear.** Your voice won't carry as far outdoors as it does inside.
  8. **Use silence** to allow your visitors the private experience they are seeking.
  9. **Carry a props bag** containing objects and examples that might help the group understand your message. (Also, a potential troublemaker can be kept busy assisting you with the props.)
  10. **Ask questions!** Don't do all the talking. Let your visitors make their own discoveries.
- 

### Do learn...

Master the basics:

- The trails, their difficulty and length
  - Reserve acreage, elevations and boundaries
  - Climate factors that affect plant and animal life
  - Special adaptations of the plants, animals and birds
  - Dominant vegetation types and their differences
  - Some fun facts
  - The most common animals, birds, reptiles and insects
  - Most common endangered plants and animals found in the Reserve
  - Basic, descriptive geology
  - Historic highlights of the Reserve. Native American culture and history
  - Ocean and lagoon points of importance and interest.
- 

*Continued on next page*

## Tips for Leading Nature Walks, *continued*

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**Walk & Talk** Many naturalists have found the simple “Walk & Talk” technique to be transformative for their field experiences with students because it kicks off discourse so well. A high level summary is provided here. A free downloadable student activity guide is available on the Beetles Project website: [Walk & Talk](http://beetlesproject.org) (beetlesproject.org).

### **Introduce the Activity**

1. Form two equal lines with everyone on the hike; include yourself and other adults in one of the lines
2. Make sure everyone knows who their partner is (fist bump, high five, etc.)
3. Introduce how it works: discussing questions and then gentle “touch of silence” (Turn and touch shoulder of person behind you to indicate it is time to stop talking. They turn and touch the shoulder of the person behind them, and so on.)

### **Discussing Questions**

1. State question twice, then say: “Walk & Talk!”
  2. After 3 minutes or so use the “touch of silence” to get attention and stop the lines.
  3. Everyone takes a step back and the whole group shares interesting things their partners said (don’t need to do this every time)
  4. The leader’s partner goes to the end of the line and everyone in that line shifts one person down. Each person greets their new partner (fist bump).
  5. Repeat the process with a new question
  6. Seek out interesting questions/points made, and ask what others think to get the whole group discussion rolling
  7. Vary the way you handle each partner switch. it works well to vary the following after partners have talked:
    - a few share what their partner said, then switch partners
    - switch partners without the whole group discussion
    - a few share their own thoughts. See if you can get an interesting whole-group discussion going.
-

## Using Questions Effectively

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**Overview** SELC naturalists are committed to enabling visiting students to become active participants in exploring nature and making sense of their discoveries. This section offers suggestions for using interesting questions to set the tone of inquiry, exploration, and the exchange of ideas that will help make that possible.

---

### Best practices

What makes a good question?

- Asks for a “why” explanation rather than a “what” explanation
- Allows opportunities for students to think and reason
- Invites multiple responses from students
- Not simple recall, vocabulary definition or one correct answer

Use questions at various points in an activity to help students:

- **Initial:** connect to what they may have learned in the classroom (pre-lessons/prior experience)
    - **Example:** What do you notice when you look around? How do you think this area is connected to where your neighborhood/school is?
  - **During:** think deeper about an activity
    - **Example:** What makes you think that? Do you agree or disagree with Sam?
  - **Wrap-up:** make sense of the activity and reconcile with previous understandings
    - **Example:** What evidence do you have that supports your claim?
- 

### Strategies to support talk

Use the following strategies to involve students in discussion.

- **Probing questions** get students to make public more of their thinking
    - **Examples:** Can you tell me more about that? What do you mean by that?
  - **Pressing questions** prompt students to reason further (out loud) about something they’ve just been talking about.
    - **Examples:** Can you give an example? What makes you think that? What evidence do you have? How does that idea support your claim?
  - **Re-voicing** is to paraphrase and re-broadcast what a student has said, in order to enhance the clarity of that contribution for other students.
  - **Prompt peer-to-peer talk.**
    - **Examples:** Can anyone add to Jose’s idea? What is the difference between what you’ve said and what Ana has said? Can anyone restate what Sarah has said using your own words?
-

## Using Questions Effectively, *continued*

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### **In our experience...**

Naturalists experience greater success using the following questioning techniques:

- Direct most questions to the entire group rather than a single individual. This indicates to the group that everyone is expected to think.
  - Ask only one question at a time
  - Allow time for an answer. This is called *wait-time*. Research shows the longer the questioner allows for an answer, the better the answer will be. Avoid answering your own questions. If no one offers a response, leave it open to be answered later or rephrase the question.
  - Gear questions to the ability of the group.
  - Develop ideas and concepts through a series of questions. Build from focus questions to process questions to evaluative questions. This challenges your group to higher levels of thinking.
  - Avoid asking questions that require a simple *yes* or *no*.
  - Accept answers to questions gracefully, even if the answers are wrong or aren't what you were looking for. Never make anyone feel foolish for actively participating.
- 

### **Categories**

The sections that follow describe three categories of questions that may be used to engage students:

1. Focus questions
2. Process questions
3. Evaluative questions

Each category is defined and sample questions are provided.

---

### **Focus questions**

Focus questions are the most basic type of question, asking for specific information. They often begin with *who*, *what*, or *where*. For example:

- What is a wetland?
- Where do nocturnal animals hang out during the day?
- What is the shape of this leaf?
- Who are the hunters in this lagoon?

Focus questions help structure a program and solicit involvement; however, they do not always provoke creative thinking.

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*continued on the next page*

## Using Questions Effectively, *continued*

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### Process questions

Process questions have a wider scope of possible responses than focus questions. Process questions ask people to integrate information rather than just remembering or describing it. They often begin with *What does this mean? What would happen if...? What experience supports...? Why did...?*

For example:

- What is the purpose of a wetland?
  - Why are some plants poisonous?
  - What would happen if a sumac leaf wasn't shaped the way it is?
  - What would happen to migrating birds if coastal lagoons vanished?
- 

### Evaluative questions

Evaluative questions usually deal with matters of value, choice, or judgment of the participants. They offer group members a chance to express their feelings. Evaluative questions often begin with *What do you think...? What about...?*

For example:

- What do you think should be done about the loss of wetlands?
  - Why does biodiversity tell us about the health of an ecosystem?
  - Why do people think spiders are scary?
  - What is the value of having open space reserves like San Elijo Lagoon?
- 

### Sources:

1. Meredith Houle Vaughn
2. [Beetles Project](#) – a program of The Lawrence Hall of Science at UC Berkeley (Better Environmental Education Teaching, Learning and Expertise Sharing)

## Ideas for Props

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### Overview

Carry a bag of props on your walks, bringing items that work for you. Obviously, you would not carry the same props for every hike you lead; your theme or main topic will influence your choices.

Select carefully! Avoid carrying a heavy bag on your hikes.

---

### Suggestions

Select your props from the suggested list below. If you think of additional props that might be used, share them with your family of docents.

- Acorn
  - Bone
  - Seeds, pine cone, leaf, rock
  - Bug box
  - Dime and jelly bean (approximate weight of hummingbird, size of her egg)
  - Feather
  - Pictures of leaves, animals
  - Fossil
  - Shells
  - Guide Books
  - 10 ft. cord with knots tied every foot
  - Magnet
  - Magnifying lenses
  - Trail map
  - Tweezers
  - Chopsticks
  - Tracks & scat sheet
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## Stories, Tales, and Tidbits for the Trail

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<b>Overview</b>	If possible, always walk the trail before your official hike. Note the location of scat, feathers, chewed leaves, galls, footprints, scratch marks, a nest, holes in the ground or a tree, wild cucumber pod, pine cone, seeds, spiders, ant lion pits, berries, birds, and flowers. <b>And incorporate them into your stories!</b>
<b>Walk quietly on the earth</b>	Show children how to place toe then heel down when walking. Demo in front of children, have them do it, you listen to see if you can hear them following you. Quiet along the trail means we might see more animals.
<b>Keep out of my space</b>	When hiking give animals their space. Demonstrate by picking a child; have them stand still as you walk closer and closer. Is this child comfortable when you are right up against them? No, I am in his/her space. Stay out of an animal's space, so we can observe them without frightening them. If we frighten animals they may try to protect themselves. Remember this reserve is the animal's habitat or home and we people are the visitors.
<b>Smell the earth</b>	Examine soil in various places along the trail. Why is it different under trees then out in an open area? How does soil type affect what grows in an area? Have each child collect a film canister of soil and see how many different objects they can identify in the soil. Look at the soil through a magnifying glass. I always carry my own little canister full of goodies like sand, plant material, sticks, bones, a seed, dirt, small feather.
<b>Bird calls and songs</b>	Pssht, pssht softly at Scrub Jays; quickly kiss fist to imitate small birds in the brush; Caw, caw, cluck, cluck like a Raven; qui-dado, qui-dado or chi-cago like a Quail. Ask children why birds sing or make calls. (Territorial, warning, mating, fun, begging for food, to keep in touch with other members of the flock)
<b>Kumeyaay program</b>	Play the Kumeyaay game, draw pictographs in the sand, tell a legend or tale, demonstrate the making of yucca or agave fiber, demonstrate a rabbit hunt, show how pottery was made, demonstrate grinding acorns, how to walk quietly, how an arrow was made, how rabbit skin blankets or capes were made, acorns were gathered.

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## Stories, Tales, and Tidbits for the Trail, *continued*

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### **The Biggest/Littlest is**

Demonstrate wingspans of birds: Know the wingspan of several different birds. (Pelican 7'5", Great blue heron 6', Hummingbird 4") Use a rope or measuring tape and count off the number of inches or feet together. Children can compare their own wingspan to that of a bird. Show height of some of the taller lagoon birds by using the rope. A person's height is close to their wingspan in length. Measure some of the children to prove the point. Not the case with birds. At one time much larger animals lived on Earth. Dragonfly with 36" wingspan, scorpion with 6' length body.

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### **Heavy or light**

How much do you weigh? Compare objects they know for instance, a hummingbird (weighs about same as a dime), mullet (can weigh as much as your backpack), mallard (weighs 2.4 lb. – 8 hamburgers), snowy egret (13 oz. - less than a can of peanuts), baby squirrel (1" long at birth - about the size of a peanut shell), salt marsh harvest mouse (size of a thumb and weighs less than a nickel). Birds have hollow bones unlike mammals and reptiles and feathers are very light. If their bones were solid like ours they wouldn't be able to fly. Carry with you: a dime, nickel, peanut in the shell, a horned snail.

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### **Hide and seek**

Can you hide in the brush? Discuss camouflage and protective coloration in animals. Camouflage is useful to help in catching prey and to keep from being prey itself. Have children look at the colors of their own clothing. Would they stand out or blend in with the background? What else do animals do to hide or protect themselves from danger? (Freeze, flee, take flight, take an aggressive posture, make a noise, attack, spray, crouch down, etc.) Why are some birds and insects very bright colors? Others dull? Can some animals change color? Would you like to be able to do that?

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### **Let's talk ears**

Discuss why hearing is important to so many animals. Have the children look at each others ears. Do humans rely on hearing for many things? Can humans move their ears in various directions like some mammals? Relatively speaking our ears are quite small. Many animals can move their ears independently of each other to pick up sound from a variety of directions. Have children face you. You say a couple of sentences. Now have the children place their hands behind their ears and point them forward. You again say a couple of sentences. Can they hear you better when they cup their hands behind their ears? They are able to capture more sound waves when their ears are more forward. Animals rely on hearing to capture prey and to escape being prey.

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## Stories, Tales, and Tidbits for the Trail, *continued*

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### **I see you**

**Talk about the position of the eyes on human faces.** Do birds have their eyes in front also? Some birds do but many have eyes on either side of the head. Their range of sight is larger than ours.

Owl eyes are fixed in their sockets and they cannot move them as we can. Have children face you, then ask them to move their eyes up, down, right and left. An owl cannot do that. They must move their entire head to see to the side or behind them. Owls can turn their head 270 degrees. Owls have the best night vision of any animal.

Talk about other animal species eyes (spiders can have up to 8 eyes of varying sizes, dragonflies and other insects have huge eyes with hundreds of lens, snakes have eyes (no eyelids) but cannot see very well, some hawks and eagles can spot very tiny prey from way up in the sky with terrific eyesight)

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### **Tree snags, rotting logs and dead animals**

What is happening inside that dead tree? Anything? Will it just be there forever? If there is a dead tree or log safely close to the trail have them put their ear to it and listen. (They almost always hear things –munching crunching, chewing, and humming) Dead plants and animals are full of creatures that help in decomposition. Can you name some things that help in decomposition? (Bacteria, fungi, termites, sow bugs, pill bugs, millipedes, worms, ants, etc.) In nature we talk about things happening in cycles. What does the word bicycle mean? Bi means two and cycle is something that goes around. A seed falls to the ground, takes root, grows, and eventually dies and decomposes returning all of the nutrients back into the soil for the next seeds to use. (Draw a circle with your hand as you describe the cycle) The same is true for animals. There are lots of cycles in nature: oxygen, nitrogen, water, etc. occurring daily without us even realizing it.

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### **Let's move**

Ask the children how many different ways they can move. Walk, run, hop, jump, crawl, etc. They can demonstrate some of these movements. Animals move in a variety of ways also. In addition to walking, running, hopping and jumping, some animals pounce (a fox can pounce 15'), slither (make a snake trail in the sand), fly, leap, roll-up (roly poly), etc.

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## Stories, Tales, and Tidbits for the Trail, *continued*

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### **Leaf adaptations**

Look at a variety of leaves and have children describe the shape, size, margins, the way the leaf feels, etc. (Magnifying glasses are fun to use) If it is a sunny day, have children face the sun then turn their sides to the sun. Which position made them feel warmer? Leaves need the sun to make food but leaves also want to retain moisture. Leaves on some plants move in order to avoid losing moisture. Laurel sumac and Manzanita plants are two examples of this adaptation. Other plants have very tiny or very waxy leaves which are adaptations and serve the same purpose. Have the children look for insects on the leaves at the same time. (Chewed holes or leaf margins, frass (insect droppings,), rolled leaves, galls, tunneling in the leaf caused by leaf miners, etc.)

You might like to hold a white sheet of paper under some foliage and gently tap the foliage to see if any insects fall out of the plant.

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### **Torrey pine investigation**

Have children pick up a cluster (fascicle) of needles. Pine leaves are called needles. Count the needles in the fascicle. Ask how many have 3, 4 or 5. Torrey pine fascicles usually contain 5 very long, grooved needles. Measure the length of several fascicles. These are some of the longest pine needles of any pine tree. Run your finger along the needle. Can you feel a groove? Moisture often in the form of fog collects on the needles, condenses and drops to the ground as water. The tree is able to get a small amount of water from fog in the air. Find a cone. What is a cone? Female part of the tree. If fertilized it will produce seeds and grow. Cones are made of overlapping scales. Look for seeds inside a cone. Male part of the tree (strobili) contains yellow pollen. Look for some male strobili. Pines are wind pollinated. Torrey Pine is the rarest tree in the US and one of the rarest in the entire world. Very small habitat. Found growing around La Jolla/Del Mar area and Santa Rosa Island. Blooming period is in January and February when everything around them is covered with yellow pollen. If you find a cone gently shake it over a piece of white paper and examine the things that fall out. You will almost always find several species of insects. Check them out with a magnifying glass. A cone is a habitat.

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## Stories, Tales, and Tidbits for the Trail, *continued*

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**Shhhhh Listen** Choose several spots along the trail to have the children stand or sit quietly for one minute. Use your watch to show this is serious saying “start” then “stop”. They may move their eyes and heads but no other parts of their body. Now by showing hands ask if anyone would like to tell the group what they heard and saw. Let them take turns until they’ve all had their say. How important is hearing for animals? Can they name an animal that must have really acute hearing? Why is that so? Animals eat and can be eaten so they must always be alert and watchful. Why do we hear different sounds and see different things in various places along the trail? There are different habitats (due to different plants, amount of sunlight, temperature, wind, hiding places, food, etc.) that meet the needs of a wide diversity of animals. Using small containers do a hearing game. Fill sets of two canisters with seeds, another two with small pebbles, another two with paper clips, another set of two with nails, another set of two with beans, another set of two with rice. Randomly pass out canisters so each child has one. They must see if they can find their twin using only their hearing. This can also be done for the sense of smell using different odors in the canisters.

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**How do I look?** Why do we bathe, wash our hair, cut our nails, etc.? Hold out your hands and let me see your nails and hands. Hands are clean and nails neatly cut. What would happen if your nails never stopped growing? You didn’t wash your hair? Do animals groom themselves or each other? Does it matter how they look? Why do they do it? What happens if they don’t keep their fur and feathers clean and neatly arranged? Can you name an animal for me that grooms? Your cat! Have you ever watched any wild animals or birds groom? Can you explain what you saw? Most animals groom daily to keep their outsides clean and in good working order. They lick, pick, smooth, scratch, arrange, etc. If they didn’t they would not be healthy and might end up dying.

Birds bathe in water or dust or both and many use oil from a special gland to treat their feathers; ants clean their antennae daily and smear them with an antibiotic substance from special glands to keep fungi/bacteria from flourishing in their nests, birds use ants to kill some parasites, rodents clean their fur of vermin and gnaw on hard substances to keep their teeth from getting too long, etc. Many animal species groom each other (you scratch my back and I’ll scratch yours). You might want to whip out of your backpack a comb, brush, nail clipper, nail file, little bar of soap, etc. as you start discussing grooming.

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## Stories, Tales, and Tidbits for the Trail, *continued*

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**Who are the recyclers of the world?** Probably insects are the best because there are so many of them. Children will name other animals and you can add bacteria, fungus, algae. Have the children name ways in which humans can recycle things. Ask how many of them do recycling in their family. Why do they do it? Why don't some of them do it? Humans are the biggest "trashers" of the earth. Animals don't litter, waste or consume more than they need so who is responsible for cleaning up and making sure all animals have a clean place to live?

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**Whose footprint is that?** Learn to recognize some common animal footprints. Rabbits, coyotes, foxes, bobcats, raccoons, opossum, bird. Many animals are nocturnal so we don't usually see them during the day but we can recognize signs they leave behind. Have the children name other signs that animals leave (scat, burrows, chewed leaves, etc.) You will almost always be able to find a footprint. It is easy to learn the difference between a cat family and dog family footprint. Carry a visual to show the kids as they are likely to find dog prints along the trail.

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**Hitchhiking seeds** Seeds are spread in many ways: by the wind, water, birds, squirrels, foxes, people. At the end of the hike have the children check their socks and clothing to see if they have any hitchhiking seeds.

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**Keeping warm** What do people do to keep warm when the temperature gets really cold?. Put on more clothing, turn up the heat. Animals use a variety of means to survive cold temperatures (They hibernate, dig dens, cuddle, huddle, migrate, etc.) For instance bees in a hive create a mass that in turn creates its own heat. Have the kids mimic a huddle. Ladybugs (Ladybird beetles) do the same thing. In San Diego, snakes do not hibernate, but are less active in cooler weather. They may be seen along the trails any month of the year. What do reptiles (cold-blooded animals) do to get warm?

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**Weave your own story about..** Argiope spiders, their webs and egg sacs. Trapdoor spiders and how they build their trap. Ant lions and their pits. Various gall making insects. Nest building techniques, materials, shapes used by birds. Common lizards, their differences, habits and ability to regenerate a tail. Learn the meaning of some animal names (Squirrel comes from a word meaning shade tail). Learn about Fiddler crabs – why are they called fiddlers, how do they make their burrow, what purpose does it serve, what do they eat? The woodrat, the nest and insects that infest the nest. Stink beetle/Grasshopper mouse story. Cochineal. Tarantula and Tarantula Hawk Moth. Spittlebug/Froghoppers. Dodder. The list could go on forever.....

Make your stories fun, use active, exciting words, exaggerate, and feel free to steal from others whose stories you enjoy.

**Contributor:** Barbara Wallach, SELC Naturalist



## PART V

### All About Birds

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**Description**

This section provides an introduction to the most common birds one may expect to encounter at San Elijo Lagoon. It includes instruction on recognizing and interpreting common bird features and behaviors (foraging for food, courtship, nest building, territorial defense, anxiety calls, juvenile behavior, and migration). References for broadening your understanding of birds are included.

Topic	See Page
Birding 101	178
Ethical Birding	188
Birding Resources	189

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## Birding 101

**Overview** This section provides a high level introduction to a few of the most common birds expected to be encountered at the San Elijo Lagoon Ecological Reserve.

**Note:** Naturalists who lead bird walks are encouraged to bring a spotting scope which may be borrowed from the Conservancy or San Diego County staff. Provide binoculars to each student. (See instructions on page 55.)

**Specialized habitats** The lagoon is home to hundreds of bird species and many thousands of individuals. Over 300 species have been reported in the lagoon. Monthly bird counts find around 100 species on the day of the count, but the assortment of species is different each month.

### Why are there so many birds?

San Elijo Lagoon provides habitat that birds need for food, shelter, and reproduction. Look around the periphery of the lagoon and you see houses, roads, shopping malls, and parking lots. Though a few species can live in suburban neighborhoods and malls, many species need more specialized habitats. San Elijo lagoon offers a variety of wetland types, such as:

- Freshwater marsh
- Salt water marsh
- Riparian forest
- Upland coastal sage scrub
- Chaparral plant communities

**Endangered species** Three endangered species live and breed in the lagoon year-round. The table below describes birds of the lagoon that are endangered because they require specialized habitats that are becoming quite rare.

Endangered species	Specialized habitat
<b>Belding's Sparrow</b>	<ul style="list-style-type: none"> <li>▪ Subspecies of the Savannah sparrow.</li> <li>▪ Lives and nests in the pickleweed of Southern California salt marshes.</li> </ul>
<b>Light-footed Ridgway's Rail</b>	Lives and nests in the grasses of the salt marshes
<b>California Gnatcatcher</b>	Only lives and nests in the coastal sage scrub of coastal hillsides

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## THEME: Birding 101, *continued*

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### **Year-round residents**

In addition to the endangered species described above, several other bird species live and breed in the lagoon year-round. Among them are: wrens, bushtits, California thrashers, California quail, Anna’s hummingbirds, common yellowthroat warbler, California and spotted towhee, mallard, and gadwall.

Many more species only visit the lagoon for part of each year. What birds might be seen at any given time depends a lot on the season and the sections that follow provide some examples.

**Note:** Monthly lists of the birds seen at San Elijo Lagoon is provided at [www.sanelijo.org/birdcounts](http://www.sanelijo.org/birdcounts).

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### **Spring/Summer visitors**

Some bird species only come to San Elijo Lagoon in the spring and stay through summer to nest and raise their young. (Examples: northern and hooded orioles, black-headed grosbeaks, chats, and western kingbirds.) The rest of the year, they live further south in Central and South America.

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### **Winter visitors**

Many species only come to the lagoon in winter to feed and rest in the lagoon, on the beaches and off-shore. These winter visitors include most of the shorebirds (waders). Among them are: western and least sandpipers, whimbrels, godwits, willets, curlews, turnstones, and sanderlings.

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### **Passing through**

Some of the species that have been reported in the lagoon are migrants that are just “passing through”. In the spring they are coming from the south where they spent the winter. They are heading north to nest and raise their young. Many of the warblers seen in the spring are at the lagoon for a brief stopover, often coming in waves with large numbers passing through in just a few days (yellow and Wilson’s warblers). Then, in the autumn, the same species pass by again, flying south to winter in warmer climates. Many of the individual birds that represent the winter species do not stay at San Elijo Lagoon for the whole winter, but stop to rest and recover for the rest of their journey south.

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## Migration Flyways

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### **Pacific Flyway**

The Pacific Flyway (See map below.) is the general name for the path used by birds migrating from south to north in the spring and north to south in the fall along the Pacific coast. Other Flyways are used for north/south migration across other parts of the United States.

Lagoons along the Pacific coast, such as San Elijo are important components of the Pacific flyway because they provide habitat where migrating birds can safely rest and refuel to continue their journey.



## Feeding Birds are Fun to Watch!

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### Overview

Birds have a diversity of feeding styles. This section explains how birds use different methods or tools – beaks, feet, flight – to get the food they need.

In addition, examples are provided of bird species occupying different niches, feeding on different things in different places to reduce or eliminate competition for limited resources.

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### Tools for getting food

Birds have tools for getting the food they need. Beaks, legs, and flight are used in different ways by different species and the morphology of these tools differs according to their uses.

Shorebirds are a good example of different types of beaks and legs that allow the birds to find the food they need. Different lengths of legs let the birds feed in deeper water or on the shore. Different beak lengths and shapes let shorebirds collect their food in different places. Obviously, long-legged birds (willetts, egrets, stilts, godwits, dowitchers) can feed in deeper water than short-legged birds (sandpipers, plovers, sanderlings).

Long-billed birds can probe deep into the mud to eat burrowing clams and worms, while short-billed birds can eat flies and larva that are on the shore or in the seaweed washed ashore.

Certain birds are especially fun to watch using their “tools”:

- **Snowy Egrets.** Use their long legs to walk along in shallow water stirring up the mud with their big yellow feet and snatching tasty bites that are dislodged.
  - **Avocets.** Swing their long up-curved beaks back and forth just below the surface of the water to stir up the top layer of mud and expose little crabs, shrimps, and other goodies.
  - **Great Egrets.** Use their long legs and long, stout bills to hunt. They stand still, “posing” immobile above the water and wait until their dinner swims by, unsuspecting, to be snatched by the dagger-like bill.
  - **Dowitchers.** Use their beaks like sewing machine needles as they systematically (up-down-up-down) probe the mud.
  - **Curlews and Whimbrels.** Use their long, curved bills to probe and explore the mud until they find just the right tidbit.
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## Feeding Birds are Fun to Watch! *continued*

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### Hunting with flight

Some species are skillful hunters from the air, using flight to catch their food.

- **Terns (Forster's and Caspian terns).** Fly overhead, looking down into the water, to catch fish by diving and catching them with their beaks.
  - **Osprey.** Dive for fish and catch them with their feet
  - **Flycatchers (black and Say's phoebes, kingbirds).** Perching birds that catch insects from the air. They watch from their perch; then fly out quickly and grab a moth in their wide, flat beaks; usually returning to their perch to eat
  - **Swallows (barn and cliff swallows).** Have wide, flat beaks for catching flying insects, but they are almost constantly in flight, catching bugs while on the wing. Swallows usually catch insects higher up in the air than Flycatchers
  - **Swifts (white-throated swifts).** Fly higher than swallows and flycatchers to feed on migrating insect swarms
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### Feeding under water

Ducks and other diving birds feed under water. They have webbed feet specialized for swimming

- **Dabbling ducks (mallards, teal, gadwall).** Have wide, flat duck beaks for sifting through the mud on the bottom of the lagoon for edible vegetation (plants). They can dive underwater, but usually feed by tipping their bottoms up in the air with their heads down in the water.
  - **Mergansers, bufflehead, grebes.** Diving birds built for swimming deep and fast to catch fish under water. Their legs are set far back on their bodies, to serve as propellers under water, which makes it hard for them to walk on land. These birds are usually seen floating on the surface of the water, then suddenly disappearing under water and popping up again in a different place.
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### Feeding styles on land

On land, the same idea of different tools and different styles of feeding apply. The seed-eating birds (sparrows and finches) have thick, short beaks for cracking seeds. Several species use their feet to shuffle around on the ground and stir up seeds buried in the litter (towhees, some sparrows, quail, thrashers). Many eat berries as they ripen (thrashers, finches, quail). Other species eat insects by flying through the brush and trees to find their food in leaves and branches (bushtits, gnatcatchers, warblers). Woodpeckers must have very specialized beaks to pound holes in trees to find insects beneath the bark and to dig nest holes.

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## Breeding, Nesting, and Raising Young

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**Overview**      Reproduction is the ultimate aim of birds, as with all life. This section describes how birds find mates, breed, nest, and raise their offspring to survive on their own. This involves fancy plumage, beautiful songs and dances, and lots of hard work.

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**Plumage variations by season**      The plumage of many of the birds we see at the lagoon varies dramatically with the seasons. Breeding plumage is especially colorful, usually only for the males, to attract the opposite sex.

Remember that many of the bird species seen at the lagoon are only there for the winter and will not stay to breed. For shorebirds, this means that they won't be seen in their breeding plumage. They are usually drab grey or brown. One might ask how the black-bellied plover got its name as the black belly is rarely seen by San Elijo birders. On occasion plovers with black bellies are seen at the lagoon. Opportunities exist in the fall when early arrivals are still in breeding plumage, or later in the spring when some birds get their breeding plumage before heading north. In the fall there may be a confusing assortment of plumages on shorebirds recently arriving from their breeding grounds, as they are in different stages of plumage change.

Ducks that arrive for the winter in November are usually in “eclipse” (non-breeding) plumage. They are all dull, brown ducks, like female ducks always are. Within a few weeks, however, the males take on the breeding plumage and become easier to recognize. Other species do not show such dramatic changes in plumage, and some do not even show differences between males and females (bushtits, towhees, wrens).

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**Songs**      Songs are used by breeding birds to attract mates and declare their territories (feeding and nesting). For many of the birds at the lagoon, they don't sing their song associated with breeding because they breed in other locations.

Even the birds that breed at the lagoon do not always sing; either because they are not trying to attract a mate at the time, or because they are very busy feeding youngsters.

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## Breeding, Nesting, and Raising Young, *continued*

**Calls** Even when birds are not singing, most of them have “calls” that they use to announce their presence, contact each other, or sound an alarm. The calls and songs are helpful in identifying birds in the lagoon and indicating what they are up to.

**Courtship behaviors** Behavior involved with reproduction includes:

- courtship behaviors to attract mates and discourage competitors
- building nests
- feeding young
- defensive or diversion behavior to protect the nest and young

In the spring, before the ducks that have wintered in the lagoon leave for northern breeding grounds one might see male ducks (especially green-winged teals) bobbing their heads and spinning in circles or chasing females.

Additional examples appear in the table below.

Species	Behaviors associated with breeding, nesting, raising young
<b>Nuttall’s Woodpecker</b>	<ul style="list-style-type: none"> <li>▪ Lots of chattering and chasing the female</li> <li>▪ May be seen posing on a high tree branch</li> </ul>
<b>Bewick’s Wren</b>	<ul style="list-style-type: none"> <li>▪ Sits near the top of a bush, singing energetically</li> </ul>
<b>California Thrasher</b>	<ul style="list-style-type: none"> <li>▪ Perches atop a bush and chatters away like a well-trained parrot</li> </ul>
<b>Stilts, Avocets, and Terns</b>	<ul style="list-style-type: none"> <li>▪ Fly overhead calling frantically and dive-bombing people who may get too close to the nest</li> </ul>
<b>Killdeer</b>	<ul style="list-style-type: none"> <li>▪ Flops around on the ground, acting injured, to lure potential predators away from the nest</li> </ul>
<b>Wren</b>	<ul style="list-style-type: none"> <li>▪ Will not directly approach the nest when carrying food for their nestlings</li> <li>▪ Will wait with a worm or caterpillar in their beak on a branch some distance away from the nest until the threat is gone</li> </ul> <p><b>Note:</b> Includes most birds</p>
<b>Mockingbird</b>	<ul style="list-style-type: none"> <li>▪ Sing from treetops and rooftops, sometimes in the middle of the night</li> <li>▪ Fly up in the air twisting and turning to display their plumage to prospective mates</li> </ul>

## Talking Points

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**Overview** Look for opportunities to engage students in lively discussions at various points along the trail.

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**Top 10 points for discussion**

The following talking points apply to the birds of San Elijo Lagoon:

1. Birds are dependent on lagoons like San Elijo Lagoon because they provide habitats that meet their needs. The diversity of habitats in and around the lagoon support a great diversity of bird species. (Over 300 different species total; about 100 observed in any month).
2. Bird populations in the lagoon vary with the season. Besides year-round residents, there are winter visitors, summer breeders, and transients that pass through on their migration between wintering and breeding grounds.
3. Three endangered species live in the lagoon year-round and breed there: Belding's Savannah Sparrow, Light-footed Ridgway's Rail and California Gnatcatcher.
4. San Elijo Lagoon is part of the Pacific Flyway, the path used by north/south migrating birds between wintering and breeding grounds. It provides a place for migrating birds to rest and refuel on their journey.
5. Many species of shorebirds and ducks use the lagoon as their winter feeding ground.
6. Some of the habitats that the lagoon provides for birds are quite scarce and becoming scarcer because of human development. These are the salt and freshwater marshes, which tend to be filled in, and coastal sage scrub, which is prime real estate for humans.
7. Go with what you see on your walk. What birds are seen and what they are doing should provide the opportunity to discuss how their morphological adaptations and behaviors enable them to get what they need from their environment

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## Talking Points, *continued*

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### **Top 10 points,** *continued*

8. Birds have a set of tools for feeding: beaks, feet, and flight. Feeding birds offer opportunities to discuss morphological adaptations, such as differences in beaks and feet, and behaviors such as flycatchers (phoebes), diving from the air (terns, osprey, falcons), dabbling and diving underwater (dabbling and diving ducks and grebes), probing the mud with beaks of different shapes and sizes (shorebirds), etc. Diversity of feeding styles means that each species feeds on slightly different things, in different places, using different tools, generally avoiding direct competition.
  9. Breeding behaviors are interesting to observe and discuss. You might observe singing, courtship displays, nest building, feeding young, and protecting the nest.
  10. Plumage is another adaptation to discuss. Males may have colorful plumage to attract a mate compared to often drab female plumage to camouflage the female on the nest (e.g. ducks and warblers). Shorebirds have drab winter plumage compared to the more colorful plumage worn on the breeding grounds.
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## Vocabulary

**Introduction** The table below defines some of the vocabulary found in “Birding 101”.

Term	Definition
<b>Adaptation</b>	Modification of an organism or its parts that makes it more fit for existence under the conditions of the environment
<b>Behavior</b>	Anything that an organism does involving action and response to stimulation or to its environment
<b>Chaparral</b>	A plant community characterized by woody shrubs adapted to dry summers and moist winters
<b>Coastal Sage Scrub</b>	A plant community of waist-high, often aromatic, shrubs on coastal slopes and flats. Named for the dominant plant, coastal sagebrush, and other sages.
<b>Diversity</b>	The quality or state of having different forms or types
<b>Endangered Species</b>	A species that is threatened with extinction, usually because the number of animals is so low that they may not be able to reproduce enough to continue their existence
<b>Flyway</b>	An established air route of migratory birds
<b>Fledgling</b>	A young bird just ready for flight or independent activity
<b>Habitat</b>	A place where a plant or animal normally lives and grows
<b>Migration</b>	Movement (usually periodic) from one region or climate to another for feeding or breeding
<b>Morphology</b>	The form and structure of an organism or any of its parts
<b>Niche</b>	A habitat supplying the factors necessary for the existence of an organism or species
<b>Organism</b>	An individual constituted to carry on the activities of life; a living being
<b>Plumage</b>	The entire clothing of feathers of a bird
<b>Reproduction</b>	The process by which plants and animals give rise to offspring (more organisms like themselves)
<b>Riparian</b>	Relating to or located on the banks of a natural watercourse (e.g., river or stream)
<b>Species</b>	A class of individuals having common attributes and designated by a common name
<b>Territory</b>	An area, often including a nesting site and a variable foraging range, that is occupied and defended by an animal or group of animals

**Contributor:** Jayne Lesley, SELC Naturalist, “Birding 101” Contributor

## Ethical Birding

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**Overview** Please review and practice the following “Ethical Birding Guidelines,” compiled by the San Diego Audubon Society. Include this information as you guide visitors along the trails of San Elijo Lagoon.

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**Ethical birding guidelines** We encourage birdwatchers to have gratifying birding experiences while maintaining the ability of birds to behave naturally. The following list of ethical birding guidelines was compiled from an extensive online search of guidelines used by organizations, birding festivals, and nature tour operators.

**Consider Wildlife** - Avoid causing disturbances which alter bird behavior and put birds at risk.

Put birds first

Be aware of the life cycle and needs of birds

Notice bird behavior

Lessen your impact

**Consider People and Place** - Avoid trespassing, know and follow rules, and be a good representative of the birding community.

Bird in public areas or when on private property, with permission

Drive carefully

Respect others

**Enjoy your Time in Nature** - Take the time to observe, experience, and reflect.

**Consider your Stewardship of the Resource** - How can you preserve and protect birding areas for future enjoyment?

Support Conservation

Carpool

Leave no Trace

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## Birding Resources

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**Overview** Interested in improving your birding skills? Check out the references below!

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**Cornell Lab of Ornithology** The [Cornell Lab of Ornithology](#) is a world leader in the study, appreciation, and conservation of birds. Their hallmarks are scientific excellence and technological innovation to advance the understanding of nature and to engage people of all ages in learning about birds and protecting the planet.

Visit the [Cornell Lab Bird Academy](#) to broaden your understanding of birds. You will find free and premium content (courses, interactive features, videos, and articles) for all knowledge levels to help you learn whatever you're interested in from birding basics to comprehensive ornithology.

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**SELC monthly bird count** Assist local bird experts at the San Elijo Lagoon [monthly bird count](#). They meet the second Monday of every month at 7:30am at the Rios trailhead. Monthly results are published and posted on the website. A handy reference!

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**Buena Vista Audubon** Join your local Audubon Society. [Buena Vista Audubon](#) in Oceanside offers regular birding field trips throughout the county and special nature programs and lectures, generally at no charge to the public.

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**San Diego Bird Festival** Attend the annual [San Diego Bird Festival](#) with four days of field trips, workshops, lectures, and vendor presentations.

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## **PART VI**

### **APPENDIX**

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**Overview**

This section includes useful instructions and reference information for docents.

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## Nature Center Loop

**Overview** This section introduces typical stopping points along the trail and tells what might be discussed, depending upon the program being presented.

**KEY** Native Americans (NA)  
 Plant and Animal Adaptations (A)  
 Ecosystems and Food Chains (E)  
 Tips (T)

### Trapdoor Row

T The trap door spider does not use a web to capture prey. Rather it waits patiently in a silk-lined den beneath the trap door and ambushes unwary prey that pass too close.

### Spider Condominium (Prickly Pear)

NA Thorns used for tattooing; pads, fruits, and flowers are all edible. Fruit rough and prickly on outside, but sweet on inside.

A Succulent, thorny, drought resistant

E In summer, pads are covered with cochineal, scale insects related to mealy bugs. Scale insects secrete a waxy coating for defense, giving them the appearance of reptile-like scales.

T Who lives here? Look for scale insect, Cochineal, from which the crimson-colored dye carmine is derived; silver argiope spiders and their green/brown egg sacks; and the tiny dew-drop spiders and their tiny “Japanese lantern” egg cases

Prickly Pear: Sprout pink buds in winter, yellow flowers in spring, and red fruit in fall. Cochineal were collected, dried, and ground into a brilliant red dye, which next to gold, was the most prized export from New Spain. It was used in royal robes, tapestries, and the red coats of the British Army.

### **Near Track Trails Rack**

#### Coyote Bush or Broom

NA Made brooms, brushes, toothbrushes

A Wind pollinated (evident in winter when seeds are blowing around), small leaves. M and F on separate plants

E Often indicates area has been disturbed, suggesting land had been cleared for farming or grazing

#### Sagebrush

NA Mosquito repellent, masking body odors, tea out of leaves

A Drought deciduous, strong sage odor, feathery leaves, light in color

E Comes back quickly after a fire, dominant plant in coastal sage scrub

## Nature Center Loop, *continued*

### Mule Fat

NA

A Wind dispersed, M and F on same plant

E Producer – could introduce this concept vs. a consumer. Plants make their own food, they are producers

T Name came from early pioneers who used plant as feed for mules

### **Heron View Deck – Read Panels**

What is an estuary? Address main points. What is brackish water, why important to keep mouth of lagoon open?

NA Lived off the land – lagoon rich in fish, clams, shrimp, crabs, birds

A Can see diversity of birds feeding - look at behavior, bills, feet, where feeding, kinds of feeding, diving, dabbling, patient feeders, busy feeders, etc. Different feeding habits prevent birds from competing for food

E What are birds eating? Fish, clams, worms, shrimp. What happens if the birds' food sources disappear? What might affect the health of the fish and invertebrates of the lagoon?

T Look for jumping mullets (lagoon Shamu show)

### **Raccoon Bridge**

NA Ability to live off the land, ate clams, birds, mammals

A Look inward, note plants – bulrush and cattails, prefer freshwater – but can tolerate brackish. Influx of freshwater from creek and runoff from development

E At low tide, holes in mud, teeming with life (show pictures of invertebrates). Sea hares, clams, worms. At low tide, look for raccoon tracks

T At this point can see four different habitats - mudflats (at low tide), salt marsh, riparian, and coastal sage scrub

### **Pickleweed at Pickleweed Point**

NA Edible, still used in salads today. Nice salty taste. Also called sea beans

A Pickleweed is a salt accumulator

E Home to endangered Beldings Savannah sparrow, resident of the lagoon nests in pickleweed, feeds on insects and tips of pickleweed. Can drink saltwater

### **Belding's Overlook – A lot of information on panels**

A Salt grass, an excreter, can you see salt crystals on grass blades? Halophyte

E Residents, migratory, and stopover birds all use the lagoon. Home to many endangered species – why? Dependent on unique habitats. Endangered: Beldings Savannah sparrow, Light-footed Ridgway's Rail, snowy plover, Least Tern

## Nature Center Loop, *continued*

### Between Belding's Overlook and Lemonade Junction

#### Willows

- NA Food, medicine, shelter, clothing
- A Freshwater plant, Dioecious (male and female on one plant) – yellow fellow, green gal
- E Red gall sawfly, a type of primitive wasp. As young leaves are developing, adult sawfly inserts eggs into expanding tissue, providing a safe and nourishing environment for emerging larva

#### Lemonade Berry

- NA Made lemonade
- A Thick, leathery leaves
- E Coastal sage scrub
- T Belongs to same family as Laurel sumac and poison oak

### Warbler Overlook

Reptiles, mammals, willows, creek – either review or introduce new concepts on panels  
Might be a good spot to make a food chain, play the wetland metaphor game, tell a story, close eyes and listen, share something they have learned on the hike.

### Between Lemonade Junction and Cottonwood View

#### Buckwheat

- NA Ground seeds into cakes and mush, brewed tea from leaves to relieve headaches and stomach aches, used as a mouthwash, believed to strengthen gums and teeth, blossoms steeped into a soothing eye wash
- T In spring covered with pink buds and white flowers

#### Cholla

- T Sometimes called “jumping cactus” because its joints break off easily and stick to clothes and skin

### Cottonwood View

#### Cottonwood

- NA Shelter
- A Needs source of freshwater
- E Found in riparian habitats

### Torrey Pine panel

- NA Kumeyaay collected and roasted pines for food
  - A Dependent on coastal fog, rarest pine in N. America. 7,000 in SD
  - E Seeds eaten by birds (especially scrub Jay, helps with dispersal, but also eaten by rodents and other mammals (and my dog)
-

## Procedure for Handling Snake Bite

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### Overview

While snakebite is rare, docents should always be prepared to handle this situation. All non-venomous snakebites should receive prompt medical attention to prevent infection.

Rattlesnake bites require immediate emergency hospital treatment. The anti-venom treatment is normally successful if given within four hours of the bite.

**Docents leading hikes should always carry a cell phone!**

---

### Guidelines to follow for rattlesnake bite

1. **CALL 911.** Give specific directions to the site.
  2. **CARRY SMALL VICTIMS TO NEAREST ROAD.** If this is not an option, stay at the site and send someone to trailhead to meet medical team.
  3. **KEEP VICTIM CALM, SITTING DOWN, QUIET** (Minimize activity). Keep wound site below heart level.
  4. **IF BITE IS ON THE HAND OR ARM**, remove rings and other jewelry from the hand.
  5. **IF BITE IS ON THE LEG OR FOOT**, remove the shoe.
  6. If friends are present who want to drive victim to hospital, make sure they have directions to nearest emergency room.  
**DO NOT ALLOW VICTIM TO DRIVE SELF TO HOSPITAL.**
  7. **DO NOT TREAT BITE IN ANY WAY** prior to hospitalization.
  8. **GET VICTIM'S NAME, AGE, PHONE NUMBER AND ADDRESS.** Try to ask if they have any medical conditions, allergies or medications.
  9. Make sure to **NOTIFY COUNTY RANGERS OF THE INCIDENT.**
-

## Driving Directions to Trailheads

### Overview

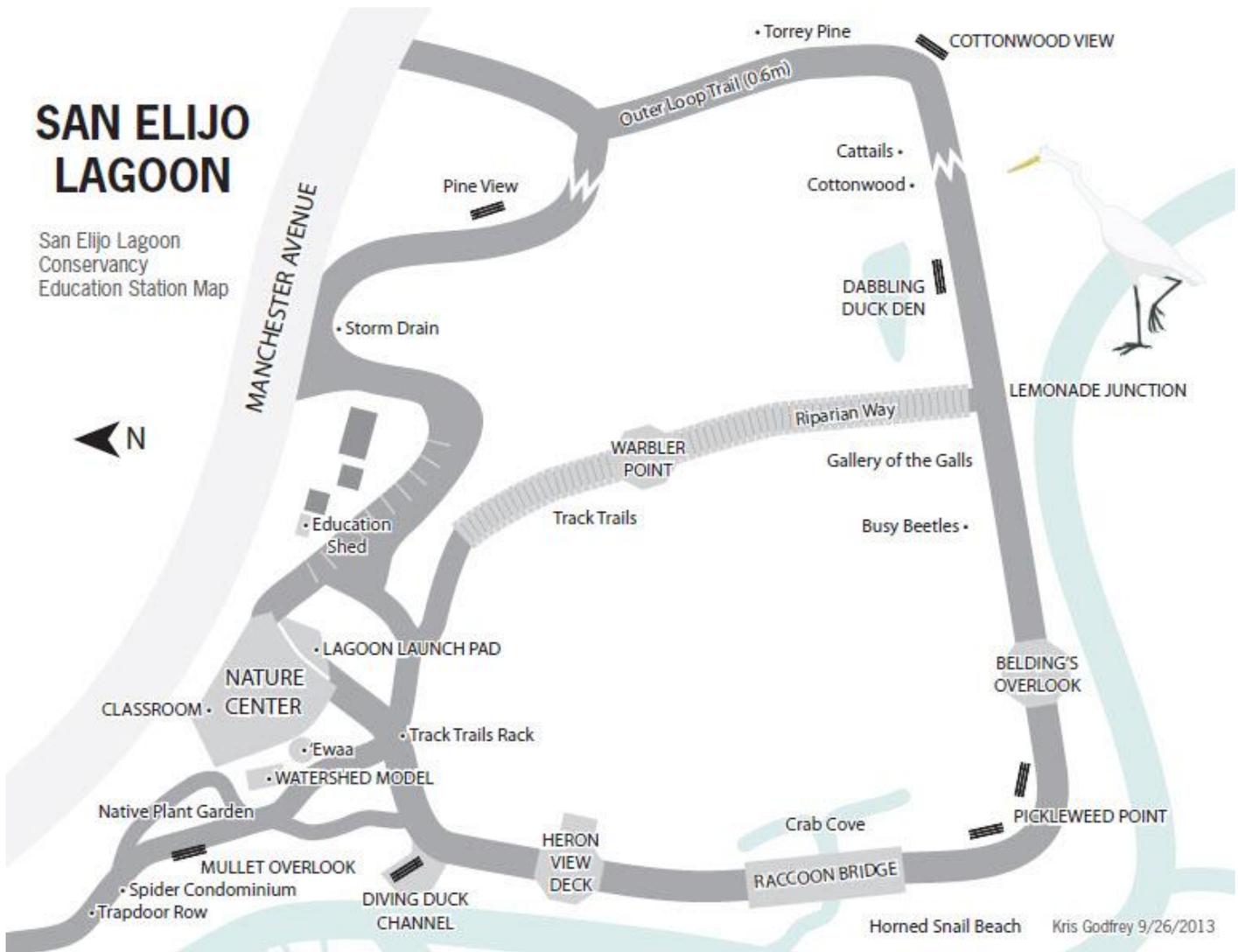
San Elijo Lagoon has six trailheads that are used for themed hikes in the education program. Driving directions are provided below.

Trailhead	Directions
La Orilla	<ul style="list-style-type: none"> <li>▪ I-5 to Lomas Santa Fe exit</li> <li>▪ Drive east off exit</li> <li>▪ Turn left on Highland Road (4-way stop)</li> <li>▪ Turn left on El Camino Real</li> <li>▪ Look for the parking area on the left side of the road before you get to the 90° bend in the road</li> </ul>
Nature Center	<ul style="list-style-type: none"> <li>▪ I-5 to Manchester exit</li> <li>▪ Turn west onto Manchester Avenue</li> <li>▪ Turn left into first available driveway</li> <li>▪ Address: 2710 Manchester Avenue</li> </ul>
Rios Avenue	<ul style="list-style-type: none"> <li>▪ I-5 to Lomas Santa Fe exit</li> <li>▪ Turn west onto Lomas Santa Fe Drive</li> <li>▪ Turn right onto Rios Avenue</li> <li>▪ Drive to end of Rios Ave. and park along the curb</li> </ul>
Santa Carina	<ul style="list-style-type: none"> <li>▪ I-5 to Lomas Santa Fe exit</li> <li>▪ Turn east off exit</li> <li>▪ Turn left at the first available street: Santa Helena</li> <li>▪ Turn left on Santa Victoria</li> <li>▪ Turn left on Santa Carina</li> <li>▪ Drive to end of Santa Carina and park along the curb</li> </ul>
Santa Helena	<ul style="list-style-type: none"> <li>▪ I-5 to Lomas Santa Fe exit</li> <li>▪ Drive east off exit</li> <li>▪ Turn left at the first available street: Santa Helena</li> <li>▪ Follow Santa Helena all the way to the end</li> </ul>
Santa Inez	<ul style="list-style-type: none"> <li>▪ I-5 to Lomas Santa Fe exit</li> <li>▪ Drive east off exit</li> <li>▪ Turn left at the first available street: Santa Helena</li> <li>▪ Turn left on Santa Rosita</li> <li>▪ Turn left on Santa Florencia</li> <li>▪ Turn left on Santa Inez</li> </ul>

## SELC Education Station Map

### Overview

The map below identifies key areas of interest along the Nature Center Trail and Outer Loop Trail. Many are locations named in the Themed Walk Station Activity Guides.



## Sponsors

Support for SELC Environmental Education is provided by...



***THANK YOU!***