

Environmental Traveling Companions

Sea Kayak Program



Education and Activities Manual

Fifth Edition, April 2019

Table of Contents

Introduction	7
What this Manual is For - And How to Use It	7
Your Outdoor Education Bag of Tricks	8
Preview, Do, Debrief	8
Dice Debrief	9
Picture Debrief	10
Natural History	12
Types of Environments	
Terrestrial	
Marine	
Intertidal	
Tide Pooling Activity	
Bay Web of Life Cards Activity	
Common Plants and Animals	
Birds	
Marine Animals	23
Terrestrial Animals	
Plants	
Natural History Card Activities (NHCA)	
Natural History Cards Activity 1: Everyone's a Naturalist Guided Walk	
Natural History Cards Activity 2: Creative Each One Teach Ones	
Natural History Cards Activity 3: Eco Bingo	
Memory Matching Game Activity	
Mussel Hustle Activity	
Migration Routes	
Migration Hopscotch Activity	39
Tides and Currents	40
Tidal Reenactment Activity	41
Faces of the Moon Activity	42
Plankton and Bioluminescence	44
Phytoplankton	45
Zooplankton	45
Bioluminescence	45
Bioluminescent Buddies Activity	46
Endemic vs. Native vs. Non-native vs. Invasive	47
Geology	48
San Francisco Bay: Raccoon Strait to the Golden Gate	49
Tomales Bay: The San Andreas Fault	49
Tasty Tectonics Activity	50
Geology Quick Rabbit Activity	51

Geography	
Sense of Place Activity	
Watersheds	
Paper Watershed Activity	
California in the Palm of Your Hand Activity	
Watershed Finger Tag Activity	
All The Water In The World Activity	
Astronomy	59
It's All Relative Activity	60
Constellations and Create a Constellation Activity	
Historic and Current Human Presence	
Native Americans	
San Francisco Bay	
Richardson Bay	
Angel Island	
Golden Gate Bridge	
Tomales Bay and Point Reyes	
Kayak History	72
Human History Timeline Activity	
Human History Skits Activity	74
Coast Miwok Food Each One Teach Ones Activity	
The Ohlone Way Guided Visualization Activity	
Immigration Station Teaching Cards Activity	80
Human Impact on the Environment	
Development Scenarios	
Drakes Bay Oyster Company Debate Activity	
Angel Island Development Scenario Activity	85
Marine Debris	
Rubber Band Entrapment Activity	
Marbled Murrelet Activity	
Beach Clean Up Activity	
Climate Change	
Ocean Acidification Tag Activity	
Sea Level Rise Discussion	
Stewardship	
Leave No Trace Activities	
LNT Activity 1: Our Natural World	100
LNT Activity 2: Leave What You Find	100
Eco Discussion and Pledge Activity	101
NIMBY: Not In My Back Yard Activity	102
Art and Reflective Activities	105
Andy Goldsworthy Activity	105
Group Haiku or Poem Activity	106

Reflective Walk Activity	
Clayton Lewis "Letter to Self" Activity	107
Sensory Awareness Activities	
Impulse Activity	
Five Senses Activity	
Powers of Observation Activity	
Pirate Eye Activity	
Fox Walk / Jedi Knight Activity	
Bat and Moth Activity	115
Name Games, Fun Group Games, and Teambuilding Activities	
Index by Population	
Name Games	
Give Me Five	
Fun Introductions	
Instant Replay	
Blanket Drop	
Bumpity Bump Bump	
Ball Toss	
Limber Name	
Ice Breakers	
Shoe ID	
Animal Roulette	
Palm Tree	119
Hoola Hoop Introductions	
Hey, What Are You Doing?	
Touch Blue	
Mime Rhyme	
People to People	
Have You Ever?	
Magic Question Ball Activity	
Tag Games	
Boffer Tag	
Capture the Flag	
Blob Tag	
Triangle Tag	
Elbow Tag	125
Ro-Sham-Bo Tag	
Killer Eyes	
Finger Fencing	125
Guessing Games	
20 Questions	
My Gesture	
Psychologist	

Patterns	127
Contact	127
Ghost Letters	127
Signs	127
Three Changes	128
Two Truths and a Lie	128
Mafia	128
Killer Wink	129
Famous Characters	129
Filler Games	130
Famous Person	130
Rain	130
Human Bingo	131
Finger to Palm	131
Couch Game	131
Team Building	132
Human Knot	132
Count to 10	132
Eye Contact	132
Birthday Lineup	132
Square	133
Prui	133
Trust Walk	133
Yurt Circle	133

INTRODUCTION

What this Manual is For - And How to Use It

Welcome to ETC's Sea Kayak Program Education and Activities Manual! Although educational goals vary greatly from group to group, we have the opportunity on almost every ETC trip to teach our participants something about the environment in which we are traveling. There's a great deal of truth to the saying: "In order to act to protect a place you have to love it, and in order to love a place you have to know it." There is little doubt that the people who come on our trips will have fun and memorable adventures – it is up to us as Guides to make sure that they also gain an appreciation for the unique environments we introduce them to and that they leave our trips with a greater desire to care for these environments and the Earth in general.

But how do we do this? If you haven't taught people about the natural world before, fear not! Most ETC Guides do not come from environmental education or teaching backgrounds. The goal of this manual is to empower you with some background knowledge and with a small arsenal of engaging educational activities that are easily facilitated by anyone. With these tools in hand, we hope that you will feel comfortable sharing information with your groups. Interest may vary widely from participant to participant, but the strategies contained here will hopefully stimulate anyone's senses of wonder and curiosity. Remember that many participants on ETC trips may not share your culturally influenced ideas about the environment or our relationship to the environment. It's important to meet everyone where they are, not pass judgment on anyone's viewpoints, and read the group so that you choose appropriate activities. If in doubt, ask participants if there is something about this area that interests them or that they have been wondering about, and use that as a starting point. The goal is not to push your values or ideas onto others, but to facilitate connection and thinking that allows participants to develop their own ideas.

In this manual you'll find short summaries of many topics that you might want to discuss with groups. More importantly, each topic is accompanied by experiential activities that make learning fun. This manual is designed to support and back up the portable, waterproof educational resources that are located at our field locations and can be brought along on trips. Of course, many books have been written on each of these topics, so what is covered here is only a sampling of information. If a topic sparks your interest, there are more in-depth resources stored with the educational activities in the ETC containers that you can peruse as you wish.

Most people do not respond well to a lecturing style of sharing information (for that matter, most teachers don't do well with a lecturing style). In the field, you'll usually do best by taking advantage of "teachable moments" and supplementing them with activities that engage your participants. Each topic in this manual includes several things:

- Some background information that you should familiarize yourself with before leading an activity
- Activities (with instructions) that illustrate or help to teach that topic
- Guidelines for appropriate audiences for each activity
- Adaptations for participants with specific needs where appropriate
- A list of materials needed

Your Outdoor Education Bag of Tricks

It can feel intimidating to know that participants are not only counting on you to keep them safe and to deliver a good trip, but to be their chief entertainer and teacher as well. Having a "bag of tricks," a bit of knowledge to share, and the ability to engage participants with some questions that get them to reflect on the natural world and their place in it can help turn an outdoor trip into a life-changing event. By helping people become more aware of their surroundings, we can achieve the first step in cultivating environmental stewardship.

But it can also be overwhelming to have too much information to digest and disseminate while you are trying to run a trip. The educational materials here are designed so that you can pick and choose from a list of options that might work. As your trip progresses, the things you encounter, the group's energy, and your participants' questions about their surroundings will serve as indicators of what will be best to cover.

Instead of carrying this manual with you in the field, laminated Quick Fact Cards in the resource boxes can be taken along with you as a "cheat sheet." Timing is everything, and developing a sense of the right timing to facilitate a particular activity takes practice through trial and error. After a few trips of trying different things, you'll discover which activities seem like a good fit for your interests and style, and you'll probably find a way to put your own twist on them. With time, you'll be able to combine your own life experiences with ideas from this manual and from observing other Guides – and then you'll have created your own "bag of tricks" that works for you. Remember to start small, bounce ideas off of others, and have fun! Good Luck!

Preview, Do, Debrief

Previewing is also called frontloading in outdoor education. Before beginning an activity, it is essential to explain *why* you are doing it and to provide some guidelines. When you preview an activity, you will usually cover several things including:

- 1. Why is this activity relevant in this place and time?
- 2. Set the tone. Let everyone know what the "flavor" of the activity is. Is this a serious discussion that calls for respect? Or a loud, fun, boisterous game? Or a teambuilding activity that will require concentration and focus?
- 3. Boundaries. What are the boundaries of the activity? How far can everyone run or what are areas that they should avoid?
- 4. Rules for the game or activity. This is basically how to play. Keep your instructions as simple as possible and always remember to ask if anyone has any questions. With more complicated games, it is often useful to break up the instructions and play a round at a simpler level, and then add more instructions.
- 5. Safety. Always be sure to check out an area first for safety and let participants know what they should look out for. Prefacing this keeps safety in the forefront of everyone's mind and lets participants know you are serious about avoiding accidents.

Next, **DO** the activity! Have fun! Remember that it is almost always better to end the activity while participants are still engaged and having fun, rather than once they have lost interest. By ending while they still want more, they will end on a positive and it will be more likely that they will buy in for whatever you have planned next.

Finally, it is important to **debrief** what you have done. It is the goal of every outdoor encounter or activity that we take away a meaningful learning experience. By running a discussion or debrief, you are

encouraging your participants to reflect, describe, analyze and communicate their experiences. The goal of debriefing is to help participants explore how the activity worked, learning from positive aspects and mediating any negative experience. Ideally you can also help participants make a connection between the activity and their everyday lives – and maybe they will apply what they learned toward making positive change. You can debrief specific activities or the entire trip – both are beneficial.

Some groups are very open to this type of discussion and others will be much less vocal. As with your bag of tricks, you will have to try out a few types of debriefing and then choose what works for you and what works for your group. Below are a couple ideas for debriefing activities that you can use in almost any situation. In other parts of this manual you will find discussion questions that are tailored to particular activities as debriefing questions, but always feel free to use your own. It is important to foster an attitude of emotional safety with these debriefs. Creating an atmosphere free of judgment is important in helping your participants feel comfortable reflecting on their experiences and sharing their thoughts.

Dice Debrief

Goal: Start some discussion about what your participants experienced.

Time: 10-15 minutes

Who: Participants of any age that might enjoy the element of chance associated with rolling a dice **When:** After a significant activity, at the end of a day, or at the end of a trip as an alternative to sharing "Kodak Moments"

Where: Any place where participants can hear each other and there are few distractions **Materials**: Dice Debrief Question Cards and large dice

Gather everyone and introduce the activity. You will have a set of six questions on a laminated card. There will be several sets for different types of activities, so choose the set of questions that best fits the discussion you want to run. Feel free to mix up the questions as you need. Tell your participants that each of them will get to roll the dice and that the number that lands face up is the discussion question that they will have to answer. Once they have answered, they can pick the next person to roll the dice. This is a good debrief for the end of the trip or following teambuilding exercises.

End of Trip Question Sets

Set One:

- 1. What was your favorite part of the trip? Why?
- 2. How were you challenged on this trip? Was it positive or negative?
- 3. Is there anyone you would like to thank?
- 4. What is something that someone else did on this trip that impressed you?
- 5. What would you change about the trip if you could?
- 6. What do you think you will remember about this trip in five years?

Set Two:

- 1. What was your favorite part of the trip? Why?
- 2. What was something you struggled with? How do you feel about it now?
- 3. Pick one person who made this trip memorable for you.
- 4. What is something you learned about yourself this week?
- 5. What is something you can take away from this trip?
- 6. What is something that surprised you about your experience?

Teambuilding Question Sets

Set One:

- 1. What makes a good teammate?
- 2. Who functioned as a leader during the last activity? How do you think it feels to be a leader?
- 3. What makes good communication? Did this group have good communication?
- 4. What might have improved the outcome of your activity?
- 5. Who was the person who listened the best during this activity?
- 6. How did your group make decisions?

Set Two:

- 1. Were decisions made with one or more people?
- 2. What type of communication was effective with this group?
- 3. How do you think the group did in completing the task?
- 4. Did you have a plan as a group? Did it help? Would it have helped?
- 5. Where there any disagreements? How were they handled?
- 6. What would need to have changed or improved to get a better or quicker outcome?

End of the Day Question Sets

Set One:

- 1. What was your favorite part of the day? Why?
- 2. Was there something that challenged you today? What was it?
- 3. Can you think of someone who impressed you today? Who was it and why did they impress you?
- 4. What was something that you learned today about yourself?
- 5. Is there something that could have made today better for you?
- 6. What surprised you about today?

Set Two:

- 1. If you could have done something different today, what would it be?
- 2. Is there something that you did today that you have never done before?
- 3. What is something that you learned today?
- 4. Name one thing you liked and one thing you didn't like about today.
- 5. What was something that made you laugh or smile?
- 6. What color was your experience today? (Admittedly this one is a little off the wall, but not a typo and can lead to some interesting answers).

Picture Debrief

Goal: Help participants reflect on their experience by using pictures to help make connections and prompt self expression

Time: 10-20 minutes

Who: This debrief works well with both younger and older participants because the bright colors and light-heartedness of the cards allow for expression without judgment.

When: At the end of a trip, or to close out a significant part of a trip

Where: Ideally in a quiet area without many distractions

Materials: Picture Debrief Cards

Gather your group in a circle and spread out the cards randomly in the middle of the circle so that everyone can see. There are pictures on the front and back of the cards. Each time you use this for debrief,

everyone is only focusing on the pictures that are face up – there's no need to worry about flipping the cards over. This allows you to use this activity more than once without too much repetition.

Once everyone is quiet, introduce the discussion by explaining that there will be two full minutes of quiet where everyone will get to look at the cards and mentally pick one (or two). The card they pick will represent their experience. Once the two minutes is up, make sure no one needs more time and then ask for a volunteer to start. They will pick up the card that they selected and explain to the group why that picture represented their experience or why they related to that picture. There are a variety of pictures, some making obvious connections, others less obvious. You never know what picture a participant will connect with to represent their experience.

Once they are done, have them put the card(s) back down and pick the person to go next. It's great to include agency staff and ETC Guides in this activity so that participants can learn about your experiences as well.

NATURAL HISTORY

Types of Environments

What: Description of different habitats and ecological communities you'll see on ETC Sea Kayak Program trips

Activities Available:

- Tide Pooling Activity
- Bay Web of Life Activity

A particular habitat is usually characterized by certain conditions (soil, water, weather, elevation etc.) that determine what plant and animal communities inhabit an area. Below you will find a list of the habitats you are most likely to encounter, along with a brief description of where they are commonly found and their major characteristic species. You can refer to ETC's Natural History Cards for pictures and further information about many of the species mentioned in these descriptions. The different habitats are easy to recognize after learning only a few of the animals and plants commonly found in each. Keep in mind that in some cases species overlap and will occur in multiple habitats and communities.

<u>Terrestrial</u>

Mixed Evergreen

Mixed evergreen forest is a common plant community in the San Francisco Bay Area that often borders coastal redwood stands. You will most likely run into this ecosystem on Angel Island and at Tomales Bay. The mixed evergreen forest plant community includes California bay laurel, Pacific madrone, big leaf maple, toyon, and blue elderberry as the larger trees and shrub-like bushes. All of these trees and shrubs are evergreens because they do not lose their leaves in the winter (elderberry is evergreen here although not elsewhere because of the mild climate). In the shade you will find herbaceous blackberry, poison oak, the western sword fern, and miner's lettuce. This community occurs most commonly on north facing slopes, since they have less direct sun exposure and therefore tend to hold moisture better than south facing slopes

Oak Woodland

This community is dominated by the coast live oak, a majestic tree that can live to be hundreds of years old and is woven into the very fabric of California's celebrated history. Many of the names you find in California contain the word *robles*, which is Spanish for oak. California buckeye trees are also found in this habitat. Historically, there were other species of oaks found on Angel Island, but they were lost to harvesting. The soil in oak woodlands is usually very dark and rich due to the amount of decomposing leaf litter found on the ground.

Northern Coastal Scrub

This community is present on both Angel Island and at Tomales Bay. Northern coastal scrub is dominated by low-growing shrubs and is characteristically found on dry, hot south and east facing slopes. These shrubs are usually adapted to drought and full sunlight conditions. The dominant woody species consist of coyote bush and California sagebrush. Herbaceous plants you will see are blue dicks and yarrow. The herbaceous plants will naturally be found more in the spring or after a rain. This habitat is easily confused with chaparral because northern coastal scrub often gradually transitions to chaparral with increasing elevation.

Chaparral

This community is found on the ridges overlooking Ayala Cove on Angel Island and on the ridge extending up to Mount Livermore. At Tomales Bay you will encounter chaparral only on longer hikes that gain elevation. This habitat is characterized by almost no shade and nutrient poor soils. Plants living in the chaparral community are among the most drought resistant plants in our region. Adaptations such as small leaves to reduce evaporation, light colored foliage that reflects light, and losing unnecessary vegetation during droughts allows plants such as chamise (greasewood), coyote bush and California sagebrush to thrive in this environment.

Marine

Estuary / Eelgrass

An estuary is a zone of transition from fresh water to salt water. It is largely protected from surf, winds and storms – or at least more protected than the open ocean. There is usually a marked tidal surge and species are largely adapted to less wave stress. Eelgrass is the plant that is the main structure in this habitat and it is the only vascular, seed-producing plant that fully lives in seawater. Eelgrass is also able to tolerate soil substrates ranging from sand to pure muck. Therefore, it is a staple in estuarine environments and can often be found beneath your kayaks. In Richardson Bay eelgrass is a haven for a number of snails, small urchins, crabs and worms. Tangled masses of eelgrass roots prevent the mud and sand of the Bay from being carried away by tides or currents and function as a nursery for many organisms. In Tomales Bay, you will often see leopard sharks and bat rays cruising through the eelgrass beds looking for their version of a fast food meal. In both places, eelgrass is an important spawning area for Pacific herring, which historically have been the target of an important fishery in the Bay Area.

<u>Intertidal</u>

Tidal Pools / Beach

You will find these environments in both San Francisco and Tomales Bays. Intertidal environments are habitats that are covered by water at high tide and exposed to the air at low tide. This causes the organisms that live there to have a variety of unique adaptations that allow them to live in this wet/dry transitional zone. In the areas you will be paddling, you will find a hybrid of rocky shores and sandy beach environments boasting a number of inhabitants that will likely fascinate your participants. These areas are most commonly inhabited by many kinds of barnacles, shore crabs, sand crabs, mussels, and shorebirds. While being sheltered within a bay does not produce a "classic" tide pool experience, rocks are prime real estate for any animals or algae looking for a place to hold on. On the rocks you will most likely find a variety of barnacles, turf algae, crabs and snails. In the sand you will find (with a little effort) sand crabs and maybe a few bivalves (like clams).

Tide Pooling Activity

Goal: Introduce participants to observational exploration Time: 10-30 minutes Who: Anyone able to walk on uneven surfaces When: Overnights when you have more time Where: Sandy beaches or rocky points and shoreline areas on Angel Island and Tomales Bay Materials: Shoes that can get wet, field guide or laminated species identification guide It is virtually impossible to squelch our natural desire to explore on a beach or along the intertidal zone. Tide pooling is a great activity because it is fun for the participants and also great for you since it practically runs itself. Good group management and a few resources (like a field guide or field laminate) will go a long ways toward making this a successful experience. Before letting everyone have free reign of the shoreline, you should establish a few ground rules:

- 1. Shoes must be worn at all times on ETC trips. Barnacles and mussels are sharp! Be sure to let participants know that algae can make the rocks VERY slippery. Move carefully, and keep three points of contact (two feet and a hand) with the ground for balance.
- 2. Never turn your back to the ocean (sneaker waves can produce an epic smack down).
- 3. Set the boundaries both along the shore and how far "out" they can go. If you do not do this, someone will inevitably find a way to fall in the water!
- 4. Tide pool etiquette: Only touch things gently, using just two fingers. Put things back where you found them and if you turn over a rock, make sure it goes back in the same spot.
- 5. It's easier to find things when your eyes have some training of what to look for. Show participants a few pictures first and give them suggestions of where to look for different species before they begin exploring.

Once you establish these basic ground rules, you just have to monitor everyone's exploration and answer questions. A tried and trusted activity is to introduce people to the joys of digging for sand crabs. A Frisbee is the perfect corral for observing the sand crabs – just put a little sand and water in it and then let the crab hunter deposit their catch into their "crab corral." Trust us, you won't be able to pull them away!

Having a field guide at this point can be really useful – for your own reference and for any enthusiastic participants who would like to use it themselves. In addition to being able to identify things, using a guide can also empower participants to take ownership of their own learning.

Bay Web of Life Cards Activity

Time: 20-30 minutes

Goals: Introduce participants to the concept of food webs and some of their major players. Illustrate the three dimensional nature and flow of energy in a food web.

Who: Participants who are interested in learning about local ecosystems

When: Overnights offer more time, but this activity can be run after lunch on a day trip if you have a group that seems interested

Where: Angel Island or Tomales Bay

Materials: Bay Web of Life Cards and a bandana for each participant

Method 1

The activity starts out with the participants placing Bay Web of Life Cards on their foreheads and asking questions of each other to find out what their organism or role is. Once everyone has figured out what they are, they are handed a bandana while standing in a circle. One at a time, each participant looks across the circle and verbally describes their "connection" to another person's role (i.e. phytoplankton uses the sun for photosynthesis, crabs live in the water, etc.). As they describe the connection, they give up their card and become connected to each other by grabbing either end of the bandana. The person who was linked to last is the next person to state his or her connection and link to someone else. By doing this in turn everyone becomes connected to someone else across the circle. You are left with a web of bandanas that the participants must then work as a team to untangle, similar to a human knot teambuilding activity. After they work together to untangle the knot, they will hopefully end up standing in a circle,

connected by bandanas. You can debrief by asking the group why they ended up in the shape of a circle, and how the circle is affected if even a single role is taken out.

Method 2

This method is for more advanced participants and shows a bit more complex version of a food web. Everyone is given a Bay Web of Life Card and then stands in a circle. The person who has the sun card will also be given a ball of yarn. The sun will hold onto the end of the yarn and begin by passing the ball to a producer (someone who photosynthesizes). That producer holds onto the string and passes it back to the sun. The sun then picks another producer and hands off the yarn to them. After all the producers are connected to the sun, a producer passes the yarn to an herbivore (or filter feeder). After all the herbivores have been linked, send the yarn back-and-forth between herbivores and predators. Eventually, the ball of yarn reaches the top predators. When each person gets the yarn, they describe how they are connected. For example: "I am phytoplankton, I use the sun's energy to make food." Or, "I am a whale, I eat krill." Once everyone is connected, have everyone notice how interconnected the web is. This represents energy flow in the system. Discuss using the questions below.

Discussion Questions

With everyone still holding onto the yarn, use these questions to facilitate a discussion:

- 1. Who is a producer (makes their own food)?
- 2. Who is a consumer (eats others)?
- 3. What would happen if one of the players (name one) was taken out of the cycle? Who would be affected?
- 4. Who is most important in the circle?
- 5. What would happen if the main predators were taken out of the web?

Common Plants and Animals

What: Background information on the most common plants and animals you will see on ETC Sea Kayak Program trips. This information is designed to equip you with fun facts about things that participants might ask you questions about.

Activities Available:

- Activities Using Natural History Cards
 - Everyone's a Naturalist Guided Walk Activity
 - o Creative Each One Teach Ones Activity
 - Eco Bingo Activity
- Memory Matching Game Activity
- Mussel Hustle Activity

This section is designed to give you a little bit of background information on the most common species that you will see on your trips. Most of the species described here are year round residents. ETC's Natural History Cards include some additional species and are a more portable resource to carry with you on trips. Most of these species can be seen on both San Francisco and Tomales Bays, but if they are specific to only one location or the other it will be noted.

<u>Birds</u>

American Crow (Corvus brachyrhynchos)

American crows are often confused with the Common raven. Ravens are larger, have a hoarser voice, and a heavier "Roman-nosed" bill. Young crows are about the same size as adults but have blue eyes and pink inside the mouth that darkens as they mature. American crows are native to North America, can be

found throughout the entire continental United States, and have a life span of up to 14 years. They prefer open habitats with adjacent trees, such as agricultural areas and grasslands. However, they also thrive in suburban and coastal areas.

Crows sometimes engage in "anting," which involves standing on an anthill and allowing the ants to scramble among their feathers. Scientists still do not know for sure why birds do this, but it is speculated that ants will remove parasites and that their acidic secretions



can have a soothing effect on dry skin when the bird is molting. As one of the most intelligent birds, crows use tools – such as hooked sticks to reach food in areas their beaks cannot reach – and cooperative feeding techniques. Some scientists consider them to be as intelligent as the great apes.

Crows communicate through a complex system of caws and kos. These calls can function as greetings to family members, body posturing, alarm or alert calls, territorial defense calls, a call-to-arms, and as a gathering call when it may be necessary to mob potential predators. As omnivores, crows eat just about anything. However, they prefer insects, worms, fruit, grains, nuts, frogs, mice, small rabbits and carrion such as road kill. They also prey on eggs and nestlings of smaller songbirds. They forage mostly by walking along the ground and along tree branches.

Belted Kingfisher (Ceryle alcyon)

The belted kingfisher is a stout bird with a large head and a specially adapted snout and toes. It ranges from Canada and Greenland in the north to Panama in the south. Belted kingfishers live along the banks of lakes, rivers, and bays, occupying areas where the banks are tall enough to dig nest burrows. Dense trees along the shoreline pose a problem for kingfishers, as the roots can make it difficult to dig a burrow. Belted kingfishers require clear, smooth water and conveniently located perching sites, since they hunt (mostly fish) by sight.

During mating season, the males establish a territory up and down the shoreline. Some migrate, but those who do not defend the territory year round. Belted kingfishers form a new pair each season and work together to build a nest. They are excellent diggers. Taking turns, they use their narrow nostril bills and specially designed feet – with two fused toes that act like shovels – to build a nest cavity that is two to three feet deep. This can take anywhere from three days to three weeks, depending on the type of soil and the amount of rainfall. At times kingfisher tunnels can be as long as eight feet! Both male and female incubate the eggs during the daytime. At night, however, only the female inhabits the burrow. Scientists



have no idea where the males go at night. The parents train the young by dropping fish into the water so that the chick will retrieve it. Within a week kingfisher chicks can fish for themselves, although parents will monitor them for up to six weeks.

Kingfishers are territorial and once they establish a territory they seldom leave it. Their call is most typically a loud, long, and high-pitched chatter that warns others to leave their territory, but they can combine at least six different calls in different ways to express different messages.

Belted kingfishers eat mostly fish that they hunt in clear and shallow water by perching on a tree limb and scanning the water. Once they spot the prey, they dive off the branch, entering the water headfirst. It is a

shallow dive, so they don't get completely wet. When they return to the hunting perch, they either strike the fish against the tree or stab it with their beak. Lastly, they toss it into the air before swallowing it headfirst. Like owls, they spit up pellets of bones, scales, and whatever else they cannot digest. Although they have a stable population and are not endangered, kingfishers have many natural predators, including larger predatory birds such as hawks and falcons. If pursued by these birds, belted kingfishers dive under water until the predator goes away.

Brown Pelican (Pelicanus occidentalis californicus)

A group of pelicans soaring above the waves, with the tips of their six-foot wings just barely clearing the surface of the water, is one of the most recognized sights from a bluff walk on the cliffs of the West Coast. These beautiful birds are brown with a white belly. During mating season, they also sport a bright yellow cap set off by a brilliant red pouch. On the Pacific Coast they are found from as far north as British Columbia to as far south as Chile. The pelican has a recognizable 12-inch bill and a gular pouch that can hold up to three gallons of water – the largest amount of any pelican species. California Brown Pelicans are the only plunge divers in the bird world and can dive from a height of one hundred feet, although most of their dives are from 10-30 feet above the surface of the water. It has been shown that



pelicans hit the water with such force that small fish as far away as six feet can be stunned. Their legs push them slightly farther under the water while they scoop up water, which hopefully contains small fish. After popping up to the surface they lean their bill forward to let the water drain, then throw their head back so that the fish will slide down their throat the correct way. Pelicans almost became extinct because of pesticide poisoning. Unlike most birds, which warm their eggs with the skin of their breasts, pelicans incubate their eggs with their feet, essentially standing on the eggs to warm them. This made them vulnerable to the effects of the pesticide DDT, which weakened their eggshells. You will see these birds in both San Francisco and Tomales Bays.

Common Loon (Gavia immer)

Common loons are swimming birds with long bodies that sit low in the water and a straight, thick, heavy dagger-like bill. This species is most abundant in Canada and the Northern United States. As a migratory bird, they winter along both coasts of North America as far south as Baja California.



Loons nest on lakes and large ponds. Weather restricts habitat selection because they cannot nest on frozen water. Common loons breed once a year in the summer and remain with the same mate for life. When they return to their breeding ground, they establish a territory of 60 to 200 acres, which they patrol regularly. The pair builds a platform nest in a sheltered location to avoid being seen by predators. Loon nests are usually about two feet wide and are made of soil, grasses, moss and other plant matter. Once hatched, the chicks spend only one day in the nest before joining their parents in the water learning to feed. The parents feed their young for up to three months. Chicks can sometimes be seen getting a free ride on their parents' backs during the first few weeks of the fledging period, and will leave their parents when they are able to fly at three months.

Their legs are placed far back on their bodies, which make them excellent flyers and swimmers, but very awkward when walking. Loons eat fish and other aquatic animals. As visual hunters, they locate their prey by sight and then dive deep to catch it. These dives can last up to a minute and can be as deep as 200 feet. Adult loons ingest much of their food while under water as they catch it, although larger prey must be brought to the surface to be eaten. Loon predators include marine mammals and large raptors,

although loon eggs are vulnerable to everything from birds to snapping turtles. Loons try to protect their eggs by nesting on islands when possible. When approached by a predator, loons retaliate by rushing toward it and attempting to impale the predator with their dagger-like beaks.

Common loons are threatened because of habitat loss. Loons are sensitive to human disturbance and pollution in the form of mercury and other heavy metals can build up in their bodies and slowly poison them. Oil spills are deadly to loons, leaving them unable to fly, dive, or swim. Although not federally listed as endangered or threatened, they are listed as threatened in some states, such as Michigan.

Cormorant (Phalacrocorax auritus)

The cormorant's name is derived through a combination of Latin, French, and Greek words that roughly translate to "eared bald crow." There are many species of cormorants, with the most common in Northern California being Double-Crested, Brandt's, and Pelagic. Cormorants weigh between three and six pounds, have a wingspan of about four feet, and have brilliant turquoise blue eyes. The cormorant is a uniquely adapted diving specialist and can dive to depths up to 280 feet, partly because they have dense bones and less oil in their tissues, which makes them less buoyant. Cormorants range throughout the Pacific Coast of North America. On both San Francisco and Tomales Bays, you will often spot them on pilings or rocks,



drying their feathers with their wings spread wide – looking a little like Batman! The cormorant does this because unlike other sea birds whose feathers shed water, its outer feathers become soaked with water (to facilitate diving) and must be dried. In parts of Asia, cormorants are domesticated and used by fishermen to catch fish. A ring is put around the bird's neck so that it can't swallow the fish.

Forester's Tern (Sterna forsteri)

Forester's terns are related to gulls but are generally smaller and more slender. They are often mistaken for similar species, including both common and Arctic terns. Arctic terns are rare in this area, while common terns often fly above the ocean far from the coast. Forester's terns are the most commonly seen species since they stays much closer to the coastline. Forester's terns are a migratory species, wintering along the U.S. Pacific Coast and spending the rest of the year further north in Canada. They are found in fresh, brackish, and saltwater marshes, especially along the edges of lakes, islands, and streams.

Forester's terns breed in colonies in the spring. During courtship, male terns make elaborate displays and offer females gifts of food such as small



fish. Forester's terns protect themselves from many predators by placing their nests in areas that are surrounded by water, such as on marshy islands, on the shoreline, on top of muskrat lodges, or on floating plant masses. When a predator does enter the colony, the terns dive and swoop at it, often striking the predator on its back. Unfortunately, many of their breeding grounds are susceptible to human disturbance. Additionally, red-necked grebes and American coots sometimes lay their eggs in Forester's tern nests and the terns will sometimes unknowingly raise these species' chicks too.

Most terns feed singly but will gather in noisy, active flocks where food is concentrated. They eat small fish, arthropods, and occasionally frogs and aerial insects. Forester's terns hunt by flying back and forth above the water, searching for food. When they spot prey, they either dive directly into the water or hover for a few seconds and then plunge head-first toward the water.

Although they have a life span of 12 years, the population of Forester's terns is limited by a low birth rate and there are estimated to be about 120,000 Forester's terns in the world. Most deaths in this species are due to predation and eggs that are lost during storms, heavy rains and high waves. Forster's terns are protected under the U.S. Migratory Bird Treaty Act.

Great Blue Heron (Ardea herodias)

Great blue herons are the largest herons in North America. They can be found in Canada, the United States, and Central and South America. Some great blue herons migrate, while others do not. They live near sources of water, including rivers, lake edges, marshes, seacoasts, and swamps. The average lifespan of a great blue heron is 15 years, although the oldest known individual reached 23 years. Usually seen singly, they nest in large trees and can be found in mixed species rookeries of up to 100 birds.

The males build the nest before performing courtship displays to attract a female. A male will perch at his nest then stretch his neck while fluffing his

plume of neck feathers. Other displays intended to impress the ladies include flying in a circle around the nest and stacking twigs into a pile. Once a female joins him they will perch together, raising their chest feathers and clattering their beaks. Typically two to seven eggs are laid, which both parents incubate and care for after hatching. The chicks are ready to fledge after two months. Before setting off on their own, the chicks are extremely territorial and will aggressively defend their nests.

Great blue herons are mainly active in the mornings and at dusk when fishing is at its best. Although known to eat fish, shrimp, crabs, crayfish, and many aquatic invertebrates, they are adaptive and resourceful and will also eat frogs, insects, snakes and even small birds. They locate their prey by sight and swallow it whole. Great blue herons can feed in deeper water by swimming or plunging. Ravens, crows, hawks, vultures, eagles and raccoons prey on herons, though usually just on juveniles.

Great Egret (Ardea alba)

Great egrets are tall and stately birds with all white plumage, long black stilt-like legs and a pointed yellow bill. The great egret can be confused with the snowy egret, which also has white plumage but has yellow legs, a black bill, and is the smaller species. The best habitat for egrets is near any source of water, including fresh water streams and lakes, fresh and saltwater marshes, and wooded swamps and wetlands.

Known for their elaborate courtship rituals and greeting ceremonies, during mating season they can be seen stretching their heads up and over their backs

with their bills skyward and clacking open and shut. It is the male's responsibility to court the female and build the nest, a platform built of twigs and stems high up in a tree. Egrets and herons often build their nests together, forming breeding colonies of up to 100 birds to avoid predation. These birds live up to 15 years in the wild and 22 years in captivity. Great egrets are very territorial and will defend their nests, mates, and young.

Although they roost together, they feed alone, slowly stalking small fish, frogs, snakes, and insects. Insects make up the largest part of their diet, but great egrets also catch fish by spearing them with their beaks. Studies have found that egrets are more successful at catching prey when standing still than when moving around. Adult egrets have no known predators except for humans, but the nestlings have many predators including crows, vultures, and raccoons.





Prior to the 20th century, the population of great egrets was nearly decimated by the demand for their lacey plumage for women's hats and other fashionable garments. Great egrets were first placed under protection in 1918, and by the mid 1900s their population was in recovery. Today, threats to great egrets include habitat loss, water and air pollution, and contamination by hydrocarbons that cause their eggshells to be thin and crack too easily.

Great Horned Owl (Bubo virginianus)

Like other owl species, great horned owls have a rounded face and yellow eyes that face forward. However, since they can live almost anywhere and must adapt to different habitats and food availability, their size and coloration varies tremendously. Their range extends from southern Alaska to the southern end of Brazil. They can live in many habitats, ranging from sea level to nearly 11,000 feet, and including grasslands, deserts, swamps, marshes, coastal forests and even among humans.

Great horned owls do not make their own nests and instead take over abandoned squirrel or bird nests. These nests can be 100 feet high in a tree in the forest, in prairie bushes, in sheltered areas in cliffs, or even on the ground. Usually solitary, they come together for mating season. While males hoot year

round to protect their territory – hooting marks boundaries and disputes can end in death – females hoot only during mating season. Hooting allows great horned owls to find one another, and it can be heard for miles. Once they are paired, they mark their territory to keep other owls away. Depending on food availability, great horned owls will have one to six chicks. They live an average of 13 years in the wild, although the longest recorded life span in the wild was 28 years.

Great horned owls have excellent binocular vision, enabling them to catch their prey in darkness. As carnivores, they eat whatever is available, ranging from fish to insects and everything in between. They hunt by first perching on a branch to spot prey, then swooping down and often catching it while still in flight. When attacking prey they often screech loudly. Great horned owls are fearless hunters, and are one of the few animals that will hunt both skunks and porcupines, giving them the nickname "flying tigers." Since owls are at the top of the food chain they have no natural predators, but crows and raccoons can rob their nests. Their worst enemies are parasites, which can threaten their lives with a form of avian malaria. They are wonderful birds to have in the neighborhood as they keep the populations of human pests such as mice under control.

Osprey (Pandion haliaetus)

Ospreys are a member of the hawk family and are also known as sea hawks. The Seattle Sea Hawks could also be called the Seattle Ospreys! They are large raptors that feed almost exclusively on fish. They have several adaptations for hunting fish, such as long legs for reaching into the water and dense oily plumage that keeps them from getting waterlogged. Their nostrils have special valves to keep the water out when diving for fish. Osprey's feet have spiny footpads called spicules, long sharp claws, and a toe that turns backwards to help hold on to the fish. Ospreys have a worldwide distribution, living on every continent except Antarctica. They are both migratory and residents.

Ospreys have such a wide distribution because their only habitat requirements are water with plenty of fish in it and a place to build a nest. Ospreys need structures – such as the sides of a cliff or tall trees – that can support their large nests and keep them safe from predators. Mating for life, they use the same nest year after year. The pair builds the nest together, using sticks for the outside and softer material like





seaweed, grasses, and cardboard for the lining. Once the eggs are laid, both parents incubate them. However, once the eggs hatch the male provides all of the food needed to support the female and all of the chicks. This means that the male has to catch up to ten fish a day.

Ospreys hunt for fish while flapping and gliding 30 -100 feet above the water. When an osprey spots a fish, it hovers briefly, then dives toward the water. Just before impact, it swings its legs forward, bends its wings back, and plunges feet and head first into the water. Once airborne, the osprey rearranges the fish in its feet, carrying it with one foot in front of the other so that the fish is facing forward. The osprey will eat the fish while on a perch, and always starts its meal with the head of the fish. Osprey predators include other large aerial birds, but usually only osprey eggs and chicks are vulnerable.

In some areas, especially forested northern regions, ospreys have historically depended on beavers to create habitat for then. Beaver dams create both shallow ponds that are ideal for osprey fishing and a collection of dead plant matter that works well for nesting material.

Red-Tailed Hawk (Buteo jamaicensis)

Red-tailed hawks are the most commonly seen hawk and are large raptors with a wingspan of four feet. Their tails are uniformly rusty red in color, and it is this trait that gives them their name. They are found throughout the United States and Canada and into Mexico and Central America. Many birds are year round residents, although the birds of the far north migrate south to escape the harsh winters.

Red-tailed hawks live in a variety of habitats, including scrub deserts, grasslands, farm fields, parks, woodlands, and even tropical rainforests. All they need are open areas for hunting and several places to perch. They prefer to build their nests at the edge of forests, in wooded fencerows, or in large trees. They mate for life and begin breeding at three years of age. During courtship, the pair soars together in circles for up to 10 minutes. They build a nest together, using the same nest for many years.

The nest can grow as large as three feet tall. Both parents incubate the eggs, with the male doing most of the hunting. The chicks leave the nest after about 45 days, although it takes six to seven weeks before they are skilled enough hunters to become fully independent of their parents.

Red-tailed hawks are territorial and defend their territories aggressively. Usually the female defends the nest site while the male defends territorial boundaries. Red-tails have excellent vision and eat a variety of prey, using their powerful talons as weapons. Close to 85% of their diet consists of small rodents, although they can also eat rabbits, reptiles, birds, and snakes.

Adult red-tailed hawks have few predators, although great horned owls will attack their eggs and nestlings. The greatest threats to red-tailed hawk populations are shootings, collisions with automobiles, electrocution on telephone poles, and human activities near nests. Lead poisoning from eating food items that contain lead shot also kills a number of these hawks each year.

Turkey Vulture (Cathartes aura)

A large bird with a wingspan of up to six feet, the turkey vulture has a distinctive red head and red legs. The vulture's naked head is an adaptation to reduce the risk of feather fouling (picking up diseases) from the carrion (freshly dead or decaying animals) it eats. Unlike raptors, it has weak feet that are more suited to walking than grasping food. It is one of very few birds with a well-developed sense of smell. Turkey vultures use their long, broad wings to help them soar for long periods of time, reducing energy loss while looking for food. Turkey vultures range from southern Canada to





southern South America. They occupy a wide range of habitats, including both forested and open environments, and can be found anywhere they can find dead animals to eat. They are both migratory and stationary.

Turkey vultures mainly live in groups. Populations that live in cold areas migrate to warmer areas during the winter. They can be gregarious, gathering in the late afternoons to roost in tall trees, and can often be seen coming to and from these nightly communal roosts. Turkey vultures are seldom heard but can make some soft hissing and clucking sounds. As scavengers, they rarely kill anything to eat and their well-developed senses of smell and vision allow them to locate the dead carcasses they feed on.

Most turkey vultures die as a result of being hit by cars, flying into power lines or other structures, or getting caught in fences or traps. Predators such as raccoons or owls sometimes eat turkey vulture eggs and chicks. Once they are adults, turkey vultures can easily avoid predators by flying at high elevations where they cannot be reached. When harassed, they sometimes regurgitate their stomach contents of rotten meat, which is usually enough to deter predators due to its putrid smell. Turkey vultures are important to us because they remove dead carcasses that pose health risks to humans and livestock.

Western Gull (Larus occidentalis)

The western gull is a large white-headed gull that lives on the west coast of North America. Often confused with the California gull, the western gull is larger and does not have the black mark on its mandible that the California gull has. It lives strictly on the coast, often seen on wharves, jetties, and docks. Rarely encountered inland or away from the ocean, it nests on offshore islands and rocks along the coast, and on islands within estuaries. Western gulls nest in colonies and there is well known colony of western gulls that nest on Alcatraz Island. Long-term pairs aggressively defend their territories. Territorial borders may shift slightly from year to



year, but are maintained for the life of the male. Western gulls nests, made of vegetation, are located inside the father's territory. Once chicks hatch, they must remain within the boundaries or they are liable to be killed by gulls who control neighboring territory they might wander into. Parents feed young chicks by regurgitating food into their beaks. When the chicks are hungry, they peck at the bright red spot on the parents yellow bill to stimulate feeding.

Western gulls feed in both pelagic (open water) and intertidal environments, eating everything from fish to limpets. To break open the shells of prey items like sea urchins and clams, the gulls drop them from high in the air to hard surfaces below. They also harass cormorants and pelicans, forcing them to regurgitate their catch, which the gulls quickly gobble up. They eat carrion and refuse as well. Western gulls are not shy and often rob people of their lunches.

Although the western gull is not considered threatened, its range is much more restricted than it used to be. Western gull numbers were greatly reduced in the 19th century by the taking of their eggs as food for the growing city of San Francisco. The automation of lighthouses and the closing of Alcatraz Prison allowed the species to reclaim part of its range. They are protected under the Migratory Bird Treaty of 1918, which makes it illegal to transport, breed, kill, or consume these gulls. The protection of this species has been an annoyance to the San Francisco Giants. At times, thousands of gulls fly over AT&T Park during late innings of the games. They swarm the field, defecate on fans, and after the games eat leftovers of stadium food left in the seats. The gulls left for a while in 2011 when a red-tailed hawk visited, but returned the moment the hawk left. A falconer would cost the Giants \$8,000 per game and the fans would have to witness the gruesome killing of gulls by the falcon. For now the gulls are here to stay, so bring a poncho and eat early at Giants games!

Marine Animals

Barnacle (many species)

Louis Agassiz, an American naturalist, once described the barnacle as a "shrimp-like animal standing on its head in a limestone house kicking food into its mouth." Barnacles are distributed in the intertidal zones of the Pacific coast, and live on rocks, pilings, floating logs, bedrock, and artificial structures. They are found in both calm and exposed waters, and can tolerate low salinity. Barnacles are related to crabs, shrimp, and lobsters, but are the only sessile (attached) crustaceans. The shell of one species, *Balanus crenatus*, is made of six calcium carbonate plates. The upper edges of the plates are toothed and the shell is often tilted to



one side. The opening is diamond shaped and is protected by two more plates that can slide to a closed position when the animal is out of the water, not feeding, or disturbed.

Most barnacles are hermaphrodites, meaning they have both male and female sex organs. Living in colonies clustered closely to one another they must fertilize each other, which requires special adaptations when you are stuck to a rock and cannot move. A retractable tube containing sperm reaches outside the shell as far as several inches to another barnacle. Newborn barnacles emerge from the adult shell as one-eyed larvae. Eating plankton, they molt into non-feeding, weak-swimming cyprid larvae, and soon settle on the bottom. They creep around on their antennae searching for a hard substrate to make their permanent home. Once found, within a few hours, a brown glue anchors the larvae's head to the substrate. They now begin to metamorphose into adults and build their protective shell. To feed, they open their shell plates and extend their feathery feet into the water, trapping plankton. Barnacle legs also have gills for gas exchange.

Barnacles' main predators are sea stars. Medium sized barnacles appear to be at the greatest risk; the smallest barnacles are ignored and the larger ones are able to withstand a sea star attack. In some years the barncacle population can be decimated by hungry sea stars!

Bat Ray (Mylobatis californica)

The bat ray's common name comes from its bat-like wings (actually pectoral fins) that they flap like a bird to propel themselves forward. Its scientific name *Mylobatis* derives from the Greek words for "grinder" and "bat," while *californica* references its original capture in Tomales Bay. Recreational anglers sometimes call them "mud marlins." Bat rays can be found from Oregon to the Gulf of California, and range from intertidal and surface waters to depths of over 350 feet. They are bottom dwellers, found mostly in bays with muddy and sandy bottoms, in kelp forests, and close to coral reefs. While bat rays



are usually seen semi-buried in the sand or lying on rocks, they can sometimes be seen right at the surface, either as individuals or in swarms.

In many areas, bat rays make seasonal inshore and offshore movements. They typically enter Tomales Bay in the spring months, when water temperatures rise above 50 degrees, and depart in the fall months as temperatures fall below that mark. Bat rays travel into the shallowest and warmest mud flats during the day and return to deeper waters at night. They can even tolerate the brackish waters of San Francisco Bay.

Bat rays feed on small bony fishes, snails, worms, shrimps, clams, abalone, and crabs. To hunt, they explore the bottom by balancing on their pectoral fins and pumping their body up and down to create large depressions in the substrate that can be several feet in diameter and about eight inches deep. They then use their heads to plow out any prey they just disturbed. Bat ray teeth are fused into plates, which they use to grind and crush any shelled prey they find. They crush the entire animal, spit out shell materials, and then eat only the soft fleshy parts. If a tooth breaks or wears out, a new one replaces it. Like other sharks, rays grow new teeth continuously. Bat ray predators include sea lions, white sharks, and broadnose sevengill sharks.

Bat rays reproduce on an annual cycle, mating during spring or summer in large aggregations. Females cannot reproduce until five to seven years of age, depending on their size. After a gestation of nine to twelve months, a female gives live birth to between two and ten pups, again depending on her size. Pups emerge tail first, with their wings wrapped around their bodies. To protect the mother, the pups' stinging spines are pliable and are covered with a sheath that sloughs off after birth. The spine soon hardens, ready for defense within a few days.

California Mussel (Mytilus californianus)

The California mussel is a large edible marine bivalve (two shells). This species is native to the west coast of North America, found from northern Mexico to the Aleutian Islands of Alaska. Living in large clusters or aggregations attached to hard substrates, they are exposed to the strong action of the surf. Although we most often see them at low tide when they are exposed to air and look lifeless, under the water they come alive. The shells open slightly and tiny hairs called cilia beat rhythmically to draw water into the gills. This water not only carries oxygen but food particles as well. To collect enough food to survive, this filter-feeding mussel must filter two to three quarts of water an hour.



The California mussel attaches to rocks, piers and pilings by fibers called byssal threads. These threads are produced in liquid form by the byssal gland. The liquid runs down a groove formed by the foot. When the foot pulls back, exposing the liquid to seawater, the liquid solidifies into a thread. The California mussel prefers the high salinity and low sediment conditions found on open rocky coasts. However, forming a colony on bare, exposed rock isn't easy and takes time. Given the right circumstances, California mussels can grow up to eight inches in length and can live up to 20 years. Mussel beds that are patchy or cleared due to wave action, storms, and predation may take up to ten years to fully reestablish themselves. Mussels are a favorite prey item of sea stars, and are also eaten by sea birds and drilling snails such as whelks.

California mussels were an important food source to the Native Americans who lived on the Pacific coast. On California's Northern Channel Islands, archaeological evidence shows that they were harvested for almost 12,000 years. Today they continue to be harvested for food and bait. They can be baked, boiled, or fried just like clams and oysters. But care must be taken, because during times of the red tide, the mussel may contain harmful levels of the toxins that can cause paralytic shellfish poisoning.

California Sea Lion (Zalophus californianus)

California sea lions are "eared seals," which means that they have external ear flaps that "true seals" do not have. They are the most recognized pinniped species, because they are commonly seen doing acrobatic tricks in shows at zoos and aquariums. California sea lions are sexually



dimorphic, with adult males weighing in at 700-1,000 pounds and adult females weighing significantly less at 200-250 pounds. Adult males also develop a sagittal crest on their heads at four to five years of age. California sea lions can migrate long distances along the Pacific coast, from British Columbia to the southern tip of Baja. They are very social animals and often form colonies of several hundred individuals on shore or on offshore rocks. They are fast, agile swimmers and are often seen porpoising (jumping out of the water while swimming) and wave riding. The deepest dive ever recorded for a California sea lion was 1,760 feet, for a time of 12 minutes! California sea lions can live in the wild for up to 25 years.

Sea lions are adapted for movement on land as well as in the water. Their wing-like front flippers have a bone structure similar to that in human arms and hands. Swimming with these flippers propels the sea lion forward, while the hind flippers steer. Both pairs of flippers enable a sea lion to walk on land. California sea lions feed on a wide variety of seafood, mainly squid and fish. They mostly forage near mainland coastlines and along the ocean bottom. Sea lions may eat alone or in small to large groups depending on food availability. They sometimes cooperate with other predators, such as dolphins and seabirds, when hunting large schools of fish. Sea lions can stay at sea for as long as two weeks at a time and males will venture as far out as 280 miles from shore.

In the U.S., California sea lions have been protected by the Marine Mammal Protection Act since 1972. The MMPA outlaws the hunting, killing, capture, and harassment of these animals. With protection, sea lion numbers have increased dramatically, and they are now increasingly taking advantage of man-made structures like docks for haul-out sites. Many docks are not designed to withstand the weight of a colony of sea lions and are damaged when they take over. Wildlife managers have used various methods to control the animals and some docks have been redesigned to better withstand their presence, like at Pier 39 in San Francisco. Sea lions are most abundant in San Francisco Bay during the winter months when there is abundant prey such as Pacific herring in the Bay.

Harbor Seal (Phoca vitulina)

Pacific harbor seals range in the northeast Pacific from Alaska to Baja California. They stay mostly in nearshore coastal waters and frequent rocky islands, sandy beaches, mudflats, bays, and estuaries. Harbor seals are residents in both San Francisco and Tomales Bays and can be sighted year round. Excluding the Channel Islands, the Point Reyes Peninsula has the largest



population of harbor seals in California, with nearly 20% of the entire state's population.

Pacific harbor seals spend about half their time on land and the other half in the ocean. They can dive to 1,500 feet and can stay underwater up to 40 minutes, although most of their dives are shallow and average three to seven minutes. Harbor seals usually haul out at preferred locations in large groups. They haul out on land to rest, give birth, nurse their young, and to warm themselves in the sun. Because of their smaller size and thinner blubber layer compared to other marine mammals, they cannot maintain their body temperature if they stay in the cold water all the time.

Harbor seals do not have external ear flaps, and have only small holes where their ears are. Also, they are unable to rotate their pelvis, so they must heave and drag their body like an inchworm on land and beaches that have a low slope. For this reason harbor seals are much more awkward on land than California sea lions, and you will never find them on rocks or docks that very far above the surface of the water. Some people think that harbor seals resemble "sea sausages." When in the water, harbor seals propel themselves with the hind flippers in a sculling motion, using their front flippers to steer (the opposite of California sea lions).

Harbor seals are opportunistic carnivores, eating fish, squid and octopus. If food is not prevalent, as in El Niño years, the females will skip giving birth, spending more time in the water looking for food. Otherwise females give birth once each year. The main predator of harbor seals is the white shark, although other sharks and orcas can eat them too. Terrestrial predators such as the coyote and bobcat prey on young pups resting onshore.

Harbor seals are extremely vulnerable to human disturbance. Seals will leave their haul out spots on land when they are harassed by people, dogs, boats, aircraft or other human activities. Even a temporary disruption stresses the animal by cutting into its time to warm up, rest, and nurture young. Harbor seals may also abandon a haul-out site permanently, as they did at historic sites in San Francisco Bay due to chronic human disturbances. It is important for kayakers to stay at least 100 feet away from hauled out harbor seals. It can help participants to visualize this distance if you tell them that one hundred feel is about the length of six sea kayaks.

Hermit Crab (Paguristes sp.)

Outside of its borrowed shell, a hermit crab resembles a lobster. Its abdomen extends behind its thorax (middle section), unlike the abdomen of a true crab, which is permanently tucked underneath the body. The hermit crabs abdomen is very soft, and therefore vulnerable to predators and the dangers of the ocean environment. Protection is one reason hermit crabs live in empty snail shells. They were named because people likened them to hermits who live isolated lives.

A hermit crab's choice of shell is very important. The shell must be large enough that the animal's whole body can retract into it for protection. The abdomen is twisted to fit around the columella (central spire) of snail shells.

While scavenging for bits of dead animals to eat, opportunistic hermit crabs are always on the lookout for a new shell. This is because a hermit crab grows while its borrowed shell does not. Once hermit crabs spot an empty shell, they check it out with their claws and antennae. If the shell seems appropriate they will get as close to the aperture as possible and instantly switch shells, checking it out for fit while the old shell is still available if they need to return to it. Some larger hermit crabs will fight vigorously over a desirable shell.

Leopard Shark (Triakis semifasciata)

The leopard shark is found along the Pacific coast of North America from Oregon to Mazatlán Mexico, and in the Gulf of California. Typically four to six feet in length, this slender bodied shark is easily recognizable due to its beautiful black saddle-like markings and black spots, which are reminiscent of leopard spots. Harmless to humans, large schools of leopard sharks are a common sight in bays and estuaries as they swim



over sandy bottoms, muddy flats, kelp beds, or reefs, mostly on the bottom. They generally stay close to shore and are found in shallow waters to about 60 feet.

These fish have a range of seasonal movement. Many leopard sharks enter semi-enclosed waters such as Tomales Bay in the spring and leave in the fall. Here they feed in the intertidal zone during high tides and retreat to somewhat deeper waters as tides fall. Water temperatures trigger their entrance and departures from these protected waters.

Leopard sharks are at home on the sea floor. Instead of a swim bladder, which would help with buoyancy, they have large livers full of oil. This helps somewhat, but they are still less buoyant than the water

around them so they tend to sink when not swimming. Leopard sharks are designed to feed on the bottom since their mouths are located on the flat underside of their head and open downward. Skimming along the seafloor, they pluck up crabs, clams, fish eggs, and burrowing worms like a vacuum cleaner. As they get older they eat more fish. They have been seen shoveling their nose into the sand or mud to search out prey.

Leopard sharks do not become sexually mature until about ten years of age, and have a life expectancy of up to 26-35 years. Females have pups annually, and rather than laying eggs she keeps them inside of herself, giving live birth after a 10-12 month gestation period. Typically she has 24-30 pups, each about seven inches long. In San Francisco Bay, the mothers drop their pups in eelgrass beds that provide both food and protection.

The federal and state governments spent \$100 million to buy 15,100 acres of salt ponds in the South Bay from Cargill Corporation in 2003, beginning the largest wetlands restoration project ever attempted on the West Coast. For decades, Cargill evaporated Bay water in the ponds to harvest the salt. The ponds were too salty to support life. But once the U.S. Fish and Wildlife Service, California Coastal Conservancy, and other agencies began opening them to Bay tides, millions of fish, crabs, clams, and other species poured in. So far, more than 3,000 acres of former salt ponds have been opened to bay waters. This drew the attention of large numbers of adult leopard sharks, which have been frequently spotted feeding in these areas. Large numbers of ducks, herons, and fish are also benefiting from this restoration.

Native Americans commonly ate leopard sharks and today both commercial and recreational fishermen catch them in substantial numbers.

Lined Shore Crab (*Pachygrapsus crassipes*)

The lined shore crab, also known as the striped shore crab, can be found from Oregon to the Gulf of California, living on rocky coastal shores. Its carapace (the back shell) is box-like in shape and can be red, purple, or green. The lined shore crab's most distinctive feature is the series of horizontal dark lines that run across the carapace. These crabs are found in crevices, tide pools, mussel beds, and sometimes on the muddy shores of bays and estuaries. It is the most semi-terrestrial of the shore crabs, living highest in the intertidal zone. Lined shored crabs forage both in and out of the water, are active



mostly during the day, and spend at least half of their time out of the water, returning periodically to pools to moisten their gills.

The lined shore crab feeds on films of algae and diatoms growing on the rocks in tide pools and crevices, which the crab scrapes off with its claws. They also scavenge on dead animals and at times eat living prey such as limpets, snails, other crabs and even the unwary fly. In turn, these crabs are eaten by gulls, octopus, rats, raccoons, and even humans. They can be cannibalistic and eat each other, but this usually occurs only when their protective shell is still soft following molting.

Pacific Herring (Clupea pallasii)

The Pacific herring is a coastal schooling fish, found from the surface waters to depths of 1,300 feet. Pacific herring have numerous populations throughout the North Pacific Ocean and its adjacent seas. In California,



herring are found offshore during the spring and summer months foraging in the open ocean. The largest spawning aggregations in California occur in San Francisco and Tomales Bays. Herring provide a major food source for many marine birds, mammals and fish and are heavily preyed upon throughout all stages of their life cycle. Herring have a lifespan of 15-19 years.

Adult Pacific herring move inshore, entering estuaries once per year in the winter months. They do not eat during the migration and spawning period. Spawning often occurs in the same location year after year. At some locations, spawning occurs in several waves that are about two weeks apart. Herring in San Francisco Bay tend to spawn on the quarter moon when the tidal range is relatively low and currents are relatively weak. The fish normally surge into the Bay in as many as 14 waves from December or January until about mid-March. Depending on the age and size of the female, she will produce between 10,000 – 77,000 eggs each season. She lays her eggs on rocks, seaweed, eelgrass, or manmade structures like pilings.

The Pacific herring fishery in San Francisco is the last urban commercial fishery in California. It is the only remaining fishing operation where spectators can actually sit on shore and watch commercial boats haul in the catch. The commercial herring fishery is one of the few fisheries in California that undergoes annual population assessments and subsequent regulatory changes. The number of herring in San Francisco Bay dropped steadily starting in the late 1990s and reached a historic low in 2009, forcing the state to close the fishing season that winter. There have been significant rebounds in more recent years though, and 2015 was a great year for herring in San Francisco Bay. Historically, herring have been in demand for their roe, called *kazunoko* in Japan, but there is a growing market for eating them as a fresh, sustainable local fish. Wholesale and restaurant buyers have been coming to San Francisco's Pier 45 in increasing numbers to buy the fish. Pacific herring are also caught recreationally off of piers, beaches, and banks by fishermen.

And yes it is true – herring fart! Herring produce gas in the gut and swim bladder and release it out the anus in what appears to be a controlled way. This pulse of gas, termed Fast Repetitive Tick (FRT) is produced mostly at night and it increases as the density of herring within a school increases.

Terrestrial Animals

Black-Tailed Deer (Odocoileus hemionus columbianus)

The black-tailed deer is one of nine subspecies of the mule deer. They live in forested mountains and foothills of the Pacific coast. Blacktailed deer typically spend their entire lives in areas that measure less than three square miles. They do not migrate, but black-tailed deer living in mountain areas often seek lower elevations in winter. Columbia black-tailed deer are seen from California to British Columbia, while Sitka black-tailed deer (the smaller of the two varieties) live in Alaska. Black-tailed deer can be distinguished from other subspecies of mule deer by their larger tail, the back of which is completely covered with black or dark brown hairs. Other mule deer have smaller tails in which only the tip is black, and are generally larger then black-tailed deer.



Black-tailed deer feed along forest edges, where they can disappear into the forest if they're threatened. Similar to cows, they are ruminants and have four stomachs! Barely chewed food is swallowed, then regurgitated and re-chewed. The food passes through three additional stomachs before entering the

intestines. Black-tailed deer can eat a wide variety of plants and can even eat poison oak without any ill effects. They also feast on acorns, berries, fungi, lichens, nuts and woody growth.

Black-tailed deer mate from November to December. Sparring to establish dominance is common among bucks. Does prefer bucks with large, heavy antlers. Fawns arrive in May or early June, and usually weigh six to eight pounds. Twin births are common, although younger does are more likely to birth a single fawn. Bucks don't participate in parenting, and instead form bachelor groups in the summer. Does and their fawns form small family groups, led by the eldest doe. Male fawns leave the family group when they reach maturity, at about 18 months of age. Females mature at around two years.

Predators of black-tailed deer include mountain lions (66%), coyotes (26%), and bobcats (3%). Humans, bears, and wolves also hunt these deer. Animals like deer that have antlers shed them every year, which is different than animals with horns, which continue growing indefinitely. Fallen antlers provide a source of calcium for other organisms in the forest. Black-tailed deer use a special kind of jumping to escape from predators. This behavior is called stotting and resembles someone jumping on a pogo stick. When a deer stotts, it uses a slower escape speed than if it ran away like other deer outside of the mule deer family. Stotting allows them to go uphill using less energy and to jump over obstacles in rough terrain, while its pursuers are slowed down by having to climb over the same obstacles. A single, springing jump can cover more than 25 feet!

Gray Squirrel (Sciurus griseus)

Three species of tree squirrels live in the Bay Area. Of these, only the western gray is native to California, and its status is of concern to naturalists. Western gray squirrels live on the west coast of the United States from central Washington to southern California. Their range has been greatly diminished due to the introduction of the eastern



gray squirrel and the eastern fox squirrel. These non-native squirrels were brought into the Los Angeles area as pets in 1904 by some Civil War veterans who were relocating, and they have been out-competing the native western gray squirrel ever since. Furthermore, an epidemic of mange in the 1930s decimated many western gray squirrel populations in Washington. While the eastern species have two litters of kits per year, the western gray squirrel has only one litter of kits per year and thus appears unable to rebound from its population decline.

Dependent upon older mixed forests, these shy squirrels are intolerant of people and are often seen darting quickly up a tree when human approach. After fleeing they often make a series of loud barks and the stamp their feet. The western gray squirrel uses the interconnected tree canopy for food, cover, nesting sites, and impressive arboreal travel. The squirrel builds two nests called *dreys*. The first is a large, round covered shelter for winter use, birthing, and rearing young. The second is a sleeping platform for seasonal or temporary use. Both types are built with sticks and twigs, leaves and long strands of grass, moss, lichens, shredded bark and fur. These nests are important because the western gray squirrel does not hibernate.

Western gray squirrels' food sources depend largely upon local habitat characteristics. Those that live in coniferous forests primarily eat pinecone seeds, while those that live in hardwood forests eat nuts and acorns. They will also eat berries, fungus, bark, and even insects. Mating season is from December to June and the gestation period is 44 days. The female delivers three to five kits, each weighing about an ounce and only about an inch in length. The mother parents alone and she has a hard job, nursing the litter for 10 weeks. During this time the mother seems to be overworked, having a stressed appearance. All tree squirrels undergo a complete head-to-tail molt, including the tail fur, in the spring and a rump-to-head molt, excluding the tail, in the fall. Their lifespan is seven to eight years.

Raccoon (Procyon lotor)

The raccoon can be found in most of the United States, southern Canada, Mexico, and northern South America. Originally, raccoons lived in the tropics where they could be found foraging along riverbanks. Over time they moved north up the continent, successfully adapting to new territories and expanding their diet. The raccoon lives in wooded areas and always near water. It is highly adaptable and is often found in suburbs and cities. It usually makes its den in a tree, but has also made its home in abandoned burrows,



caves, barns, houses, and even sewers. A nocturnal and solitary animal, raccoons may live up to 16 years in the wild, but most don't survive past two years. If they survive their youth, their average lifespan is about five years, although in captivity or as a pet they can live into their early 20s.

The raccoon is omnivorous and opportunistic. In the wild the raccoon eats nuts, fruits, insects, frogs, eggs and fish. In suburban and urban areas, it forages through trashcans for food. In the wild its predators include mountain lions, bobcats, wolves, owls, hawks, and coyotes. In the cities these predators are not present and the combination of a lack of predators, hunting and trapping restrictions, and a readily available food supply make the city ideal for raccoons. Unfortunately, they carry diseases that can be harmful to humans and their pets.

The male raccoon is slightly larger than the female and is called a boar. The female is called a sow, while the babies are called kits. Mating season runs from January to March. The gestation period is about two months, after which a litter is four to six kits is born. It takes four to six weeks until the kits can stand. They are weaned at nine to ten weeks, and learn to hunt at nine to twelve weeks. The mother is protective and will attack predators that come too close.

Raccoons generally walk but can run at speeds up to 15 miles per hour! They make a number of vocalizations, including hisses, whistles, screams, growls, and snarls. Raccoons do not hibernate, but will spend weeks in their dens in the winter living off of their fat reserves. Christopher Columbus is the first individual we know of to describe this species in writing.

Tule Elk (*Cervus elaphus nannodes*)

The tule elk is endemic to California. It is the smallest subspecies of the North American elk. The other two subspecies of North American elk are the Roosevelt elk and the Rocky Mountain elk, and both can be found in California. Tule elk have been reported to be half the size of Roosevelt elk, and are sometimes referred to as dwarf elk, but this may only be a reflection of tule elk subsisting on marginal habitats and having poor nutrition. In the early 1800s, tule elk were widespread in California and were described as being as large as other elk. However, once cattle were introduced their food supplies dwindled and their range decreased. Combined with overhunting, this caused them to become locally extinct in the Bay Area by the 1870s, and less than 30 remained in the entire state.



In the spring of 1978, two bulls and eight cows were brought to Point Reyes National Seashore from the San Luis Island Wildlife Refuge near Los Banos. The elk were contained within a temporary, three-acre enclosure to allow for adjustment to their new surroundings. That summer, six of the cows bore calves. In the fall, 17 elk were released from the enclosure at Tomales Point to 2,600 acres of open grassland and

coastal scrub. By the summer of 1988, the population was at 93 animals. In 2009, over 440 were counted at Tomales Point, making the Point Reyes herd one of the largest populations in California. The elk in Point Reyes have begun to expand their range and are now coming into conflict with cattle ranchers. Through similar conservation efforts, by 2013 there were 22 populations throughout the state, with total numbers of over 4,000 head.

Tule elk forage on annual grasses such as red brome and cheat grass, as well as on perennial plants like globe mallow and wild licorice. In addition, alfalfa is important to the herd's diet. Tule elk's natural predators include mountain lions, coyotes, and the now extinct California grizzly bear.

The bulls live most of their lives separate from the females and calves except during rutting season, which begins in the end of July. During rutting, a dominant bull controls a harem of females and calves. With the bulls fighting for dominance and the females fighting for position within the herd, it is a busy season indeed. The cows give birth in May and June of the following year.

Prior to the 1800s, before they were forced off their lands, native peoples used the elk in various ways. The antlers and bones were used for tools, the hides were used for clothes, and of course the meat was an important food source.

<u>Plants</u>

Bay Laurel (Umbelluaria californica)

Bay laurel is a large evergreen hardwood tree that is native to coastal forests of California and southern Oregon. In Oregon it is known as the Oregon myrtle. In California it goes by many names: California bay laurel, California bay, California laurel, pepperwood, spicebush, cinnamon bush, peppermint tree, headache tree, mountain laurel and Balm of Heaven. The tree's pungent leaves have a similar flavor to the bay leaves used in cooking but are much stronger. This tree mostly inhabits redwood forests, mixed wood forests, and oak woodlands. It can reach heights upwards of 100 feet.

Native Americans highly valued this tree for its many uses. They used the leaves as a cure for headache, toothache, and earache. Poultices of the leaves were used to treat rheumatism. A tea made from the leaves was used to treat stomachaches, colds, and sore throats. The leaves were steeped in hot water to make an infusion that was used to wash sores and treat head lice. Both the flesh and the inner kernel of the fruit were used as food. The bay laurel nut itself was roasted and eaten whole or ground into powder and prepared as a drink similar to unsweetened chocolate. Chumash hunters burned the leaves to attract and stupefy deer.

Some modern-day foragers and wild food enthusiasts have revived the native practice of eating the roasted fruit and the nut. It is also considered a high quality hardwood, and is used today to make cabinetry, furniture, paneling, guitars, bowls, spoons, and other small items.

California Buckeye (Aesculus californica)

Also known as California horse chestnut, California buckeye is native to California and southwestern Oregon. It can be a large shrub or small tree, reaching a height of 20-40 feet. It is typically multi-trunked, with an estimated lifespan of 250-300 years. It has adapted to its Mediterranean climate by growing during the wet late winter and spring months and entering dormancy during the dry summer months. California buckeyes growing in coastal regions tend to hold their leaves until mid-autumn.



32

The California buckeye is widely distributed in California, growing along the central coast and in the lower elevations of the Sierra Nevada and Cascade Ranges. It is found in a wide range of conditions, ranging from crowded, moist, semi-shaded canyon bottoms to dry south-facing slopes and hilltops. In the coastal ranges north of Big Sur, it is found growing alone or with various oaks and California bay laurels.

Local Native Americans used the poisonous nuts to stupefy schools of fish in small streams to make them easier to catch. The bark, leaves, and fruits contain the neurotoxin glycoside aesculin, which causes hemolysis of red blood cells. The nectar of the flowers is toxic to honeybees but is a rich source of nectar to butterflies.

Coast Live Oak (Quercus argifolia)

Coast live oak is a large evergreen tree that grows to heights up to 100 feet. It has a short trunk with numerous crooked spreading branches. Like all other oaks, coast live oak is both monoecious (male and female reproductive organs are found on the same plant) and wind pollinated. This tree has elevated levels of acorn production every two to three years.

Coast live oaks grow in the coastal ranges from north central California to northern Baja California. It is the only native oak that thrives in the coastal environment. Although rarely found directly adjacent to the shore, living close to cold ocean waters allows it to benefit from mild winters and summers. In

summer the coastal fog provides protection from California's rainless summer heat. The coast live oak is particularly well adapted to fire because of its thick bark, and is able to produce new shoots from its branches after being burned.

Coast live oaks stabilize soil on slopes, provide an organic-rich litter, and contribute to habitat diversity for insects, birds, and mammals. Acorns are an important food source for birds, small mammals, and deer. Deer often eat the young foliage of coast live oaks as well. Native Americans used acorns as an important food staple and early European colonists found that the wood of the coast live oak made a superior charcoal for use in a variety of industries, including baking and preparing mortar. Today the wood is used to make bowls, spoons, and some jewelry pieces like buttons.

Coyote Bush (Baccharis pilularis)

Coyote bush is also known as chaparral broom, and is a shrub that grows in Oregon, California, Arizona, New Mexico, and Baja California. These plants are found in a variety of habitats including coastal bluffs, oak woodlands, grasslands, chaparral, on hillsides and in canyons. Coyote bush is drought tolerant, with small leaves that minimize the surface area exposed to the sun. Its leaves are also fire-retardant, making it an excellent landscaping choice. This species is a nectar source for most predatory wasps, small butterflies and native flies. The Coast Miwok heated the leaves to reduce swelling. They also used the wood of the coyote bush to make arrow shafts and for building houses.

Eelgrass (Zostera marina)

Eeelgrass is an underwater grass, or sea grass, that lives in shallow waters. Eelgrass is not a seaweed or an algae, but is a flowering underwater plant. Different varieties of eelgrass prefer different water temperatures and salinity, but all require sunlight to grow and reproduce. Each blade of eelgrass can grow up to three feet long.





Eelgrass beds provide shelter and food for many forms of life. Some fish use these beds for protection from predators, while other fish use them as a permanent shelter for their entire lives. Some fish, like herring, use the eelgrass as a nursery on which to lay their sticky eggs. Leopard sharks drop their babies in the safety of eelgrass beds. Small invertebrates, such as crabs, sea snails, amphipods and crustaceans can also live here, while larger animals hunt for food in eelgrass beds. Eelgrass provides benefits to humans as well. It improves water clarity by filtering polluted runoff and absorbing nutrients such as nitrogen and phosphorus. It also protects our shoreline from erosion by absorbing wave energy.

Eelgrass has been used by Native Americans for food. The rhizomes and leaf bases of eelgrass were eaten fresh or dried into cakes for winter food. It was also used for smoking deer meat. Other uses included thatching for roofs, packing material, stuffing for mattresses and pillows, and home insulation. Oddly enough, at one time it was used to stuff the seats of early models of Volkswagens.



Both eelgrass and oysters are important foundation species in San Francisco Bay. Eelgrass beds provide food, shelter, and spawning grounds for a diverse assemblage of native species, while native oysters help to improve water quality by acting as a natural filtering system. These valuable resources have suffered degradation in the Bay due to the impacts of development.

Blue Gum Eucalyptus (Eucalyptus globules)

Originally from Australia, this non-native invasive tree is found throughout California. It was first introduced to the San Francisco Bay Area in 1853 as an ornamental tree. Soon after, when domestic lumber sources were depleted, it was widely planted for timber production because it grows rapidly, reaching a height of 200 feet in only ten years. Unfortunately, people realized that these trees do not make good lumber. Blue gum eucalyptus was also planted for windbreaks, privacy barriers, erosion control, or to mark boundaries on lands that are now in national and state parks, and other natural areas. Rapid growth is accompanied by rapid water uptake, which is why eucalyptus plantings were also used to drain wetlands to make way for development and agriculture.

This species constantly sheds it highly flammable bark, creating abundant ground liter. Fire spreads rapidly among these trees and eucalyptus groves burn very hot. However, this is not a problem for the tree. It sprouts new shoots quickly after a fire, and fire makes its seeds pop open, allowing them to germinate on the cleared ground. Once established, blue gums can spread rapidly, outcompeting the native vegetation and altering the landscape significantly. In addition to being able to withstand fire, they can even survive being cut. Their response to being cut is to undergo mass sprouting from the base or trunk.

A study comparing the use of different types of trees by wildlife on Angel Island found three times more arthropods, more small mammals, and more bird species in the native oak and bay woodlands and grasslands than in stands of eucalyptus. The few bird species that have been found to prefer eucalyptus are widespread species that occupy many different habitats throughout their range.

Madrone (Arbutus menzieii)

Also known as bearberry, strawberry tree, the refrigerator plant, and arbutus, madrone is an evergreen tree with orange-red bark that peels off in thin sheets when mature. The exposed wood feels cool to the touch, hence the name refrigerator plant. Madrone is normally seen as a small tree about 2-3 feet in width, but with ideal conditions it can reach close to 100 feet in height and be 5-8 feet wide at the trunk. Madrones are native to the western coast of North America, ranging from British Columbia to California. They

prefer south or west-facing slopes with good drainage. Drought tolerant, they rarely need watering after becoming established.

Native Americans sometimes ate madrone berries, but more commonly made the berries into a cider-like drink. They also used the berries to make necklaces and fishing bait. Madrone bark and leaves were used to treat stomachaches, cramps, skin ailments, and sore throats. Many mammal and bird species feed off the berries, and birds often choose madrones for nesting.

Although the wood is beautiful when finished, large pieces of madrone lumber tend to warp severely and are unpredictable during the drying process. For this reason its wood is mostly used to make bowls, spoons and other small items.

Manzanita (*Arctostaphylos sp.*)

Manzanita, closely related to the madrone, also has beautiful red bark. It occurs as an evergreen shrub or very small tree and is found in the chaparral biome of western North America, ranging from southern British Columbia to southern Mexico. There are 106 species of manzanita, and 95 of them are found in the Mediterranean climates and cooler mountain regions of California. This diversity of species ranges from ground hugging shrubs to 20-foot trees. The name manzanita means "little apple" in Spanish, and is descriptive of its fruit.

Native Americans dried manzanita berries and ground them into a coarse meal for cooking, made cider from branch tips soaked in water, and used the leaves as toothbrushes. Due to the way it cracks against the grain, manzanita wood is difficult to cure and is not useful as lumber. However, it is sometimes used in furniture, decorative art, and small ornamental pieces.

Some manzanita species are among the rarest species in the world. The Presidio Manzanita is the most endangered and restricted plant in the mainland United States. In 1987 only one known plant remained at a secret location in San Francisco's Presidio, but it has since been successfully cloned. Another species endemic to San Francisco, the Franciscan Manzanita, had been believed to be extinct since 1947 until it was found in the Presidio in 2010.

Miner's Lettuce (*Claytonia perfoliata*)

Miner's lettuce, also known as winter purslane or Indian lettuce, is an edible, native, winter annual broadleaf plant, found throughout the western mountains and coastal regions of North America, from southern Alaska to Central America. Miner's lettuce inhabits natural plant communities, agricultural land, and urban areas, and prefers cool, damp conditions. You can find it almost anywhere in the San Francisco Bay Area, in locations ranging from Golden Gate Park to Angel Island. Occasionally it can even be seen growing in cracks in the sidewalk!

Miner's lettuce got its name during the California Gold Rush, when miners ate it because its high vitamin C content kept them from getting scurvy... Today it is most commonly raw in salads, but is not quite as delicate as other types of lettuce. Many people regularly forage for this plant in the months of February, March, and April, and occasionally you can find a restaurant serving it up as well.









Poison Oak (Toxicodendron diversilobum)

Pacific poison oak, also called western poison oak, is a woody vine or shrub that is able to thrive in a diverse array of habitats. Poison oak ranges from British Columbia to Baja California and is is California's most widespread shrub, occuring in mixed evergreen forests, woodlands, chaparral, coastal sage scrub, and riparian zones. It grows best in disturbed areas such as forest trails, city parks, suburban backyards, and roadside embankments. Its leaves are typically bronze when they first unfold in February and March, bright green in the spring, yellow-green in the summer, and bright red or pink from late July to October.



All parts of the plant contain the surface oil called urushiol, which causes an allergic reaction in humans. This oil causes contact dermatitis in 85% of all people and severe reactions in 10-15% of the population, sometimes requiring hospitalization. The oil is persistent; even a dead poison oak twig that is 100 years old can cause a reaction. One of the most serious ways of contacting poison oak is through fire. In California, Oregon, and Washington, close to one third of firefighters and forestry workers at some point will suffer from rashes and lung irritations due to burning poison oak and the toxic smoke it produces. The effects of urushiol result in more workers compensation claims from lumberjacks, park rangers, and firefighters than any other hazard.

Black-tailed deer, mule deer, squirrels and other indigenous fauna feed on poison oak leaves, which are rich in phosphorus, calcium, and sulfur. Birds use the berries for food, and utilize the plant structure for shelter. California's Native Americans used the plant's stems and shoots to make baskets and its sap to cure ringworm, and applied a poultice of fresh poison oak leaves to rattlesnake bites. The juice or soot was used as a dye for sedge baskets, tattoos, and skin darkening. The Chumash used the sap to remove warts, corns, and calluses, to cauterize sores, and to stop bleeding.

Toyon (*Heteromeles arbutifolia*)

Toyon, also known as Christmas berry and California holly, is an evergreen shrub that grows 6-15 feet tall. In exposed places, toyon is low and dense, whereas in woodlands it becomes more open, rangy and tree-like in shape. It is common in the foothills and low mountains up to 4,000 feet, and prefers open woodlands and chaparral. Toyon typically occurs together with oaks, manzanitas, and sages. The abundance of this plant in the hills above Los Angeles gave rise to the name Hollywood, because early European settlers mistook toyon's beautiful red berries as holly berries.



The fruits are consumed by birds, including mockingbirds, American robins, and cedar waxwings. Mammals such as bears and coyotes also use toyon as a food source. The fruits were also used by Native Americans as a food source that they made into a jelly, although most of the fruits were dried and then later cooked into porridge or pancakes. They made tea from the leaves as a stomachache remedy.

In the 1920s, collecting toyon branches for Christmas became so popular in Los Angeles that the State of California passed a law forbidding the collection of toyon on public land or on any land not owned by the person picking the plant without the landowner's permission.

Natural History Card Activities (NHCA)

Goal: Participants take responsibility for their own learning about what they are seeing in the environment

Time: This can be a quick 10-minute activity or it can be done over the course of a longer hike Who: Mostly youth. However, adults may be interested in looking through the cards themselves. When: Any trips where you have a few spare moments. You could use the cards on a hike, after lunch on a day trip, or when rafted up on the water if you select appropriate cards Where: Richardson Bay, Angel Island, or Tomales Bay Materials: A set of ETC Natural History Cards

Materials: A set of ETC Natural History Cards

Natural History Cards are great portable teaching tools. They feature the name of a species and an illustration on one side, and bullet points of information on the other side. This type of card is considered absolute gold in every outdoor educator's bag of tricks. It is a great way to disseminate information while keeping everyone actively participating. Once you decide where you will be using the cards, make sure that you have the correct cards for that area and then choose from one of the following activities or invent your own:

- Everyone's a Naturalist Guided Walk Activity
- Creative Each One Teach Ones Activity
- Eco Bingo Activity

Natural History Cards Activity 1: Everyone's a Naturalist Guided Walk

Gather your participants in a group and enlist a chaperone or a fellow guide to help. Make sure you have a stretch of trail that no one can get lost on. Your helper will be the "trail guard" and will space the participants out, allowing one person to head up the trail about every two minutes. Hand each participant a card and ask them to read it. Take about half of the group and walk up the trail. Space the participants out by several paces (enough so that when they are teaching one another they don't disturb another group. As your chaperone sends the participants every two minutes they will progress along the trail, stopping at each person they meet. When they "meet" someone on the trail, that person will "teach" their fellow student the information on the card. When a student gets to the end of line, they take their place in the line so that they can teach what is on their card. This way, everyone gets to hear all of the information. You can always encourage creativity, like giving everyone a theme to speak in their best professor voice or maybe like they all have a head cold. Mix it up and keep them laughing!

Natural History Cards Activity 2: Creative Each One Teach Ones

You can also keep everyone together on the hike, especially if you have a bunch of limelight hogs. Hand out a card to everyone and give them a few minutes to get familiar with the info. Let them know that as you progress on the hike, when they see what is on their card, they will be sharing the information on the card (i.e. you pay attention and remind them when their animal or plant is present). This activity can also be run in kayaks while on the water – in this case, the teachable moments should occur at times when the boats are all grouped together in one spot. Here is the twist: give the participants a predetermined way in which they will read or present the information on the card. It really helps if you can rock it and do the first one. Once you're done, be sure to collect the cards after you are done – be especially careful to collect the cards if you use them on the water! Here are a few ideas - everyone will read their card...

- As a rap song
- In your best Arnold Schwarzenegger (or any other actor) impersonation
- As a Valley Girl
- With an echo
- In your best accent
- With opera singing (this one takes an audacious group, but it can happen)
- As their favorite song
- Or whatever else you can come up with!

Natural History Cards Activity 3: Eco Bingo

For this activity you will need a set of ETC's Sea Kayaking Eco Bingo cards (one per participant) in addition to a set of ETC Natural History Cards.

Give everyone a Sea Kayaking Eco Bingo card and some space markers – rocks or pebbles will do. One at a time, pull out a Natural History Card and read only the bottom "Who am I?" sentence. Participants put a rock or other marker on the animal or plant that they think goes with that phrase. When they have a complete line of markers, they will yell BINGO! Once someone yells BINGO, make sure that they have marked the correct squares before declaring a winner.

Option: If you have extra time, you can play blackout and require that the whole board be filled before anyone can shout BINGO!

Note: This is a great game to play after using the set of Natural History Cards on a hike or on the water.

Memory Matching Game Activity

Goal: To learn about common species and places while testing participants' memory and having fun! **Time:** 30-45 minutes, probably best on overnights

Who: Anyone, but could work well with groups that are less mobile but still interested in learning about the local environment

When: Angel Island or Tomales overnights, after or instead of a hike, before or after meals Materials: Set of Memory Matching Game Activity cards

- 1. Cards are laid out in a grid of however many cards you want (make sure that the matching cards of all cards used are also present in the grid.)
- 2. On your turn, you flip two cards over. If one of the cards is the definition, description, or explanation of the other card, then you get to keep them and go again. If not, PUT THE CARDS BACK IN THE EXACT SAME PLACES WHERE THEY WERE.
- 3. Everyone else tries to remember the locations of all of the cards as they take their turns.
- 4. The game ends once all the cards have been taken in pairs
- 5. Whoever has the most pairs at the end wins. You could use all the cards for one big game, or split it up into smaller easier games.

Mussel Hustle Activity

Goal: To have fun, get your participant group energized, and learn a little bit about mussels and their adaptations

Time: 15-20 minutes

Who: Younger participants

When: Before or after intertidal zone exploration time / tidepooling, ideally after having observed some mussels

Where: On a sandy beach or a similar environment with space to move and few hazards Materials: None

Opening

We are going to play a game called the Mussel Hustle. If you already know a few things about mussels, you will probably be very successful at this game!

The Game

- 1. Divide the group into two teams by counting them off by 1 and 2. The 1s in the group will be the mussels and the 2s will be the ocean.
- 2. Draw a large circle on the ground. This represents where the mussels live. Ask this question: "Do you know where mussels live?" Then clarify the correct answer: "That's right, they like to live on hard surfaces in salty water. These surfaces can be a rock, a boat, etc." The 1s should stand within the circle.
- 3. Right now it's low tide and the mussels are inside this circle sealed up tight so that they don't dry out.
- 4. When I say "High Tide!" all of the 2s (the ocean) will come into the circle and pull as many mussels as they can out of the circle and out to sea.
- 5. When I say "Low Tide" everyone stop and we will see how many mussels remain. As the facilitator, call "Low Tide" before all of the mussels have been removed from the circle. The timing of your calls is key!
- 6. After the first round, have your mussels get together and form a plan to stay on their rock (within the circle), and have your ocean get together to figure out how they can get more mussels.
- 7. Play as many rounds as you want for your time frame.

Closing

Ask participants: "What did the mussels do to be able to stay on their rock and not be taken out to see?" and allow time for them to give some answers. You probably saw a bunch of people clustering together and holding onto each other very tightly. This is exactly how mussels behave to survive the ocean's currents, tides and waves. They form extensive, crowded beds, anchoring themselves by very strong threads called byssus. The ocean may be able to take a few, but it won't take them all when they cling together. Feel free to ask the participants if they can think of anything comparable in their lives

Migration Routes

What: Information on the Pacific Flyway Activities Available:

- Pacific Flyway Quick Facts Card
- Migration Hopscotch Activity

Bird conservation first came to the forefront of our consciousness with the near extinction of the whooping crane around 1941. Its numbers had dropped to only about 15 individuals due to habitat loss and because its feathers were in high demand for ladies hats. While bird banding can be traced back to Roman times, James Audubon modernized the process in the early 1800s. Tracking birds by applying a small metal band around its leg allowed us to exponentially expand our understanding of bird migration, which had been a largely unknown phenomenon. Naturalists who recaptured banded birds were able to track their movement, and flyways emerged as a new concept in our understanding of birds. An ornithologist named Frederick Lincoln made numerous contributions to the field, including the concept of protecting and managing



areas along the main flyway corridors. The protection of flyway corridors allowed the whooping crane to be saved, and its numbers continue to recover today.

The Pacific Flyway is a migratory route that is used by more than a billion birds every year and we get to paddle on key parts of it every trip! As a kind of freeway for birds, it extends from Alaska to the southern tip of South America and is made up of a diverse chain of habitats that bird species will travel to in search of food, breeding grounds and overwintering grounds. Birds travel part or the all of the route with the changing of the seasons in the spring and fall. San Francisco and Tomales Bays are critical stopovers along the Californian stretch of the flyway because they are large areas where good habitat still exists. With the building of the railroad that traces the length of our coast, many of our historical estuarine habitats were destroyed. Now the major stopover areas in California include The San Francisco Bay and the Sacramento / San Joaquin Delta, Mono Lake, Suisun Marsh, the Central Valley and the Salton Sea. A patchwork of smaller habitats are still functioning, but none are able to support the bulk of biomass that these locations can. Of these, San Francisco Bay is the largest estuarine habitat on the west coast of the Americas and it is speculated that fully 20% of the bird population in North America has passed through the Bay and 50% of those that use the Pacific Flyway use the Bay during part of the year. At any one time, there can be over 800,000 birds present in San Francisco Bay!

With the reconstruction of the Giacomini Wetlands, Tomales Bay has been regaining some of its historical importance along the Flyway. Damming to create dairy farmlands compromised habitats in the past, but now wildlife has begun to repopulate previously unavailable areas. There are over 50 species of birds that have been identified as overwintering species in Tomales Bay. Many populations of birds that travel along the Pacific Flyway are declining in numbers due to loss of habitat, making the conservation of habitats that are still functioning and healthy – such as Tomales Bay – all the more important.

Migration Hopscotch Activity

Goal: Participants play a fun game to learn about the difficulty birds face when migrating in the face of habitat loss

Time: 20 minutes

Who: Younger participants take to this activity well. Older participants might enjoy the Frisbee version a little more, but it depends on the group.

When: Overnight trips primarily, but this information is a great discussion topic while you are paddling and looking at migratory bird species

Where: All of our kayaking destinations are considered critical habitat on the Pacific Flyway Materials: A beach with wet sand, or sidewalk chalk if wet sand is not available. Also, a stone or marker for each participant

Hopscotch is a time-honored game that may be unfamiliar to your younger clients in this increasingly digital era. However, we can bring it back while also teaching about the importance of saving the Pacific Flyway! The basics of migration hopscotch are:

- 1. Draw out the basic pattern in wet sand or with chalk on pavement
- 2. Each box is numbered (classically to ten). See figure at right:
- 3. Each person finds a marker (shell, rock, etc). Here is where you can explain what a flyway is and that this hopscotch course represents the Pacific Flyway from Alaska (#10) to San Francisco (#1). We aren't considering the whole flyway today. If you have a larger group, it would be great to have several boards drawn and break the participants into groups of 3-4. You can even name each team as an endangered bird species.



- 4. One at a time the participants will toss their marker to one of the numbers and hop through the course on one foot. If there are two squares next to each other then they may use both feet. Classically, the game is played by starting the marker in square #1 and proceeding numerically. However, once everyone gets the hang of it, you (the evil mastermind) with each round will announce a disaster (oil spill, railroad, habitat loss for a development of houses, SFO, landfill, etc.) and wipe out a numbered square. Everyone should still manage to navigate the course after the first disaster. However, with each round you will take out another square. It should become increasingly difficult. If a participant falls, or can't make the jump, they can no longer migrate and help their species.
- 5. But wait!!! There is hope! After a few disasters, you can "reintroduce" a square with an example like the Giacomini Wetland project that reintroduced 550 acres of habitat back into the system, or the protection of Richardson Bay as a Pristine Estuary.
- 6. Run this activity for about 5-6 rounds and then end with a discussion. Possible discussion questions:
 - a. What do you think? Was it hard to lose those squares?
 - b. What happened when you lost a square?
 - c. What can we do to help preserve the Pacific Flyway?
 - d. How would you go about charting bird movement

Possible Variation:

Use a Frisbee or ball. Each of the participants represents a stopover location, the Frisbee is the bird and must complete a migration. Spread everyone out and have them toss the Frisbee to each person (stopover), moving person by person from one end of the "flyway" to the other. Be sure that everyone is not spaced in a straight line. The Flyway is not straight, so move them around a bit. With each round, the "disaster" of your choosing has a person sit out or stand, thus making it harder to get the Frisbee along the route. If anyone drops the Frisbee, that is one failed migration. With a piece of paper and pen, you can chart how many birds make it each round. Again, if you have a large group, break them into smaller groups so they are easier to manage and more people are involved at a time.

Tides and Currents

What: Basic information on what causes tides and currents and ways to teach these concepts Activities Available:

- Tides and Currents Quick Facts Card
- Tidal Reenactment Activity
- Faces of the Moon Activity

This section explains what causes tides and currents and some good ways to go about teaching that information to your participants. For information about how to safely navigate tides and currents on trips, please refer to the Sea Kayak Program Guide Manual.

What causes currents in the ocean? Equatorial currents in the ocean are caused by heat, wind, and the spinning of the earth. When the sun heats air, it rises. As air gets sucked in from adjacent areas to replace the rising air, it creates wind. The air that rises will eventually cool and sink back down again, creating a continual circular pattern of airflow. When the cooled air falls back down, the earth will have turned, pushing that circular air pattern slightly to the side. Friction between this continual pattern of air and the water is how the major ocean currents of the world get started. Since the earth has landmasses that get in the way of ocean current movement, we have large-scale circulation systems for each of the major oceans of the world. These are called gyres.

In San Francisco and Tomales Bays, we experience smaller-scale currents that are caused by the flood and ebb of the tides in and out of these bays. Depending on the group, consider introducing your

participants to the terms flood (when water is coming into the bay on a rising tide), ebb (when water is going out of the bay on a falling tide) and slack (the transition time between ebb and flow).

What causes the high and low tides that we experience everyday? Tides are caused by the gravitational pulls of the earth, moon, and sun on the water that fluidly moves over the earth's surface. If you have ever experienced the force that pushes outward from the center as you are spinning (like on a merry-go-round), you have experienced centrifugal force. Gravity pulls inward, while centrifugal force pushes outward. Therefore the earth's water is being acted upon by the earth's gravitational pull (inward), centrifugal force (outward), *and* the gravitational pull of the moon and the sun. The strength of these forces changes every day as the earth rotates around the sun and the moon rotates around the earth. Since the ocean's movement is dependent upon the forces acting upon it, ocean tides are different every day.

As the earth rotates, centrifugal force causes water to bulge outward on the side of the earth that is farthest from the moon. However, on the side of the earth closest to the moon, water will bulge toward the moon because the moon's gravitational pull overcomes the earth's centrifugal force. Thus, the oceans are almost always bulging outward in two different areas of earth. An area of the world where the ocean is bulging with more water can be equated with high tide. Similarly, the "thinner" areas of water where the oceans are not bulging correspond with low tide. In most places on earth, we have two high tides and two low tides every day. This is referred to as having semidiurnal tides.

The sun also has an effect on our tides, although the force of its pull is about 2.5 times less than that of the moon because it is so much farther away. However, when the sun and moon are in alignment, their gravitational pulls combine and create super low and super high tides called spring tides. These occur at new and full moons. When the sun and moon are at right angles, their gravitational pulls cancel each other out a bit. The result is that the difference between low tide and high tide levels is not as extreme – these more "normal" tides are called neap tides.

These can be tricky concepts to explain and visualize. Therefore, the activities and games for this section mainly involve participants physically walking through the water movement so they can start to get a handle on what is going on.

Tidal Reenactment Activity

Goal: Visualize how water moves relative to the earth to create the tidal changes that we see every day Time: About 20 minutes
Who: Sixth grade and up
When: Overnights or lunch on a longer day trip
Where: Open area with nothing to trip on. Grass or a beach area would work well.
Materials: Some kind of treat (cookies work well), diagrams in this write-up

Gather everyone together and talk a little bit about what causes water to move or bulge on the earth's surface. Be sure to cover centrifugal force and gravity. You can quickly demonstrate these forces by having a volunteer jump up into the air to demonstrate the earth's gravitational pull and then having a second pair of volunteers grab hands and spin in a circle to demonstrate centrifugal force (be sure to manage safety on this one). Then you can introduce the concept that with gravitational pull, water will "bulge" toward that source of gravitational pull. This can effectively be demonstrated by pulling your shirt away from your core. Grab a volunteer and have them be the moon. If they are standing in front of you, pull your shirt toward them. Now have them move to your left. Move your shirt accordingly. You as the earth haven't moved, but the water that your shirt represents has.

 For the first step of this game, you might want to play up what a wonderful treat you have for everyone (i.e. M&Ms, Oreos, etc.). You will be the moon and will have control of the treat. Have everyone stand in a circle and interlock elbows. If you have another adult or guide, have them stand in the center of the circle and be the earth. Be sure to let the participants know that they are representing the water on the earth's surface.



- 2. Next, let everyone know that if they work together they might be able to reach the treat on the moon. However, they cannot move the earth and they cannot break their circle. You as the moon have the treat and if they can touch you, they can have a group treat.
- 3. Now you as the moon move to a position keeping just out of their reach. As the treat keeper, you are only going to let them have the cookies at the end. Don't let them reach you!
- 4. Move again to another position. While trying to get the treat, everyone is demonstrating the water bulges on the earth that create the tides. It works really well to either have the diagrams in this write-up on hand or to "deputize" a participant to help instruct the "water" where to go.
- 5. Hopefully, you have another guide or adult who can act as a second treat master. When you as the moon have moved a few times and the group has unsuccessfully tried to reach you, introduce the sun (the second treat master). Use the diagram if you need to and position yourselves so that you can demonstrate spring and neap tides. The circle of participants should be pulled in two different ways (as you should see in the diagram).
- 6. Discussion time!
- 7. Feel free after the cookie discussion to get back up and have everyone demonstrate one more time, if they seem interested.

Discussion

Let everyone know they did a good job and have them gather in a circle. Pass out the treat or cookies and while the group is munching start a discussion. Here are some possible questions:

- What happened when the moon moved? Did you try to get the cookies?
 - Your desire to get the cookies mimicked the gravitational pull of the moon on the earth's water.
- Did you ever leave the earth?
 - No, and the water can't either. It can only pull toward the moon.
- Why are there two high tides and two low tides every day?
 - Explain that due to centrifugal force there is actually a second bulge on the side of the earth opposite the moon. Since it takes 24 hours for the earth to revolve, if you were to mark a place in the ocean with a flag, that flag would pass under a bulge of water twice a day creating our semi-diurnal tides.

Faces of the Moon Activity

Goal: Participants understand why we see different phases of the moon

Time: 10-15 minutes

Who: This is great for younger participants. Older students (7th grade and up) will go through this activity quickly.

When: At night / after dark Where: A dark room or outside if it is not super bright from the moon Materials: Two volunteers and a bright flashlight

Background

Is the moon actually shrinking and growing before our eyes every month? The phases of the moon are caused by differing angles of the earth, sun and moon in relationship to each other as the moon orbits the earth. It is a common misnomer that the dark new moon and other moon phases are caused by the earth's shadow. In reality, half of the moon's surface is always lit by the sun. Sometimes we can see that whole illuminated portion (full moon), sometimes we see part of the light and dark portions (quarter moons), and sometimes we cannot see the illuminated portion at all (new moon). This happens because we are



always seeing the same face or side of the moon as it makes its slow rotation around the earth (one rotation roughly every 27 days). For this activity, we will be considering only four phases: new moon, first quarter, full moon, and third quarter. The phase of the moon can give us a clue as to where it is in relation to the sun and the earth. With a headlamp or flashlight and someone's face, you can demonstrate how this happens.

Running the Activity

- 1. Ask for two volunteers. One will be the "face" of the moon, and one will be the sun.
- 2. The person with the flashlight will be the sun. They are stationary and will have the flashlight pointed at the face of the moon.
- 3. The moon is basically donating their face. Be sure to preface with them to close their eyes when the light is shining on their face.
- 4. Because the earth does not cast a shadow on the face of the moon, we will have everyone else, as a group, represent the earth sitting down. They (the "earth people") will be grouped together between the moon and sun so that they can see from the same vantage point and as the moon moves, they will rotate while staying seated (see diagram).
- 5. We know that from our vantage point on the earth and with how slow the moon rotates on its axis that we are always seeing the same "face" of the moon. Therefore, the volunteer moon will always face the grouped up earth people. From their starting position the moon will side step around the earth people while always facing them.

- 6. Set the moon and sun facing each other (about two feet apart). Now have the moon face away from the sun so that the back of their head is illuminated. The earth people should be facing the moon and see a face that is dark. This represents the **new moon**. This demonstrates the concept that when there is a new moon, half of the moon is still illuminated (the back of the moon's head) by the sun, but from our vantage point on earth we cannot see it.
- 7. Have the moon sidestep counterclockwise around the earth people. Make sure observers change their orientation as well so that they are always looking toward the face of the moon. Half of the moon's face will be illuminated and the shadow will be somewhat crescent shaped. This is the **first quarter moon** and demonstrates that we are still seeing the same face of the moon, but we are seeing part of the sunlit portion and part of the shadowed portion.
- 8. Again have the moon sidestep counterclockwise until the earth is between the moon and the sun. The moon's face should now be fully illuminated. This is the **full moon**.
- 9. Sidestep again and the moon's face should again be half shadowed, but now it is the *other side* of their face. This is the **third quarter moon**. Once you are a little more comfortable with the concepts, you can tell by which way the moon's crescent is facing whether the moon is waxing (moving toward the full moon) or waning (moving toward the new moon.
- 10. One more sidestep and you should return to the new moon.
- 11. Once you have successfully gone through the rotation, do the activity one more time with another volunteer so that the original moon volunteer can see the effect.

Extra Notes

The earth does not cast its shadow on the moon because the earth and sun are on slightly different orbital planes. However, sometimes they do line up. When the sun, moon and earth become perfectly aligned, we experience either a solar eclipse (where the moon blocks our view of the sun) or a lunar eclipse (where the earth blocks our view of the moon).

Plankton and Bioluminescence

What: Cool facts about plankton and basic information about bioluminescence Activities Available:

- Plankton Quick Facts Card
- Bioluminescent Buddies Activity
- Plankton Web of Life Cards Activity

The word "plankton" derives from the Greek word for wanderer. The misnomer that plankton are only microscopic is false! Anything that cannot swim against a current is considered a plankter (plural: plankton). And while the attention-grabbing aspect of plankton is that the majority of plankton species can produce their own light, plankton has very important roles in fixing atmospheric carbon (good for global climate change), producing oxygen (good for us air breathers), and serving as the base layer of a very complex web of energy in the ocean. They also have really cool names! For the purposes of this manual, we will focus on just a few of the most common species. Plankton can be grouped into a few main categories:



Phytoplankton

Phytoplankton are plant-like micro algae. Diatoms and dinoflagellates are the most well known types in this group. Like plants, they can photosynthesize and are so very important because they use nearly three billion tons of atmospheric carbon every year! Every year it is estimated that phytoplankton are responsible for removing nearly half of the carbon dioxide that we emit by burning coal, oil and gas, from the atmosphere. Beyond taking out our trash, it is also estimated that they produce at least 40% of the earth's atmospheric oxygen. These powerhouses of energy are eaten by zooplankton and are the beginning of the oceanic food web. The darker side to the dinoflagellates is that some species produce a biotoxin. When they undergo blooms – namely when there is a lot of freshwater runoff – they can cause a dangerous "red tide." When filter-feeding animals like mussels eat the dinoflagellates and then we eat them, those biotoxins can cause us to become sick. But don't worry – only about 75 of the thousands of species of phytoplankton produce these biotoxins.

Zooplankton

When we think about what large whales eat, we often think of small, shrimp-like animals called krill. Krill are a type of zooplankton, or animal-like plankton. Most marine life begins as zooplankton in its juvenile form (fish eggs and the larval forms of snail, crabs, sea jellies, anemones, and much more). As they grow larger, many of these animals become capable of controlling their own movement in the current. Animals that start off as "drifters" but then stop being planktonic are referred to a meroplankton. Other zooplankton are permanently planktonic, or "drifters for life," and are called holoplankton. One of the most interesting examples is the enigmatic copepod. The copepod is the world's strongest and fastest animal (relative to its size, which is about about 1 mm or the size of a grain of rice). If you were to scale a copepod to the size of a cheetah, the world's fastest land animal, a copepod's top speed would be 2,000 mph compared with the cheetah's 70 mph! Its long antennae can propel it up to 500 times its body length in less than a second! Many species of copepods squirt out a bioluminescent cloud when trying to escape predators as they motor around in the water. It is also estimated that copepods amount to one of the greatest biomasses on the planet. If you have ever swallowed seawater, you have eaten a copepod.

Bioluminescence

The beautiful "sea sparkles" that you can see on night paddles when there is no moon or other light are mostly caused by a type of plankton called dinoflagellates (*dinos* = to spin; *flagellate* = having a whip-like tail). Dinoflagellates and many other types of plankton (both phytoplankton and zooplankton) contain a compound called luceferin, which reacts with an enzyme and oxygen to create light when the water

around the organism is disturbed – such as when a fish swims by, a boat makes a wake, or when your kayak paddle dips into the water. The energy that is released by the reaction comes in the form of the blue-green light that is visible in the water. Interestingly, the reaction that causes bioluminescence is a cold reaction. While most enzymatic reactions produce heat, luciferin reacting with oxygen only releases energy in the form of light and there is no heat – this is a very efficient reaction. This is the same reaction that makes fireflies glow. No one really knows why dinoflagellates bioluminescence, but scientists think that the use of bioluminescence in animals is either to scare away predators (allowing them to escape!), find a mate, or lure food in. As an example, mysid shrimp will flash light that momentarily blinds their predators. There are many animals and plants that can bioluminescence (including fireflies and flashlight fish), but the main types you will see glowing from your kayak are dinoflagellates, diatoms, and copepods.

Bioluminescent Buddies Activity

Goal: Help participants understand how bioluminescence can help identify different animals in the dark **Time:** 10-15 minutes

Who: Anyone! Plankton is amazing! For visually impaired participants, see extra bioluminescent buddies adaptation.

When: Evening program and night time paddles

Where: Tomales Bay

Materials: Bioluminescent Buddy Activity Cards. These are cards with a picture of the plant or animal on the front. In each area that the plant or animal bioluminesces, there will be some glow paint. Once the lights are off, all you will be able to see are the glowing areas. All you need are the cards, a flashlight and darkness.

This is a simple game that can be played as many times as the participants wish. Charge the "glow-inthe-dark" paint with a flashlight and hand out a card to each of the participants randomly. Do not let anyone see their cards before placing the card on their head facing upwards. Ideally, they will not see the cards in the light; they will only look at the glowing patterns in the dark. Once everyone has their cards, discuss safety (walk slowly so you don't run into anyone in the dark). Turn off the light and have everyone bring their card down in front of them. Then they must find their "matching species" by looking at the glowing patterns on their cards and comparing them to others cards. Everyone will walk around trying to find their match. Although it is a quick game, sometimes the cards must be re-charged during a round and always between rounds. Once the participants get the hang of it, they can even recharge them as they go along. The variations of this game can be endless. For example, you could divide the species into predator and prey and play until the predators have "caught" their prey.

Things to discuss before and during the game:

- This game is played in the dark, so exercising caution and moving slowly is important.
- Identifying a species by only its luminescent spots can be difficult if participants are continually ruining their night vision with flashlight flashes. However, this could also become a teachable moment about how useful it can be to flash your predator in the eyes while you escape!
- If it is a full moon outside, the game may be better played inside so that participants can only see the bioluminescence (glow-in-the-dark paint) and not the outline of their organism.
- For visually impaired groups, there is another set of cards that they can feel before playing the game to learn what the shapes of the organisms are. And then once they play the game you will explain that only the "lit" areas on the card will be raised. Once they find their "buddy" you will be able to hand them the outline card to match with the bioluminescent pattern card.

Endemic vs. Native vs. Non-native vs. Invasive

What: Definitions of these terms and examples of each Activities Available:

- Quick Facts Card
- Discussion Topics

Our two main locations for overnights, Angel Island and Tomales Bay, provide great examples for the discussion of endemic, native, non-native and invasive species. It's important to remember that what might be native in one area may become invasive in another. But what exactly do these terms mean? Let's review the definitions:

- An **Endemic species** is a plant or animal that is found in one area and nowhere else in the world. Islands often have a high incidence of endemic species (if they survive human intervention), because they become isolated and therefore often evolve into their own species with a unique set of adaptations to their island life. Australia is well-known for its abundance of endemic species (koalas, kangaroos, platypus, etc.). The best example for our area would be the Angel Island Mole (first identified in 1939).
- A Native species is a plant or animal that was originally found in a place but can be found elsewhere as well. All endemic species are native, but not all native species are endemic. For example, coyotes are native to California, although they are also found elsewhere in North America and thus are not endemic to a single spot. In contrast, the Angel Island mole is native to Angel Island but also endemic to the island since it is not found elsewhere.
- A **Non-native** species is a species native to another place that has been introduced to an area. There is still scientific debate today about how far back in time a species has to have been introduced to a place for us to consider it native or non-native. From an ecological perspective, we usually consider those species that were introduced to an area by humans to be non-native. The introduction of a non-native species by humans can either be inadvertent (ship bilge water) or for some purpose (Blue Gum Eucalyptus trees for erosion control, or Black tailed deer for sport hunting on Angel Island).
- An **Invasive** species occurs when a non-native is so well suited to living in an area that it "takes over" and outcompetes the native species for resources (living space, water and food). San Francisco Bay is one of the most "invaded" Bays in the world with an estimated 90% of its biomass made up of invasive species. A good example of an invasive species is crystalline ice plant, which is native to South Africa. It was introduced to California as early as the 1500s from sand used in ships' ballast. The Department of Transportation used it for a while for erosion control, but discontinued its use in the 1960s. Ice plant is detrimental because of its extraordinary ability to take up water from its surroundings and outcompete surrounding native plants.

Rather than provide extensive lists here, you will find an organism's status (native, non-native, endemic or invasive) on ETC's Natural History Cards. The following is a chart with a common example of each category for San Francisco and Tomales Bay.

	Endemic	Native	Non-Native	Invasive
San Francisco	Angel	Coast Live	Blue Gum	Scotch
Bay	Island Mole	Oak	Eucalyptus	Broom
Tomales Bay	None	Olympia	European Green	Atlantic
		Oyster	Crab	Snail

Discussion Topics:

After giving examples of each of these categories, it can be useful to query your participants to facilitate discussion and help them explore why we should care about native populations or what it would mean to them for a native population to disappear.

- 1. What do you think? Why is it important to care about native and non-native species?
- 2. What do you think would happen if our native population of herring disappeared from the Bay?
- 3. How would you be affected if oak trees were gone because they were outcompeted by eucalyptus trees?
- 4. Why should we care about our impact on the local ecosystems?
- 5. How do you think Angel Island (or Tomales Bay) will look like 50 years from now?
- 6. How do you think we could go about protecting these areas from invading species?

Geology

What: Basic descriptions of rock types and specific geologic formations found at our sites Activities Available:

- Geology Quick Facts Card
- Tasty Tectonics Activity
- Geology Quick Rabbit Activity

You can share a teachable moment about geology with just a basic knowledge of the three main types of rocks and the understanding of a few basic concepts. The Earth is made up of three basic layers, starting with the core at the center of our planet and moving outward to the mantle and the outermost shell, known as the crust. The crust is made up of pieces called *plates* that usually have both an oceanic and continental component. These plates "float" on top of the mantle, and where plates are adjacent to each other the movement along their boundaries falls into four different categories. The possibilities include:

- 1. Plates can scrape against each other creating transform fault zones. An example is the San Andreas Fault, where one plate is moving north and the other is moving south.
- 2. One plate can be shoved underneath the other (this is called subduction). In California, both the Sierras and Coast Ranges were formed this way.
- 3. Plates can mash together, forming mountains (this is called uplift). India crashing into Asia caused the uplift of the Himalayas.
- 4. The plates can pull apart from one another, creating a space for new material to rise to the surface (seafloor spreading, which leads to mid-ocean ridges)

By looking at the rock formations around us, geologists can usually figure out what happened to lead to particular structures and types of rock being found in a place.

Rocks fall into three basic categories: sedimentary, metamorphic and igneous.

- Sedimentary rocks are those that are formed by layers of sediment and organic waste that have been deposited and compressed. Sedimentary rocks are usually softer rocks and have a layered appearance. An example would be sandstone or chert, which makes up a lot of what we see here in the San Francisco Bay Area.
- **Metamorphic** rock is a type of rock that has been subjected to heat and pressure (without being melted). An example would be marble or limestone.
- **Igneous** rocks are cooled and solidified magma (liquid rock). Examples are granite, basalt, and lava flows from a volcano.

At our paddling locations we have rich fodder for a "rockin" discussion, as we have a form of rock considered such a hot mess that it received its own name (the Franciscan Formation), and to the north we have the famous San Andreas Fault, which passes directly through Tomales Bay. These phenomena are well studied and there is plenty of information available.

San Francisco Bay: Raccoon Strait to the Golden Gate

The San Francisco Bay is a drowned river mouth formed by the merging of the Sacramento and San Joaquin Rivers. Twenty thousand years ago, at the end of the last ice age, sea level was 400 ft lower than it is today (all that ice takes up a lot of water!). In fact, exposed land extended all the way to what are now the Farallon Islands, twenty miles west of San Francisco. While this low-lying river valley was exposed, the ancestral Sacramento River carved out what is now known as Raccoon Strait. Apparently the water flow was enough to cause large rapids, which is why this strait is still the deepest part of the bay at 234 ft deep (with the exception of the main channel where the bay passes through the Golden Gate, which is deeper). About 10,000 years ago, the ice started to melt and the river valley flooded, isolating hilltops as islands and making the area appear a little more like it does today.

The Sacramento and San Joaquin Rivers still empty out into the bay, carrying sediment that is continually deposited. Because so much sediment has been deposited over the years, the average depth of the bay is only about 12ft deep! The continual deposition of sediment, mixed with large amounts of phytoplankton called radiolarians, is what comprises the majority of the sedimentary rock foundation under San Francisco Bay. Prior to the formation of the San Andreas Fault, this sediment was compressed, faulted, folded and combined with metamorphic rocks in such a random manner that it has puzzled geologists for years and come to be called the Franciscan Formation. Ninety percent of the rocks in the Franciscan Formation are a muddy



From *An Introduction to the San Francisco Estuary*, by Andrew Cohen. Illustrations by Jack Laws.

type of sandstone called graywacke. Chert, also a sedimentary rock, is formed of layers of deposited single celled plankton called radiolarians (their glass shells are deposited on the ocean floor when they die) and is often folded into wavy patterns. The predominant metamorphic rock found here is basalt, which is a remnant of the oceanic crust.

Tomales Bay: The San Andreas Fault

The San Andreas Fault, arguably one of the most well-known faults in North America, demarcates the boundary between the North American and Pacific Plates and runs right down the middle of Tomales Bay. The discovery of this fault came with the historic San Francisco earthquake of 1906 and there are several hikes in the Point Reyes area that show historic evidence of the movement of the fault. The San Andreas is a strike-slip fault that occurs as the North American and Pacific plates slip by one another. Therefore, the Point Reyes Peninsula is on the Pacific Plate, while the rest of Marin County is on the North American Plate. Three faults converge near Bolinas Lagoon to form the San Andreas Fault zone including the San Andreas, the Golden Gate and the San Gregorio Faults. These three faults run the length of Tomales Bay. The rocks on the east side of the bay are made up of the Franciscan Formation rocks,

mainly grawacke, chert and oceanic basalt. On the west side of Tomales Bay is a unique form of salinian granite thought to be around 100 million years old. This particular granite matches the granite found in the Tehachapi Mountains, over 300 miles south of Point Reyes. This tells us that Point Reyes has been traveling northward for a long time!

Tasty Tectonics Activity

Goal: Create a visual (and edible!) demonstration of the concepts you are talking about Time: 10 minutes Who: Participants of any age When: Day paddles or overnights Where: All sites Materials: A sandwich cookie (such as an Oreo) for each person. This works best if the cookies are at room temperature.

This particular activity is well known in outdoor education, and this version is adapted to the geology of San Francisco and Tomales Bays.

- 1. Gather everyone into a circle and hand out the cookies, but make sure they don't eat them yet!
- 2. Separate both halves without breaking them.
- 3. Hold the cookie with the most frosting in your left hand and the least frosting in your right hand.
- 4. Your oceanic cookie is made up of three components. The bottom layer (the hard cookie) is <u>basalt</u>, an igneous rock formed by eruptions from underwater vents and volcanoes in the middle of the ocean. The frosting layer (the frosting is representing two softer layers) is chert and grawacke. <u>Chert</u> is a sedimentary rock that is made up of the silica skeletons of billions of glass-shelled algae called radiolarians. When the radiolarians died, their skeletons were deposited on top of the basalt. The top layer is <u>graywacke</u>, a sandstone made of sediments from the continent that were carried by coastal currents and deposited on top of the chert. Your continental cookie (right hand), should have almost no frosting if you can manage it and represents the continental edge of the North American Plate.

Left Hand	Most frosting	Represents oceanic Pacific Plate
Right Hand	Least frosting	Representing continental North American Plate

- 5. Hold the cookies about shoulder width apart and start moving the Pacific (left hand) cookie slowly toward the North American (righ hand) cookie. The Pacific plate moves toward the North American at a rate of about 2.5 inches per year. This is about the rate at which your fingernails grow!
- 6. Eventually, your oceanic (left hand) cookie comes into contact with the continental (right hand) cookie. Since oceanic plate material is denser or heavier than continental material, the oceanic cookie will be pulled under the continental cookie. This is called subduction.
- 7. As your oceanic cookie is subducted beneath the continental cookie, scrape off the frosting on the oceanic cookie into a big mound on the edge of your continental cookie.
- 8. The mound of frosting on your continental cookie represents the scraped-off seafloor rocks of the oceanic plate. The Marin Headlands are a great example of this. As the Farallon plate was subducted underneath the North American, oceanic deposits and basalt were scraped off and piled up into what we see today as the Marin Headlands.
- 9. By now everyone is probably really ready to eat their cookie. Let everyone eat their geology and ask if there are any questions.

Geology Quick Rabbit Activity

Goal: Participants learn the three main types of rock while playing a fun game
Time: 10-15 minutes
Who: This activity works best with younger participants around middle school age, or anyone with higher energy levels
When: On a hike to provide a quick and fun break
Where: Try to do this in a place with an example of interesting geology
Materials: No materials are needed except high energy

Stand everyone in a circle. You will be in the middle. It is best to introduce this game in steps (or in layers – no pun intended!)

Layer 1: As you slowly turn in a circle, you will randomly point to a person and quickly say "Rockety Rock Rock Rock!" That person must respond with "Rock!" before you finish speaking or they will be in the middle. However, if you stop and *only* say "Rock" while pointing at someone, they must stay *quiet* or they will be in the middle. Practice a few rounds with lots of energy.

Layer 2: Now you will be introducing the different rock types. With the same set-up as before you will be adding to the things you can say when you point at someone from the middle. Now you can say one of the three rock types while pointing at someone. The motions they must do to avoid winding up in the middle will involve the person on either side of them.

Igneous: When you point at someone and say "igneous" they must pantomime a volcanic eruption while the person on either side of them put their hand up in the air making up the sides of the volcano. **Metamorphic**: When you point at someone and say "metamorphic" the person in the middle will "squish" between their neighbors who push on either side while chanting "heat and pressure, heat and pressure."

Sedimentary: When you say "sedimentary," the person you point to and their neighbor on either side, must quickly stack their hands in layers, alternating bringing their hands to the top of the stack of hands while chanting "layers, layers, layers!"

In each case, if the person who is pointed at does not respond quickly enough, they become the person standing in the middle. Practice just this part for a few rounds.

Layer 3: Now put it all together! The person in the middle can say one of five things while pointing at someone.

- 1. Rockety Rock Rock Rock!
- 2. Rock!
- 3. Igneous!
- 4. Metamorphic!
- 5. Sedimentary!

The person in the middle is trying to get out and the quicker they can throw instructions at the people the point to, the better. Make sure that you actively manage the game and feel free to step in and curtail any behaviors that you do not feel are within the spirit of the game. For example, make sure that the person in the middle is looking at the person they are pointing at and giving instructions to. Have fun!!!

Geography

What: A collection of information that will help you give your participants a sense of where they are Activities Available:

- Quick Fact Cards for Angel Island, Richardson Bay, and Tomales Bay
- Sense of Place Activity for San Francisco, Angel Island and Tomales Bay

Sense of Place activities can be used on almost any trip and will generally be appreciated by participants. It can be amazing how little we know about our surroundings until we pause for a second, look around, and consider who and what is around us. Are we in a city? In the wilderness? In a park? What kind of park? Who takes care of the area? Who else recreates here? Who lives here? Who historically lived here? Often times, we never consider these questions unless they are brought to our attention. The sandy beaches that we have access to provide the perfect canvas to draw a map in the sand and talk about the places we are visiting, what is there, and why it is important.

Sense of Place Activity

Goal: Give the participants an idea of where they are spatially and where you will be going on the trip Time: 10-30 minutes Who: Participants of any age When: All trips, both day trips and overnights, when you can squeeze it in Where: All sites Materials: Simple area maps and a stretch of sandy beach.

In both Sausalito and Tomales Bay, there are several copies of a laminated map of the area in the education resources. Divide the participants into groups of 3-5 people. Instruct the groups to recreate the map to the best of their ability in the sand. Encourage them to go big! They can use rocks, shells or seaweed that they might find on the beach, but cannot remove anything that's alive. Before you start, orient the maps to a "real life" position so that when you review at the end you can physically point on the map and to the real thing (i.e. which direction we will be going in to reach the destination). The success of this activity depends on you encouraging the participants to add detail like digging out the areas of water or building up the mountain and then wandering between the groups with comments, answering questions and maybe even helping them a little. Give the groups 5-10 minutes to create their maps and then bring everyone together to have a share session. As a group, move to each map and have them explain or describe their map. This does create repetition, but as they proudly describe their creations the repetition helps them learn the area. Pick a map (there's no "winner," so make up some other benign reason) and gather all around. Congratulate them on their excellent work and ask if anyone has any questions. Now you can fill in a few more facts, point out landmarks, and show where the trip will be going (or where you have been depending on when you run the activity) using the map that you have chosen. This activity is designed to give everyone a thumbnail sketch of the area. Below are some ideas for information to share about Richardson Bay, Angel Island, and Tomales Bay.

Richardson Bay

- An offshoot of the San Francisco Bay and considered a pristine estuary and therefore super important for bird populations both residential and migrating
- Named for William Anthony Richardson, a sea captain who served as the Captain of the Port of San Francisco and built the first significant building in the city
- Adjacent to Richardson Bay, Raccoon Strait at 234ft deep is the deepest point in the San Francisco Bay (with the exception of the main channel where it passes through the Golden Gate). In contrast, Richardson Bay is only about 12ft deep.

- Large shipbuilding center in WWII
- Has a world famous houseboat community of over 400 boats whose history is rooted in the salvage and reconstruction of shipyard materials after the end of the WWII.
- Before the Golden Gate Bridge, Richardson Bay was the terminus of the train lines and roads for cars. People approaching San Francisco from the north would then take a ferry across the Golden Gate.
- Known for its breeding population of midshipmen fish (also called the humming toadfish) that come in during the breeding season and can be heard as a distinct humming sound all around Sausalito

Angel Island

- The largest island in San Francisco Bay
- Just over one square mile in area (740 acres)
- Five miles of coastline
- State Park since 1963
- Tallest Point: Mt. Caroline Livermore at 785 ft tall and named after the lady who spearheaded the movement to make Angel Island a state park.
- Has been used for many purposes throughout history including:
 - The Miwok Indians had villages here as long as 3,000 years ago
 - Russian fur traders and hunters used it as a base of operations and fur storage (1839-1906)
 - Civil War era fort, from which recruits from the East were dispatched to fight in the
 - Indian Wars of the West (late 1800s)
 - A quarantine station (1892-1952) where ships from foreign ports were fumigated and immigrants suspected of carrying infectious diseases could be isolated
 - A large immigration center, "the Ellis Island of the West," processed over 175,000 people from China and 60,000 people from Japan (1910-1920s)
 - A Rock Quarry, which provided stone for many early buildings in San Francisco

Tomales Bay

- Long narrow bay of the Pacific Ocean; 15 miles long and 1 mile wide
- 30 miles northwest of San Francisco
- Forms the eastern boundary of Point Reyes National Seashore
- Three major geological faults converge and run the length of Tomales Bay: the San Andreas, the Golden Gate and the San Gregorio Faults
- Sir Francis Drake was the first European explorer to land here in 1579
- Tomales is thought to be a Spanish inflection for the Miwok word for bay.

Variation 1

If you have the time, you can add a cultural element to this and have the participants imagine where they would live and find resources if they were Native Americans living here many years ago. Encourage them to consider where they would build their house, where they would get water and food, and how they would survive. Have them build (in miniature) their "village" using natural materials, planning out and building these places on their sand map. Once everyone is done, go around as a group and have the participants explain what they have built.

Variation 2

Talk a little bit about the currents that will be occurring on your trip. You can draw arrows in the sand of the map which direction the water will be flowing and why. You can discuss ebb and flow and depending upon your group you can also discuss when the high, low and slack times are.

Variation 3

A third option would include discussing how species get to Angel Island. Normally, animals and plants find their way to an island by one of three ways; wind, waves or wings. Wind can blow seeds on its currents allowing seeds to disperse and colonize a new area. Animals and plants can float or swim in the water, under either their own power or floating on vegetation mats. Birds can fly and either carry seeds and plant matter in their feathers or they can eat seeds on the mainland and poop them out on an island (a fertilized seed packet!). Angel Island is relatively close to shore, but to illustrate how difficult it can be to colonize an island you can talk about sweepstakes dispersal. It is almost like winning the lottery to not only travel to the island, but to find the right conditions in which to grow, or find food, or find a mate. Have everyone pick three small rocks. Draw a line in the sand a good 20ft away from the map you choose to use. Everyone stands on the line *facing away from the map*. One at a time, they name an animal or plant and without looking throw the rock representing that organism over their shoulder toward the map. If it lands on the island then that animal or plant successfully colonized. After everyone has thrown their rocks, you can tally what species made it and who is populating your island. Will there be enough food for everyone? Are their enough inhabitants on the island to make an ecosystem?

Watersheds

What: The section explains what a watershed is and provides information on the watersheds where we operate our trips

Activities Available:

- Paper Watershed Activity
- California in the Palm of Your Hand Activity
- Watershed Finger Tag Activity
- All The Water In The World Activity

"That area of land, a bounded hydrologic system, within which all living things are inextricably linked by their common water course and where, as humans settled, simple logic demanded that they become a community." -John Wesley Powell

What is a watershed? Let's consider rainwater in the mountains. When water falls in the form of rain it is either absorbed into the ground water or it will "run off" to form streams and rivers. Since water follows the laws of gravity whether it is above ground or below ground, it will inevitably run downhill. As streams in the mountains streams become rivers and eventually join the ocean, this grouped network of water ways becomes a watershed. Visually illustrating this to your participants is usually the best way to get the concept across, and the simple yet effective Paper Watershed Activity below works very well.

Watersheds are nature's way of dividing up the landscape. In simplest terms, a watershed is defined as an area of land that captures rainfall and snowmelt, and then as the water flows downhill, all the streams and river collect in one place. That place may be a river, lake, estuary, wetland, stream, groundwater basin or even the ocean. A watershed becomes a complex web of natural resources, including soil, water, air, plants and animals.

San Francisco Bay

Here are a few facts and figures to help everyone understand how big and important this area is to California. The San Francisco Bay is a part of the San Francisco Bay Delta Watershed that covers over 75,000 square miles extending from the Cascade Range in the north to the Tehachapi Mountains in the south. It is composed of five regions: the San Joaquin River region, the Sacramento River region, the San Joaquin / Sacramento River Delta region where the rivers meet, the San Francisco Bay, and the Tulare Lake Basin Watershed. Specifically, the San Francisco Bay Watershed is 4,600 square miles and includes the largest Pacific estuary (700 miles of rivers and sloughs) along the west coast of the Americas. The depth of the central bay averages only 43ft, with the main channel through the Golden Gate reaching a depth 360 ft. Ninety percent of the fresh water runoff in the Bay comes from the San



Joaquin and Sacramento River Delta and overall 47% of the water that drains through the state of California ends up in San Francisco Bay!

Richardson Bay Watershed

Richardson Bay is considered its own sub-watershed. Despite its developed periphery, Richardson Bay is considered one of the most pristine estuaries of the West Coast. This is because beyond the houses most of the upper slopes and ridges surrounding Mt. Tamalpais (the highest point in this watershed) are protected. The main creeks in the system are Coyote, Ryan, Sutton, East and West Creeks. Like San Francisco Bay, Richardson Bay is listed as an Important Bird Area and is critical stopover habitat for migrating birds along the Pacific Flyway.

Tomales Bay

The Tomales Bay Watershed is made up of the Walker Creek, San Geronimo Creek, East Shore, Inverness, West Shore and Lagunitas Creek Watersheds. Our paddling destinations are in the East Shore and Inverness sub-watersheds. The entire watershed is a part of The Gulf of the Farallones National Marine Sanctuary. This is a resource-rich watershed that supports over 900 species of plants and animals, including many that are listed as threatened or endangered, as well as being important bird habitat along the Pacific Flyway. In particular, the San Geronimo and Lagunitas Creek Watersheds are considered critical habitat for salmon. Salmon are anadromous fish (can live in fresh and salt water) that return to the creek or river they were born in, as adults to spawn. These creek watersheds are historical salmon spawning grounds and are critical for the next generations of the species. The surrounding lands toward the southern end of the bay were dammed to create land for the Giacomini dairy farms. In recent years, much of this land has been purchased and restored back to 550 acres of marsh habitat. As this area encompassed the largest freshwater input to the bay, this has been a major step in restoring this resourcerich area as well as decreasing the amounts of sediment and pollutant inflow.

Paper Watershed Activity

Goal: Give the participants a visual idea of a watershed from the mountains to the ocean **Time:** 15-20 minutes

Who: Middle school, high school, or adult participants

When: During a day or overnight trip, perhaps before beginning a hike where elements of a watershed will be noticeable

Where: On a beach or any area with a view of geographic features in Richardson Bay, Angel Island, or Tomales Bay

Materials: Piece of scrap paper for each group, washable marker, water bottle

Group your participants into groups of 3-4 and give each group a piece of paper, preferably 8.5 x 11. Tell everyone to crumble it into a ball (real tight). Now unfold the paper just enough to make a mountain (don't have them smooth it flat). You should have a crinkled paper mountain. Give each group a marker and have them mark where they think the main flow of water will run if they were to imagine dripping water onto the top of their mountain. Have them draw a house for where they would live. Where would the water collect or flood (wetland or flood plain)? Once they do this, take the water from your water bottle and drip (with your fingers, don't pour) onto the top of the paper mountain. Ask the participants if their guesses were right. Sometimes, depending on your crumple, you can have 2-3 watersheds per mountain. Point out ridges, valleys, rivers, and tributaries and where the water ends up. Once you determine where the water flows (and if you have sand), you can make a model of one side of the "mountain" into the beginning of the San Francisco Bay Delta Watershed.

Discussion Questions

Who do you think lives, works and plays along these water routes?

- Skiers in the mountains, fishermen along the river, towns near the lake, farmers in the flatlands?
- Cities, homes, roads and factories modify the watershed and affect its natural resources. Farming, recreation, hydroelectricity generation, mining, construction and forestry can also significantly affect a watershed.

Why do you think watersheds are important?

- Fish and wildlife also need healthy watersheds for food and shelter
- Watersheds provide water for drinking, irrigation and industry as well as hydroelectric power for communities and businesses.
- Watersheds are also important to our recreational needs, providing opportunities to enjoy natural beauty as well as boating, fishing and swimming.

California in the Palm of Your Hand Activity

Goal: Help participants remember the areas of the watershed they likely know or have heard of **Time:** 10 minutes

Who: Participants of any age. This works well for visually impaired participants.

When: This could work well in conjunction with the Sense of Place Activity, or after looking at a map **Where:** Anywhere

Materials: Your hands

Ask your group: "Did you know that you can actually make a map of California's watershed in the palm of your hands?" Have them bring their hands together like this: cup both your hands together, with your fingers slightly curved to the sky.

Check this out!

• Your fingertips can represent the mountains of the Sierra Nevada.

- The snow would fall on your fingertips, then melt into water that fills smaller rivers that can be represented by the space between your fingers.
- The place where your fingers meet your palm can represent the two big rivers: the Sacramento and the San Joaquin.
- Now, check out the space where your palms touch together. This represents the Delta, and our palms are the Central Valley, where we grow the majority of our food in California.
- The space between your arms represents our beautiful San Francisco Bay, and your body is our giant Pacific Ocean.

Remember – because you can see the SF Bay Watershed in the palm of your hands, it reminds us that it is in the care of your hands. So, remind your group to consider how all these places are connected by every little thing we do.

Watershed Finger Tag Activity

Goal: Introduce parts of a watershed to participants. Due to the fun energy that this game creates, it is best to do this in conjunction with the California in the Palm of Your Hand Activity. The sequencing is up to you! Time: 10 minutes Who: Participants from a group that is interested in learning about watersheds When: Anytime Where: Anywhere there is space to create a circle Materials: No materials needed

Provide the following instructions to the group:

- 1. Everyone is in a circle
- 2. Ask everyone to bring their arms out to their sides with their left hand palm up, and right hand with its index finger pointing down and touching on their neighbor's outstretched left palm. Left hand is flat like a plate and right hand is hovering like a fork over their neighbor's plate.
- 3. In this game the word "Water" is the magic word that requires you to do two things... at the same time! You need to grab the finger in your left hand while at the same time lifting your right finger to keep it from being grabbed!
- 4. So understand, when you hear the word "Water!" you have to grab your neighbor's finger, while trying to keep your own finger free

Now narrate the following story – its fine (and encouraged) to put it in your own words!

So, today we are going to be exploring "Water!" and something called a "Watershed!"

A "Water-shed!" is basically an area of land that sheds "water!" San Francisco Bay's "Water-shed" is an awesome system! It begins in the mountains of the Sierra Nevada where in the wintertime snow falls down on the peaks. Then in the spring and summer this snow melts into "Water!" and starts flowing over the land and into "watery" rivers. These rivers are full of "www-rapids", and "www-waves" that then flow into bigger rivers such as the San Joaquin and the Sacramento. All of this "Water" is delicious, drinkable fresh "water!"

These two big, fresh "water" filled rivers make their way into the Delta. The delta's "water" moves into San Francisco Bay, where it mixes with salty "Water" and becomes brackish. The "www-wind" and "www-waves" of San Francisco Bay are the playground for many amazing animals who love to

live in the brackish "Water" that then moves through the tiny opening of the Golden Gate out into the salty "Water "of the great big Pacific Ocean.

You guys did great! – Thanks for playing.

All The Water In The World Activity

Goal: Introduce the concept of limited water availability and of the importance of water conservation **Time:** 15 minutes

Who: Participants of any age and ability

When: After introducing the concept of watersheds. This is a great activity to do around lunchtime. **Where:** Anywhere

Materials: Inflatable Earth ball, 1 L water bottle, irrigation syringe, two cups

The Big Picture

How have you personally used water today? The amount of fresh water available on land surfaces is a tiny fraction of the total amount in the world. Typically, people think that because water falls from the sky, it is an unlimited resource. The same water just keeps circulating around in the water cycle. Even though water is not abundant, it is perceived to be.

Toss the Globe

First, demonstrate to your group how much water there is in the world by playing "Toss the Globe"

- 1. Have students circle up in a large area.
- 2. Toss a large blow-up ball of the earth around the circle.
- 3. Each student that catches the ball must see where their RIGHT THUMB is touching, and shout either "WATER!" or "LAND!"
- 4. Hopefully, most of the students will have had their thumbs land on water.
- 5. So, there is a lot of water on the planet! Now move on the next part of the activity.

All the Water in the World

70 percent of the Earth's surface is covered by water! That should be enough for everyone! Water can be found almost everywhere on Earth. But, how much of this water is actually available for human use?

- 1. Ask them the following questions:
 - Name all the places you can think of where we find water in the world...
 - The should come up with three categories
 - Salt Water (oceans, bays and some lakes)
 - Liquid Fresh (rivers, lakes, aquifers)
 - Frozen Fresh (ice caps and glaciers)
 - Have them guess the percent of each:
 - \circ Salt Water is 97%
 - Fresh Water is -3%
 - Of this 3%:
 - Two thirds are locked up in ice caps and glaciers
 - Only one third (or 1% of the total water on earth) is fresh surface water: lakes, rivers, streams, ponds, aquifers, and atmosphere
- 2. Can you imagine what that 1% might look like? Imagine that this water bottle represents all the water in the world. Show them a clear Nalgene (1000 mL) of water.

- 3. Ask "Where is most of this water is located?" hold up the blow-up globe again and point out that, of course, it's mostly in our oceans.
- 4. "Is this water drinkable or can it be used to grow our food?" of course not, at least without the use of the very expensive process of desalination.
- 5. Pull out 30 milliliters (30 cc's) with the water syringe, and pour it into a clear cup marked Fresh Water.
- 6. Show them how this tiny remaining amount is only 3% of the world's water.
- 7. "Okay, now, what do you find at the earths poles? That's right, Ice. So, that means that two thirds of this fresh water is frozen, and we can't use it."
- 8. Now use the water syringe to pull out 20 milliliters from the cup and place it in another cup marked "Ice."
- 9. Shake this remaining 10 mL around a bit "This remaining amount represents all of the fresh liquid water found on the ground and lakes."
- 10. Pour the remaining amount into the lid of the Nalgene, and use the water syringe or your finger to collect 1 drop of water.
- 11. "Of all this fresh liquid water, the actual remaining amount that is healthy, non-polluted, accessible water can be represented by this one drop. Which is about .003 percent of the total!

<u>Wrap Up</u>

This precious drop must be managed properly! Of course this drop is actually quite a large volume of water on a global scale, but obviously it is a very small percent of the total water on the planet. What are some ways that you can help protect this water?

Astronomy

What: An introduction to running a solid astronomy evening program Activities Available:

- It's All Relative Activity
- Constellations and Create a Constellation Activity

Spending an evening looking at the night sky with participants can be one of the most memorable and special moments on an ETC trip. If you already have some depth of knowledge about astronomy, this can seem like a fun and easy thing to do. For those who have less comfort with the subject and less information to share, facilitating even the most casual discussion about the night sky can be a terrifying proposition. However, with a little study, good resources, and engaging activities you can lead an astronomy lesson for your group like a star! Most participants and groups are not expecting or looking for you to give them a lecture about the stars. Just seeing the night sky can be powerful enough for people who don't commonly have that opportunity. But it is always a good idea to be able to enrich their experiences by equipping yourself with a few tools that make for a well-rounded evening of astronomizing:

- 1. **Question and Answer Session** This is a good style of interactive learning and will give you an idea of what your group's existing knowledge is.
- 2. **Constellations** Everyone loves to lay on their back and look at the stars when there is someone who can point out some constellations. Armed with an ETC green laser pointer and the knowledge of just a few well known constellations, you can do no wrong!

- 3. **Myths and Stories** These go hand-in-hand with constellations. There's no wrong or right version everyone can tell the stories in their own way and there are MANY stories from many cultures that go with the stars.
- 4. A Couple Solid Activities This can be anything from the Create a Constellation Activity to sharing some of the awe inspiring facts in the It's All Relative Activity. It is important to run the activity that you feel most comfortable with, so be sure to experiment with a few to figure out a good fit.

It's All Relative Activity

Goal: Inspire a sense of wonder for the size and scope of the universe **Time**: 15-25 minutes **Who**: 5th grade and up **When**: On overnights when you have at least a partial view of the stars **Where**: A wide open space with few trees and a good view of the night sky **Materials**: Red light (to read by).Planet and Star Comparison Cards

Set-Up

This collection of short activities is designed to engage your participants and get them to start thinking. After a long day, it can be tough to settle down and listen to concepts that can be hard to grasp. Reading a quote and talking a little bit about the size and scope of the universe can really set you up for success. If you have a tarp, it is nice to lay something down on the ground for everyone to lie on. If not, sweatshirts are fine.

Beginning Quote

When we think about the stars, our solar system and space, the numbers can seem overwhelming and beyond our comprehension. Starting small with something we can imagine and working our way up can help us to grasp numbers and concepts. Whether it is talking about planet size or how many stars are in the sky, inspiring awe is the name of the game. The following quote can be a great place to start.

"Remain motionless... Feel nothing but your breathing, your heartbeat and ponder these thoughts... You are sitting on a piece of Earth at about latitude 36 degrees, which means you are spinning west to east at a rate of about 860 miles an hour. At the same time, this Earth is moving through its orbit around the Sun at 66,661 miles per hour, and the Sun is carrying itself and its planets toward the star Vega at 31,000 miles per hour. The Sun and Vega move around the Galaxy at the blinding speed of 700,000 miles per hour and the Galaxy itself rotates at 559,350 miles an hour. Plus our Galaxy moves in relation to all other galaxies as they rush through the universe at better than 1,000,000 miles an hour. So while you sit still we move at an accumulated speed of ... maybe two and a half million miles an hour."

-Excerpted from Space, by James Michener

Count the Stars

How many stars are in the sky?

- Everyone look up to the stars. How many stars do you think you can see on the very darkest night with only your naked eye? Allow for some guesses. The correct answer is that at best we can see somewhere around 5,000 stars.
- As we look at the stars, we are looking into our galaxy, the Milky Way. How many stars do you think are in the Milky Way? Allow for some guesses. Roughly 100 billion! AND, the Milky Way

is just one of MANY galaxies. How many galaxies do physicists think there are? Once again, the answer is about 100 billion!

• How big of a number is 100 billion? Have participants do the following to get an idea:

"Here is what I would like everyone to do. Quietly and to yourself, I would like you to count out loud as fast as you can. No cheating! You must say each number to yourself quietly so that you don't mess anyone else up. We will count for 30 seconds. Ready, set, go!" Time 30 seconds on your watch and tell people when to stop counting.

- How high did you get? Call on several people to get a range of numbers. You should get answers ranging from 70-130. Any higher than 150 and you will know that they were most likely incorrect or fibbing.
- Good! Now let's say that as a group, on average we can count to 100 every 30 seconds, or 200 every minute. If you were to count at this speed for 24 hours a day, 7 days a week, 52 weeks a year, you would reach the number 100 billion only after counting continuously for 1,000 years!
- Here is another way to appreciate the size of this number: 1 billion seconds is equivalent to 31.5 years. That means that 100 billion seconds is equal to 3,150 years!

Planet and Star Comparisons

- What kinds of stars are there? There are four main types of stars: Red, Blue, Yellow and White. Red stars are generally the largest and oldest, blue and white stars are the hottest and youngest, and yellow stars are somewhere in the middle.
- What is our closest star? The Sun.
- How big are stars? Stars are MASSIVE! Our Sun is a yellow star that is average in size, as stars go. We would have to line up 109 Earths next to each other to span the diameter of the Sun. AND, you could fit 1.2 million Earths inside the Sun!

Show Planet and Star Comparison Cards #1-3. Start with the Earth and work your way up, naming the planets or having participants name the planets until you get to the Sun. Wow!

• What are some of the largest stars we can see? With a good star chart or app on your phone, you can learn to point these stars out and then show them on the cards for comparison.

Show Planet and Star Comparison Card #4

Sirius is a blue star located in the constellation Canis Major, and is the brightest star we can see in our night sky. It is 8.5 light years from Earth.

Pollux is a yellow star located in the constellation Gemini. It is just under 10 times the diameter of the Sun.

Arcturus is a yellow giant, located in the constellation Bootes, 37 light years from Earth. It is the second brightest star in our sky and about 26 times the size of our Sun.

Show Planet and Star Comparison Card #5

Betelgeuse (pronounced like beetle juice) is found in the constellation Orion. It's so big, it would take 650 Suns lined up next to each other to equal its diameter and it would take roughly 200 million Suns to fill it up. If you took this star and put it in the Sun's place in our solar system, it would reach all the way to Jupiter!

Antares is a red giant, located in the constellation Scorpius. It is 850 times the radius of the Sun!

Understanding Light Years

We have mentioned light years several times now.

- How would you measure the distance from you to me? Participants will list inches, feet, meters, etc.
- How do we measure the distance from where we are to our homes? Miles. But these are too small to measure the distance to things in space. So for distance in space we use both a distance and the time it takes for light to travel that distance.
- How fast does light travel? 186,000 miles per second. If you could run that fast, you could run around the earth seven and a half times per second! Alternatively, in minutes, the speed of light is 11,160,000 miles per minute, and traveling at the speed of light for a minute you would be able to run around the earth 453 times!
- A light year is the distance you can travel by traveling at this (highly impressive) speed of light for a one year. The closest star to us after the Sun is called Proxima Centauri and it is 4.2 light years away. This means that you would have to travel at the speed of light for 4.2 years to get there!
- **Introduce the concept** that because the distances are so great, we are seeing light that was produced in the past. It is totally possible that we could be seeing a star that blew up three years ago and no longer exists, but the light it produced before it blew up is just reaching us now.
- A few more facts:
 - By comparison, the Moon is VERY close to us it is about 250,000 miles from the earth or only 1.34 light seconds away.
 - The Sun is 92,960,000 miles from the Earth. The light produced by the Sun reaches us in about 8.3 minutes.

Constellations and Create a Constellation Activity

Goal: Introduce some constellations and allow participants to tell a story about a constellation they create **Time**: 30 minutes

Who: 5th grade and up

When: On overnights when you have at least a partial view of the stars

Where: A wide open space with few trees and a good view of the night sky

Materials: Book titled *The Night Sky*, by Jonathan Poppele; green laser pointer; 4" x 6" index cards and pens

Set-Up

This activity takes a little preparation on your part. If you are able to identify four or five constellations – starting with the Big Dipper – and tell a short story (reading out loud is okay) that goes along with each one, then the rest of the activity will run itself and you will be set for the evening. A good star chart, or a star app on a smartphone for the more technologically minded, are your best resources for becoming familiar with the night sky.

Background

Why are there constellations? Throughout history, humans have looked into the sky and imagined pictures formed by connecting the dots between stars. What different people saw was a reflection of the things that were important to their cultures – animals, hunters, queens and princesses, heroes, and so on. Indeed, it is hard to gaze up into the night sky and not imagine some of these shapes and beings jumping out at you. With this activity, you can point out as many constellations as you can and perhaps learn a few of their accompanying stories before having participants create their own.

Point Out Constellations

It is a good idea to highlight a few things when you are pointing out constellations:

- The grouping of stars and trying to visualize the shape or picture that they create
- The stars themselves, e.g., .the North Star is the end of the handle of the Little Dipper
- A story that goes along with the constellation, i.e., the mythology

The Big Dipper

To get you started, below is some information on the Big Dipper. Afterward, have a couple other constellations of your choosing that you can describe before you ask participants to create their own constellation. Begin by using the green laser to point out the stars that form the Big Dipper. Your group might be enthralled with the laser, but try to keep the focus on the stars for now. In North America the Big Dipper is the most well known grouping of stars and is actually a subset (asterism) of the larger constellation Ursa Major. It is conveniently circumpolar (it never sets below the horizon from the viewer's perspective) and is therefore visible year round. It is also very useful in locating other constellations.

• Mythology

• "Ursa Major is identified with Callisto, a beautiful and renowned huntress. Zeus seduced her and fathered her child, Arcas. Hera, Zeus's jealous wife transformed Callisto into a bear, robbing her of her beauty. When Arcas was older, he became a hunter and saw Callisto. Unaware of her true identity, he gave chase. Callisto fled into the Arcadian temple of Zeus, unaware that the law punished trespassers with death. Seeing her plight, Zeus hoisted her into heaven by her tail, stretching it. Arcas was transformed into a bear as well (Ursa Minor), so he could be with his mother."

-Excerpted from The Night Sky, by Jonathan Poppele

• This story can be read out loud or you can tell it with your own style. If you prefer, find a constellation that has a story that might interest you more. Stories are always better when you are interested in what you are talking about. Just make sure it is a constellation that you can point out.

Creating Constellations

After pointing out some constellations and telling a story or two, it is fun to have participants break into groups of two and pick out their very own constellation. Instruct them to look into the night sky, as they would look at clouds during the day, and try to see shapes. Once they have picked out a shape, they can have 10-12 minutes to make up a story or myth to go along with it. Give each group a 4" x 6" index card. They are to draw their constellation on the card. Where the stars are located they can use the pen to poke a hole through the card. Sometimes, participants can really get into the story and will pull out notebooks in order to write it all down. Once everyone is done, lead a session where every group gets to stand up and tell their story. Put a flashlight behind the card and the light will shine through. Depending upon the maturity of your group, you can even let them point out the stars in the sky with the laser pointer. Just be sure to preface laser safety: don't point at airplanes or into anyone's eyes. Also, help each group to observe where their constellation is in reference to the Big Dipper so that will be able to locate it again in the future.

HISTORIC AND CURRENT HUMAN PRESENCE

What: Information about ETC's paddling destinations, both historically and in modern times Activities Available:

- Human History Time Line Activity
- Human History Skits Activity
- Ohlone Visualization Activity
- Miwok Ocean Each One Teach One Activity
- Immigration Station Teaching Cards Activity
- The Ohlone Way Guided Visualization Activity

Native Americans

The human history of both San Francisco and Tomales Bays began at least 8,000 years ago with the civilization of a Native American people called the Coast Miwok. The Miwok people lived a comfortable life centered on the tasks of gathering acorns and berries, hunting deer and elk, and catching salmon and shellfish.

Prior to European contact, Miwok villages on Angel Island were located at what is now Ayala Cove, Camp Reynolds, Fort McDowell and the Immigration Station. These villages were seasonally inhabited and Coast Miwok people did not live on the island year round. At Tomales Bay, villages were located on nearly every fresh water stream that entered the Bay. The Coast Miwok lived in small tribal communities centered on larger villages. A headman was elected for every family, and together, these men elected a

tribelet headman. Rather than being hereditary, the tribelet headman was chosen because he exhibited traits of patience and goodwill and was responsible for finding the best solutions for the greatest good of the community. The Miwok mastered the art of living harmoniously together in nature, and there was little or no warfare among these people.

Acorns were the staple food of the Coast Miwok, supplemented by deer, elk, rabbits, squirrels, birds, clams, crabs, salmon, eel, sturgeon, kelp, berries and other wild plants. Bows and arrows tipped with obsidian and basket traps were used for catching game, while fish were caught in nets. They were proficient fisherman and discovered that soaproot was not only edible and useful for cleaning, but could also be used to stupefy fish in the water while they were fishing As



Coast Miwok acorn storage structure found in every Miwok home. Credit: Tomales Bay State Park Environmental Living Program.

hunter-gatherers, the Miwok men hunted, while the women gathered plant material and wove a remarkable variety of baskets for a multitude of uses.

Miwok shelters were called *kotchas*. Kotchas were either made from redwood stacked into a conical shape, or from pliable willow poles bent over into a dome framework and interwoven with bundles of tule. An earth covered house functioned as a sweathouse or dance house used for rituals and purification.

Men generally went naked or wore only a loincloth of deerskin, while women wore skirt-like garments made of bulrushes. The Miwok had animistic beliefs and believed in many spirits in nature. They did not construct walls in their dwellings so as to not impede the spirits' movement, and were careful to not do things that might upset the spirits. It was common to apologize to the spirits after doing something that

might disturb them in some way. Canoe-like boats called *sakas* were made by binding bundles of dry tule together. Some of the larger sakas could hold up to 12 people.

The Miwok way of life was not seriously threatened until the Spanish Mission Period of 1779-1823, when Spanish conquistadors and missionaries set north from Mexico to expand Spain's empire into California. The Spanish believed they were bringing the native people the gifts of civilization: education, agriculture, modern trade, and above all, Catholic salvation. The Coast Miwok who accepted baptism were forced to

leave their villages behind and live at either Mission San Francisco Assisi (Mission Dolores) or Mission San Rafael Archangel. Once there, they were given Spanish names and were required to abandon all the elements of their culture, from diet to clothing and behavior. They occupied the lowest rung of social order in the missions. Those who attempted to return to their villages were forcefully returned to the missions. Countless natives died from European diseases for which they had no established immunity. By 1820, most if not all of the Coast Miwok had been taken to the mission, fled to the east or died.



Tule boat or *saka* used by the Coast Miwok. Credit: http://sun.menloschool.org/~mbrody/ushistory/angel/human_history/

After the settlers of California and Mexico established independence from Spain in 1822, colonists sacked the missions and divided the properties among themselves. Having lost their land and cultural solidarity, most Miwok people then became feudal laborers on Mexican ranchos throughout their confiscated territory. Many intermarried with settlers of Mexican and European descent.

San Francisco Bay

History

The San Francisco Bay has always been a sought-after place to live. It is the largest estuarine habitat on the West Coast and is therefore a region of immense resources that has supported many settlements over the course of its history. Archaeologists estimate that over 50,000 native people lived here in villages and settlements before the first European caught sight of the beautiful Golden Gate Strait. The remains of over 400 middens, or native rubbish dumps, have been found in the Bay Area, attesting to the presence of flourishing populations of Coast Miwok and Ohlone people. In 1775 Captain Juan Manuel de Ayala of the Spanish ship *San Carlos* was searching for Monterey Bay when he mistakenly sailed into San Francisco Bay, realized it was a strategically located area of abundance, and claimed it for Spain. A year later the Spanish established the Presidio as a fort and mission. In 1822 the Mexican Revolution caused rule over California to pass from Spain to Mexico. The Mexican government opened San Francisco to free trade, and whaling vessels and traders began visiting the area and causing the town to grow. Mexican rule lasted only until 1846, when the USS *Portsmouth* took control of the undefended bay.

There were not many settlers in the area until the discovery of gold ore on the banks of the American River in 1848 by John Marshall. In a matter of two years, San Francisco's population swelled from 400 to over 25,000. The Gold Rush era saw huge growth and the subsequent induction of California into the United States. It is estimated that in only two years 100,000 prospectors passed through San Francisco. Hydraulic mining, a process of aiming high-powered water cannons at sedimentary cliffs to erode them

and loosen the gold within, resulted in over a billion cubic yards of sediment traveling downstream into San Francisco Bay between 1849 and 1914. In combination with the naturally occurring sediment from the Sacramento and San Joaquin Rivers, this has been a major cause of the increasing shallowness of the Bay. At the same time, the region's population exploded and over half of the Bay's watersheds were diked and filled to provide farm and rangeland.

After the Gold Rush, the rampant influx of sediment reduced San Francisco Bay's size by a third. It is estimated that 90% of the Bay's tidal marshes were destroyed. In the 1960s there were plans to fill another 60% of the remaining area of the Bay, which would have reduced it to just a small shipping channel. Three women who lived in the East Bay – Kay Kerr, Sylvia Mclaughlin and Ester Gulick – were so disturbed by this idea that they began a movement to halt these plans. They wrote letters, made phone calls and collected monies (one dollar per resident) in order to raise the funds to create the Save The Bay Association. Save the Bay, the organization formed by these early conservation pioneers, is still going strong today and to date is the largest regional organization working for the protection of San Francisco Bay. Their accomplishments include

- Legislation against further filling of the Bay
- The closure of 30 garbage dumps along the shore
- A halt to the practice of dumping raw sewage into the Bay
- The establishment of a state agency, The Bay Conservation and Development Commission (BCDC), which was the first ever coastal zone management agency and is studied as a model system around the world

Save the Bay today boasts more than 50,000 members and has overseen the creation of 300 miles of bay trails that ring over half of the shoreline of the Bay suitable for hiking, cycling and wildlife viewing. They continue to block all proposed bay fill projects.

Historic Fisheries

As one of the most productive estuaries in the Americas, fisheries have gone through many cycles depending upon currents trends of popular tastes in fish and fluctuations in native populations. The following are all fish that supported a fishery at some time during San Francisco's history; Chinook salmon, Striped Bass, American Shad, Sturgeon, Pacific Herring, Northern Anchovy, Starry Flounder, Surf Perch, Sharks, Rays, Oysters, Mussels, and Shrimp. At one time or another, all of these organisms supported a fishery, some of them introduced, some native to the area. As the population of San Francisco exploded with immigrants from all over the world, they often brought animals or "homeland foods" with them that wound up in the bay contributing to some of the invasive species we see today, but also supporting some of the fisheries during different eras. Fish were caught for either food, bait for more fishing or fishmeal used in a variety of different products. However, because of overfishing combined with the damming of rivers, streams becoming clogged with silt from hydraulic mining (cutting off spawning grounds), and pollution, all but one fishery (herring) has disappeared.

Current Uses

Shipping

Commercially, San Francisco Bay has been designated as a U.S. Port of Entry and a free trade zone. The Ports of Oakland and San Francisco handle about one third of trade on the West Coast, amounting to 200,000 tons of cargo annually.

Herring Fishery

The herring fishery is currently the only fishery in California to occur almost entirely within a bay. Herring are an important schooling fish on the Pacific Coast that migrate inshore during the winter to spawn. The largest spawning aggregations on the Pacific Coast are found in San Francisco and Tomales Bays, since they provide soft substrate and eel grass beds. These form the perfect habitat for baby fish that will stay in estuarine habitats until they are large enough to swim out to sea in the summer. Both the herring roe (eggs) and fry (baby fish) are a significant food source for birds, fish, invertebrates and mammals living in the bays. The commercially important herring fishery is regulated by the California Department of Fish and Wildlife (DFW). DFW conducts annual abundance surveys to determine the following year's quota. For example, in 2013 the projected total herring biomass was estimated at 60,600 tons, and 3,737 tons of this were designated for the fishery. In the 2009 and 2010 seasons the fishery was shut down to let numbers rebound. Most of the herring caught in the Bay are harvested for their roe (eggs), which are shipped to Japan where they are considered a delicacy called *kazunoko*.

Recreation

The Bay offers many types of recreation, from hiking and biking trails at the perimeter to many types of recreational boating. San Francisco Bay is one of the most popular recreational boating destinations in the world and powerboating, sailing, sailboarding, fishing and rowing are all prevalent, especially during the summer months. Those who are lucky enough to live in the Bay Area have the unique opportunity to live in an urban setting while being minutes from some of the most beautiful wilderness areas in the world.

Richardson Bay

History

Richardson Bay was named for William Anthony Richardson, who sailed into the Bay for supplies in 1822 on a ship named the *Orion*. During a storied night on the town he met the daughter of the Commandant of the Presidio of San Francisco, who he later married. Richardson became a noted ship builder and is known for receiving the first land grant and building the first substantial building in the city of San Francisco. Today's Richardson Bay formed the northern border of that large land grant. It is thought that Sausalito was named for the Spanish word *sauzalito*, meaning little willow grove. When Richardson petitioned the governor for his land grant it was so he could establish what he called his Rancho Saucelito, possibly named for the willow groves along Coyote Creek. The Tiburon Peninsula, which flanks the eastern side of Richardson Bay, was named by Captain Juan Manuel de Ayala, who claimed San Francisco Bay for Spain. He named it Punta del Tiburon, or shark point. Ayala may have thought the peninsula looked like a shark, or he could have named it this because of the leopard sharks that come up into the warmer waters of the Bay to breed each fall.

The town of Sausalito was developed to be a ship building center during World War II and was the southern terminus of the North Pacific Coast Railroad. Once the war was over, the use of salvaged materials and abandoned shipyards of the war era made the birth of the Sausalito houseboat community possible.

Current Uses

The Sausalito houseboat community is still present today and contains over 400 homes. The community hosts a tour annually of their eclectic collection of members and their houses. As a community, Sausalito is known for being a bright, artsy community with many art galleries, boutique shops and great food. It is a quick trip over the Golden Gate bridge or a short ferry ride from San Francisco. Sausalito, Tiburon, and Belvedere also surround the area used for our day paddles on Richardson Bay.

Angel Island

<u>History</u>

Angel Island is the largest island in the San Francisco Bay. Though clearly visible on all but the foggiest days, it remains somewhat of a mystery, unknown even to many native San Franciscans. This little island, just over one square mile in area, has played a much larger role in the history of the San Francisco Bay Area and our nation than its size alone might indicate.

Angel Island has been:

- Home to several villages of the native Coast Miwok as long as 8,000 years ago.
- The base camp from which a young Spanish lieutenant, Juan Manuel de Ayala, directed the first nautical survey of San Francisco Bay in 1775
- The alleged site of buried treasure, looted from treasure-laden Spanish galleons
- A camp for Russian sea otter hunters and a storehouse for their furs (1806-1839)
- A source of fresh water and firewood for ships during the peak years of the whaling industry and the hide and tallow trade (late 1700s – late 1800s). It was called "Wood Island" by Richard Henry Dana, who wrote about the island in his book <u>Two Years Before</u> <u>the Mast</u>.



Quarantine Station on Angel Island. Credit: http://sun.menloschool.org/~mbrody/ushistory/angel/huma n_history/

- A smugglers' hideout for evading the Spanish and Mexican customhouse officials
- A Mexican cattle ranch (1839-1848)
- A rock quarry, which provided stone for many early buildings in the San Francisco Bay Area (1850s-1920s)
- A dueling spot for settling "affairs of honor," sometimes witnessed by mobs of spectators (mid 1800s)
- A Civil War era fort, from which recruits from the East were dispatched to fight in the Indian Wars of the West (late 1800s)
- A small farm for growing vegetables to provide produce for inmates of Alcatraz
- A navigation hazard and site of numerous shipwrecks, which led to the building of three lighthouses and fog signal installations more than anywhere else on the West Coast
- A quarantine station, where ships from foreign ports were fumigated and immigrants suspected of carrying infectious diseases could be isolated (1892-1952)
- A debarkation and discharge facility for U.S. troops during the Spanish-American War and later our nation's largest induction and assignment center during World Wars I and II
- A prisoner-of-war camp during WWII
- A large immigration center, "the Ellis Island of the West," which was built both to process European immigrants coming through the new Panama Canal and as the major point of entry for Chinese and other Asians from the East (1910-1940)
- A post-WWII Nike Missile Facility (1954-1962)

Current Uses

Today, Angel Island is best known as a California State Park. The park has grown from 34 acres around Ayala Cove in 1954 to the entire 740 acres of the island in 1962 (excluding the seven-acre Coast Guard Station at Point Blunt). The island boasts recreation facilities including lawns, campsites with barbeques,

and a variety of delightful beaches and fishing sites. Yachtsmen and small-boat sailors have a sheltered anchorage in Ayala Cove, which is particularly popular with the sailing population as it has one of the largest public moorings on the Bay. There is a small museum at Ayala Cove with exhibits of the island's history and ecology.

Hikers can follow a number of trails around the island past the ruins of the old forts, historic sites and past spectacular views of the city of San Francisco, the Golden Gate Bridge, Sausalito, Tiburon and the East Bay. The strenuous hike to the island's summit, 781ft high Mount Caroline Livermore, offers a spectacular panoramic view of the entire Bay area.

Angel Island State Park also runs an overnight Living History program for 4th and 5th grade students, allowing them to sleep in historic buildings, role play historical events as members of the U.S. Army in 1864 and try their hand at primitive skills. This program runs twice a week for groups of around 44 people.

Text in this section adapted from the Angel Island State Park website.

Golden Gate Bridge

History

In 1846, as he declared California's independence from Mexico, Captain John Fremont named the entrance to the San Francisco Bay *Chrysophlae*, or "Golden Gate" in Greek. The bridge that now spans the mouth of the strait was given the same name. In the midst of the Great Depression it was considered insane to attempt to build such an expensive bridge, especially one that many thought would be impossible to complete. However, the engineer, Joseph Strauss, insisted that he could do it. Not only that, but he claimed he could complete the project for \$35 million, which seemed audacious when San Francisco's City Engineer estimated the cost to be \$100 million. In May of 1937 the 1.7 mile suspension bridge was completed ahead of schedule and under budget. From its opening until 1964, it was the longest suspension bridge in the world. Recently, a senior engineer on the project was given much of the credit originally claimed by Strauss for the overall structural design of the bridge.

Irving Morrow, a residential architect, designed the towers, art deco theme, lighting, railings, and walkways, and ultimately determined the now famous color. If it had been left up to the Navy, the bridge would have been painted black with yellow stripes for better visibility. The International Orange Paint was chosen for its visibility and for how it complemented the warm palate of colors of the surrounding hills.

The building of the bridge was also monumental for the rigorous safety measures that were enforced while it was being built. Hard hats were required (a first) and a safety net was spread underneath the floor of the bridge, which saved the lives of 19 men. Only 11 men lost their lives with the building of the bridge – quite an improvement in an industry that estimated one life would be lost with every million dollars spent on a project. The bridge continues to be maintained by a hardy crew and is claimed to be the most photographed bridge in the world.



Golden Gate Bridge Facts

- Construction began: January 5, 1933
- Opened to automobile traffic May 28, 1937
- Cost: \$35 million (along with \$39 million in interest)
- Materials: 83,000 tons of steel, 389,000 cubic yards of cement and 1.2 million rivets in the towers along.
- Length: 1.7 miles
- Weight: 887,000 tons
- Width: 90 ft
- Water clearance: 220 ft (at the middle of the bridge)
- Main Cables: 7,650 ft long, diameter 36 3/8"
- Number of wires per cable: 27,572
- Total wire used: 80,000 miles
- Total paint used to upkeep the bridge: 5,000-10,000 gallons of paint annually

Current Uses

Pedestrian and cyclist traffic is not counted every day, but an average of 112,000 vehicles cross in the six lanes of traffic every day. The bridge is visited by some 10 million visitors a year including pedestrians and cyclists that cross in a special sidewalks separate from the auto lanes. The bridge continues to be an iconic symbol of the West Coast of the United States as one of the most recognized bridges in the world.

Tomales Bay and Point Reyes

History

The entire Coast Miwok population was probably around 3,000 individuals. Within the Tomales Bay and Point Reyes region there were eight village sites, including one ten-family site, two five-family sites and five smaller sites. There is a replica Coast Miwok village at Point Reyes National Seashore's Bear Valley Visitor Center, about 10 miles south of Tomales Bay State Park. In 1579 Sir Francis Drake sailed into Tomales Bay and laid claim to the whole area for England, naming it Nova Albion (New England). This name was not to last however, because in 1603 Spanish explorer Don Sebastian Vizcaino sailed along the Northern California coast and named the Tomales Bay area "La Punta de los Tres Reyes," or The Point of the Three Kings. This name was given because it was the 12th day of Christmas and the Feast of the Three Kings. The name Tomales is thought to be the Spanish inflection of the Miwok word for bay.

The first known contact between the Spaniards and the Miwok of Tomales Bay occurred on October 3, 1775, when Lieutenant Juan Francisco, commander of the schooner *Sonora*, sailed into Tomales Bay and anchored on the northeastern side of the bay at Tom's Point. The following is an excerpt from his account:

"There were innumerable Native Americans (named Tamales or Tamals), who crossed in reed floats from one side to the other to reach a hill near our anchorage. After a large number had gathered, they began to shout and continued for two hours without stopping. At the end of this time two of them came alongside the ship and with perfect frankness presented us with plumes, bone necklaces, a basket of seeds that tasted like hazelnuts, and various other trifles of this kind. I recompensed their offerings with handkerchiefs, mirrors, and glass beads, and they departed very pleased."

Dairy Ranching

Family farms have had a huge impact on both the local economy and the environmental quality of the Tomales Bay Region. Many of the ranches have been passed from one generation to the next for over 100 years.

Following the California Gold Rush of 1848, white settlers poured into California and the demand for groceries skyrocketed. No city grew bigger or faster than nearby San Francisco. After it was discovered to be "cow heaven" in the late 1850s, it wasn't long before Point Reyes became one of the largest centers of commercial dairy production in the region. Cheese and butter produced here was shipped throughout the West by train or schooner.

By 1880, the demand for Point Reyes Butter was so great that dairies around the area were counterfeiting it. Empty Point Reyes Butter boxes would be repacked with "common" butter and sold at a higher price. Upon learning this, Point Reyes Butter was trademarked and the letters P.R. were stamped on each package made on its ranches. This may be one of the first forms of branding a consumer product in California.

In 1993, the Straus Family Farm, established in 1941 and nestled in the hills along Tomales Bay's eastern shore, became the first certified organic dairy west of the Mississippi River.

Oyster Farming

Oyster cultivation has been a major industry on Tomales Bay since the late 1930s when San Francisco Bay was deemed too polluted for their harvest. Tomales Bay has long been the heart of the California oyster scene with two companies dominating the business: The Tomales Bay Oyster Company and Hog Island Oyster Company. Tomales Bay is ideal for oyster cultivation because of its clean, unpolluted, calm water and muddy soft bottom. It is widely thought that because oysters are filter feeders, they contribute to the cleanliness of the water in which they live in. Along with eel grass, oysters are considered *a foundational* species, or a species on which other organisms can grow and base their community structure.

Areas of Interest

- Indian Beach Look for the reconstructed redwood Coast Miwok shelter, called a *kotcha*.
- Laird's Landing (just south of Marshall Beach) –. In the 1800s, brothers George and Charles Laird operated a wharf here where schooners serving the ranches could tie up. In 1860, George Laird gained fame for producing a 1,600 pound cheese.
- Cypress Grove Research Center These white buildings across from Marshall Beach are the headquarters of Audubon Canyon Ranch's Conservation Science and Habitat Protection Programs.
- Pelican Point Closed to the public year round to protect harbor seals from disturbance
- Hog Island A favorite haul-out for seals and roosting place for brown pelicans
- Launch for Hire A historic sign hailing back to an era where the elite of San Francisco would come for daylong pleasure trips to boat on the bay. The boathouse here is where they could hire a boat for a day of picnicking and boating.

Conservation History

1940s: Real estate developers began private development of coves on the west side of Tomales Bay. Local residents rally for public purchase in order to secure public access to beaches.

1946: Diking and draining of 550 acres of historic tidal marsh to facilitate the running of the Giacomini Dairy Ranch. The practice of creating dikes and draining wetlands had been going on for a while, but this time was particularly damaging, as it cut off one of the largest freshwater inputs to the Bay.

1952: Tomales Bay State Park is created

1959: The Marin Resource Conservation District was established to help farmers and ranchers conserve and enhance the natural resources on their lands while maintain a viable agricultural economy.

1962: President Kennedy designated all the land west of Tomales Bay as federally protected Point Reyes National Seashore.

Early 1970s: Proposals for increased coastal development included a city with a population of 125,000 people on the shores of Tomales Bay.

1980: The Marin Agricultural Land Trust (MALT) was founded. MALT pays landowners to enter a legal agreement that prohibits non-agricultural development or subdivision on their properties. Partnerships with landowners conserve the undeveloped rolling hillsides of the area by allowing ranching and farming families to meet financial challenges without having to sell, divide or develop their property.

2008: The man-made levees of Giacomini Ranch that had transformed Tomales Bay's southern end from wetlands to pasturelands in the 1940s were finally breached. Tidal marshes have now reclaimed the area.

Current Uses

Currently Tomales Bay is considered one of the most "pristine estuarine" environments on the West Coast, as it has been relatively protected in comparison to other coastal California environments. Today the Bay forms the eastern boundary to Point Reyes National Seashore and is also home to the much smaller Tomales Bay State Park and numerous observation, conservation, and education centers. A tight knit community of concerned citizens continues to promote a balance between recreation, conservation and commercial enterprises. Thriving dairy farms supported by MALT continue to exist on the Point Reyes Peninsula, although the world famous Drake's Bay Oyster Company recently had to close its doors and stop all oyster cultivation when the National Park Service chose to not renew their lease (a highly controversial decision). Tomales Bay continues to be a recreational destination for paddlers and wildlife watchers and is a beautiful place to visit.

Kayak History

Kayaking is an ancient activity believed to be around 4,000 years old. The word kayak comes from the Aleutian word *iqyak*, meaning man's or hunter's boat. Kayaks were originally developed by the indigenous Inuit (Arctic regions of Greenland, Canada, and the U.S.), Yupik (Alaskan and Russian), and Aleut peoples (Aleutian Islands).

Depending on where the users lived, early kayaks were made of either whalebone or wood frame skeletons, with seal or other animal skins stretched over them. Each boat was completely customized to the individual: men built their own kayak, often assisted by their family, to the specifications of what they needed to use it for. Generally, the length was around three times the length of the user's outstretched arms and the width was the width of the paddler's hips plus a fist with the thumb extended.
Once a hunter was seated in his kayak, a *tuilik*, or skin, was laced to the kayak to create a waterproof seal. There were three main styles of kayaks – *baidarkas* (thought to be the oldest), West Greenlands, and East Greenlands. The style of kayak someone would build depended on where they lived and the types of animals being hunted. Whale oil was used to seal boats and make them waterproof and seal bladders were inflated and placed in the bow and stern for buoyancy.



Baidarka was the term fur-seeking Russians used during their occupation of the Aleutian Islands. The word was

Single passenger baidarkas. Credit: Baidarka, by George Dyson.

used to describe the smaller of the distinctively hatched, skin-covered boats that they found in use by the Aleut people.. The indigenous peoples that they found preferred to be called Unagan, or "coastal people," but the Russians named them Aleuts after the island chain that they inhabited. The Unagan are believed to have migrated over the land bridge from Asia 12,000-15,000 years ago. They were a peaceful people who were initially friendly with their Russian visitors, but after increasing brutality and occupation, they understandably became rebellious. Initially, it was common for Russian fur traders to take Aleut hostages, releasing them only in exchange for otter pelts. However, the Russians struggled to live in a harsh environment with little support from their nation. With time, the Russians did their best to integrate themselves into Aleut communities, where they would force the men to build hundreds of *baidarkas* and to hunt for lucrative otter pelts. Not only did the Russians manage to get the skilled Aleut men do their hunting for them, they would even "rent" hunters to other fur traders in remote areas of Alaska when local otter populations became decimated by the intense onslaught of hunting. Without the Aleut hunters and *baidarkas*, it is doubtful that the Russian advance across the Aleutian Islands, into Alaska, and down the West Coast would have ever been possible.

Human History Timeline Activity

Goal: Give participants an idea of the relative amounts of time between defining moments of local history by illustrating time spatially

Time: 20 minutes

Who: This activity is better for middle school ages

When: Along a hike or after lunch on an overnight trip

Where: The beach is ideal because it is long, flat and has no trees or visual obstruction. A straight section of traffic-free road works well too.

Materials: Human History Timeline Activity cards, participant backpacks or other visual markers

The Human History Timeline Activity cards each describe a single event in local history. Gather everyone together, preferably on a stretch of beach, and have participants bring a small bag or jacket to act as a marker. Hand out the cards to the participants and give them a minute to read them. The cards are numbered and are to be read in order. You will be taking a measured number of steps between the reading of each card, with each step representing fifty years. After reading the first card, everyone will walk in a line together, counting off the number of steps indicated on the card. After each card is read, drop a visible marker, such as a backpack or bright sweatshirt, in that place and leave it behind as the group

advances forward. Feel free to give more information or answer questions after reading each card. With each of the timelines, you will notice a trend toward fewer steps between events as you progress through the sequence of cards. Once you finish, gather the cards and call everyone to a discussion circle to wrap up the activity.

Discussion Questions

Ask everyone to look back at the timeline we created using backpacks / jackets.

- 1. What can you tell from looking back at our markers?
- 2. Is there a pattern that you can see from those markers?
- 3. What might that pattern mean?
- 4. What's happening now that will be considered a historic moment by future generations?
- 5. Are you a part of those events? Could you be?

Human History Skits Activity

Goal: Reinforce historical knowledge by creating fun and creative skits Time: 30 minutes preparation, then 20-30 minutes for presenting Who: Student participants of any ability When: After dinner is usually best Where: Angel Island and Tomales Bay Materials: Human History Skits Activity cards, props for costumes (encourage creativity!)

Skits can take two forms: they can either be amazing, entertaining experiences, OR they can crash and burn in epic proportions. The difference is you! Follow the below tips and tricks to help coach groups through the skit preparation process, so that when curtain time comes, you can sit back and be entertained!

It is important to evenly distribute your participants among groups. You need at least two groups – someone has to be the audience! Have the groups spread out and take a skit card with them. The skit cards will have between five to seven words pertaining to the human history of the area. Hopefully you have already discussed all or at least some of these words. If you haven't, don't stress: you can either pass on a word or explain it to everyone. Before brainstorming begins, here are some guidelines and boundaries to preface:

- 1. A skit is usually between 5-6 minutes.
- 2. Everyone needs to be involved.
- 3. There needs to be a beginning, middle and end.
- 4. There will be a set of criteria on the card that they need to make sure is in the skit; the rest is up to them to be creative about.
- 5. Content must be appropriate (to be approved by you after a trial run before they hit the stage).

After reviewing these guidelines with your participants, open the floor for them to start bouncing around ideas. Sometimes groups will come up with a perfectly entertaining skit with little help. Most of the time they will get bogged down with too many ideas. After a few minutes of careful listening, ask the group to select a few of these ideas to focus on and have them go from there. Sometimes you will have to do the "listen and stop" a few times, until you have a basic story line and accompanying roles. If you notice something they are missing, pose a question such as "Tommy doesn't have a role yet, what part can he play?" By posing questions, it allows the students to lead and make a skit that is truly their own. Skit prep also takes active monitoring. Keep a close eye on anything that might be inappropriate and guide participants accordingly. Lastly, set a time limit! If you do not, your skit prep may go on infinitely.

After everyone has a skit prepared, you can come back together and have a show. Be sure to preface with audience members to be polite and supportive. Remind groups to face their audience when they speak and to project their voice so that everyone can hear.

Coast Miwok Food Each One Teach Ones Activity

Goal: Participants think about how their food differs from the traditional food of this area **Time:** 10-15 minutes

Who: Participants of any age who might be interested by the human history of the area... or by food! **When:** Before or after eating a meal

Where: Along the shore of Tomales Bay works well, as it is easiest to imagine people foraging and hunting for food there

Materials: Coast Miwok Food Each One Teach One Cards (7 cards)

Instructions for the Facilitator

- 1. Before or after a meal (lunch works well), when participants are excited about eating the food they have brought on the trip, ask them what they think the people who lived here a long time ago used to eat. What can they see around them that would sustain human life?
- 2. After some ideas are shared, tell participants that you have some information on what used to be eaten here that they might find interesting.
- 3. Hand out a Coast Miwok Food Each One Teach One Card to seven lucky participants in your group and give them a few minutes to get familiar with the info. There might be a lot of information on the card, but have them choose two or three things that seem the most interesting to them and just focus on those.
- 4. Ask everyone to imagine going back in time 3,000 years and think about what it would be like to live in this exact same place then. What would be the same? What would be different? What would they do when they got hungry?
- 5. Go around the circle and have everyone share the highlights of what's on their card. Encourage them to paraphrase the most interesting information instead of reading off the card. Once you're done, be sure to collect the cards.
- 6. Wrap this up with a discussion:
 - a. If you had to survive here for a week, what foods would you be most interested in finding and eating?
 - b. Think about the food we have on this trip. How far away from here do you think it was grown?
 - c. Can you think of any opportunities to eat locally produced foods in your life at home?

The Ohlone Way Guided Visualization Activity

Goal: To place participants mentally in the time of the Ohlone people and to help them imagine what the Bay was like before it was irrevocably changed

Time: 20 minutes

Who: Participants on Angel Island overnights

When: This is a great activity to break up a hike

Where: You could do this anywhere, but the Sitting Tree, aka the Malcolm Tree, on Angel Island works great.

Materials: This reading and the Animal Medicine Cards

Directions to the Malcom Tree

Head up the dirt road through the eucalyptus grove to the main viewing benches. Continue east (left) on the paved perimeter road a short distance until you meet a dirt trail. Turn left and hike up the hill past two camp sites. The trail will veer to the left as you continue up the steep hill. You will come upon a large serpentine rock outcropping with a view overlooking Raccoon Strait. Stop a minute to take in the view. The rock outcropping is a great place to enter into a "silent" agreement with all participants. On the opposite side of the trail from the rock outcropping is the tree. Look for a large oak tree intertwined with a Bay and more serpentine rock.

Set-Up

Hike to the Sitting Tree / Malcolm Tree with your group, or to another spot that would lend itself well to participants quietly listening to a story. Have participants find a safe spot in the tree. When everyone is comfortable explain that you are going to take them on a journey of the imagination and begin the following reading.

Is everyone comfortable? Excellent. We are now going on a journey. We need you to be quiet and enjoy the peacefulness of this moment. (pause for a few seconds to a minute for everyone to quiet).

Tell the Story

Hello everyone. My name is Uli (Ohlone for warrior). I am here to take you on a journey back in time when you would not recognize the land that you now call home. Come with me to visit a land teeming with life and nature's bounty. In the days of my people, tall, sometimes shoulder-high stands of native bunch grasses cover the vast meadowlands and the tree-dotted savannahs. Marshes spread for thousands of acres fringing the shores of the Bay. Thick oak-bay and redwood forests cover much of the hills.

The intermingling of grasslands, savannahs, salt-and freshwater marshes, and forests create wildlife habitats of almost unimaginable richness and variety. When early explorers, visit us, they talk of traveling the world, but they never have seen the plentiful animal life that is here. One visitor, French Sea Captain la Perouse told me "There is no place in the world which more abounds in fish and game of every description." That's because flocks of geese, ducks and sea birds are so enormous that alarmed by a rifle shot, they rise in a dense cloud with noise like that of a hurricane. Pronghorn antelopes, in herds of one or two hundred, dot our grassy slopes. Packs of wolves hunt the elk, antelope, deer, rabbits, and other game. Bald eagles and giant condors glide through the air. Mountain lions, bobcats and coyotes are a common sight. And of course there is my friend the grizzly bear. Grizzlies are everywhere feeding on berries, lumbering along beaches, congregating beneath mighty oak trees during the acorn season, and lingering at nearly every stream and creek during the annual runs of salmon and steelhead. Grizzlies are omnipresent.

Now consider in your heart the ocean. Life in the ocean and the bays is abundant and plentiful beyond belief. There are mussels, clams, oysters, abalones, sea birds and sea otters in profusion. Sea lions blacken the rocks at the entrance of the Bay in such numbers that they appear to cover the surface of the water like a dark, rich blanket. Long, wavering lines of pelicans thread the air. Clouds of gulls, cormorants, and other shore birds wheel and screech at the approach of a tribesman. Rocky islands are white from the droppings of great colonies of birds. Whales are incredibly common, Along the bays and ocean beaches whales often wash ashore, with grizzly bears in countless troops or in many cases our own people going down to the beach to feast on the bounty.

In the days of my people it was a moist swampy land. Water was much closer to the surface and settlers who came here easily tapped into clear, fresh water within a few feet of digging their wells. Water was virtually everywhere, especially where the land is flat. Settlers suffered more from mosquitos, spongy earth and hard-to-cross rivers than they did from thirst (even in the heat of summer).

Before the Bay became filled with sediment, from the Gold Rush, it was much larger than what you see today. Rivers and streams empty in and fan out into estuaries which support many tule marshes where we harvested tule grass to build our boats and temporary homes. The low, salty margins held vast pickle weed and cordgrass swamps providing much food as it was the richest wildlife habitat in our known realm.

The environment of the Bay area has changed drastically in the last 200 years. Some of the birds and animals have disappeared, and many others have vastly diminished in number. Even those animals that have survived have altered their habits and characters. The animals of today do not behave the same way they did centuries ago in the time of my people. When the first European explorers arrived they found that the animals of this area were mostly unafraid of people. Foxes, that were virtually underfoot, are now very secretive. Mountain lions and bobcats that were prominent and visible, now are hardly ever seen. Sea otters, which were readily caught on land, now spend almost their entire lives in the water. No doubt chased away by explorers like Otto von Kotzebue, an avid Russian hunter who delighted in what he called the "superfluity of game." He brought with him a crew of Aleutian Eskimos to hunt sea otters. Because they have no blubber, their pelts are the thickest of all marine mammals.

This land we see now changed with the arrival of the European and his rifle. For years the hunting was easy- so easy that the thrill of the hunt was missing. But the advantages of the gun were short-lived. Within a few generations some birds and animals had become totally exterminated, while others survived by greatly increasing the distance between themselves and people.

Today we are the heirs of that distance, and we take it entirely for granted that animals are naturally secretive and afraid of our presence. But for the Native Americans who lived here before this was simply not the case. Animals and humans inhabited the very same world, and the distance between them was not very great.

The Ohlone depended upon animals for food and skins. As hunters my people had intense interest in animals and an intimate knowledge of their behavior. A large part of a man's life was spent learning the ways of animals. Every member of my tribe had a spirit animal.

But our intimate knowledge of animals did not lead to conquest, nor did their familiarity breed contempt. The Ohlone, my people lived in a world where people were few and animals were many, where the bow and arrow were the height of technology, where a deer who was not approached in the proper manner could easily escape and a where a bear might conceivably attack; indeed, my people lived in a world where the animal kingdom had not yet fallen under the domination of the human race and where people did not yet see themselves as the undisputed lords of all creation. We, like hunting peoples everywhere, worshipped animal spirits as gods, imitated animal motions in their dances, sought animal powers in their dreams, and even saw themselves as belonging to clans with animals as their ancestors. The powerful, graceful animal life of the Bay Area not only filled our world, but filled our minds as well.

Now my friends, as heirs of this land, we all have a choice; to follow in the spirit of our ancestors who honored this land or follow in the path of our ancestors who pillaged it. You too can embrace the spirit of the Ohlone warrior and live in greater harmony with the land. You can become wiser stewards of the natural world that surrounds you. Tend it. Care for it. Teach others that we are all connected to one other and the world in which we live in and you too will have something to pass along to your children.

Discussion Questions

- 1. How were you able to imagine what it would be like to live in the time of the Ohlone? How did it feel?
- 2. How do you feel about all of the changes to the land, animals and the environment?
- 3. What are some things you can do to be wiser stewards?

- 4. What are some big ideas that might help us to protect all habitats, all creatures of the Earth? How can we live a more balanced way of life?
- 5. What would that look like?
- If you have time, have everyone choose an animal card from the *Animal Medicine Card* set. Later, back in camp, students can take time to read their animal card out of the book to gain further insight and inspiration.



View of the Bay in the time of the Ohlone



Ohlone with his Tule Boat

Immigration Station Teaching Cards Activity

Goal: Introduce the history of Angel Island as an immigration station, sensitize participants to the experience of immigrants who passed through the station, and discuss the concept of historic preservation **Time:** About 20 minutes

Who: Any group that has expressed interest in learning about the immigration station on Angel Island **When:** Ideally, complete this activity right before touring the immigration station.

Where: Anywhere on Angel Island

Materials: Immigration Station Teaching Cards (13 cards)

Instructions for the Facilitator

The immigration station on Angel Island is an outstanding educational opportunity. On trips where time allows for a visit to the station, it's a good idea to introduce your participants to the basic history and get them thinking before they begin their tour.

- 1. Pass out one of the cards to each person in the group. There are a total of 13 cards.
- 2. Go around the circle and have each participant read their card out loud and then share any pictures on their card with the group.
- 3. For cards with questions in red at the bottom, the participant reading the card can read those out loud as well. They can either be asked rhetorically, without people sharing answers, or you could encourage participants to share their thoughts about the questions if time allows.
- 4. After all the cards have been read, including the biographies and the poems, ask the group a few general questions: Did they know about this history? What are their reactions / first impressions after hearing some of these stories?
- 5. Now go explore the immigration station together! Have fun!

HUMAN IMPACT ON THE ENVIRONMENT

Every living thing has an impact on the environment that it inhabits. This can be a positive or a negative impact, but all of it is change. This section explores concepts of our personal impact on the surrounding areas that we paddle through, larger worldwide issues of climate change and how we can become better stewards of the natural areas that we live in.

Development Scenarios

What: Development scenarios involve assigning roles to your participants and having them argue or discuss local issues from the point of view of their character. They are an effective and interactive way to teach about many of the resource stakeholders and user groups in the areas in which we travel, making it possible to understand complex issues related to development better than most other visitors. Development scenarios are a longer running activity and are best for overnights or layover days when you have more time.

Activities Available:

- Drakes Bay Oyster Company Debate Activity
- Angel Island Development Scenario Activity

Drakes Bay Oyster Company Debate Activity

Goal: Participants learn about a local resource debate, explore the perspectives of different land use stakeholders, and learn to make persuasive arguments

Time: At least 1.5 hours - you can break this up depending on your time constraints

Who: Participants of any age on trips with a more educational focus

When: Overnights or multiday trips

Where: Tomales Bay

Materials: Drakes Bay Oyster Company Debate Activity cards (contain roles and articles), paper and pen for notes

This is a role-playing activity in which your participants will each assume the role of one of the players involved in the controversy surrounding the Drakes Bay Oyster Company. While the outcome of this particular debate has already reached a conclusion in real time, having your students debate from the point of view of their roles will lead to a greater understanding of how everyone is affected. It will also help them understand that there is not always a clear-cut solution and that the solutions reached will almost never please everyone. Each time you run this activity there is the possibility for a different outcome, which is fine. The goal is for participants to gain a better understanding of the complex bigger picture. Active management on your part is extremely important. For a successful facilitation, you need to be mindful of whom you are assigning roles to and really encourage everyone to "get inside the head" of their role. The activity will fall flat if participants just get up in front of the group and read their card. They need to work at *convincing* their audience.

Assign Roles

It is important to be mindful of whom you assign each role to. For example, don't hand the park superintendent role to the most shy and quiet person in your group. It is also a good idea to make your role assignment *seem* random, since that will make participants feel less judged. If you do not have enough roles to give each person their own, pair up the participants on some of the roles. Each role card will indicate what their role is, some background on their character's stance, and which article they need to read to gain a deeper perspective. There is more than one role assigned to read each article, so have everyone group together by the article they are supposed to read. If you have enough adults or staff,

assign an adult to each group to help with the reading. Allow about 10-15 minutes for everyone to read the article together, read their role card, and plan his or her statement.

Roles for DBOC Debate: Should it stay open?	
Kevin and Nancy Lunny—Oyster Company Owners	For
Federal District Judge	Against
California Senator	Neutral
Dairy Farmers	For
Park Superintendent	Against
Oyster workers who have worked at the farm 20 years	For
Environmentalists from Environmental Action Committee	Against
Restaurant owner who buys Drakes Bay Oysters	For
Truck Driver who delivers oysters to restaurants	For
Citizen concerned about harbor seal protection	Against
Independent scientist	Neutral

Group Debate

Gather everyone together. Preface with the group that 1) audience members need to pay attention and be respectful, and 2) when it's time to state your case you will need to present convincingly or the vote will not go your way. Give each person 2-3 minutes to present his or her role's case. Since you will not be reading the roles out loud to everyone else, make sure the participants introduce themselves as part of their presentation. Some presentations will be short on time and some you will have to gently cut off so that the activity doesn't drag on too long. After each presentation, allow for a question or two from other students (or teachers if they want), and then move on to the next presentation.

The Vote

Once all the presentations have been made, inform everyone they are now themselves again and will be voting on their own opinion *based upon the presentations they have seen*. Feel free to open up the vote to anyone who has observed the activity (i.e. teachers and guides), since this may motivate participants to really sell their presentations and will give the outcome of the activity more of a "wild card" feel. When working with youth, votes are usually best when they are done in secret. So, either have everyone write FOR or AGAINST on a piece of paper or close their eyes and raise hands.

The Discussion

Tally the votes and give the verdict. A discussion will help wrap up the activity in a meaningful way. The following are some discussion questions that you can use to facilitate finding out what everyone learned and what they think about the outcome.

- 1. Does anyone feel like sharing what their vote was? Why did you vote that way? Several people may want to answer this question. If no one does, gently encourage sharing by selecting someone who you think might not mind answering.
- 2. How do you think the Lunnys feel about this verdict? What about the National Park Service?
- 3. What do you think is the right answer? Was closing the DBOC the right decision in real life?
- 4. Do you think a compromise in the real-life controversy could have been reached?
- 5. What would your idea of a compromise look like?
- 6. If the DBOC was left open, what negative effects could have come from it down the line?

Wrap-Up

Finish by reading Kevin Lunny's thank you letter to the community

Roles

Kevin or Nancy Lunny: You run the historic oyster farm in Drakes Estero, located in Point Reyes, Marin County, that has been part of the community for nearly 100 years. You are the Lunnys, a third-generation Point Reyes ranching family, who purchased the oyster farm in 2004. Modern environmentalists and proponents of sustainable agriculture praise your company as a superb example of how people can produce high-quality food in harmony with the environment. The farm produces approximately one third of all the oysters grown in California, and employs 30 members of the community. You also contribute the oyster shells to projects that make possible the restoration of native oysters in San Francisco Bay and create habitat for the endangered Snowy Plover and Least Tern. As the last oyster cannery in California, Drakes Bay is the only local – and thus the only safe and affordable – source of these shells. You are proud of your contributions to a sustainable food model that conserves and maintains the productivity of the local landscape and the health of its inhabitants. (Text adapted from Drakes Bay Oyster Company website.)

Park Superintendent: You manage Point Reyes National Seashore, which boasts 80 miles of spectacular, undeveloped coastline and protects more than 90,000 acres of land including more than 30,000 acres of wilderness. The history-rich landscape is important to ranchers and the area boasts biological resources as well. The park is home to a tremendous diversity of native plants and wildlife – more than 1,000 species – and offers extraordinary recreational opportunities on nearly 150 miles of trails, backcountry campgrounds, and wild beaches. The park, created by Congress in 1962, welcomes more than two million visitors every year. The park is an important link in a chain of protected areas, shares boundaries with the Gulf of the Farallons and Cordell Bank National Marine Sanctuaries, Tomales Bay State Park, Marin Municipal Water District Lands, and Golden Gate National Recreation Area. You have to find a balance between keeping this environment protected and serving the people who for years have relied on the resources of Point Reyes for their livelihood. (Some text adapted from PRNS website.)

Federal Court Justice: You are Federal District Judge Yvonne Gonzalez Rogers, the federal justice in charge of upholding or allowing the appeal of the Drakes Bay Oyster Company's lawsuit against the park service. You will make your ruling from the bench in an Oakland courtroom after hearing arguments from lawyers representing the US Department of the Interior and lawyers representing a coalition of Marin County interests including Drake's Bay Oyster Company. You reject virtually all of the coalition's arguments. You even consider issuing sanctions against the coalition for bringing a frivolous lawsuit based on a "complete lack of merit."

California Senator: You became concerned about this issue when you found that the science regarding the impacts of the oyster farm had been manipulated and that the oyster farm operator had been treated in a biased and unfair manner. Since 2006, The Park Service has repeatedly misrepresented the scientific record to portray the farm as environmentally harmful, and it is your belief that the Park Service is doing everything it can to justify ending the oyster farm's operations. You also asked the National Academy of Sciences to review the same Park Service environmental reports for a second opinion. Mostly, you want to facilitate a meeting between the Park Service and the Lunnys to explore ways in which the oyster farm could continue to operate while protecting Drakes Bay's sensitive natural resources. (Text adapted from Senator Dianne Feinstein's 2012 letter to the California Department of Fish and Game,)

Drakes Bay Oyster Company Workers: You are a DBOC worker who has worked for the company for 30 years. You are a specialized worker who knows everything about the business. Your spouse works for DBOC as well and your children go to school in nearby Inverness. Your whole world is here in this small community. If you were to lose your job at the oyster company, you would likely have to move away from both family and community in order to use your skill set at a similar job.

Citizen Concerned about Harbor Seal Protection: You own a small house in the neighboring town of Inverness and you love the small community and its commitment to preserving the wilderness you love. Drakes Estero is one of your absolute favorite places in the world. You attend naturalist classes at Point Reyes National Seashore's Bear Valley Visitor Center so that you can better understand all of the wildlife that you love to watch. Lately, you have become concerned that motorboat traffic will disturb the harbor seal haul out spot in Drakes Estero where you enjoy sketching and painting. Since harbor seals are easily disturbed to a point where they will never come back, you are concerned that their favorite hangout is in danger because of the noise from boat traffic.

Environmentalist from the Environmental Action Committee of West Marin County (EAC): You are a long-time member of the EAC, which is a tenacious, highly effective grassroots advocacy organization founded in 1971 and dedicated to the protection and appreciation of West Marin's wild lands, wildlife, wilderness, watersheds, and rural character. EAC works for clean air, pure waters, healthy ecosystems, a diverse and thriving native flora and fauna, and the preservation of a rural, community spirit. You are fighting to uphold the promise made years ago to designate Drakes Bay a wilderness area where there would be no commercial interests to interfere with the pristine environment. (Text includes EAC's mission statement.)

Dairy Farmer: You are a third generation dairy cow farmer. Your family has been utilizing this land since the ranching boom in the Point Reyes / Tomales Bay region in the 1930s. You have a lease for your land from the National Park Service and you receive support through the Marin Agricultural Land Trust (MALT) to keep your business running. Dairy farming is an integral part of the history of this area and of your family! If the National Park Service prevents the Drakes Bay Oyster Company from renewing their lease, will you be next?

Delivery Truck Driver: You drive a delivery truck and all of your business is in connecting highly sought after oysters with high-end restaurants throughout the entire bay area. Recently, you've had to deal with the State of California requiring you to make a \$10,000 modification to your truck to reduce emissions. Since this is a new requirement that you weren't expecting in your budget, if you subsequently lose Drakes Bay Oyster Company as the main client of your delivery business, you will be sunk!

Restauranteur: You own a four-star restaurant that has built its business around the unique flavor of the oysters produced in Drakes Bay. Oyster flavoring is unique to the water and sediment the oyster is grown in. Your clients have discerning palates and prefer to support local agriculture. You have worked hard as a chef to foster community between yourself and the local producers who supply the food products on your menu. What will happen to your business if the cornerstone product on your menu disappears?

Scientist from the Proceedings of the National Academy of Sciences (PNAS): You are a scientist that has made a career of fact checking the science behind articles that are sent in to the scientific journal *PNAS*. You are impartial and nothing matters to you except the data! If the science is not there or is in error, you do not allow reports to be printed. The Lunnys have asked you to check the scientific studies that have been released about their oyster farm's impact upon the environment. Not only do you find that there are errors in the National Park Service's reports, but you are not convinced that the oyster farm is detrimental to the health of Drakes Estero. You think that another study conducted by an impartial scientist is needed to truly determine what the impact on the bay is. It might even turn out that the oyster farm is good for the bay; you just won't know until better data is there to support it.

Angel Island Development Scenario Activity

Goal: Engage participants in considering the demands on a place from different stakeholders. Involve participants in a discussion about natural resource management.
Time: 1.5 hours
Who: This works great with high school students
When: Overnights or multiday trips
Where: On Angel Island
Materials: Angel Island Development Scenario Role Cards; selfish map templates; markers

An island development scenario is an effective tool for actively engaging participants in thinking about and discussing the island they are visiting. Some of the concepts that are covered include: who might be interested in using the island, the process by which we decide how to manage our natural resources, and the challenge of group decision-making. Remind yourself and your participants that there is no single correct solution and that processes involving compromise usually mean that not everyone will be 100% satisfied with the final outcome.

<u>Set Up</u>

This is a longer activity, and it helps if early on in the trip you can prep your participants with the knowledge that they will be considering how to manage the island later in the day. That way, when you are sharing information about history or resources during your paddle, they can consider what they are seeing and learning and apply it later. You can also clue in staff members from the group, and they can give you advice on who might be good to fill the community planner role. As the facilitator, you should also observe the group and think about who might be good for each role. Be sure to have read the activity all the way through before the day begins.

Activity

Gather the group together and explain the situation: Angel Island is a blank slate, with no current management or plan in place for its development. Everyone here will help determine how the island will be used. Here's the general flow of how the activity will run (these steps are described in more detail below):

- 1. Hand out role cards
- 2. Everyone reads their roles out loud to the group in the first person (change "you" to "I")
- 3. Have participants place their characters on a continuum
- 4. Hand out selfish map templates. Everyone will get about 15 minutes to develop the island on their selfish map and prepare.
- 5. Regroup and listen as each person explains their selfish map and states their case to the community planner(s)
- 6. The community planners will decide how the island is to be developed based upon the presentations
- 7. Community planners present
- 8. Wrap-up discussion

It is important that you cover a few things with participants before handing out their roles:

- You need to state that there is no right or wrong outcome of the activity. As a group you will be exploring how to decide what is best for the island.
- Once the roles are handed out, everyone must attempt to argue and develop their maps according to their *character's role*, not their own opinions. Explaining that it is okay to not agree with your assigned role will help someone if they receive a role they perceive to be bad or unpopular, like Chevron Charlie.

• The community planners will need to observe carefully, because they need to listen to everyone's arguments and make decisions based on those arguments. They should not feel like they need to please all the characters – they should base their planning on the strength of the arguments presented to them. Because there is not a known outcome, participants will gain a better understanding of how important it is to get out and make their voices heard. It does make a difference!

Place Characters on a Continuum

Once everyone has read their roles, it can be helpful to draw up a continuum. Draw a horizontal line on a piece of paper and label one end "Development" and the other end "Preservation." Explain what both ends of the spectrum mean and have everyone write their character's name where they think they belong in relation to the extremes of the continuum. This will help everyone get a good idea of where their character is in relation to the others. Below is an example – but there is no single correct order. Make sure no one has any questions and then hand out the selfish maps.



Selfish Maps

The templates are outlines of the shape and physical features of Angel Island. Participants' task is to develop the island as their character would if their character could have everything they wanted. Pose some questions to the group to get their ideas flowing on their maps:

- Where will everyone live?
- Where will you place different things you build?
- How will you address transportation? Food? Fresh water supply? Energy needs?
- How will you protect your island?
- What will you do with trash and sewage?
- Where will people be allowed to go or not go on the island?

Have everyone spread out with some markers and draw out how their character would address these questions. It's a good idea for them to write plenty of labels and a few notes on the map so that they won't forget what they want to say when it comes time to present their ideas. During this time, you can be wandering around, checking on everyone's progress, answering questions and encouraging them. You can also be working with the community planner a bit so that they feel ready for their job (they don't fill out a selfish map).

Town Council

Once the majority of the group is finished with their selfish maps, regroup and give each person 2-3 minutes to explain their map and state their case to the community planner. Remember to emphasize that they must convince the community planner if their plan is to be carried out. The community planner may want to take notes, but it usually works well to have everyone turn in their selfish maps to the community planner goes to work and creates a map that will be a master plan for the island. It is a good idea to gather your

participants so they don't lose focus while the community planner is working. If there are extra adults, it is a good idea to check in on your community planner to see if they need any help.

Wrap-up / Discussion

Have your community planner present his/her plan. This will usually be met with groans and cheers! Once their plan is presented, share some information with the group about the actual story of Angel Island's history and conservation as a California State Park. It's also important to lead a discussion to find out what your participants thought about their experience. Here are some discussion questions:

- 1. Did you agree or disagree with your character role?
- 2. Was it hard to argue for your role?
- 3. Why do you think the development turned out the way it did?
- 4. What did you think about this experience and what did you learn from this process?
- 5. How do you think this activity relates to your actual life?
- 6.

Note: If you have too few participants to assign all the roles, just make sure that you have about the same number of roles on either side of the debate. Some repetition is built into the roles for this reason. If you have too many participants, pair people up for some of the roles, starting with the community planner. Don't worry about the gender name assigned to each role. It is very easy to switch a name like Ranger Ruth to Ranger Randall.

Roles

Community Planner: You are the community planner. It is your job to listen to all of the people who want to utilize Angel Island. You have the best interests of your people at heart and must make your decisions based upon what they tell you. You don't have any information about this place that needs to be managed, and while you hold the pen and will make the decisions, you have no personal opinions or interests about how the island will be used. Each presentation you hear needs to convince you to include that person's interests in your final plan.

Chevron Charlie: You are Chevron Charlie. You come from a long line of oilmen and plan to continue the proud legacy of Chevron in this area. Chevron's roots are right here in the Bay Area, and your grandfather was involved with the company when it was called the Pacific Coast Oil Company. Chevron has a big, beautiful refinery in Richmond, which you can see right from Angel Island. With forecasters predicting the world's energy needs increasing by 50% in the next 30 years, we will need every molecule of energy we can get. Why not continue the Bay Area's tradition of oil production and processing by using this island to look for new oil. It is close to the refinery in Richmond, which has several state of the art oil tankers ready to send oil all over the world and boost the local economy into the stratosphere!

Baker Bonnie: You are Bonnie. You own the award winning bakery Bake My Day in San Francisco and are looking for a new location. Since Angel Island is centrally located near all the ferries and you have heard the island is to be developed and have a lot more foot traffic, you want to be in on the action. Your bakery will be an oasis for sluggish commuters in the morning who are looking for a good cup of coffee and a pastry. Angel Island is a perfect location for you because it seems like a place where there will be strong support for a local business, without the threat of huge chain coffee houses. You've also always wanted to live on the island, and it would be great to live in a house with a nice view that's close to your business.

Frank the Ferry Captain: You are Frank, a boat captain that has lived on a boat your entire life. You live and breathe boats. You are in favor of anything that increases the boat business,. You know every little wrinkle of the Bay and would be the perfect person to run a commuter ferry business that was based on the island for locals and tourists alike. Not only would your boats be the fastest and most comfortable,

you would take care of those who lived on the island with specialized storage on your boats for people's kayaks and recreational gear.

Donald Grump: You are Donald Grump, an international development mogul. You can see that the Bay Area is beautiful but lacking space! Angel Island is the perfect place for the region to grow. The view is worth a million dollars alone. How perfect that the island is only a ten minute ferry ride from the cities, although you'd also like to see another bridge or two to provide better connections to the island. You plan to build a group of luxury town homes for people wealthy enough to afford them. With all of the tech industries moving into town, you expect there will be plenty of buyers who are looking for rest and relaxation when they get home from their jobs in Silicon Valley

Joe Fishman: You are Joe the sport fisherman. You live in the Bay Area and you live to fish. You are looking to turn your hobby into a full time business. Angel Island is the perfect base of operations. It sits smack dab in the middle of the bay where people can fish for anything from leopard sharks to flatfish. And there is always that champion striped bass! You would run a fishing business that would take locals and tourists alike out on fishing charters both within and outside of the Bay. Angel Island would be the perfect place to build a mid-sized marina, and maybe you could find someone to open a bait and tackle shop.

Ranger Judy: You are State Park Ranger Judy. You work at a nearby state park, where you manage the ecological and cultural legacy of the area around Candlestick Park. Angel Island has many things to offer, both recreationally and culturally, and you want it to be protected as a state park as well. You want to make sure that people can come to the island to enjoy hiking trails and camping, while also preserving Native American artifacts and old buildings that tell stories of immigration and military history. You believe in balanced use, and would like to see both continued conservation efforts for the natural and human history of the island and opportunities for public access and education.

Sam Saver: You are Sam and you are a proud native San Franciscan (Go Giants!), who is very involved with Save the Bay. You want to do your part to keep the Bay Area beautiful and productive for future generations. That includes being a responsible citizen and steward of the wilderness that is just steps from your home. You use the Bay Trail for jogging every morning, hike Land's End on the weekends and always make sure that your food is locally sourced. You recycle, compost and carry your own bags to the grocery store. By volunteering for Save the Bay you help to preserve the wild beauty of the San Francisco Bay Area. You are concerned that if developers get ahold of Angel Island, one more piece of nature will go away and that this will be a step toward the rest of your beloved bay to be paved over.

Kiku: You are Kiku, a direct decedent of the Coast Miwok Tribe. Although you have an English name, you have adopted *kiku*, the Miwok word for water, as your name. Angel Island is an important part of the history that you are trying to preserve. Your work is primarily in revitalizing the Coastal Miwok language and keeping alive the fine art of basket making (the Miwok were known for their baskets). You want to expand parks, open spaces and sacred sites within the Historic Coast Miwok Territory. Commercial development would be devastating to your hopes for returning this land to its rightful caretakers.

Harry Ingman: You are Harry, an avid fisherman who thinks that Angel Island would be the perfect place to open a bait and tackle shop for all of the fisherman who visit San Francisco Bay. It would be a small place where people could swap fish stories while resupplying their tackle boxes. You would cater to locals and the wealthy alike. Angel Island would be a great place to start a new business without leaving the amenities of the city far behind. It would really boost your business if the island became known as a getaway destination.

Cole Manfred: You are an outdoorsy type who utilizes every weekend to enjoy the great outdoors. You hike, bike, backpack, fish, kayak and windsurf. Your garage has no room for your car because of all the outdoor gear you own. You believe in keeping wild areas open and free. Angel Island is your go-to spot to kayak and camp, while still staying close to your job in the city. You actively participate as a volunteer to restore habitat because it's a good cause and you don't want anyone taking away your wilderness spaces.

Emily Environmentalist: You are Emily and your main passion in life is saving natural areas. You have at least 10 bumper stickers on your bicycle that start with the words "Save the…" You believe that humans are destroying the earth with our smog belching factories, air clogging cars, nasty looking condominium complexes and view killing skyscrapers. Angel Island is just one more beautiful space that has been abused and needs to be returned to its natural state. Any development at all is not an option! In fact, if you had your way, all the existing buildings would be removed and the island would become a sanctuary for the Angel Island Mole (the only endemic species on the island) to protect it from extinction. You speak for the trees!

Bone Hunter Bruce: You are an archaeologist who specializes in indigenous peoples. You are fascinated by the native history of this island. In fact, you had the opportunity to come in after the fire of 2008 and you were able to recover many indigenous artifacts that had hidden under trees and plants that burned in the fire. While the fire was devastating, it made you realize how much history was here. You would like for the island to be off limits to everyone but scientists. This island is a unique opportunity for biologists and archaeologists alike to study an isolated environment. The history you could piece together would be priceless!

Marine Debris

What: Basic information about marine debris with local statistics Activities Available:

- Quick Facts Card with Visuals / Photos
- Rubber Band Entanglement Activity
- Beach Clean Up Activity

Marine debris are objects that do not belong in the oceans but are there because of human activities. Essentially, marine debris is another way of saying "trash in the ocean," and it can be categorized into two main categories: land-based and ocean-based.

- **Land-based** marine debris originate from activities on land. They are usually not intentionally placed in the oceans, but end up there. The majority of these are plastic based.
- **Ocean-based** marine debris are a direct result of commercial activity in the oceans, such as throwing trash overboard from a cruise ship or freighter.

Although marine debris can be many items (metal, rubber, rope, etc.), plastics are the most problematic since they persist in the environment for so long without breaking down and are toxic. Only about 20% of marine debris is from ocean-based sources. The remaining 80% of marine debris is generated on land, and consists primarily of consumer plastics that have not been disposed of properly and industrial discharges. Trash from further up in a watershed can end up in the ocean by flowing through river systems, but sadly a lot of debris also comes from coastal communities. For example, Bay Area residents use around 3.8 billion plastic bags annually and an estimated 1 million of those wind up in the water of the Bay (data from Save the Bay).

Plastics are oil-based products that first became common in the 1950s. They were an amazing chemical breakthrough – a substance that could be manufactured to have any size, shape, thickness, hardness, and color. While some plastics were engineered to provide decades of use, others were designed to be "single-use," or used only once and then disposed of. This was thought to be a huge quality of life improvement that would save people time and energy. For example, housewives managing their households could be more efficient if disposable products were available. Serving would family dinner on throwaway plastic plates would mean less dish washing – hooray! The development of plastics enabled us to become a society that places the highest value on convenience and is more likely to throw something out rather than reuse it.



Why is this a problem? Plastic is NOT biodegradable, and due to collection problems and the economics of recycling, most plastics we use are NOT recycled. Inevitably, plastics eventually wash downstream into the oceans, where they will float near the water surface for decades and centuries. Although plastic does not biodegrade, UV light from the sun causes it to photodegrade and break into smaller and smaller pieces. This makes clean up even more difficult *and* makes plastic debris easier for animals to mistakenly eat.

With around 500 miles of shoreline, San Francisco Bay includes environments like wetland estuaries, eel grass beds, mud flats, sandy beaches, rocky shores and open water. With urban areas surrounding all of these environments we have a huge number of entry point for trash into the marine environment.

But why are marine debris such a problem? Debris in the ocean and in the Bay affects everyone: it is unsightly, clogs drains and waterways, and poses many risks to wildlife that we don't often witness first hand.

Marine animals can become strangled or entangled by plastic in the ocean, leading to wounds, infections, or loss of body parts. If they cannot free themselves, they will become impaired by either not being able to eat or losing the ability to move. Brightly colored plastics also look very much like food to many marine animals. For example, the red cap of a plastic Coke bottle fades to pink in the ocean and looks like shrimp to seabirds. In the 1980s, a study showed that 98% of seabirds had an average of 12 pieces of plastic in their stomachs. In the 1990s that same study found an even more sobering picture, with 98% of seabirds having an average of 38 pieces of plastic in their guts. It is very probable that the birds that fly over and around you on your paddle have bellies full of plastic that will eventually kill them. While birds and whales are the animals that we might think of ingesting plastic, over 177 different marine species have ingested plastics that they mistake for food.

If that wasn't bad enough, plastics both absorb and leach toxic chemicals that are introduced to the environment, such as DDT and PCBs. When animals eat the the plastics, they ingest the toxins as well. These toxins can be passed on to their young or continue up the food chain when that animal is eaten by a predator. This biomagnification results in high levels of toxicicity in animal tissues. This affects us too, as



Top: Albatross gut filled with plastic pieces **Bottom:** Sea turtle with shell that has been shaped by a piece of plastic it is trapped inside of

we are the predators of many fish and other ocean species that may have ingested toxic plastic material in the ocean.

Scientists estimate that 268,940 tons of plastics pollute the global ocean right now. That's equivalent to 700 pieces of plastic for every person on earth! Plastic is the most common pollutant in the ocean today. This can easily feel like an overwhelming and depressing problem to your participants (and to you!), but remember to end on a positive note about what we as individuals can do to help solve this problem. This will empower your participants to make a difference. The Algalita Marine Resarch Foundation has done a lot of work on marine debris and their motto is "do no more harm." How can we do that? Here are a few simple actions that anyone can make to directly decrease the use of some of the most commonly found plastics in the ocean.

- 1. Don't use plastic straws.
- 2. Say no to single use plastics like disposable water bottles and plastic bags. Bring your own reusable water bottle or container for leftovers when you eat out at a restaurant. You can also carry a set of reusable eating utensils so that you do not have to use the disposable ones at fast food restaurants.
- 3. Use reusable bags.
- 4. Recycle everything properly. We are lucky to live in a region that has awesome recycling facilities that are not available in many other places. Take the extra step to recycle as much of your trash as possible.
- 5. Reuse whenever possible. Wash out that yogurt container and use it to store your lunch the next day.
- 6. Buy things with less packaging or that come in boxes rather than plastic containers.
- 7. When you see trash, especially plastic, whether it's on the beach or on the sidewalk, pick it up to keep it from entering the ocean! Other people will notice and will consider doing the same thing.
- 8. Clean green. Vinegar, baking soda and ammonia will clean most anything that you need in your house. This cuts down on plastic containers of cleaning supplies and on the harsh chemicals that come in many cleaning products.
- 9. Get involved in community based projects. Living in the Bay Area we are lucky to have many ocean conservation organizations that we can get involved in. Check out Save the Bay and Surfrider Foundation to get started.

Rubber Band Entrapment Activity

Goal: Participants empathize with how difficult it can be for an animal to become entangled in marine debris Time: 15-20 minutes Who: Participants of any age When: Anytime Where: Anywhere Materials: Marine Debris Quick Facts card, rubber bands, and a small collection of pebbles

Gather everyone together and start by leading a small discussion about what marine debris is. Poll your participants and see what kind of knowledge they have about marine debris. What are some examples of trash you have seen near the water? Why is all this trash bad for animals who live here in the Bay? What can it do to them? Show them some of the graphic photos of marine life interfacing with plastics and introduce the idea that animals that become entangled in trash become severely hindered in living their daily lives.

<u>Set-up</u>

Gather everyone in a circle. In the middle of the circle should be a collection of small pebbles. Hand out a rubber band to each person. Be sure to preface that shooting rubber bands is dangerous and won't be tolerated. All rubber bands will be collected at the end so they will not become trash.

<u>Activity</u>

- 1. Instruct everyone to place the rubber band around their thumb and pinkie finger with the bands running across the *back* of the hand. After you see that everyone has placed their rubber band properly, ask participants to place their non-rubber banded hand in a pocket or behind their back. Now, instruct everyone to try to remove the rubber band. Very few if any should be able to accomplish this. Be sure to let everyone try for a few minutes but not too long as frustrations will defeat the purpose of the activity.
- 2. Have everyone place their thumb and index finger together. Place your rubber band so that it pinches these two fingers together. You will have to wind the rubber band around your pinched fingers a few times. If you have extra adults they can help as well. Now, participants are to try and pick up a pebble. Again, this should be near impossible for everyone.

Wrap-up

Collect all rubber bands and be sure to count to make sure you got all of them (both for everyone's safety and so there is no trash left). Start a wrap-up discussion. Let everyone know that the first rubber band placement represented a bird or whale that had become entangled in some sort of debris. How easy was it to remove the rubber band? This is about how easy it would be for a whale to remove a fishing net. The second rubber band placement represented a bird's beak that was stuck together with something such as fishing line. How easy was it for participants to pick up pebbles? This helps everyone understand how difficult it would be for a bird to eat with something stuck on its beak.

Discussion Questions

- 1. How did it make you feel to not be able to remove the rubber band? Why?
- 2. What are some other pieces of debris that could do this to animals in the ocean?
- 3. How many animals can you think of that might get entangled?
- 4. We all are nice people and don't mean to harm anybody, so how does so much trash get into the ocean when we don't mean for it to be there? (wind, loose trashcan lids, not recycling, accidental dropping, etc).
- 5. How do you think we can fix this?

Marbled Murrelet Activity

Goal: To help participants understand how complex human impacts on the environment can be **Time:** 20 minutes

Who: 5th grade and up. Requires mobility and it fairly active

When: Lunch or on an overnight

Where: Open space like a field or a beach

Materials: Splash bombs and water bottles or some other space marker

Marbled Murrelets nest in old growth redwood forests. They also catch and eat fish from the sea. When they bring the fish up from the ocean to their nesting sites (and therefore leave bones and other refuse around the redwood forest), they bring valuable nutrients to the forest. In this way the Marbled Murrelets really help out the redwood forest. Stellar Jays are notorious scavengers and also frequently destroy Marbled Murrelet nests. With an increase in human trash (at campsites, on roads, on beaches, etc.), the stellar jay population has increased. As their population increases, so do the number of nests they destroy. They therefore cause the population of Marbled Murrelets to go down. As the Murrelet population decreases, the forest doesn't get as many good nutrients from the ocean and the whole forest is less healthy.

Activity:

- 1. Set boundaries for a playing area and give some background on the Marbled Murrelets, Stellar Jays, and redwood forests.
- 2. The first round of the game is showing what happened with the jay and marbled murrelet population before humans impacted the environment.
 - a. Start off by asking for three volunteers; these people will be your jays. The rest of the group will pair off to be marbled murrelets.
 - b. Each pair will have a "tree" where they will nest (use a water bottle or other space marker). Once every pair is at their tree, explain that the pairs are trying to get fish (splash bombs) which will be set around the playing area. The pair can get only one splash bomb at a time and must bring it back to their nest. Only one person from each pair can leave at a time.
 - c. While the murrelets are collecting fish, the jays are trying to steal fish from the nests. Jays can only steal when there is only one marbled murrelet at the nest. When jays steal, they can only steal one fish at a time, but they do not collect them, they just throw them back in to the play area.
 - d. Once these rules are clear with the group let everyone go! Allow play to continue for a few minutes.
 - e. Bring the group back together and explain that each pair must have at least 3 fish to continue on to the next year. Check in with each pair to see how many they have (most/all pairs should survive).
- 3. The second round shows what happens when the stellar jay population increases due to human impacts (more trash!). In this round ask for 5-6 volunteers to be jays. The rest of the group pairs off again to be marbled murrelets. Repeat the play above, but this time when you check in at the end, a larger number of the pair will probably not survive!
- 4. Some variations for more rounds:
 - a. Keep increasing the number of jays!
 - b. Decrease the number of splash bombs! (pollution in the ocean causes the fish population to decrease)

Wrap-up/Discussion:

- 1. What happened to the marbled murrelet population when the jay population increased? Why?
- 2. What effect do you think this would have on the forest over time? Why?
- 3. How could we (as humans) help keep the natural populations in balance?
- 4. Why are the marbled murrelets important to us even if we never interact with them?

Beach Clean Up Activity

Goal: Participants clean a beach, notice how much debris is on a beach, and develop a sense of stewardship

Time: 30 minutes

Who: Participants of any age

When: Day or overnight paddles, especially before leaving a beach where you have spent some time **Where:** Any beach or area with trash to be picked up. This is especially great for overnights on Angel Island and trips to Seaglass Beach, as these beaches tend to accumulate more debris.

Materials: Beach Clean Up Kit (Collection box, labeled containers, tape, Sharpie, logbook)

This activity is an important stewardship or service project, and it will hold more weight with your participants if you sort the debris that you find and have a discussion afterward. Make sure to gather everyone first and cover a couple guidelines:

- Give boundaries for the area to be cleaned up.
- Preface safety: if something is sharp ask for help rather than picking it up.
- Look for micro trash that might not be obvious at first tiny pieces that may be tangled in seaweed or on rocks.

If you have a group that is not engaged, you can always have everyone stand in a straight line parallel to the area that you want to cover. Then everyone takes a step at a time and with each step, you look for trash. This is a more uniform way to cover the area and it helps you manage if you have a rambunctious group that is not focused on finding trash. Once you have covered the area, do one more sweep – there is always one more piece.

Next, gather everyone around the collection box and sort what you have. If you have a bulky set of trash that is too much to sort, add some to the box for sorting and dispose of the rest properly without sorting. Place tape on the Mason jars and use a Sharpie to label them with categories (cigarette butts, plastic bags, Styrofoam, and other categories as you see fit). You can use the existing labels on the jars, or apply new labels for new categories. Also show the group some saved items that have been collected on previous trips.

Wrap-up / Discussion

- 1. What kind of trash did we find? Where do you think it came from?
- 2. What made up the majority of our collection?
- 3. Was any of the trash ours?
- 4. Look at the trash we found. What animal do you think would look at this trash and think it was food?
- 5. Which of these items would be the easiest for us to help keep out of the ocean?

Climate Change

What: Information about carbon pollution, global climate change and ocean acidification **Activities Available:**

- Ocean Acidification Tag Activity
- Sea Level Rise Discussion

Carbon dioxide, methane and nitrous oxide are gases that occur naturally in the atmosphere. They are important because they help trap the sun's heat, which keeps our planet from freezing. Carbon pollution from the burning of fossil fuels increases the amount of these largely carbon-based greenhouse gases in the atmosphere. This leads to several huge problems that affect the entire planet, including the oceans and the Bay.



Global Climate Change

By disrupting the natural balance of greenhouse gases in the atmosphere, too much of the sun's energy is now being trapped. This leads to an enhanced greenhouse effect, which is causing an overall trend of the earth warming. It's important to remember that there is a lot of local variation and that warming is not uniform across the globe – some places are getting colder while others get much warmer – but the overall trend is undeniably one of warming. Worldwide, 2014 was the hottest recorded year since global temperatures began being recorded in 1850. Even more powerful evidence of the trend we're experiencing is that 14 of the 15 hottest years on record have occurred since the year 2000. There used to be some debate about the role of humans in causing global climate change, but almost all scientists now agree that anthropogenic (human-caused) emissions are responsible. This climate change has a multitude of interconnected effects, including:

Changes in Precipitation

As temperatures change, so do precipitation patterns. Some regions are becoming wetter, while others are becoming drier. Climate change is believed to be responsible for causing severe droughts in many areas where they did not previously occur. In our region, less rain and snow means that less fresh water is entering the San Francisco Bay Delta Watershed. Reduced flows in our rivers not only lead to water shortages for our society, but also affect the water quality of the Bay.

More Extreme Events

Globally and locally, climate change is considered to be responsible for an increase in extreme weather events, ranging from hurricanes and typhoons to heat waves and fires. The increased frequency of these events increases the vulnerability of both human populations and natural communities, and makes it more difficult for us to adapt and survive.

Habitat Shifts

Species that were once able to live in certain areas are no longer able to survive there when the environment changes. Many plants that thrive in warmer climates are expanding their ranges northward in the U.S., where they outcompete species that were adapted for cooler climates. In the oceans, many organisms can only survive within a very narrow range of temperatures. For this reason, many fish, top predator, and invertebrate species are leaving areas they have long called home in search of more suitable waters.

Sea Level Rise

As the earth warms, glaciers and the polar icecaps melt. When the water formerly trapped as ice enters the oceans, global sea level rises. Melting ice is one cause of sea level rise. The other cause is that as seawater becomes warmer, it becomes less dense. This is called thermal expansion, and causes the oceans to take up more space, or rise. At Crissy Field in the Presidio, tidal records show a sea level rise of about eight inches has already occurred in the last 100 years. This may not seem like much, but it is much faster than historical accounts have been. If global warming progresses at the predicted rates, based on the amount of carbon pollution we are producing now, sea level could rise three feet or more by the end of this century. Sea level rise is a concern because it causes erosion of beaches and bluffs, increased flooding and storm damage, inundation of low-lying areas, and saltwater intrusion into aquifers and surface waters.

Ocean Acidification

The global ocean has absorbed about 50% of the CO_2 humanity has produced since we started burning fossil fuels. It is our largest carbon "sink," or absorber of atmospheric carbon. This is a good thing, because it has reduced the amount of carbon in the atmosphere and kept climate change from being even

more severe. However, with climate change occurring, warmer ocean waters are not able to soak up as much carbon.

What happens with all of the carbon that has already been absorbed by the oceans? First, we need to consider that a large number of animals in the ocean, such as snails, oysters, and corals, build their shells out of calcium carbonate molecules that occur naturally in seawater. When the ocean absorbs carbon dioxide from the atmosphere, the carbon dioxide reacts with seawater and releases hydrogen ions. These hydrogen ions are attracted to calcium carbonate molecules and actually bind to them, making the calcium carbonate inaccessible to the organisms that need them. In addition, all of those extra hydrogen ions that are floating around are making the ocean a more acidic environment. As the ocean's acidity keeps rising,

animals that have calcium carbonate shells will see them begin to dissolve. This means less food for other marine animals and less food for us. It is estimated that one in seven people depend upon seafood for the main source of protein in their diet.

Solutions

How can we help reduce the amount of carbon in the earth's atmosphere and slow the effects of carbon pollution? Personally, we can do this by thinking about our carbon footprint and finding ways to reduce it. Our carbon footprint is the amount of carbon we personally produce each year that contributes to the increase in greenhouse gases. The gas we burn in our cars, the electricity we use (which is most often produced by



Butterfly snail shell placed in acidified seawater over a period of 45 days. http://ocean.si.edu/ocean-acidification

burning fossil fuels), and the production of the food we eat all contribute to our carbon footprint. Meat production causes more much carbon pollution than vegetable production. Although such a large global issue can seem overwhelming, everything that each person does to be part of the solution makes a difference!

Ocean Acidification Tag Activity

Goal: Illustrate how carbon pollution is contributing to ocean acidification by playing a fun game of tag **Time:** 20 minutes

Who: 7th grade and up

When: Overnight paddles may have more time in which to play the game, although, a longer day trip might have enough time for a round or two on the beach.

Where: A large area where it is safe to run, ideally near a beach with shells that could be a prompt for a discussion about ocean acidification

Materials: This game is best with at least 12 participants.

Introductory Material for the Facilitator

1. Carbon dioxide produced by people burning fossil fuels is called carbon pollution.

- 2. When this carbon dioxide reacts with seawater it makes the seawater become more acidic, which means there are more loose hydrogen ions floating around in the ocean. This is called ocean acidification.
- 3. Those loose hydrogen ions bond with calcium carbonate molecules that are also floating around in seawater. Once they bond, the calcium carbonate is no longer available to other things in the environment.
- 4. Shellfish like crabs, mussels, and oysters have shells that are made up of calcium carbonate. When calcium carbonate becomes limited, it is harder for these animals to grow and for their shells to form properly.

Set-up

Divide your group up in half. One half will be crabs and the other half will be calcium carbonate molecules. It's best to have at least five crabs and seven or more molecules. Feel free to recruit adults or other guides - everyone loves a good game of tag! Make sure the boundaries for the game are small enough so that the calcium carbonate molecules can be caught/tagged without too much trouble. Each round is timed – you will secretly determine how long the round will be.

Round 1

Everything is awesome! This is the normal state of the environment. Crabs want to grow bigger and they do this by "catching" a calcium carbonate molecule by the elbow. After they catch a molecule by linking arms, they are safe for five seconds. After that five seconds they have to "molt," and let go of their molecule. They must find another molecule in order to strengthen their shell. You will most likely have to monitor to make sure that crabs find another molecule and not the one they just released. This will give crabs incentive to continually chase after calcium carbonate molecules. At the end of the round, crabs are out of the game if they have do not have molecule hooked up to them by the elbow. With this first round, no crabs should have a problem growing bigger or maintaining their shells.

Round 2

Uh Oh! The burning of more fossil fuels is spewing tons of CO₂ into the atmosphere and as a result the ocean is becoming more acidic. Take two of your molecules and turn them from calcium carbonate into free-floating hydrogen ions. For example, you might now have five crabs, five calcium carbonate molecules, and two hydrogen ions. These hydrogen ions are on a mission catch calcium carbonate. Hydrogen ions try to catch calcium carbonate molecules, <u>but they do not give up their calcium carbonate after five seconds like crabs do</u>. You'll see that the calcium carbonate molecules become locked up by the hydrogen ions and are thus unavailable to crabs. By the end of the round this should disable at least two of your crabs, which will be eliminated from the game because they won't have the calcium carbonate they need to grow.

Round 3

Now ocean acidification is in full swing. The ocean has taken up so much CO_2 that it is becoming much more acidic and there are even more hydrogen ions floating around. Keeping your number of crabs at five, turn at least half of your calcium carbonate molecules into hydrogen ions. You might now have five crabs, three calcium carbonate molecules and four hydrogen ions. This round should end, rather quickly and depressingly, with most of the crabs dying from a lack of available calcium carbonate. This will set the stage for a discussion afterwards.

Discussion

Gather the group after the game and start a discussion to both wrap up the activity and answer any questions that anyone may have.

- 1. Why does it matter if animals in the sea cannot make their shells? Do you eat seafood? (One in seven people in the world get their main source of protein from seafood).
- 2. How many animals can we name that have shells and might depend upon calcium carbonate to make their exoskeletons? (Crabs, corals, mollusks phytoplankton/diatoms).
- 3. What can you do to reduce your carbon footprint?
 - Walk or carpool or take public transportation
 - Use less electricity
 - Reduce what you use
 - Find ways to reduce energy usage at home
 - Buy local less emissions from trucking and shipping

Sea Level Rise Discussion

Goal: Introduce participants to the concept of sea level rise and what causes it, and explore how future life may be impacted by sea level rise

Time: 20 minutes

Who: 6th grade and up. Discussions with older participants will likely have more depth.

When: This discussion fits in almost anywhere you have time. Lunch on the beach is a great time for this. **Where**: This activity is very impactful on the beach where participants are right next to the level of the water.

Materials: Images on the laminated cards that accompany this activity; Climate Change Quick Facts Card

Discussion

- Start by asking your participants if they think there are any impacts or signs of climate change in the place where you are right now.
 - Use the responses you get to gauge your participants' level of knowledge. If necessary, use the information on the Climate Change Quick Facts Card to explain how climate change is caused by carbon pollution.
- If it hasn't already been mentioned, explain how sea level rise is caused by climate change in two ways:
 - Melting icecaps and glaciers add more liquid water to the ocean
 - On a warmer planet, warmer ocean water takes up more space because it is less dense
- The most common estimate is that we will have about three feet of sea level rise by the year 2100. Ask everyone to imagine what this area would look like if it were covered by three additional vertical feet of water. From what they can see where they are, what are some specific living an non-living things in this place that would be impacted by this change?
- What would it look like around the Bay Area if the ocean rose by three feet? Show participants the images that are part of this activity. Go around the group and have everyone name a place that they know that might be affected. This could be a park, beach, building, or street.
- What could some of the broader impacts be? Consider impacts on tourism, property values, beaches, and saltwater contamination of groundwater.
- Ask: Can this problem be fixed? Whose fault is this and whose responsibility is it to fix it? Is sea level rise (and other effects of global climate change) an environmental justice issue?
- Ask: What can we do to use less fossil fuels? Consider your energy use related to:
 - Cars, planes, and other types of transportation
 - Heating and cooling your house and water
 - Electrical appliances
 - Manufactured products that you buy
 - The types of food we eat

Stewardship

What: Activities to encourage participants to be good stewards of the environment Activities Available:

- Leave No Trace Activities
 - Our Natural World Activity
 - Leave What You Find Activity
- NIMBY Not in My Back Yard Activity
- Eco Quote Reflective Walk and Discussion

A steward is a person who looks after someone or something. To be an environmental steward, we begin to take responsibility for looking after the natural environment that we live in. We do this by becoming responsible for the use and protection of our environment through conservation and sustainable practices. Let's start with some definitions:

- **Conservation**: A careful preservation and protection of something; *especially* planned management of a natural resource to prevent exploitation, destruction, or neglect
- **Sustainability**: Capable of being <u>sustained</u>; of, relating to, or being a method of harvesting or using a resource so that the resource is not depleted or permanently damaged; of or relating to a lifestyle involving the use of sustainable methods
- Stewardship: The conducting, supervising, or managing of something; *especially* the careful and responsible management of something entrusted to one's care, e.g. *stewardship* of natural resources

We can do various things that our society considers "green" or "eco-friendly," but can we sustain the impact of these actions to make a difference in the long-term? Whenever we seek change or teach change, it is important to consider the sustainability of the change. Helping your participants to minimize their impact during your trip may create a lasting impression that encourages them to consider the environmental impacts of choices they make in their lives at home.

Leave No Trace Activities

Goal: Introduce the concepts of connection with the natural world and the ethic of minimizing impact **Time**: 20 minutes

Who: These activities are geared toward younger audiences, although LNT can be discussed with any age group

When: Anytime - perhaps before a hike or after seeing an area that has been impacted Where: Anywhere. Activity 2 requires more space.

Materials: Leave No Trace Laminate and bag

Leave No Trace (LNT) is the most widely accepted outdoor ethics programs that teaches people to enjoy the outdoors responsibly. There are seven LNT principles:

- 1. Know before you go: plan ahead and be prepared
- 2. Choose the right path: stay on the trail, camp on durable surfaces
- 3. Trash your trash: pack it out
- 4. Leave what you find: don't take anything but pictures

- 5. Be careful with fire: keep fire in designated fire pits and know restrictions
- 6. Respect wildlife: don't scare the animals or deface trees
- 7. Be kind to other visitors: loud voices carry

These activities are quick, fun and help to illustrate these principles. If adults or youth participants are interested in learning further, there is an online course on the Leave No Trace website as well as workshops around the country each year. These activities and principles were created by the Leave No Trace Organization.

LNT Activity 1: Our Natural World

Gather everyone in a circle. Spread out the Our Natural World cards on the ground so that everyone can see them. These cards all have pictures of things in nature. Instruct everyone to mentally choose two (don't pick them up) and then take two minutes to think about them. For both their cards they should think about:

- 1. What they have in common with what's depicted on their card
- 2. How the thing depicted on their card helps them

For example, if someone chooses the card with a Great Blue Heron on it, their answers might be "we both like to eat fish and watching it inspires me." It may take a little practice, but with encouragement your participants will be able to make the connections. Once the two minutes have passed, go around the circle and have each person share. They can pick up the cards and hold them while speaking, but afterwards have them replace the cards so that someone else can use them if they chose the same ones. This activity builds empathy for things in the natural environment and is a great segue to discussions about stewardship.

LNT Activity 2: Leave What You Find

Break your group up into three smaller groups – even if it means having just one or two in a group. In advance, you will have staged the set of Leave What You Find cards. These are cards with a puzzle each showing different pictures. In three different locations that are far enough removed that the groups will not be able to see or hear each other, place the puzzle pieces according to this system:

Group 1: In the first location, place most of the puzzle pieces. Spread them out a bit so they are harder to find.

Group 2: In the second location, place about half of the puzzle pieces, and again spread them out. Group 3: In the third location, place only one or two pieces that do not fit together.

In each of these places, not all puzzle pieces will be present. Participants will have to find these pieces and try to guess at what the picture is from the incomplete picture, simulating the task that, say an archaeologist would have with a fossil.

Once the groups are formed, preface with everyone that they are explorers and they need to figure out the puzzle according to what they find. Feel free to make up a fun story to go with the activity if you like. Make sure each group knows where their puzzle is and then give the groups about 10 minutes to find it and put it together or think about it.

Bring everyone back together and one group at a time ask them what they found a picture of. What do they think it might be and why?

Wrap-Up/Discussion

- 1. Who had the most complete picture?
- 2. How easy was it to reconstruct the puzzle?
- 3. Why would finding all parts of a puzzle be important to scientists trying to figure out what animal a fossil belongs to?
- 4. What would happen if someone had found the fossil and taken it or moved things around?
- 5. What about accidentally disturbing something? What about driving off road? What would that do to the surrounding environment?
- 6. What is something else that we might want to leave alone so that scientists can figure it out? For example, what should we do if a fish that no one has ever seen before gets caught in a fisherman's net?

Eco Discussion and Pledge Activity

Goal: Help participants reflect on their interaction with the natural world and encourage them to make a pledge to become a steward of the environment once they go home
Time: 20-30 minutes
Who: All ages, however, you may have to tailor your quote selection to the age of your clients.
When: This activity usually fits best at the end or a trip before everyone heads home.
Where: A quiet area where there will not be foot traffic with plenty of space
Materials: Eco Quote Cards

Spending time outside in spaces that provide respite from the hustle and bustle of city life can help us appreciate the value of natural places. Participants may not naturally make a connection to the importance of conserving these areas. This activity encourages them to reflect on how they can be better stewards of the environment and play a part in taking care of the areas they have visited on their trip.

The Eco Quote Cards are a collection of quotes from noted naturalists and government officials who have rallied for care of the environment. There are a couple different ways to use these, and whether you chose Option 1 or Option 2 it is important to end with a discussion. Be sure to encourage staff and other guides to participate in this activity.

Option 1

If you have time for a short walk or hike, set up the cards spaced apart on the ground along the walk. Make sure to pick a road or trail where no one can get lost or hurt. Have a helper monitor participants at one end, sending people along every 2-3 minutes. You move along the trail placing cards far enough apart so that participants can read them without being interrupted by others. You wait at the far end and collect everyone after they read the last quote.

If a hike is not possible set the cards in a large circle, print side up and oriented toward the outside of the circle. Have participants stand on the outside of the circle of cards and read a card. After every 1-2 minutes, call a switch and have everyone rotate in the same direction. Continue until each participant has gotten to read each card. After everyone have gotten to read all the cards, sit down and begin the discussion. Each participant will share three things:

- 1. Which quote spoke to you the most?
- 2. Why did it affect you in that way?
- 3. What will this quote encourage you to do differently when you go home?

Feel free to add to these questions if you like, but the purpose is to have everyone take responsibility for something that they can change when they go home.

Option 2

Get your group together in a circle. Pass the quotes out randomly (feel free to select the quotes you like most or think that the group would most benefit from). Each person takes a turn and reads their quote. After reading the card out loud, the person holding it should explain what they think the quote means. Others can also share ideas if they have something to say. If no one offers an opinion or response, you can use a few questions as prompts: What do you think this means? How can we apply this to our own lives? Get through as many quotes as you have time for and then announce a quiet time of two minutes where everyone will come up with a pledge of something they can change when they go home. Regroup and have everyone share their pledges. Examples might be:

- 1. Carry a re-usable cup
- 2. Start recycling
- 3. Turn off the water while brushing teeth
- 4. Volunteer with an organization like Save the Bay
- 5. Carry a bandana instead of a napkin or Kleenex
- 6. Take a short shower
- 7. Pick up trash on the street or do a beach clean-up
- 8. Carry re-usable bags
- 9. Bring friends and family members into the outdoors more
- 10. Talk to your parents about ways your family can contribute

NIMBY: Not In My Back Yard Activity

Created by Jeremy Fox

Goal: Participants think about the process by which locations are chosen for less desirable and pollution causing developments

Time: 20-30 minutes

Who: 5th grade and up. Older participants can have more in depth and meaningful discussions. **When**: This will most likely be a game that you play on overnight trips when you have more time for

games.

Where: A large area where it is safe to run

Materials: Foam Spots (nine); 50 Squashed Marbles (25 white, 25 color)

Background

NIBMY stands for "Not in My Back Yard," and refers to the reaction against having the negative effects of industry, agriculture, and development in your backyard. What might these effects be?

- Air pollution
- Sewage draining to rivers
- Garbage dumps
- Nuclear waste
- Changing climates

It could be as simple as your neighbor dumping his yard waste over the fence into your backyard. But nowadays our backyards are harder to define, let alone fence in.

- Is the air we breathe part of our backyard?
- How about water quality of the oceans?
- What about our waste being exported to other countries?

Where do our backyards begin and end, and what responsibility do we have to protect our backyard while not wrecking someone else's? Who has the power in these situations, and who are most likely to be the victims? The NIMBY mentality presents some big issues. *Before* we discuss those issues, let's play a game to really get into the NIMBY mentality!

Set-up

Arrange eight carpet squares in a large circle with a ninth square in the middle of the circle. In the center of the circle, on top of the middle square, place all of the poker chips in a pile (25 white and 25 color).

If you have more than eight people in your group, participants will have to take turns playing NIMBY (if you play with more than eight, you'll run out of chips too fast). When not playing, participants can observe, help enforce rules, strategize and cheer.

Each square forming the circle is the "backyard" of one student. Students waiting to play in another round must stay outside of the circle.

The Game

- 1. You want as many color chips as possible.
- 2. You want as few white chips as possible.
- **3.** When the Facilitator yells "GO!" obtain chips by running into the middle and taking ONE and only one of each chip from the middle. When you take a color chip you MUST take a white chip.
- 4. Run the color chip back to your backyard (no throwing it!). Once a white color is in your backyard, no one else can take it.
- 5. The white chip can either stay in your backyard (refer to #2) or you can get rid of the white chip by putting it in someone else's backyard (no throwing!). Until you get rid of the white chip you cannot go back to the middle for another color/white chip combo.
- 6. To block someone from putting a white chip in your backyard, you must be standing on your backyard square and shout "NIMBY!" at the person who tries to give you his or her white chip. If you are the person trying to get rid of your white chip and someone shouts "NIMBY" at you, you must try and take it somewhere else (you can always take it to your backyard, but refer to #2).
- 7. White chips cannot go back to the middle, only to a backyard square. If you find white chips in your backyard, you can attempt to take them to another backyard.
- **8.** Play until all color chips are out of the middle. The facilitator can hold onto a couple color/white chip pairs to put into the middle if the action becomes stagnant. When the color chips are all gone, have players return to their backyards with whatever white chips may be in their hands.
- **9.** Play a few rounds so participants can figure out some strategies and to allow everyone the opportunity to play.

Discussion

While playing several rounds of NIMBY can be pure competitive pleasure, you can facilitate a really meaningful and educational debrief with this activity. Keep your group in a circle to discuss some things that came up with the game:

• Who finished with more color chips than white chips? Vice versa? What were some strategies you developed? Did you block anyone from putting white chips in your backyard? How did you feel when you returned to your backyard and found someone else's white chips there?

Now some discussion points on the concept of NIMBY:

- Who can explain the "Not in My Back Yard" concept in terms of the game you just played?
- What are some things in real life that the color chips represent? How about the white chips (keeping in mind that the white chips always accompany the color chips)?

• Who is responsible for keeping their backyards clean? Who is responsible for dealing with the white chips that come with the color chips?

And finally some discussion points on the real life NIMBY issues:

- What are some current environmental issues you see that deal with the NIMBY concept? (see **Background** section for some ideas)
- What are the color chips in this issue? The white chips? Where are the white chips going? Is this right?
- Can anyone think of an environmental issue in which the backyard is hard to define? (examples: climate, air pollution) What responsibilities do we have as individuals to deal with NIMBY issues?

Any number of ethical and moral discussions can come up here...roll with it and be a good facilitator!

ART AND REFLECTIVE ACTIVITIES

What: This is a collection of activities that are designed to prompt reflection both on an individual and group level

Activities Available:

- Andy Goldsworthy Activity
- Reflective Walk Activity
- Group Haiku or Poem Activity

Andy Goldsworthy Activity

Goal: Help participants to see the beauty and details of their surroundings by engaging in a creative hands-on art activity

Time: 30 minutes to an hour

Who: All ages can enjoy this activity

When: At a point when individuals need some mellow, quiet exploration and reflection time **Where:** Any place that has natural materials available. Beaches with lots of stones and debris along the high tide line are ideal.

Materials: Andy Goldsworthy Cards; an open outdoor area with natural materials

Andy Goldsworthy is a British sculptor, photographer and environmentalist that creates site-specific art made out of collected natural materials using only his hands and found tools. Most of his sculptures are temporary and only survive in pictures that he takes shortly after completing a piece. His main goal is "to understand nature by interacting with it."

"I enjoy the freedom of just using my hands and "found" tools--a sharp stone, the quill of a feather, thorns. I take the opportunities each day offers: if it is snowing, I work with snow, at leaf-fall it will be with leaves; a blown-over tree becomes a source of twigs and branches. I stop at a place or pick up a material because I feel that there is something to be discovered. Here is where I can learn."

Andy Goldsworthy is the perfect inspiration for participants to use what is around them for a reflective and creative art activity. It is common that everyone will ask for more time for this activity than you might have available. (without harvesting anything alive)

<u>Setup</u>

Begin by introducing Andy Goldsworthy and who he is. Reading the above quote works well. Then allow everyone to see the example photos of work by both Andy Goldsworthy and other outdoor education participants. Explain that now we are going to have the opportunity to create our own Andy Goldsworthy art projects. If you have a short amount of time, break everyone into small groups. If you have more time, encourage participants to complete their art projects individually. Be sure to preface with everyone the boundaries (how far they can go) and that they are not to harvest anything alive (they must collect things that are already down or unoccupied).

Activity

Spread everyone out and give them a time limit. They may have questions, so be sure to wander around and check in with people as they are working. Give a five minute warning when the time is close. This will give you an idea of where everyone is in their process and whether they need more time or not.

<u>Wrap-up</u>

Come together as a group and announce that now you will travel around as a group and admire each art piece. The artist can offer an explanation of their work – or not. Preface with the group to watch out for other pieces as they move and to be quiet and respectful when each artist is presenting their piece. Leave time for photos!

Group Haiku or Poem Activity

Goal: Participants pause to reflect and observe their surroundings

Time: 20 minutes

Who: 6th grade and up

When: This is a great activity to do on a hike as you move down the trail. If you do not have time to hike, this activity fits well when paired with another sitting activity like drawing.

Where: On the trail or a good stopping point with a view.

Materials: Plain paper and pencils for everyone

Background

A Haiku is a traditional Japanese poem of 17 syllables. The first line has five syllables, the second line has seven syllables, and the third line has five syllables. You group poem will wind up being like a collection of Haikus with each participant adding one line.

Set-up

- 1. Get a plain sheet of paper. Notebook paper works best because it has lines, but blank paper will work as well.
- 2. Count the number of participants you have and count out that number of lines on your paper in advance so that you have one line for each person.
- 3. Label the lines with the number of syllables that should go on that line use the order of a haiku: 5, 7, 5, and then repeat: 5, 7, 5, 5, 7, 5, etc. If you have a group size that is not a multiple of three, try to use other guides, staff, or yourself to finish it off so that it ends after a sequence of 5, 7, 5.

Activity

It works best if you as the facilitator write the first line of five syllables. Let everyone know what a haiku is and that they will be creating a series of haikus as a group with each one of them contributing a line. Once you add your line, fold over the paper so that the next person cannot see what you wrote. Instruct everyone to do the same. Once everyone has written their line, take a minute and read aloud the whole series.

Additional

If you choose to do this activity along the trail, the haiku usually comes out almost like a snapshot of your hike because participants usually write what they see. Feel free to be creative with this and set a theme. Ideas for themes could be: living things, auditory sounds, or subtle things they didn't notice until starting this activity. When the haiku comes out particularly well it can be copied into participant's journals if they brought them.

Reflective Walk Activity

Goal: Participants learn to observe what is around them and appreciate the beauty of what they are seeing **Time:** 15-20 minutes

Who: All ages enjoy this activity

When: Any trip where you have the time to do at least a short hike

Where: The beach is ideal, however, a clearing in the trees offers a wealth of material as well. **Materials**: Reflective Walk Cards

Pick a section of trail or road that is straight and where there is *no possibility* of getting lost, e.g. no major junctions or forks. You will walk along the trail first, placing cards with enough space between them so that participants will not be disturbed by each other (at least 20 feet, or more if space allows). Place a small rock on top of each card to keep it from being blown away by the wind.

Have another guide or staff member monitor participants and send one person up the trail every 3 minutes. Participants will proceed along the trail, stopping and reading the cards at their own pace. Remind participants to put the rock back on top of each card when they move on. You will be at the end of the section of trail or road to collect everyone. Your helper who is responsible for spacing participants should come up the trail last and collect the cards as they come. Feel free to use as many or as few cards as you would like on the trail.

It's often a great idea to have a discussion afterward where everyone shares one card they liked and what it made them think about.

Clayton Lewis "Letter to Self" Activity

Goal: Allow participants to reflect on their trip with a letter to themselves, while learning the history of the land and the artist Clayton Lewis, who lived on Tomales Bay.

Time: 15-20 minutes

Who: 5th grade and up

When: Overnight paddles to Marshall Beach will have more time and experience to write letters to themselves that they can reflect on after their trip ends.

Where: Ideally, participants can visit the abandoned house and studio of Clayton Lewis to feel immersed in the history of the site and learn about Lewis' "mail art." This activity can be done there, or participants can learn and do the activity at Marshall Beach or elsewhere on Tomales Bay.

Materials: Supplies from "Letter to Self Kit" (see below), laminated cards with more examples of Lewis' art

Introduction: Who was Clayton Lewis?

Clayton Lewis was a well-known artist who was born in Washington state in 1915. In 1936 he moved to Seattle to study at the Cornish College of the Arts, before moving to San Francisco to study at the California College of Fine Arts. Eventually, he settled in the North Bay on the Point Reyes Peninsula, building at studio home in Laird's Landing near Marshall Beach. Lewis' art includes sculpting, painting, water coloring, and producing envelope or mail art. These letters were mostly sent to loved ones, and some have been exhibited at art shows and the San Francisco Museum of Modern Art.



Set-up:

This can be done on-site at the remains of Clayton Lewis' home / studio, or at a location where participants can spread out for personal space. Give participants blank postcards along with writing or art supplies. Tell participants they will be making these postcards for themselves as they will be collected and mailed to them at a later date. Inform participants they will have 10-15 minutes to write or decorate their postcards however they want, show examples of Lewis' mail art for inspiration, and have them find a spot within sight but away from each other. Afterwards, make sure the postcards have the participants' addresses written on them and collect them in a ziplock bag. For participants with visual impairments, use pipe-cleaners, beads, and cottonballs and gluesticks to create 3-D outlines of shapes.

Follow-up:

After all the postcards have been collected, give space for participants to share their designs IF they wish to. Within 3-5 months mail out the postcards using the postage stamps in the kit.

Letter to Self Kit checklist:

- Blank postcards
- Postcard-rate postage stamps
- Colored pencils, markers, crayons
- Pipe cleaners
- Beads
- Cottonballs
- Gluesticks
- Ziplock bags to collect all the supplies
SENSORY AWARENESS ACTIVITIES

What: A collection of activities that encourage participants to use all of their senses to explore an environment

Activities Available:

- Impulse Activity
- Five Senses Activity
- Powers of Observation Activity
- Pirate Eye Activity
- Fox Walk / Jedi Knight Activity
- Bat and Moth Activity

Impulse Activity

Goal: This fun game is great to explain predator/prey relationships in nature and the concept of competition between species who rely on the same food source. It is also a great way to talk about the role of the spinal cord and what happens in the case of a spinal cord injury.

Time: About 20 minutes.

Who: This is a great adaptive game for people of all ability levels and ages.

When: Anytime – after lunch works well

Where: On a field or beach. This could also be done indoors.

Materials: Water bottle and a coin

<u>To Play</u>

- 1. Divide the whole group into two equal groups and get each group to decide on a bird of prey name. For example, you could use Red Tail Hawks and Ospreys.
- 2. Have the two types of hawks line up together, across from one another. One species in one line, the other species a couple feet away in a different line.
- 3. Explain: the person at one end of the line is the **brain or eyes** of the hawk. The person at the other end of the line is the **talons** of that hawk.
- 4. Put a water bottle or some other object at the talon end of the lines on the ground, equal distance from the talons of both birds. This is the **mouse or prey.**
- 5. The game leader stands between the brains of each hawk and explains:
 - Everyone in each hawk line need to hold hands to connect your brain/eyes to your talons. You are creating the spinal cord of each hawk. Now everyone must close their eyes except the brains.
 - The game leader flips a quarter coin. If it is heads, do nothing. If it is tails, the brain/eyes sends a squeeze down the hands or spinal cord of the bird to the talons. When the talons feel the squeeze they open their eyes and try to grab the mouse before the other hawk gets it. Competition. Fun!
 - Whichever hawk get the prey first wins that round. To show they won, the talons of that hawks moves up to become the new brain and everyone else slides down a position.
 - If the brain squeezes when the coin is a head instead of a tail, it wasted energy when there was no mouse. To show this loss of energy, the brain must go down to become the talons and everyone shifts one position *backwards*.
 - When a hawk completes a full forwards rotation and gets back its original brain, it WINS!
 - If you don't have time to complete a full rotation, you can say the winning hawk must get 3 new brains or 4 new brains.

Adaptation

If you are playing with a visually impaired group, you can use one and two squeezes of the hand of the brain instead of a coin.

Discussion Questions for the Group

- 1. What did your team do well? What could you have done better?
- 2. What happens if a spinal cord is injured and it can not send the signal from the brain to the talons? Explain what happens with a spinal cord injury in a person.
- 3. What are some other predator/prey relationships in nature?
- 4. What are you the predator of?
- 5. Who is a predator of humans?

Five Senses Activity

Goal: To tune people in to all of their senses to better appreciate the environment we are exploring **Time:** 10-20 minutes

Who: Participants of any age and ability

When: At a point in the trip where group energy is conducive to a reflective activity

Where: This is a great activity to do on the water in a calm and protected area.

Materials: None

Opening

We rely on our five senses to provide us with information daily. Let's go ahead and name the five senses. Of course, the five senses are: smell, taste, touch, sight, and hearing. Now we are going to do an activity to tune us in to our five senses. We will begin with everyone closing their eyes.

Procedures

- 1. Have the group form a circle, or raft up their kayaks, and then close their eyes.
- 2. Ask a question to a particular sense each time (usually hearing first because it is the second most important sense). Choose questions from the list below that are appropriate to your surroundings, and feel free to add your own!
- 3. Depending on the question and the group, allow a number of seconds or even close to a minute between questions.

Sample Questions

Hearing

- 1. Lift up your fist and lift a finger one at a time, as you count off five different sounds from nature.
- 2. Do you hear the wind blowing? Is it loud or quiet today?
- 3. Identify the different sounds the birds make, some are high pitch, some are low pitch. Can you identify which sound belongs to which bird?
- 4. Can you hear seals? Listen carefully and tell me which one is really making the noise.
- 5. Listen for the loudest sound. Now, listen for the quietest sound.
- 6. Can you hear the waves? Are they big or small?
- 7. Can you hear you own heartbeat? Is it fast or slow?

Smelling

- 1. Can you smell the salt in the water?
- 2. Do you smell the sunscreen you put on today?
- 3. What smells do you notice? How are they different from where you live?

Feeling

- 1. Can you feel the sun on your skin? Which direction is the sun shining from?
- 2. Can you feel the people around you?
- 3. Feel the wind on your skin. Which direction is it coming from?
- 4. Dip one of your fingers in the water and stir it. Is the water colder or warmer than you expected?

Tasting

- 1. Dip one of you fingers in the water and taste it. Is it salty? Or less salty than you expected? Do you like the flavor?
- 2. If you are near anything edible such as pickle weed or wild radish, have them taste it. What does it taste like? Does it taste similar to something?

Sight

- 1. Now open your eyes. Look around and count how many different colors of green you see.
- 2. Can you identify anything you might find back at home?
- 3. Can you identify anything you have never seen before?.

Closing Remarks

They say that the more senses you use, the more you remember. Through our senses we make connections to the places we live and explore. So, now that your senses are tuned in to your new environment, we want you to use them. Become aware of the new things that are around you as well as those things that are familiar. And when we are out here today remember how people and the natural world are tightly bonded. We get everything we need to live life from the natural world. All our water, food, energy, and materials to build our homes, comes from places life this. Let's use our senses to appreciate these gifts today!

Powers of Observation Activity

Goal: To get participants ready to observe their surroundings with a keen eye

Time: About 5-10 minutes per activity

Who: Participants of any age. These activities are focused primarily on using our sense of sight, so they are not well suited to visually impaired participants.

When: Before starting a hike is a perfect time for these activities.

Where: These can be done anywhere outdoors

Materials: No materials needed for Activities 1 and 2. For Activity 3, you need a pen or pencil.

As the facilitator, you can choose to do all three of these activities in sequence, or just try one of them.

Opening

We want you to increase your powers of observation today. These are some fun activities to challenge you to take notice of the details around you. We want you to start watching things like a **Hawk!**

Let me share a few things with you today about a hawk's vision. Did you know that a hawk can see something from 20 feet way that people can only see from 5 feet away? A hawk can actually see a mouse from the height of one mile. Most predatory birds, like hawks or owls, have binocular vision. This is the ability to focus on an object with both eyes, which creates a single image. Humans have this kind of vision, but a hawk's vision is obviously much better.

Activity 1: Where Am I?

- 1. Have everyone stand somewhere outside where there is a good view. They don't need to be in any particular arrangement, and can be slightly spread out, but they need to be able to hear you clearly.
- 2. Tell them to take a quick 5-10 seconds to look around them in all directions and try to take some snapshots with their eyes of their surroundings.
- 3. Have everyone close their eyes as soon as that 5-10 seconds is finished.
- 4. You will call out a number of things, and ask them to point with their arm toward where they think that thing is. Go through about 10-12 different questions. You should make up some of your own based on your surroundings, but here are some ideas to get started:
 - Point to the tallest tree
 - Point to Sausalito
 - Point to San Francisco
 - Point to the ocean
 - Point to where we ate lunch
 - Point to someone who's wearing a blue shirt
 - Point to someone who's not wearing socks
 - Point to the direction the wind is blowing from
 - Point to a mountain
 - Point to an animal that's not a person
- 5. Now have everyone open their eyes and look around. How did you do?
- 6. Ask participants if there was anything around them that they hadn't noticed before. Why didn't they notice it? How can we pay better attention to our surroundings?

Activity 2: Hawk Eyes

- 1. Have everyone get into pairs
- 2. Tell all participants to look at each other and notice everything about their partner.
- 3. The pairs choose one person who will go first.
- 4. Have the pairs turn around so they are facing away from each other and can't see each other.
- 5. The person who is going first should change three things about their appearance. They can take off a shoe, an earring, a sweater, close their zipper or change their hair-do, etc.
- 6. Then turn back around and have the other person try to figure out what their partner has changed.
- 7. Do it again, and this time the other person changes three things.
- 8. Congratulate everyone on their growing powers of observation!

Activity 3: The Purple Pen

- 1. Before starting, create a square or rectangular area by marking the corners with items (a water bottle in one corner, a backpack in another, this rock in another, and that tree in the last corner or something like that!). It should be about 20 feet by 20 feet.
- 2. Gather participants you tell them you have a magic pen you can show it to them. You want to see how sharp their powers of observation are, so you are going to place the pen somewhere within the square or rectangle you have defined. Tell them that it will not be covered up or buried, it will be somewhere in plain sight.
- 3. Have everyone stand outside the rectangle and close their eyes and keep them tightly closed!
- 4. Walk around all sides and corners of the rectangle but do NOT place the pen anywhere. Instead, place it above your ear (and make sure it is not covered by your hair).
- 5. After about a minute, tell participants they can open their eyes. They can now enter the rectangle and look for the pen. When they find it, it is very important that they do not give away its location, because that would ruin the challenge for others. So when they find it, just stay quiet and stand on the outside of the rectangle.

- 6. You should stay within the rectangle while they are looking. Everyone will be looking at the ground. Don't make the pen TOO obvious, but feel free to stand right near participants who are searching, with the pen side of your head facing them.
- 7. There may be a couple people who take forever to find it offer them encouragement!
- 8. When everyone has finally found it, ask the group why you did this activity. After they share ideas, let them know that it's important that when we're hiking we shouldn't just look at our feet or the person in front of us. There are things to notice in every direction, so be sure to look up and around!

Closing

Now that you are warmed up, let's go out and explore. See if you can notice the details around you.

Pirate Eye Activity

Goal: This is a fun activity that lets participants explore how night vision works and has a "wow" factor! **Time:** About 20 minutes

Who: This is a great activity for people of all ability levels and ages

When: At night in a fully dark setting where there is minimal light pollution that would affect the group's night vision

Where: On a field, road, or beach. Under tress helps to make sure it's dark enough. This could also be done indoors.

Materials: A source of light (the brightest headlamp or flashlight in the group is ideal).

<u>To Play</u>

- 6. Have participants group up in a circle and sit down.
- 7. In the center of the circle, place a headlamp that is turned on.
- 8. Instruct participants to cover one eye with one hand so that it does not allow any light to come through. They should keep that eye open while it is completely covered with their hand. They should stare at the headlamp with their other, uncovered eye.
 - If it is a full moon, finding a low hanging oak tree can get you enough darkness for this activity to work.
 - If you can keep everyone from using their flashlights when walking to the activity area, their night vision will be better and make for a better experience. Consider reading the optional night reading at the end of this activity before starting a night walk to help encourage them to keep their lights turned off.
- 9. While everyone is sitting and covering one of their eyes, you should spend 3-5 minutes talking about rods and cones (the cells in our eyes that allow us to see) and tell a short pirate story.
 - Rods and Cones: Rods and cones are the specialized cells in our eyes that enable you to see with color or black and white / shades of gray. Cones are responsible for observing color (remember C for color), while rods are responsible for seeing shades of gray. We have a large number of cone cells, whereas other animals have a large number of rod cells. This is great for nocturnal animals because it enables them to see (hunt) in the dark. Rhodopsin is a pigment found in rod photoreceptors that allow us to receive light in low light conditions or in the dark. This protein falls apart in light or photo-bleaches. This is why when your night vision is built up and someone flashes light in your eyes, you cannot see for several seconds. For your rhodopsin to fully build back up (and for us to regain our full "night vision" ability), it takes a full 30 minutes.
 - <u>Why Pirates wear patches</u>: Many people think pirates wore patches to cover a missing eye, but this is not the real reason! Back in the day when pirates would hijack other ships, they would battle on the deck of the ship. After killing the other pirates, they would have to go below the ship for the booty. It was always dark under the ship because pirates usually attacked at night. They

would switch their patch from one eye to the other and would instantly have good night vision for navigating the hold of the ship. (As the facilitator you can embellish this story and add to it as you wish).

- 10. Now, when you say go, have everyone take away the hand that's been covering one eye and uncover that eye. The effect is most dramatic at this point if they move their hand back and forth, switching it every couple seconds to cover one eye and then the other eye.
 - The goal here is to allow the covered eye to gain good night vision, while keeping the other eye adjusted to the light. This will allow everyone to be able to compare night vision to day vision.
 - Warning: If everyone does a good enough job, the difference between your eyes can make it hard to walk. Be sure to allow everyone enough time for their eyes to adjust before you get up and continue your walk.

Optional Night Reading

Again the fire begins to fail. Letting it die, I take my walking stick and go for a stroll down the road into the thickening darkness. I have a flashlight but will not use it unless I hear some sign of animal life worthy of investigation. The flashlight, or electric torch as the English call it, is a useful instrument in certain situations, but I can see the road better without it. Better, in fact.

There's another disadvantage to the use of the flashlight: like many other mechanical gadgets it tends to separate a man from the world around him. If I switch it on my eyes adapt to it and I can see only the small pool of light which it makes in front of me; I am isolated. Leaving the flashlight in my pocket where it belongs, I remain a part of the environment I walk though and my vision, though limited, has no sharp or definite boundary.

-Edward Abbey

Fox Walk / Jedi Knight Activity

Goal: This is a fun activity / game that introduces night adaptations and helps participants use senses other than their vision. AND, they get to role play being a Jedi.

Time: About 20 minutes

Who: This is a great adaptive game for people of all ability levels and ages.

When: Anytime – after lunch works well, or at night

Where: On a field or beach. This could also be done in an indoor area with plenty of space. Materials: Blindfold, a water bottle and a pool noodle bopper.

Set-up

- 1. Gather everyone together and ask what adaptations an animal might need to hunt at night. Answers might include: Big ears, big eyes, echolocation, fur between their toes to muffle the sound of walking, etc.
- 2. Demonstrate how to walk like a fox hunting at night and give everyone a chance to try it.
 - a. Start by relaxing your body.
 - b. Stand tall, as if an invisible cord is pulling up and out of the crown of your head.
 - c. Keeping your weight on one leg, begin to take a step. Make contact with the earth on the outside ball of your foot and roll softly to the inside and the heel of your foot.
 - d. As you take a step, be sure to feel the earth before shifting your weight, to make sure this is a good place to step (no snapping sticks).
 - e. Try to move slowly and fluidly so that your head does not bob or bounce as you walk.

<u>To Play</u>

1. Have participants group up in a circle and ask for a volunteer.

- 2. Explain that when some senses are taken away others work overtime and compensate. As the facilitator you can get creative with a fun story to get participants pumped about the game. Example: "There is a war up there everyone, a war you don't even notice is being fought. The fate of the victory is in the hands of one, chosen, JEDI."
- 3. Place your volunteer JEDI in the center of the circle blindfolded. They cannot move their feet, which should be spread a foot apart, with the water bottle standing between their feet. The JEDI is protecting the fate of the universe, which is represented by the water bottle.
- 4. The JEDI uses his light saber (the pool noodle bopper) to guard the universe. When they hear someone coming to try to steal the water bottle, they can swing the bopper (gently!) in that direction. The JEDI only gets three swings and must swing gently in an up and down movement.
- 5. The facilitator walks around the circle and taps one person on the shoulder. This person will attempt to sneak into the center of the circle as quietly as possible, grab the water bottle, and bring it back to their place in the circle. If successful, they will have taken over the universe and get to become the next blindfolded guard of the water bottle in the center of the circle. If they get hit with the bopper (caught in the act), they must return the water bottle to its place and return to their place in the circle. The facilitator will then choose someone else to try.

Consideration

You can choose to let the students in the circle make noise with their feet, or you can tell them to be silent. You can also let them figure out who will attempt to steal the bottle.

Discussion Questions for the Group

- 1. What was it like to be the JEDI with no sight? Was it hard?
- 2. Was it easy to steal the water bottle? Why or why not?
- 3. What do you think is your strongest sense? Why?
- 4. What are some things that happen once your sight is taken away?
- 5. Name some animals that use less vision. What sense do they use more than vision?

Bat and Moth Activity

Goal: This is a fun activity / game that introduces night adaptations and helps participants use senses other than their vision

Time: About 20 minutes

Who: This is a great adaptive game for people of all ability levels and ages. It is well suited to visually impaired groups.

When: At night

Where: On a field or beach. This could also be done indoors. Regardless of the location, the ground must be even and not have too many tripping hazards.

Materials: Blindfold (1) and a pool noodle bopper

Set-up

Gather everyone together and ask them what they know about how bats are able to hunt at night. Explain the theory of echolocation. Bats send out a high pitched squeak. The sound waves bounce off their prey and the amount of time it takes them to come back allows them to calculate the location of their prey.

<u>To Play</u>

- 6. Have participants group up into a circle.
- 7. Get two volunteers, one will be the bat and one will be the moth. Blindfold the bat.
- 8. Everyone in the circle is the bat's habitat (trees). Tell the "trees" their job is to be the protectors of the bat and keep the bat safe.
- 9. The trees stay quiet, but if the bat bumps into the trees, the trees say "Tree!"

- 10. The bat claps and the moth must clap back.
- 11. The bat is trying to tag the moth by gently swinging low (below the waist) with the pool noodle bopper.

Discussion Questions for the Group

- 6. What was it like to be the bat with no sight? Was it hard?
- 7. What about the moth? Was it scary to have the bat come after you when you clapped? How do you think a moth can adapt to protect itself from the bat?
- 8. What do you think is your strongest sense? Why?
- 9. What are some things that happen once your sight is taken away?
- 10. What other adaptations does a bat have that help it hunt at night? Hint: big ears.

NAME GAMES, FUN GROUP GAMES, AND TEAMBUILDING ACTIVITIES

Index by Population

To aid you in choosing a game for the group you are working with, the games in this section are listed here with codes that indicate the populations they are best suited for:

- V: People with visual impairments
- **D**: Deaf people
- W: People in wheelchairs

Name Games

Give Me Five (W, LM) Fun Introductions (V, LM, W) Instant Replay (V, LM, W, D) Blanket Drop (LM, W, D) Bumpity Bump (LM, W) Ball Toss Name Game (W) Limber Name (V, D, W, LM, S)

Ice Breakers

Shoe ID (LM, W, D, S) Animal Roulette (V, W, LM, S) Palm Tree (W, V, adapt for D) Hoola Hoop Intros (V) Hey, what you doing? (W) Touch Blue (D, W) Mime Rhyme (V, S, W) People to People (V, W, D, S) Have you ever? (W) Magic Question Ball (W, LM, S, D) **Tag and Running Games** Boffer Tag (W, D) Capture the flag (D)

Capture the flag (D) Blob tag (V, D, S) Triangle tag (D, S, W) Elbow tag (D, S, W) Ro-Sham-Bo tag (D, S, W) Killer eyes (D, LM, W, S) Finger fencing (D, W, S)

- LM: People with low or no mobility
- S: people with difficulty speaking or who are shy

Guessing Games

20 Questions (V, LM, W) My gesture (D, W, S) Psychologist (LM, W) Patterns (V, D, LM, W, S) Contact (V, LM, W) Ghost Letters (V, LM, D, S, W) Signs (D, S, W) Three Changes (D, S, LM, W) Two truths (V, W, LM) Mafia (V, D, LM, W) Killer Wink (LM, W, D, S, V) Famous Characters (W, LM, V) **Filler Games**

Famous Person (V, W) Rain (S, W, V)

Human Bingo (V, LM, D, S, W) Finger to Palm (V, D, S, W) Couch Game (V, W, LM, D, S)

Team Building Games

Human Knot (V, S, D) Count to 10 (V, LM, W) Eye Contact (D, S, W) Birthday Lineup (D, S, W) Square (V, LM, W) Prui (V, LM, W) Trust Walk (V, LM, W, D, S) Yurt Circle (V, D, S)

Some games require adaptations. Our ideas for adaptations are included in the descriptions of the game. Please continue to adapt games and add adaptations for varying ability levels.

Name Games

Give Me Five

- Accessibility
 - Good for low mobility, people in wheelchairs, and all ages
 - o Requires sight
 - Requires fine motor usage
 - Requires speech
- The group stands in a circle, and everyone puts out their hands. One person goes into the middle. A leader says someone's name. The person called then tries to say a new name before the person in the middle slaps their hand. If the person called flinches or doesn't say a name before their hand is slapped, they are in the middle.

Fun Introductions

- Accessibility
 - Great for VIP's and low mobility
 - Deaf people may require an interpreter or can act out their answer
- Have the group introduce themselves and a fun fact such as: what magazine cover they would be on, what tale they would have, their favorite place in the world

Instant Replay

- Accessibility
 - People with low mobility can stay in their spot and use facial expressions or dramatic voices.
 - Deaf people could show their name sign and actions dramatically
 - For VIP's, skip the actions and just do dramatic voices
- The group forms a circle and a leader explains that today we will practice our acting. For this to work, each person is to step into the circle and dramatically introduce himself or herself.
- The rest of the group will mimic their actions and voice as close as possible before the next person goes.

Blanket Drop

- Accessibility
 - Great for all ages
 - Good for people in wheelchairs
 - This game could be used with deaf people if everyone has or gets name signs. Then participants would quickly show the other persons' name sign.
 - This game requires sight
- After doing introductions with the entire group, separate everyone into two groups and have two people (not playing) hold a large, thick blanket separating the two groups so that neither group can see the other.
- The group sends one person forward from each side to face the blanket. When the blanket drops, the first person to correctly call out the name of the other group's designated person wins the round and the loser joins their team.

Bumpity Bump Bump

- Accessibility
 - Great for any age
 - Great for people in wheelchairs or with low mobility
 - This game requires sight and speech
- Participants get into a circle and introduce themselves to the person on either side of them.
- One person is the "bumper" and stands in the middle of the circle.
- The bumper points to a person and says either "left bumpity bump bump" or "right bumpity bump bump." The person pointed to must say the name of the person to their left or right before the bumper finishes speaking. If the person pointed to speaks too slowly, they are in the middle. If not, the bumper continues pointing to new people.

Ball Toss

- Accessibility
 - Great for people in wheelchairs
 - Requires the ability to throw and catch
 - Uses sight and speech
- One player starts out in the center of the circle. Each person in the circle should introduce himself or herself briefly before the game starts. The action begins when someone in the circle who is holding a safe throw-able object says his or her name followed by the name of someone else in the circle, and then tosses that person the ball.
- The person who received the ball has to try to say their name followed by another players' before they person in the middle can tag them. If a player is tagged, they switch places with the person in the middle. This game tends to gain speed quickly and it is sometimes helpful to call time out and remind the group to keep the ball in control.

Limber Name

- Accessibility
 - Great for deaf people, VIP's, or people with limited speech
 - Can be adjusted for all levels of mobility
- Everyone stands in a large circle with arms distance on either side of them. One person starts by introducing themselves and demonstrating their favorite stretch or yoga position.
- The whole group does the stretch, and then the next person in the circle goes.

Ice Breakers

Shoe ID

- Accessibility
 - Can be adapted for people in wheelchairs by putting shoes on a table and having everyone sit around it
 - Can be adapted by people with low mobility by randomly passing out shoes and helping participants find partners
 - Can use pen and pencil for deaf or mute participants' interviews
 - Good for all ages
 - This game requires sight
- Everybody takes off a shoe and throws them in a large pile on the floor.
- On the count of three, each person grabs a shoe from the pile and finds the person with the matching shoe on their other foot. They ask their new partner their name and three things about them they didn't already know. Works best with larger groups.

Animal Roulette

- Accessibility
 - Great for all ages and mobility levels
 - Easily adapted for people with visual impairments by having a guide or other adult tap whoever is being pointed to
- Everyone starts off by standing or sitting in a circle with one leader in the middle who closes their eyes. If the group is high mobility they can walk counter clockwise while the leader spins clockwise. The leader stops and with their eyes still closed points at someone in the circle. The leader says an animal that the person they are pointing to has to make the noise of. The leader then tries to guess who they are pointing at without opening their eyes. If they guess correctly, the leader gets to join the circle and the person they were pointing to gets to be in the middle.
- Limiting each person in the middle to three wrong guesses before being swapped out is usually a good idea.
- This game can get really fun by choosing animals that make unknown or difficult noises! Be creative!

Palm Tree

- Accessibility
 - Great for all ages, people in wheelchairs, and VIPs
 - Deaf people would need an interpreter or participants would need to learn signs for "palm tree", "elephant", and "Elvis".
- The leader explains that the point of the game is to make a palm tree, an elephant, or Elvis in a group of three before the person in the middle counts to three. Each thing to act out is then explained:
- The Palm Tree: the person in the middle puts their hands above their head as leaves and the people on either side do the same while leaning out.
- The Elephant: the person in the center bends like they are going into a dive and the person on either side make large ears with their arms to form a trunk and ears.
- Elvis: the person in the middle acts as if they are singing into a microphone and the people on either side put their hands on either side of their face and act as screaming fans.

• After explaining, the person in the middle points to someone and begins counting to 3 while they make their animal, person, or object. If the person pointed to takes to long, they are in the middle.

Hoola Hoop Introductions

- Accessibility
 - Great for all ages and VIPs
 - Deaf people would need an interpreter
 - May be difficult for people in wheelchairs unless they have a great deal of creativity
- The entire group stands in a circle holding hands and the leader places a hoola hoop between two people. The hoola hoop must go around the circle without anyone letting his or her hands go.
- The entire time you are touching the hoola hoop you must tell the group about yourself.

Hey, What Are You Doing?

- Accessibility
 - Requires mobility to do actions and speech
- This game also doubles as a name game or is great when you only half the group is there and you just want an easy game that can start and end whenever. The group stand in a circle, the leader begins by doing some motion without talking, for example brushing their teeth. She prompts the person on her left to ask," Hey Mary, What are you doing?" (Assume Mary is her name) Mary responds by naming an activity that is totally different than the action she is actually doing- she might say, "I'm waxing my car."
- Whatever action she says that is what the next person has to do until the person on their left, asks, "Hey _____, what are you doing." This game can be played for a long time and become very amusing depending on how creative the group gets. For example, "I'm break dancing," or "I'm proposing to someone." Be aware that some groups may need you to tell them to keep it rated PG-13.

Touch Blue

- Accessibility
 - Good for people in wheelchairs
 - Requires some mobility
 - Easily adapted for deaf people by showing instead of saying the color or object people need to touch
 - Requires sight
- With everyone standing in a circle and the leader in the center; the leader asks everyone to "Touch Blue" and everyone hurries to touch some article of blue clothing or shoe, etc. on someone else. Everyone returns to the circle and the leader might say, "Touch a back shoe" or something else.
- A more advanced version of this game looks a bit like Twister. Same as above but if the leader first said touch blue and you did that, and then they say touch pink you still have to keep part of your body in contact with blue while you try to touch pink. The last one to fall down laughing is the winner.

<u>Mime Rhyme</u>

• Accessibility

- Although this activity does not require speech or hearing, deaf people may find it difficult to find rhyming words
- Great for VIP's if a person who is picking the word cannot see, the game would be adapted by adding a sighted person to explain what people are acting out as their guesses
- Requires some mobility for acting out words
- We gather in a comfortable group. (What? No circle?) One of us reveals that he's thinking of a word and it rhymes with-deep, for example. The rest of us try to figure out the chosen word, testing our guesses by acting them out in pantomime.
- For instance, one of us closes his eyes and rests his head on his hands, only to be told by the person who selected the word, "No, it's not sleep." Other players try crawling sneakily and jumping high in the air, but the answer isn't creep or leap. Other possible guesses to mime: honking a horn, wiping away imaginary tears, driving a vehicle that can take on bumpy roads, or peering through a tiny hole.

People to People

- Accessibility
 - Great for all ages, people in wheelchairs, and VIPs
 - This could be adapted for Deaf people by miming directions or having a staff call every round
 - This is an active game
- The leader teaches the chant, "mingle, mingle, mingle" to the tune of a Congo line. The group is told that when they hear that they can dance around until they hear someone yell, "people to people" and then they need to grab a partner. Whoever doesn't have a partner gives the group commands to touch appropriate body parts like elbow-to-elbow or foot-to-foot.
- After a few times, the group mingles again and a new leader is found.

Have You Ever?

- Accessibility
 - Great for all ages
 - Deaf people will need interpretation
 - People with difficulty speaking can use paper and pen or have a few pre-written questions to choose from
 - Requires movement
- Have the group stand in a circle with one person in the middle. Each person in the circle puts an object at his or her feet. The middle person then says something they like to do or have done (I like to ride my bicycle).
- Everyone who has also done that has to find a new spot. The person in the middle will then try to steal a spot. Whoever doesn't get a spot is now in the middle.

Magic Question Ball Activity

Goal: Icebreaker for groups or conversation starters for the trail

Time: About 10 minutes

Who: Works well with all ages, but requires people who are able to throw/roll and catch a large soft ball When: Opening circle of a trip, or at various moments of downtime / non-kayaking time Where: Anywhere with enough space to toss a ball around a tight circle of participants Materials: This card and the numbered ball in the resource kit.

The Magic Question Ball is a great icebreaker or name game activity. It is also very fun to do along the trail to help start up conversations while you walk. Have your group stand in a circle. Call someone's name and toss the ball to them. The ball is covered with numbers from 1 to 60. They should catch the ball with both hands and then announce to the group which number their right thumb landed on (or was closest to). You will read the question with the same number from this card and have them answer it. The first set of questions are more open-ended and lend themselves well to storytelling and conversation, while the either/or set of questions is for a faster lightning round.

- 1. What is the best meal you have *never* had?
- 2. Who is your hero?
- 3. What is your favorite healthy food?
- 4. Five years from now what will you be doing?
- 5. What would you do if you were locked inside your favorite store overnight?
- 6. What is your favorite holiday food?
- 7. What is your least favorite food?
- 8. What is one thing about yourself that you really like?
- 9. What is a bad habit you cannot break?
- 10. What is one junk food that you cannot live without?
- 11. What is your favorite vacation spot?
- 12. What is a time you never want to forget?
- 13. What would you do if all the electricity in the entire world stopped?
- 14. Which planet would you travel to in the solar system?
- 15. What would you do if the dinner served to you in a fancy restaurant came with a fly in the mashed potatoes?
- 16. What is your favorite genre of music?
- 17. If you could give anyone \$1,000,000, who would you give it to and why?
- 18. What is your favorite kind of weather?
- 19. What is your favorite holiday?
- 20. What is your idea of paradise?
- 21. What would you do if you did not have to work or go to school?
- 22. What makes a person a good friend?
- 23. What is the nicest or kindest thing anyone has ever done for you?
- 24. Do you have any hidden talents?
- 25. Name something that you absolutely refuse to do under any circumstance.
- 26. Name one thing on your bucket list.
- 27. What do you do that annoys your friends?
- 28. What is your favorite television commercial in the world?
- 29. What type of clothing should never be allowed to go out of style?

- 30. What will you be like when you are 90 years old?
- 31. Do you have any phobias? Name one.
- 32. If you could be any mythical creature, what would you be and why?
- 33. What is the craziest thing you have ever done?
- 34. If you could do something that you never have done before, what would it be?
- 35. What electrical gadget would you not be able to do without?
- 36. Who is your favorite Disney princess?
- 37. What is your favorite article of clothing?
- 38. Name a skill that you would like to be able to do.
- 39. What is your favorite homemade food?
- 40. What was it like to spend your first night away from home?
- 41. Describe your favorite thirst quenching drink on a hot summer day.
- 42. If you had only one hour left to live, what would you do with it?
- 43. Have you ever built a sandcastle, mud pie, fort or tree house? Which one?
- 44. Have you ever caught a firefly, cricket, frog, snake, lizard, or grasshopper?
- 45. What is your favorite pizza topping?
- 46. What is the most interesting type of transportation that you have experienced?
- 47. If you could own any vehicle for transportation, which would you own?
- 48. What is your favorite thing to do in the summer?
- 49. What would your friends say you are like first thing in the morning?
- 50. What do you do to relax?
- 51. Can you speak a second language, even a little?
- 52. What is your earliest memory?
- 53. Was there ever a time that you were frightened for your life?
- 54. What is your favorite comic strip?

- 55. Do you have any family members living in another country right now?
- 56. If you became a multi-millionaire overnight, what is the first thing you would buy?
- 57. What have you done that you think is your greatest accomplishment up to now?

Magic Question Ball Either/Or Lightning Round

- 1. Spring or fall?
- 2. Pepsi or Coke?
- 3. Sunscreen or tanning oil?
- 4. Snowboard or skis?
- 5. Vanilla or chocolate?
- 6. Mac or PC?
- 7. Truck or car?
- 8. Mountains or the beach?
- 9. Night owl or early bird?
- 10. Showers or baths?
- 11. Coffee or tea?
- 12. Dark chocolate or milk chocolate?
- 13. Pie or cake?
- 14. Playstation or Wii?
- 15. Board games or video games?
- 16. Pen or pencil?
- 17. Live in the city or live in the country?
- 18. Books or digital reader?
- 19. Christmas or Thanksgiving?
- 20. Cookie Monster or Elmo?
- 21. Shoelaces or Velcro?
- 22. Winter or summer?
- 23. Sunrise or sunset?
- 24. Glasses or contacts?
- 25. Bungee jumping or skydiving?
- 26. Roller skates or rollerblades?
- 27. Swimming in the ocean or swimming in a pool?
- 28. Black and white photos or color photos?
- 29. Hamburger or hot dog?
- 30. Great America or Discovery Kingdom?

- 58. At which store are you most likely to max out your credit card or spend the most money?
- 59. Describe the funniest thing that has ever happened to you.
- 60. If you won the lottery, how long would you wait to tell people?
- 31. Los Angeles or New York?
- 32. Sneakers or flip flops?
- 33. Superman or Batman?
- 34. Ice hockey or roller hockey?
- 35. Drive or fly (to a particular destination)?
- 36. Tent camping or hotel?
- 37. Shorts or long pants?
- 38. Mexican food or Chinese food?
- 39. Sandwich or burrito?
- 40. Wizards or vampires?
- 41. Dogs or cats?
- 42. Apples or bananas?
- 43. Canned or bottled soda?
- 44. Waffles or pancakes?
- 45. Breakfast or dinner?
- 46. Facebook, Instagram or Twitter?
- 47. Vegetarian, carnivore or omnivore?
- 48. Salty snacks or sweet snacks?
- 49. Risk taker or cautious?
- 50. Ruffles, Fritos or Doritos?
- 51. Frozen yogurt or ice cream?
- 52. Curly hair or straight hair?
- 53. Cloudy or sunny?
- 54. Rain or snow?
- 55. iPhone or Android?
- 56. Checkers or chess?
- 57. Starbucks, Coffee Bean or Peet's?
- 58. Shower gel or bar soap?
- 59. Paper napkins or cloth napkins?
- 60. Hoody or zippered sweatshirt?

Tag Games

Boffer Tag

- Accessibility
 - Great for <u>all ages</u>
 - <u>Deaf people</u> will need interpretation of directions or to be shown this page
 - o Requires mobility but can be easily adapted for people in wheelchairs
 - This game requires sight

- Games
- for Tag
- ames

- Boffers are usually foam swords that can be used to swat people; they are safe and pain free. If you don't have boffers, you can improvise with an empty wrapping paper tube wrapped in duct tape.
- The group stands in a large circle with the person who is "It" in the center holding the boffer. In the center of the circle is a small circle marked with rope or a hula hoop. "It" walks around the inside of the circle, then at random chooses someone and swats his or her legs with the boffer. Next "It" has to try to run back to the center carefully place (not throw) the boffer into the small circle in the center, then run and take the persons place in the circle that they just swatted.
- If you were the one swatted, you run to the center and as soon as "It" places the boffer down in the center, you grab it and try to swat "It" before they get back to your spot. If you don't tag them, than you become the next "It".

Capture the Flag

- Accessibility
 - Great for all ages
 - <u>Deaf people</u> will need interpretation of directions or to be shown this page
 - Requires mobility but can be played on a large field for wheelchair accessibility
- Best played in a wooded area. Great for behind the cabin on snow days.
- Players divide into two teams each on one side of the playing area. Each side places a "flag" (baseball hat, bandana, etc.) behind the dividing line on their side. The object of the game is to capture the opponents' flag and bring it back across the dividing line without getting tagged. As player is subject to being tagged or caught as soon as he enters enemy territory.
- Those caught are placed in prison. A prisoner may be freed by a free member form his own side by getting close enough to touch him. Both may then walk back to their own side.

Blob Tag

- Accessibility
 - Great for <u>all ages</u>
 - Easily adapted for <u>VIP's</u> by having a few sighted staff or participants around the edges to tell people when they are leaving the boundaries or having people play in pairs
 - Great for <u>deaf people</u>. Directions are simple and could be mimed easily.
 - Requires mobility. May be difficult for people in wheelchairs to hold onto the blob while moving
- Leader explains to the group that a Blob is nasty, sticky, oozing, living thing that tries to eat everything it comes in contact with. With children, you can tell them what the Blob sounds like, and have them mimic the noise.
- Start with one person as the original Blob. It's great to play this in a field or on a beach with designated boundaries. The Blob counts to ten, giving everyone time to scatter. Then they run and try to tag someone.
- If the Blob tags you, you become part of it by linking hands with it. If the Blob grows to become four people they can divide in half, and there are now two Blobs on the loose.

Triangle Tag

- Accessibility
 - Great for all ages
 - <u>Deaf people</u> will need interpretation of directions or to be shown this page
 - Requires mobility. Can be adapted for <u>wheelchair accessibility</u> if participants are flexible

- Divide everyone into groups of four, with three people holding hands in a small circle/triangle. Within each circle, one person needs to be designated as a target while two are his/her protectors.
- The remaining person is "It." Now, the people who are "It" try to tag targets, while being blocked form that tack by the Protectors. If a target is tagged, that person becomes "It" and the former "It" joins the trio, and the trio needs to choose a new target.

Elbow Tag

- Accessibility
 - Great for all ages
 - <u>Deaf people</u> will need interpretation of directions or to be shown this page
 - Requires mobility but can be played on a large field for wheelchair accessibility
- Everyone divides up into partners, and links elbows with that partner, keep outside elbow bent with hand on hip. One person volunteers to be "It" while another volunteers to be the runner. The person who is "it" tries to tag the runner of course, but here's the twist, the runner can avoid being tagged by linking the outside free elbow of one of the partner groups. When this happens the player the runner did not link elbows with, now becomes the runner. If the runner is tagged, the roles are switched and the runner becomes "It." One variation is that the person who is "It" can also rest by linking elbows with someone and creating a new "It."

Ro-Sham-Bo Tag

- Accessibility
 - Great for all ages
 - <u>Deaf people</u> will need interpretation of directions or to be shown this page
 - Requires mobility but can be played on a large field for wheelchair accessibility
- Two teams line up facing each other on the centerline of the playing area. At the count of three (or "Ro-Sham-Bo) each team displays Rock (fists), Paper (open palm), or Scissors (two fingers out). The one symbol the whole team will display should be decided between each round in a team huddle. The team that throws the winning symbol (rock beats scissors, scissors beat paper, and paper beats rock) chases the other and tries to tag members of their team before they get to their home base line. Any tagged players join the other team, so there is no elimination and team size is always changing. If both teams display the same symbol, they should shake hands, and do it again.

<u>Killer Eyes</u>

- Accessibility
 - Great for all ages
 - <u>Deaf people</u> will need interpretation of directions or to be shown this page
 - Requires no mobility
 - Requires no speech
- Everyone stands in a circle with some object placed in the middle (backpack, sweater, anything). The leader instructs everyone to stare down at the object, and then when he says "Eyes Up" you stare at someone else in the group. If the person you are looking at is also looking at you, and eye contact is established, then you have both died and step out of the circle. The game continues until there are three people left, and the final "Eye's up" is called. The last one alive is the winner.

Finger Fencing

• Accessibility

- Great for all ages
- <u>Deaf people</u> will need interpretation of directions or to be shown this page
- Requires some upper body fine motor skills
- Great for people in wheelchairs
- This is a partner game. The partners shake hands, and while still holding hands, each person points their index finger at the other. With arms connected the object is to tap the other person three times with your index finger without being tapped yourself. Another variation of this is two grab your partner just above the wrist and then try to tap his forehead with your hand.

Guessing Games

20 Questions

- Accessibility
 - Great for low mobility and VIP's
 - Deaf people may need an interpreter
 - Mind game, may be difficult for younger groups
- There are no preparations or materials to play. Works best with small groups of 2 to 5 players.
- Select one person to begin by choosing a person, place, or thing. Basically anything can be chosen, but try to make the selected item something that can be reasonably guessed. It's no fun to play a guessing game that is impossible to solve!
- After the person has chosen a person, place, or thing, the other players take turns and ask "yes" or "no" questions in an attempt to figure out what the chosen word is. After each guess, keep track of the number of guesses that are used until it reaches the limit of 20.
- If a player correctly guesses the word before they reach 20 questions, they pick the next word. If not the word is revealed and a new person picks a word.

My Gesture

- Accessibility
 - Great for deaf or mute people (requires no speaking)
 - Difficult for motor impaired
 - This game requires sight
- Each person gets an animal sign or other funny sign and shows it to the group. Then the first person hits their legs twice and does their own sign, legs twice and someone else's. Whoever's name was signed goes next. The game should follow a beat of two hits name. People who miss can be out or the game can keep going.

Psychologist

- Accessibility
 - Great for low mobility
 - Mind game, may be difficult for younger groups
 - Deaf people may need an interpreter
- Someone leaves the room and the remaining people decide a funny way to answer questions (starting with P, has to have a color, ends in L) then the psychologist returns and answers questions to figure out the pattern

Patterns [

- Accessibility
 - Great for deaf groups
 - Can be adapted by using sounds or words that change for VIP's (Bah, mom, dad)
 - Easy for all ages and development levels
- The group sits in the circle
- One person is selected to be the detective and leaves the circle out of site
- The group selects someone to be the pattern master (person to start a gesture and change gestures at random).
- The pattern master starts a gesture (like clapping) and the detective is invited back. The detective stands inside the circle and tries to guess who the pattern master is as the pattern master changes gestures and everyone follows.

<u>Contact</u>

- Accessibility
 - Great for VIPs and low mobility
 - Deaf people may need an interpreter
 - Mind game, may be difficult for younger groups
 - One person selects a word and tells the group the first letter of their word.
- A person tries to guess the word by giving hints about a word that starts with that letter. EX: if the letter was A, the person may say it is a red fruit.
- The other teammates would know it was an apple and scream, "3 2 1 CONTACT APPLE!" Before the person giving hints said Apple. If the rest of the group says the word first the person giving hints has to the group the next letter in the word.
- The game continues until the group figures out the word.

Ghost Letters

- Accessibility
 - Great for VIP's and low mobility
 - Easily signed for deaf people if someone knows the sign language alphabet or writes on a board
 - Mind game, may be difficult for younger groups
- A player selects a letter and says it aloud. The next player must add a second letter to the first letter so that the two letters are the beginning of a word but not a finished word.
- For example, if the first player says the letter "A," the second player should not say the letters "N" or "T," because they would produce the finished words "an" or "at." He can say the letter "G" because "Ag" is the beginning of possible words, such as agriculture or agrarian.
- The third player can add a letter to the first two letters (if they can think of a word), add a letter (and act like they can think of a word), or challenge the last player that no words begin with those letters.
- If the third player thinks that no words begin with the letters A and G, she can challenge the second player. If the second player can name a word, however, player 3 loses. If a player cannot think of a letter to add to a word, or is forced to complete a word, he or she loses.

<u>Signs</u>

- Accessibility
 - Great for deaf or mute participants (no speaking)

- This game requires sight
- May be difficult for participants with low fine motor skills
- Everyone sits in a large circle, facing inward. The players choose a detective and he leaves the circle
- The group then chooses a "sign," that is easily detectable by others, although not too obvious. Good examples include:
- Waving your hand, squeezing your nose, patting your head
- The goal is to keep passing the sign to other players as long as possible, without getting caught by a detective who stands in the center of the circle. The detective tries to find out where the sign is within the group and catch the person who currently has it. The detective has 3 guesses.

Three Changes

- Accessibility
 - Great for deaf or mute participants (participants can point or mime changes)
 - This game requires sight
 - o Participants with low motor skills may need help making the changes they want
- One person volunteers to go first. They stand up in front of the group and let the group observe his/her clothing and accessories. Then everyone in the group turns around or shuts their eyes. While the group is not looking the person makes three (or 5) changes related to their clothing and general appearance. This might include untying a shoe, changing a watch to a different hand, or taking their hair out of a ponytail. When they announce "Ready," the group tries to guess all the changes, and a new person's selected.

Two Truths and a Lie

- Accessibility
 - This game requires speaking or writing
 - Great for VIP's, people in wheelchairs, and people with low mobility
- Each person thinks of two true things about themselves and one lie. Each player gives a brief description of the three stories that have happened in their life, two are true, and one is false. The rest of the group then tries to figure out which story is a lie.

<u>Mafia</u>

- Accessibility
 - Great for low mobility and all ages
 - Deaf people may need an interpreter
 - VIP's may need help as mafia silently picking people to kill
- There are 5 roles: Mafia, Doctor, Detective, Narrator, and Town people. Narrator is chosen at the beginning as someone who knows the game and likes to tell stories. To give remaining roles, cards are passed out that represent each character. (Ace-Mafia, Queen-Doctor, Jack-Detective, 1-10 is town people.) There should be 1-3 mafias, 1 doctor, 1 detective, and the rest of the group should be town's people.
- The narrator tells the story: everyone lives in a town that is being taken over by the mafia and the town's people are trying to find the mafia to save themselves.
- The narrator tells everyone to put their heads down and close their eyes.

- If you are playing with deaf participants, the group should be told: when they feel one stomp, mafia should look up, two stomps, doctor, three stomps detective, four stomps everyone should wake up.
- The narrator asks the mafia to look up, silently pick someone to kill, and go back to sleep
- The narrator asks the doctor to look up, silently pick someone to save, and go back to sleep
- The narrator asks the detective to look up and silently pick someone to accuse. The narrator tells the detective if their choice is correct and the detective goes back to sleep.
- The narrator wakes up the whole town and tells what happened during the night. EX: If Katie had been killed, the doctor saved no one, and the detective found out nothing, "Last night while everyone was asleep Katie went for a late night walk and witnessed the mafia committing a crime. She tried to run to the police station but was killed by the mafia. The detective is looking for clues.
- The group accuses a person of being mafia, votes to have him executed, finds out if he was mafia, and goes back to sleep.
- Game continues until all mafia are killed or all townspeople.

Killer Wink

- Accessibility
 - This game is great for <u>all mobility</u> levels and all ages
 - For <u>deaf</u> or <u>mute</u> participants, adapt the accusation by having the accuser raise their hands to pause the game and accuse someone
 - For <u>VIPs</u>, the game uses a handshake instead of eye contact and the killer tickles the other persons' palm with their middle finger.
- Have everyone stand in a circle. One person must be the moderator (who doesn't play that round). All players close their eyes and the moderator selects one person by tapping his or her shoulder. This person is now the secret "killer".
- The group mingles around and looks each other in the eyes. The mystery killer tries to wink at other players without being detected by others. If a person is winked at, they must continue mingling for a few seconds and soon "die" a horrible death. Play continues.
- If someone suspects they have detected the killer, they say I ACCUSE and the game stops. They point to who they think the killer is. If they are correct, they win. If they are wrong, they die and the game continues.
- There is NO TALKING or communicating of any kind allowed! It is great to recommend dramatic deaths!

Famous Characters

- Accessibility
 - Deaf people may require an interpreter
 - Requires speech
 - \circ Great for <u>VIP's</u> or people with low mobility
- Prepare slips of paper on which names of famous people, both past and present are written. Tape one slip on each person's back and let him or her know they are not allowed to see it until the game is over.
- The group begins mingling and can start asking Yes/No questions of each other to try to find out whose name is written on their back. They can also choose to have a conversation with someone after reading who they are, and talk to them as though they were that person. For example, one might talk about professional athletics or basketball if the person's sheet said Michael Jordan. The conversation and questions continue until everyone figures out who they are.

Filler Games

Famous Person

- Accessibility
 - Deaf people may require an interpreter
 - Requires speech and site
- This game is an ideal after dinner game while sitting around the table, and is especially good for group with a varied age range. The leader cuts or tears paper into small pieces (about the size of a Post-It) then gives about 8-10 to each person playing, along with a pen or pencil. The leader instructs everyone to write one name of a famous person (past or present, from any media or genre).
- The game is great when there is a good mix of well-known people like Hilary Clinton, along with more obscure artists, musicians, poets, etc. Have everyone tightly fold their paper in half and place them in one large bowl or hat in the center of the table. Next divide the group into teams, they don't all half to be even and 2-3 people per team is ideal, but that is also flexible. One team is designated to go first. One player on that team will be the reader while everyone else on the team are the guessers. Someone from another team should be the timekeeper.
- The reader will draw a paper and read the name to himself. He has to try to get his teammates to say the name on the paper without saying the name or any part of it himself. He can do this by giving clues verbally. For example, if the paper said "Judy Garland", he might say the star of The Wizard of Oz. He could also use action and/or sound to give clues. When the team gets it right that paper is kept in front of the team to keep score, and the reader quickly gets another. The reader only has one minute to get through as many papers as possible.
- If time is called while the group is still guessing, the answer is not given and the paper goes back in the bowl. When each team gets a turn, they should choose a new reader. If a reader draws a name of someone they don't know, they need to get creative and try to find a way to get the team to say it, or the players may decide to allow one pass per team. When all the papers are gone, each team counts their pile and the team with the most wins. You can play another round by using the back of the paper.

<u>Rain</u>

- Accessibility
 - This game is not good for deaf people
 - This game does not require speech
 - \circ Great for <u>VIP's</u> or people with low mobility
- Everyone sits in a circle, and then closes their eyes for a few moments of quiet. Each person is instructed to repeat the sound the person on his right will be making. The leader begins by rubbing his palms together, back and forth. The person to his left joins him, and then the next until everyone in the circle is rubbing palms and we can listen to the drizzling rain building in intensity. Then the leader starts to snap his fingers. One by one around the circle, we replace palm rubbing with finger snapping and the drizzle turns into a steady patter.
- Then the leader switches to hand clapping, as we begin to hear a hard rain. The storm now builds to a downpour as the leader begins slapping his thighs, then the skies open and thunder crashes as the next round has us stomping are feet. Then the storm begins to subside, just as it grew- foot stomping, thigh slapping, hand clapping, finger snapping, and back to palm rubbing. For the final

round the leader stops rubbing his palms and takes the hand of the person to his left, as each of us does in turn around the circle until there is silence once again.

<u>Human Bingo</u>

- Accessibility
 - Deaf people may require an interpreter
 - Requires speech or an interpreter and requires sight
- This is actually an ice breaker put it requires a bit of prep work. Each person in the group receives a sheet with something that looks like a BINGO grid on it. In each of the squares is written each a description of someone (someone who never cheated on a test, someone who prefers frozen yogurt over ice cream, etc.) or it may have a description of an activity that someone has to do (ask some one to sing Happy Birthday to you, ask someone to teach you how to write something in another language.) Each square should have room for the players to get signatures from each other or write other needed information. The first person to either get all of their boxes filled is the winner, or you can set a time limit and the person with the most when time is called, wins.

Finger to Palm

- Accessibility
 - Great for all ages
 - <u>Deaf people</u> will need an interpretation of the story or the game could be adapted to be a certain motion like putting the pinky up
 - Requires some upper body fine motor skills
 - Great for people in wheelchairs
- This is a short game and very easy to play. Have the group stand in a circle with their right index finger pointed down on the left palm of the person to their right. So each person should have their left palm facing up at their side and their right index finger pointed on someone else's palm. The leader tells the group a key word and then begins telling a story. When the group hears the word everyone tries to grab the index finger in their palm while trying to keep their finger from being grabbed.

Couch Game

- Accessibility
 - Great for VIP's with additional updates about people's positions
 - Can be adapted for people in wheelchairs by having four spots on the rug and everyone not in a wheelchair sits on the floor.
 - Easily adapted for deaf or mute participants with writing or finger spelling names
 - This game requires participants to move or switch seats
- Form a circle with a couch (with four spots) or four chairs (next to each other) and enough chairs for all participants plus one. Place two males and two females on the couch, and have the rest of the people fill in the circle, in alternating order (guy next to girl). One chair must be left open.
- Have everyone fill out his or her name on a piece of paper. Place all the pieces of paper in a container. Go around the room and have someone pick out a piece of paper with someone's name on it (they cannot have their own name). They must not let anyone know whose name they have.
- The person to the left of the empty chair begins by calling out someone's name. The person who is holding a paper with that name must move from their seat to the empty seat. The object of the game is for the guys to get four guys on the couch while the girls try to get four girls on the couch.

Team Building

<u>Human Knot</u>

- Accessibility
 - Great for Deaf people, people who cannot speak and VIP's
 - This game requires mobility
- Knots can be a useful way to get a group to work as a team, and work on communication skills, as well as identify ones' role throughout the process. Each knots group should have about six to nine people to be effective and safe. Everyone stands in a circle shoulder to shoulder and the leader asks everyone to reach across with his or her right hand and take someone else's hand across the circle. Then repeat with the left hand. Make sure that know one in the group is holding two hands of the same person. Before they are allowed to start explain that safety is very important and if at any time someone shouts "Stop" then everyone needs to let go. The object is for the group to untangle themselves while still holding hands. Switching your grip on someone's hand is allowed, to avoid sprains.
- Variations: Have the group complete the task without talking, or have some people blindfolded.

Count to 10

- Accessibility
 - Deaf people may require an interpreter
 - Requires speech
 - Great for <u>VIP's</u> or people with low mobility
- This activity creates group cohesion and almost a symbiotic feeling quite subtly. The leader tells the group that they have two try to count to ten as a group, with one person saying each number. If two people say the same number they have to start over. They can not go around the circle, each saying the next number, plan out verbally who will say what number, or nod their heads of signal who should speak. Often a group will struggle for some time to get to "Three" then somehow they will get in the flow and keep counting to Thirty.

Eye Contact

- Accessibility
 - Requires no speech or hearing
 - This game requires movement and sight
- A lot can be expressed through eye contact; how we feel, what we want. Everyone stands in a circle facing each other. The leader says to look around the circle and establish eye contact with someone. Once you are both looking at each other, exchange places in the circle. There should be no talking except by the leader. Then find someone new and change places again. The leader will let people switch places about six times than ask everyone to stop. Look at who is on either side of you, and remember this. Then continue to switch places again. After about three more switches, the leader will stop everyone again. Now the object is to get back between the same two people that you were last time the game was stopped, and you can only move where you want to go, by establishing eye contact with people and trading places with them.

Birthday Lineup

• Ask everyone in the group to see how fast they can lineup by their birth month and day, without talking.

<u>Square</u>

• This is best done with about 20 people. Everyone is asked to shut their eyes (or be blind folded) then the group is given a long rope. As a team they have to figure out how to make a large square by holding the rope and moving their bodies in the shape of a square. If the group handles the square quite easily the leader might ask them to make a star or hexagon.

<u>Prui</u>

• This game is as much fun to watch as it is to play. This game should be played in an open area without obstacles around. Ask for 2-4 volunteers to be spotters. Everyone else should be spread out randomly around the playing area. Leader tells everyone to shut their eyes, and says he taps their head than they are Prui. One person is tapped to be Prui. Prui's job is to stay in the same place and let everyone come to them. They also get to keep their eyes open. Everyone else is told that they need to go search for Prui with their eyes shut. They should put their hands up in front of them as bumpers. When they bump into someone, they should ask, "Are you Prui?" If the person is not Prui they say so and the both keeping looking. If you ask someone, "Are you Prui?" and they don't answer you will know you have found Prui because he doesn't talk. Now link arms with Prui and open your eyes to watch the rest try to find you. The spotters are needed to make sure nobody goes walking off away from the game.

Trust Walk

• A trust walk can be used as an activity in and of itself of can be used as a way to transition to a new location or challenge. A great way to transition into the trust walk formation is to ask the group to shut their eyes then get into a line from shortest to tallest. Now if everyone places their hands on the shoulders of the person in front of them, you are in formation for a trust walk. Explain to the group that this is a time to concentrate on what they hear, feel, smell, and sense around them. Most trust walks are done in silence. The leader begins the walk be guiding the first person and everyone follows in caterpillar formation. If the walk is being done on a hill or in rough terrain, it is important to have spotters on both sides of the line. Some leaders guide the entire walk and some prefer to tell the first person to open their eyes and let them lead for a short time, then that person goes to the end of the line and the next person gets a chance at leading the group. Always have a debriefing after a trust walk.

Yurt Circle

• A yurt stays upright because each part is responsible for supporting the whole, with interplay of forces in opposition and in harmony at the same time. This takes group cooperation. Everyone stands in a circle, arms length apart. There needs to be an even number of players. One person starts by saying "In," and the next says "Out" and this keeps going until everyone knows whether they are in or out. On the leader's count of three, all the "Ins" lean in towards the center of the circle while all the "Outs' lean back. It's important to keep your body straight and stiff and your legs wide enough apart so you feel stable. Once the yurt in stable we can try counting to three and having the Ins and Outs switch roles while we continue to hold hands. If we get really good, we can try switching back and forth in rhythm.