

WELCOME TO THE TIME CAPSULE / CHAPARRAL TO OCEAN SCIENCE SCHOOL COMBO PROGRAM

"When we try to pick out anything by itself, we find it hitched to everything in the universe."
John Muir

You and your students are about to embark on a unique program taking you from the Santa Ana Mountains to the Pacific Ocean. During the three days spent at the Time Capsule / Chaparral to Ocean Science School, you and your students will have the opportunity to take an exciting adventure through California history and explore up to five Southern California ecosystems: chaparral, oak woodland, riparian, intertidal, and pelagic.

On the first day of your program, students have the opportunity to investigate the historic grounds of Mission San Juan Capistrano with an Ocean Institute instructor as their guide. Upon transport to the Lazy W Ranch, they settle into their cabins and then continue their exploration of the past. Students learn about the daily life of the Acjachemen Indians, and see how their lives changed after the Spanish began settling and constructing the California missions. At night, students take part in the Rancho economy of Mexican California.

On the second day, the focus switches to California's natural history. Students hike along Hot Springs Creek and up the Los Piños trail to explore the biotic and abiotic factors that make each ecosystem a "living system." They identify plants, collect insects, study microhabitats, and determine how each element fits into a working system of living and non-living parts. On the third and final day, they travel to the Ocean Education Center in Dana Point to investigate the intertidal and pelagic ecosystems found off the coast of California.

Both the Time Capsule and Chaparral to Ocean Science School curriculum is aligned with Content Standards for California Public Schools. Students will develop and exercise the scientific processes, including observing, communicating, inferring, interpreting data, identifying, and classifying.

In order to help you prepare yourself, your class, and your parent chaperones for the upcoming journey, we have provided a teacher materials package. In this package you will find:

- Administrative Preparation Materials
- Administrative Check List
- Program Description
- Links to California Content Standards
- Background Resources
- Classroom Activities

Before embarking on your journey, you will also need the Required Forms, which are available on the Ocean Institute website. These forms include the following packets:

- Teacher Information Packet
- Chaperone Information Packet
- Parent Information Packet

As your program date nears, please review the administrative checklist and program agreement for final preparations before your program. If you have any questions about your visit to the Ocean Institute, please do not hesitate to contact our Outdoor Education Program Director, Sara Ludovise, at 949-496-2274 ext. 344.

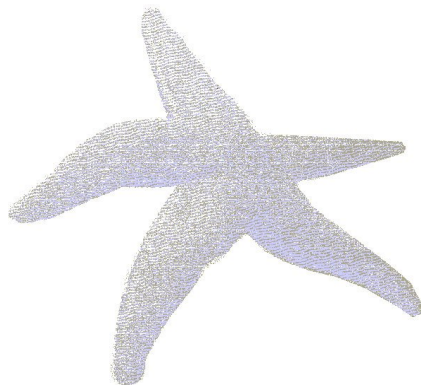
Again, welcome to the Time Capsule / Chaparral to Ocean Science School program. We are looking forward to your visit.

Sincerely,

Rick Baker
Vice President, Education

TABLE OF CONTENTS

WELCOME TO THE TIME CAPSULE / CHAPARRAL TO OCEAN SCIENCE SCHOOL PROGRAM	1
A. ADMINISTRATIVE PREPARATION FOR PROGRAM	3
Administrative Contact / Introduction	3
Teacher Information: Before Your Program / Teacher Information: During Your Program	3
Payment / Final Count / Student Aid / Information Packets	4
Medical Issues	4
Seasickness / Lunch on Day 1 / Meals at the Lazy W Ranch	5
Program Forms	6
Transportation / Directions	7
Parent Chaperone Recruitment / Pre-Trip Parent Meeting	8
Student Preparation / Student Behavior Expectations / Wildlife and Safety Precautions	9
Student Safety Rules on the <i>RV Sea Explorer</i>	10
<i>Chambers Gallery</i> Book and Gift Store / Souvenir T-Shirts	10
B. ADMINISTRATIVE CHECKLIST	11
C. DESCRIPTION OF TIME CAPSULE / CHAPARRAL TO OCEAN SCIENCE SCHOOL	12
Example Program Schedule	12
Program Description	13
D. LINKS TO CALIFORNIA CONTENT STANDARDS	15
E. RESOURCE MATERIALS	17
F. CLASSROOM ACTIVITIES	24
The Way Things Were	24
Recipe for a Fiesta	25
Biotic vs. Abiotic	26
Ecosystem Vacation Destination	33
Vascular and Nonvascular Plants	39
Rules to Live By	48



A. ADMINISTRATIVE INFORMATION AND PREPARATION

ADMINISTRATIVE CONTACT

For questions regarding the Time Capsule / Chaparral to Ocean Science School, please contact:

Sara Ludovise, Outdoor Education Director
Address: 24200 Dana Point Harbor Drive, Dana Point, CA 92629
Telephone Number: (949) 496-2274, extension 344
Fax Number: (949) 248-5557
E-mail: sludovise@ocean-institute.org

INTRODUCTION

Thank you for choosing the Ocean Institute as your field trip destination. We appreciate the time and effort it takes to prepare your students for their program, and we will do everything we can to make their experience as rewarding as possible.

Please make sure that all of the participating teachers have a copy of these teacher materials. The information contained here can help you find answers to your questions, develop your preparation timeline, and prepare both your students and chaperones. This package also contains directions to the Ocean Institute and the Lazy W Ranch as well as contact telephone numbers — please call us at any time with any questions you may have about your field trip!

TEACHER INFORMATION: BEFORE YOUR PROGRAM

There are several things that you can do prior to your arrival at camp that will help your program run as smoothly as possible:

- Review the program goals and expected behaviors with the students before you arrive. Complete the classroom activities with your students, and make sure they have a clear understanding of the educational concepts they will explore during the program
- Spend some time choosing and preparing your chaperones. It is vital that the chaperones are prepared for the program. Review the program goals, station activities, and expected student behaviors with them before you arrive. Make sure that they have a clear understanding of their role as a chaperone.
- Fax the “**Program Information Sheet**” to the Ocean Institute (949-248-5557) at least one month ahead of time, with all necessary dietary and health information.
- Have a signed Acknowledgement of Risk and Waiver and a signed Medical Form for each student and chaperone before boarding the bus.
- Send program payment to the Ocean Institute at least 10 days before the scheduled date of your field trip. Please mail a single check for the total amount of the program minus the deposit you have already paid. **Please make checks payable to Ocean Institute.**

TEACHER INFORMATION: DURING YOUR PROGRAM

Ocean Institute instructors are all well trained to work with students of different ages and abilities. Both you and the adult chaperones can help the instructors monitor student behavior and safety. There are several things that you can do to help facilitate the smooth running of your educational program:

- Work cooperatively with Ocean Institute instructors and your parent chaperones to manage students during the program.
- Work cooperatively with Ocean Institute instructors and your parent chaperones to solve student and chaperone management problems.
- Report any problems (including facilities and management) to the Ocean Institute staff as soon as possible.

PAYMENT

Payment must be received 10 days before your program date. Please mail a **single check** for the total amount of the program (minus the deposit that you have already paid) to:

Ocean Institute
24200 Dana Point Harbor Drive
Dana Point, CA 92629

Please make the check payable to **Ocean Institute**. If your school cannot meet the Ocean Institute's payment policy, please contact your Reservation Coordinator at (949) 496-2274, extension 211.

FINAL COUNT

Call the Ocean Institute at (949) 496-2274, extension 211 before your program if the number of students or adults changes. When you arrive at the Lazy W Ranch for your program, you must have an accurate count of students and adults participating in the program. If the number of participants listed on your Confirmation Form is not accurate, call the Ocean Institute immediately.

STUDENT AID

The Ocean Institute maintains a student aid fund for students who are unable to obtain sufficient funding to attend the program. Please call (949) 496-2274, extension 211 for more information and to receive the necessary forms for student aid.

CAMPER INSURANCE

All campers visiting the Lazy W Ranch are covered by camper day insurance through Cal-Pac Camps. For more information regarding this policy, please contact the Outdoor Education program director at (949) 496-2274 ext. 344.

INFORMATION PACKETS

We have posted separate packets for the teachers, chaperones, and parents on our website (http://www.ocean-institute.org/teacher/fieldtrips/chaparral_ocean_sci.html). These packets contain copies of information and forms that must be completed before arriving for the Time Capsule / Chaparral to Ocean Science School Combo program. **IT IS IMPORTANT THAT YOU ARE FAMILIAR WITH ALL THE INFORMATION AND FORMS FOUND IN EACH PACKET.** These packets are ready to be copied and distributed to the appropriate participants. Information on each of the forms is in the next section.

Please make sure that you provide chaperones with both the Chaperone Information Packet (for themselves) and the Parent Information Packet (for their child).

MEDICAL ISSUES

The teacher-in-charge keeps all medical forms and is responsible for storing and distributing student medications (both prescription and non-prescription). If your school's policy does not allow teachers to handle medications, please contact the program director **immediately** at (949) 496-2274 ext. 344 so that alternate arrangements can be discussed.

Please notify the Ocean Institute in advance of any participant with special dietary or other needs. Please be aware that we do not have a medical doctor or nurse on site, and we do not have housing for sick students. Parents of ill or injured students will be notified immediately and arrangements made for transportation to the hospital or home.

SEASICKNESS

If you are scheduled for a trip on the *RV Sea Explorer* and are concerned about seasickness on board, there are several things that you and your students can do to avoid seasickness on boat programs:

- Eat a good breakfast or lunch before the cruise.
- Take anti-motion medication at least 2 hours before boarding the vessel. We recommend a **non-drowsy** form of Dramamine or Bonine.

LUNCH ON DAY 1

Please make certain that everyone in your group (including students, chaperones, and yourself) brings lunch for Day 1. Separate out or collect the lunches and make certain that they are readily accessible.

Lunch on the first day will be eaten at the Lazy W Ranch upon arrival. All other meals during the program will be provided. Please let Ocean Institute staff know in advance if your school has any particular dietary needs.

MEALS AT THE LAZY W RANCH

Your group will need to bring lunch for Day 1 of your program. All other meals will be provided at the Lazy W Ranch, where they will be prepared by the kitchen staff and served family style.

Although the Lazy W kitchen can accommodate most dietary restrictions (i.e., vegetarians, food allergies), some specific restrictions (vegans, organic foods, extremely strict kosher, gluten allergies) may require guests to bring supplemental food. If you have a question about whether the Lazy W Ranch kitchen can accommodate a specific dietary restriction, please contact the Program Director in advance at (949) 496-2274 ext. 344.

As the teacher, you may select the meals that you would like served during your program. Please indicate your selection on your Program Information Sheet.

Breakfast: (All breakfasts served with cold cereal, milk, juice, and coffee)

- Breakfast Burrito, Salsa & Cheese, Fresh Fruit
- Scrambled Eggs, Bagels, Fresh Fruit
- Pancakes, Sausage, Fresh Fruit
- French Toast, Bacon, Fresh Fruit

Lunch: (All lunches served with punch, chips, and a dessert)

- Grilled Cheese Sandwiches
- Turkey Hot Dogs
- Turkey Sandwiches

Dinner: (All dinners served with salad bar, dessert, milk, and water)

- Make-Your-Own Burritos, Beans, Rice, and Chips and Salsa
- Baked or BBQ Chicken, Rice Pilaf, Steamed Vegetables, and Corn Bread
- Chicken Strips, Macaroni and Cheese, and Steamed Vegetables
- Spaghetti or Lasagna, Green Beans, and Garlic Bread
- Roasted Turkey, Dressing, Mashed Potatoes, Fresh Vegetables, and Dinner Rolls
- Chicken Enchiladas, Rice, Beans, and Salsa
- Chicken Stir Fry, White Rice

If you would like to select meals for your program, your Program Information Sheet must be received at least *ONE MONTH* before your program date. Please be aware that if meal selections are not received on time, the Lazy W kitchen staff will not be able to prepare the requested meal.

Breakfast on Day 3 will be a walking breakfast (Breakfast Sandwiches with egg, cheese, and ham; Fresh Fruit, and Hot Chocolate). Pizza will be served for lunch on Day 3.

PROGRAM FORMS

The following forms are included in the Forms and Information packets that are available on the Ocean Institute website (http://www.ocean-institute.org/teacher/fieldtrips/timecapsule_combo.html). Please make sure that all of the forms are completed before you arrive for the Time Capsule / Chaparral to Ocean Science School Combo Program. Make sure that you use the forms from the packet posted on the website — they are the most updated forms.

- **Program Information Sheet**

The Program Information Sheet should be completed and faxed to the Ocean Institute **at least one month** before your program date. This information will help us prepare for your program. Use this form to request your explorations and inform us of any special needs.

- **Hiking and Cabin Group Forms**

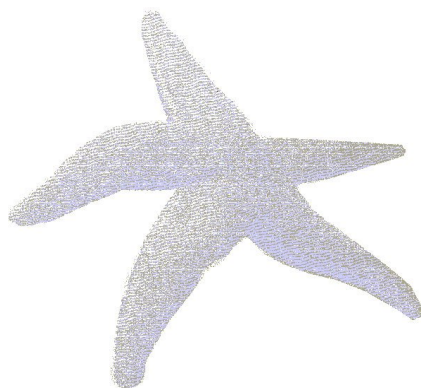
Once you have a final roster of participating students, divide them into hiking and cabin groups. During the program, each hiking group will be assigned to an Ocean Institute instructor who will guide them through their instructional activities. A hiking group consists of 12 – 16 students (mixed genders, please) and one or two adult chaperones. Choose an identifying name for each of the hiking groups (for example: coyotes or dragonflies). A cabin group consists of nine students of the same gender and one adult chaperone. Please be prepared to present the on-site administrator with a copy of the Activity and Cabin Group lists upon arrival.

- **Medical Forms**

You will find **medical forms** in the packets. You must have a completed and signed medical form for each student and adult participating in the Time Capsule / Chaparral to Ocean Science School Program. In order for a child to receive any prescription or non-prescription medication during the program, the Administration of Medication form must be completed and signed by the parent or guardian and the child's physician.

- **Acknowledgement of Risk and Waiver**

Each student must have this form signed by a parent or guardian to participate in the Time Capsule / Chaparral to Ocean Science School Combo Program. Please make sure that you have one signed form for each student, adult chaperone, and teacher when you check in with the Ocean Institute staff. **Participants without a signed form will not be permitted to participate.**



TRANSPORTATION

Student transportation should be arranged well in advance. Please make sure that your bus can drive over the 1½-mile dirt road to the Lazy W Ranch. If your bus cannot do this, call the Ocean Institute as soon as possible to make arrangements for luggage transport. The students must walk the 1½ miles into camp.

The Ocean Institute will schedule transport between the Lazy W Ranch and the Ocean Institute. If you would like to arrange your own transportation, please let us know. We highly encourage schools to bring a U-Haul to transport luggage in order to minimize the amount of times that luggage needs to be loaded or unloaded. Please let us know ahead of time if you will be bringing a U-Haul.

Transportation Schedule for the Time Capsule / Chaparral to Ocean Science School Program

First Day of Program:

9:45 AM	Arrive at Mission San Juan Capistrano and wait
11:00 AM	Leave Mission and head to the Lazy W Ranch
11:45 AM	Arrive at Lazy W Ranch and drop off students

Third Day of Program:

1:30 PM Arrive at the Ocean Institute to pick up students and luggage (without boat program or with an early morning boat program),

OR

3:30 PM Arrive at the Ocean Institute to pick up students and luggage (with boat program)

Please check your PROGRAM AGREEMENT for your scheduled departure time.

DIRECTIONS TO THE MISSION SAN JUAN CAPISTRANO

Address: 26801 Ortega Hwy, San Juan Capistrano, CA 92675

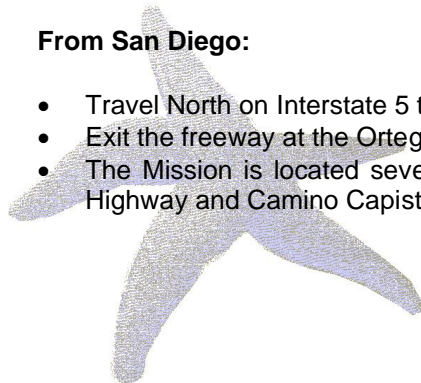
Note: Bus parking at the Mission San Juan Capistrano is located on Camino Capistrano. There is plenty of street parking for cars. The Ocean Institute staff will meet you in front of the Mission when you arrive.

From Los Angeles:

- Travel South on Interstate 5 toward San Juan Capistrano
- Exit the freeway at the Ortega Highway (74) exit and turn right
- The Mission is located several blocks west of the freeway. The entrance is on the corner of the Ortega Highway and Camino Capistrano

From San Diego:

- Travel North on Interstate 5 toward San Juan Capistrano
- Exit the freeway at the Ortega Highway (74) exit and turn left
- The Mission is located several blocks west of the freeway. The entrance is on the corner of the Ortega Highway and Camino Capistrano



DIRECTIONS TO THE LAZY W RANCH

Address: 25832 Hot Springs Canyon, San Juan Capistrano, CA 92623.

Phone Number: (949) 728-0758

- Take Interstate 5 toward San Juan Capistrano.
- Exit the freeway at the Ortega Highway (74) exit and turn left (from north) or right (from south).
- Follow the Ortega highway east for approximately 12 miles.
- Turn left off the Ortega Highway at San Juan Hot Springs Road (just before the San Juan Fire Station).
- Follow the road 1.5 miles until you reach the Lazy W Ranch parking lot (the road dead-ends in the parking lot). Please park on the left against the logs.

Note: You will cross the stream four times as you drive down San Juan Hot Springs Road. The crossings all have concrete bottoms.

DIRECTIONS TO THE OCEAN INSTITUTE

Address: 24200 Dana Point Harbor Drive, Dana Point, CA 92629.

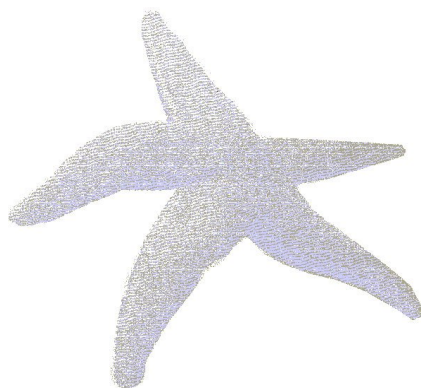
Phone number: (949) 496-2274

Directions from Los Angeles:

- Travel south on Interstate 5.
- Exit on the Pacific Coast Highway Exit.
- Stay in the right lane of the exit ramp and go north on P.C.H.
- Turn left onto Dana Point Harbor Drive.
- The road ends in the Ocean Institute parking lot.

Directions from San Diego:

- Travel north on Interstate 5.
- Exit on the Beach Cities Exit.
- Stay in the left lane of the ramp and go north on P.C.H.
- Turn left onto Dana Point Harbor Drive.
- The road ends in the Ocean Institute parking lot.



PARENT CHAPERONE RECRUITMENT

Your recruitment of chaperones is very important. Their support and enthusiasm are vital to a successful adventure. Chaperones may be teachers, parents, grandparents, college students, or older brothers or sisters of students. They must be at least 18 years old, in good physical condition, and supportive of the Time Capsule / Chaparral to Ocean Science School Combo Program goals.

Each chaperone will be assigned to both a cabin group and a hiking group. You will need at least one chaperone per cabin (each cabin can sleep ten people total), which means that you will need to bring at least one adult for every nine children.

Please meet with your chaperones before your trip to make sure they have a complete understanding of their responsibilities, and distribute the Chaperone Information Packet. The onsite administrator will meet with all of the chaperones at the beginning of the program to address any questions or concerns.

Please remember that the Time Capsule / Chaparral to Ocean Science School experience is designed for the students and that, while parent participation is important, too many parent chaperones can shift the focus of the information away from the students.

PRE-TRIP PARENT MEETING

The Ocean Institute staff is excited to help with your trip preparation in any way that we can. If you would like, we are happy to visit your school to present information to parents about the Time Capsule / Chaparral to Ocean Science School Combo Program and to answer any questions. If you are interested in arranging a presentation, please contact the Ocean Institute at (949) 496-2274, ext. 211.

STUDENT PREPARATION

We have found that the more familiar the students are with program concepts and content before they arrive, the more they will benefit from and enjoy their experience. We have included background information to introduce important concepts to your students before they arrive for their program.

STUDENT BEHAVIORAL EXPECTATIONS

Please take time to discuss the academic nature of their field experience with your students before arriving for your program. During the program, we expect your students to follow the same behavioral rules you have in your classroom.

WILDLIFE AND SAFETY PRECAUTIONS

The Lazy W Ranch is located in the Cleveland National Forest, which is a designated wilderness area. Animal residents of the area that make precautions necessary include mountain lions, bobcats, coyotes, rattlesnakes, scorpions, and bees. While encounters with these animals are rare, both adults and students must be aware of camp policies and procedures. Close supervision of students by the accompanying adults is essential, and strict adherence to the camp rules is necessary.

All teachers, chaperones, and students attending the Time Capsule / Chaparral to Ocean Science School Combo Program must read and understand the following wildlife and safety rules prior to their visit

- All students must remain in close proximity of an instructor or chaperone. Close proximity shall be strictly defined as “visual contact.” Students are never to go anywhere alone. Students will be advised of the “visual contact” rule and the seriousness of compliance.
- Two adults will accompany each activity group. An Ocean Institute instructor will lead the group and a designated chaperone will follow.
- Students and chaperones must stay with their instructor on established trails. On winding and narrow trails the instructor will stop regularly to allow students to catch up. The distance between the instructor and the adult at the end shall not exceed 30 yards.
- At least one chaperone will oversee the recreation area during the recreation periods. At least one chaperone will oversee the cabin and shower areas before and after dinner.
- Food (including gum and candy) is not allowed in the cabins or on the trails.
- Closed-toed shoes must be worn at all times (except for sleeping and showering). Students are required to wear long pants on trails.
- Littering is not tolerated.
- Students may not touch any of the camp animals or pets, including the cats and dogs.
- The stream area is off limits unless accompanied by an instructor during an organized activity.
- Students must remain in their cabins from “lights out” until 7:00 AM, except for bathroom visits. Chaperones must accompany students on night bathroom visits.
- Instructors will carry walking sticks, air horns, and emergency first aid kits on hiking trails. In addition, all instructors are First Aid and CPR certified.
- Cabin raiding is not allowed.
- Students will report any injury or illness to an instructor or chaperone immediately.
- Students are expected to follow established classroom guidelines.

Upon arrival at the program, the on-site administrator will review these rules and guidelines with the students and chaperones. If there are discipline or safety concerns during the program, the on-site administrator will work with the teachers to resolve issues appropriately following the school's normal procedures.

STUDENT SAFETY RULES ON THE *R/V SEA EXPLORER*

The boat portion of the Time Capsule / Chaparral to Ocean Science School takes place on the *R/V Sea Explorer*. An Ocean Institute Floating Laboratory Specialist will review the following safety rules with you and your students.

- Everyone must walk at all times while onboard the *R/V Sea Explorer* — running and horseplay are not permitted.
- Passengers must keep both feet on the deck at all times, and remember to keep one hand on the rail whenever possible.
- Passengers must keep off the upper deck and access ladder, off of the anchor chain, and stay behind the painted yellow lines unless permitted by Ocean Institute instructors.
- Passengers must keep hands off the equipment until instructed to do otherwise.

LAURENA G. CHAMBERS GALLERY BOOK AND GIFT STORE

Chambers Gallery Book and Gift Store is a fun and unique non-profit museum store open daily from 9:00 AM to 5:00 PM and definitely worth the visit. The revenue is directed toward lowering tuition for schools that participate in Ocean Institute programs.

To help accommodate all of the schools that would like to shop each day, please have one teacher from your school check-in with a store staff member before your students begin shopping.

There will be a limit on the number of students allowed to shop at one time and we encourage you to organize them so that they all have time to enjoy the shop. Please have one or two adults in the store to help supervise your students. We ask that all food, drink, and backpacks be left outside while they are shopping. Teachers receive a 15% discount in the shop if members of the Teachers Club and 10% normally.

Please remind your students that sales tax will be added to their items.

In order to ensure a positive experience, we recommend the following:

1. Let the on-site program administrator know if you would like students to have time in the gift store so that they can allow adequate time to shop.
2. All purchases should be stowed safely away and out of sight for the program.
3. Please allow only 10-12 students in *Chambers Gallery* Book and Gift Store at a time. Remaining students should remain outside in a manner that does not interfere with traffic in and out of the building.

CHAPARRAL TO OCEAN SCIENCE SCHOOL SOUVENIR T-SHIRT

Your students can take home more than just knowledge and memories from their Ocean Institute adventure! Chaparral to Ocean Science School t-shirts are available for both students and adults. This comfortable t-shirt features the Science School logo and is *only* available to participants who have completed the program.

Group and individual order forms are included in the Required Forms packet, available on the Ocean Institute website. If you would like to place an order for your school, please combine all individual orders onto one Group Order Form (individual checks are okay!) and fax it to (949) 496-4296. All orders must be received at least six weeks in advance of your program date.

If you have any questions, please contact the *Laurena G. Chambers Gallery* Book and Gift store at (949) 496-2274.

B. ADMINISTRATIVE CHECKLIST

Immediately upon receiving this package...

- Carefully review the Teacher Preparation Package (this document!).
- Mail an information letter to parents to arrange a parent orientation, and make sure to ask for parent chaperones. **If you would like Ocean Institute staff to make a presentation at your parent orientation, please contact us at least 1 month in advance at (949) 496-2274 ext. 211.**
- Arrange your transportation
- Distribute T-shirt information to students and adults

Two months prior to your trip...

- Eighty percent of your funding should be secured.
- Confirm student and adult numbers with the Ocean Institute.
- Arrange for parent chaperones—we require one adult per nine students. See the confirmation form for the cost of each chaperone.
- Fax your T-shirt order 6 weeks before your program to guarantee the requested sizes and a complete order.

One month prior to your trip...

- Distribute Chaperone Information Packets and Parent Information Packets. **KEEP THE MEDICAL FORMS AND THE ACKNOWLEDGEMENT OF RISK FORMS SEPARATE.**
- Begin student preparation.
- Confirm the final number of students and chaperones, as well as any dietary or medical needs, and select your main explorations by filling out the Program Information Sheet. Mail or fax your Program Information Sheet to the Ocean Institute at (949) 248-5557.

Two weeks prior to your trip...

- Mail program payment to the Ocean Institute — **full payment must be received a minimum of 10 days before your program.**
- Collect signed Acknowledgement of Risk and Waiver and signed Medical Forms from each student and chaperone.
- Fill out and sign the Acknowledgement of Risk and Waiver and Adult Medical Form for yourself and any other teachers attending.
- Meet with chaperones to communicate expectations and go over the details of the program.

One week prior to your trip...

- Review behavioral expectations with students.
- Divide students into activity and cabin groups, and complete the activity and cabin group forms.
- Contact the Ocean Institute with any last minute questions or changes.

24 hours to go!!!...

- If inclement weather is expected, contact the Ocean Institute for status of the program. The Time Capsule / Chaparral to Ocean Science School is a rain-or-shine program, but we may make minor adjustments in case of inclement weather.
- Be sure all forms have been collected. Please keep the Acknowledgement of Risk and Waiver separate from the Medical Forms.
- Gather boxes to separate sack lunches for Day One.
- Prepare nametags for students and adults.

When you arrive at the Mission San Juan Capistrano...

- Pass out nametags to the students and adults.
- Check in with the Ocean Institute on-site administrator to give him or her a final count of students and adults. The on-site administrator will collect the Acknowledgement of Risk and Waiver forms from you. You will hold on to the Medical Forms.

C. DESCRIPTION OF THE TIME CAPSULE / CHAPARRAL TO OCEAN SCIENCE SCHOOL COMBO PROGRAM

During the Time Capsule / Chaparral to Ocean Science School Program, students spend three days in a wilderness setting exploring three different time periods and five different ecosystems.

Over the course of their three-day exploration, students will see what life was as a California Indian before and after the Spanish arrived in California. They will step into the shoes of scientists to identify biotic components of different ecosystems and investigate their interactions with abiotic components.

EXAMPLE PROGRAM SCHEDULE

Day 1

9:45 AM	Arrive at Mission San Juan Capistrano
10:00 AM – 11:00 AM	Explore Mission San Juan Capistrano
11:00 AM	Load Bus for Lazy W Ranch
11:45 AM	Arrive at Lazy W Ranch / Orientation / Lunch
1:00 PM	Cabin Orientation
1:30 PM – 3:00 PM	Time Capsule Activity #1: Indian Survival
3:00 PM – 4:30 PM	Time Capsule Activity #2: Spanish Settlement
4:30 PM – 5:30 PM	Supervised Recreation / Showers
5:30 PM – 6:30 PM	Dinner
6:30 PM – 7:30 PM	Supervised Recreation / Showers
7:30 PM -- 9:00 PM	Evening Program: Mexican Rancho Days
9:00 PM	Back to the Cabins
9:30 PM	Lights Out!

Day Two

7:00 AM	Good Morning!
7:30 AM – 8:15 AM	Breakfast
8:15 AM – 9:00 AM	Hike Preparation / Recreation
9:00 AM – 11:00 AM	<i>Ecosystem Investigation #1</i>
11:00 AM – 11:30 AM	Field Notebook
11:30 AM – 12:15 PM	Lunch
12:15 PM – 1:30 PM	Rest and Relaxation
1:30 PM – 3:00 PM	<i>Ecosystem Investigation #2</i>
3:00 PM – 4:30 PM	<i>Ecosystem Investigation #3</i>
4:30 PM – 5:30 PM	Supervised Recreation / Showers
5:30 PM – 6:30 PM	Dinner
6:30 PM – 7:30 PM	Supervised Recreation / Showers
7:30 PM – 9:00 PM	<i>Nocturnal Investigation or Camp Fire Program</i>
9:30 PM	Lights Out

Day Three

6:45 AM	Good Morning!
7:00 AM – 7:30 AM	Clean Cabins and Pack
7:30 AM – 8:15 AM	Breakfast
8:15 AM – 9:00 AM	Clean Camp and Load Buses
9:00 AM – 9:45 AM	Transport to Ocean Institute
9:45 AM – 11:15 AM	<i>Ecosystem investigation #4: Intertidal Ecosystem</i>
11:15 AM – 12:00 PM	Lunch
12:00 PM – 4:00 PM	<i>Ecosystem Investigation #5: Living Systems Lab / Cruise</i>
4:00 PM	Load Bus and Head Home

Please note that this is a sample schedule. Please check your **PROGRAM AGREEMENT** for your departure time.

Day 1: Indian Survival and Spanish Settlement

On the first day of the program, students will learn about California history as they take part in the Time Capsule program. After spending an hour investigating the Mission San Juan Capistrano, they will explore three different time periods upon arrival at camp.

Indian Survival

- **Shelter Building**
Students must locate building materials and use them to construct a shelter as they experience life as a hunter-gatherer and learn how the Acjachemen had to work together to stay alive.
- **Sand Painting**
After viewing an example of a sand painting and discussing its symbolism relative to the Acjachemen creation story, students work in small groups to come up with an Indian legend and create a sand painting to illustrate their story.
- **Oral History Hike**
Students discover why communication and oral tradition were important to the Acjachemen as they teach each other about the uses of native plants.

Spanish Settlement

- **Adobe Brick Construction**
Stepping into the shoes of Juaneño workers, students must overcome a language barrier as they learn how to mix and lay adobe bricks.
- **Grinding Corn**
Students experience the daily life of a Juaneño woman as they grind corn in preparation for dinner on a mission.
- **Making Tortillas**
As they make and sample their own tortillas, students learn about some of the new foods that the Spanish brought to California and discover how life changed for the Juaneños as they shifted from a hunter-gatherer to an agricultural economy.

Evening Program: Teachers may choose between **Rancho Days** or the **Gold Rush Town Meeting**.

Rancho Days

- **The Candle Factory**
Students discuss the Tallow-and-Hide Trade and the cultural change that took place in Alta California following the Mexican Revolution as they hand dip their own candles.
- **Weaving**
Students learn to weave on simple flat looms. They explore the simple technology of the ranchos and analyze how the lifestyle of the Indians changed after Mexico came into power.
- **The Fiesta!**
Students discuss the emerging Mexican culture during a fiesta. Students who correctly answer a question about California history get the chance to swing at a piñata. All the students share the candy when the piñata is broken open.

ECOSYSTEM EXPLORATIONS

During the Chaparral to Ocean Science School portion of the program on the second day, your students complete three "Ecosystem Explorations." Please read the descriptions and select the **three** explorations best suited for your group. Once you have made your selections, enter your three explorations on the

Program Information Sheet in the Teacher Information Packet, and return the form to the Ocean Institute.

- **Chaparral**
Students examine the adaptations of the plants and animals living in the chaparral ecosystem, measure the abiotic factors of the chaparral using a Physical Factor Test Kit, search for evidence of animals, identify plant and animal species, construct a food web to study energy transfer, investigate the concepts behind fire ecology, and study the impact of humans on the chaparral ecosystem.
- **Riparian**
Students identify and examine the adaptations of plants and animals living in the riparian ecosystem, collect and identify insects living in the stream microhabitats, test the water quality using scientific equipment, measure the abiotic factors of the riparian ecosystem using a Physical Factors Test Kit, discover interactions between organisms, and study the impact of humans on the riparian ecosystem.
- **Oak Woodland**
Students examine the adaptations of the plants and animals living in the oak woodland ecosystem, identify plants using a dichotomous key, interact with animals in our Nature Center, measure the abiotic factors of the oak woodland using a Physical Factors Test Kit, study food and water transport inside vascular plants, and study the impact of humans on the oak woodland ecosystem.
- **Riparian / Oak Woodland**
Students combine the riparian and the oak woodland explorations described above, including stream collection and a visit to the Nature Center.
- **Earth Science**
Students search for evidence of tectonic activity while examining the geologic history and makeup of the Santa Ana Mountains. Students will rotate through activities designed to illustrate how plate tectonics have shaped the Santa Ana Mountains in the distant past, and how erosion forces continue to shape the landscape in present day as they identify the geological composition of the Lazy W Ranch.

EVENING ACTIVITY

During the second night of the program, your students will also participate in one of these two additional explorations:

- **Night Hike**
On the first night at camp, students explore the Lazy W Ranch after dark to learn about nocturnal adaptations. Students will make connections to the ecosystems that they explored during the day as they discover how the five senses of nocturnal animals are adapted to help them survive in a vastly different environment.
- **Campfire Program**
On the second night at the Lazy W Ranch, the entire group will participate in a campfire-side celebration of their time at Chaparral to Ocean Science School. Songs and stories from Ocean Institute instructors, as well as skits written and performed by the different cabin groups, make this an experience that students will never forget.

DAY THREE ACTIVITIES

- **Marine Life Refuge Investigation**
After arriving at the Ocean Institute on the third day, students will discover the intertidal ecosystem as they venture into Dana Point's Marine Life Refuge. They will analyze the abiotic factors present in the

tidepools as they encounter the plants and animals that have adapted to survive in this harsh environment.

- ***Living Systems Lab***

At the Ocean Institute, students begin an exploration of the pelagic ecosystem. They discover how aquarists put together an aquarium and test the water to see if it is healthy, dissect a fish to explore its digestive system, and use microscopes to construct an ocean food chain.

- ***Living Systems Boat Program*** (optional)

In this extension of the basic Chaparral to Ocean Science School program, students set out to sea on board the *RV Sea Explorer*. There, they study plankton, analyze a mud sample, and search for other ocean life as they explore the pelagic and benthic ecosystems. **If you would like to add the Living Systems Boat Program to your Chaparral to Ocean Science School, please check your PROGRAM AGREEMENT. Please contact the Ocean Institute at (949) 496-2274 ext. 211 with any questions.**

D. LINKS TO CALIFORNIA SCIENCE CONCENT STANDARDS

All Ocean Institute programs are based around California Content Standards. The activities and investigations that your students participate in during the Chaparral to Ocean Science School Program coincide with the concepts being taught back in your classroom.

Here is a list of the general California Science Content Standards that are included in the Time Capsule / Chaparral to Ocean Science School Combo Program. If there are specific concepts that you would like to see focused on during the program, please contact us in advance. We are happy to adjust the program to meet your needs.

History

4.2 Students describe the social, political, cultural, and economic life and interactions among people of California from the pre-Columbian societies to the Spanish mission and Mexican rancho periods.

1. Discuss the major nations of California Indians, including their geographic distribution, economic activities, legends, and religious beliefs; and describe how they depended on, adapted to, and modified the physical environment by cultivation of land and use of sea resources.
3. Describe the Spanish exploration and colonization of California, including the relationships among soldiers, missionaries, and Indians.
4. Describe the mapping of, geographic basis of, and economic factors in the placement and function of the Spanish missions; and understand how the mission system expanded the influence of Spain and Catholicism throughout New Spain and Latin America.
5. Describe the daily lives of the people, native and nonnative, who occupied the presidios, missions, ranchos, and pueblos.
6. Discuss the role of the Franciscans in changing the economy of California from a hunter-gatherer economy to an agricultural economy.
7. Describe the effects of the Mexican War for Independence on Alta California, including its effects on the territorial boundaries of North America.
8. Discuss the period of Mexican rule in California and its attributes, including land grants, secularization of the missions, and the rise of the rancho economy.

Life Sciences

- 2.a. Students know plants are the primary source of matter and energy entering most food chains.
- 2.b. Students know producers and consumers (herbivores, carnivores, omnivores, and decomposers) are related in food chains and food webs and may compete with each other for resources in an ecosystem.
- 2.c. Students know decomposers recycle matter from dead plants and animals.
- 3.a. Students know ecosystems can be characterized by their living and nonliving components.
- 3.b. Students know that in any particular environment, some kinds of plants and animals survive well, some survive less well, and some cannot survive at all.
- 3.c. Students know many plants depend on animals for pollination and seed dispersal, and animals depend on plants for food and shelter.

Investigation and Experimentation

- 6.a. Students will differentiate observation from inference (interpretation) and know scientists' explanations come partly from what they observe and partly from how they interpret their observations.
- 6.b. Students will measure and estimate the weight, length, or volume of objects.
- 6.c. Students will formulate and justify predictions based on cause-and-effect relationships.
- 6.d. Students will conduct multiple trials to test a prediction and draw conclusions about the relationships between predictions and results.
- 6.e. Students will construct and interpret graphs from measurements.
- 6.f. Students will follow a set of written instructions for a scientific investigation.

E. RESOURCE MATERIALS

CALIFORNIA HISTORY

The Indian Period: Date Unknown - 1500s

The first inhabitants of California were localized Indian tribes who lived on what they hunted and gathered. These tribes were dominated by Spain, by Mexico, and finally by the United States. The Acjachemem Indians lived in the area that was later to become San Juan Capistrano. The Spanish renamed them the Juañeno Indians after they founded the Mission in Indian territory. They were a migratory tribe whose land extended from the sea to the southern continuation of the Sierra Santa Ana Mountains. They depended upon plants, animals, and the land for their survival. Their structures varied from an easily constructed circular brush hut to a temporary lean-to. On the average, villages contained ten to thirty dwellings along the foothills near a stream of water. Because the Indians moved about a great deal to gather seasonal wild plants, their regular villages were occasionally abandoned. Temporary huts were usually built at different hunting grounds or food gathering places.

The Spanish Period: 1500s - 1822

The Spanish began exploring California in the 1500s, but it was not until the late 1700s that missions were established in Alta California. Father Serra founded the first mission in Alta California in 1769 at San Diego. Colonization by mission was chosen because it was inexpensive and did not require much Spanish manpower. The missions were designed to be agricultural and industrial complexes, built, and worked by the local people. They were to be the main method of conversion and assimilation into the Catholic faith and the Spanish citizenry. Spain's original plan was to secularize the missions after ten years of operation. In ten years, they thought the neophytes could be freed from complete supervision, and the lands could be released for other uses. This never happened. In 1821, Mexican revolutionaries won independence from Spain. The news finally reached California in 1822. The province ceased to be a possession of the King of Spain. In 1835, the Church was ordered to give up the mission land that it still held, and much of this land was sold to individual landowners.

The Mexican Period: 1822 - 1848

In 1822, word finally reached California that Mexico had won their independence. Spanish control in North America had ended, and a new government in Mexico was being organized. California was to become a part of the new Mexican Republic. This political change ushered in a time of social and economic change. During this turbulent first half of the 19th century, the large ranchos were established. The new Mexican government granted land, generally carved out of mission land, to individual landowners. The new government also opened the borders of the country to international trade. Because of this, the ranchos played an integral part in supplying the Boston hide trade and, in doing so, opened California to international influences.

Life in an Indian Village

"Prior to the arrival of the Europeans, this state boasted a diverse and rich population. Scholars estimate that 300,000 Indians dwelled in California in AD 1500, with the Great Central Valley hosting more than half. By 1910—about the time Ishi emerged from the wilderness--disease, displacement, massacres, and the destruction of their environment had reduced their number to only 16,000."

Many Californias: Literature from the Golden State, Ed. Gerald Haslem, page 10

The first inhabitants of the area now called San Juan Capistrano were the Acjachemem Indians. They lived in settled villages, each with its own hunting, collecting, and fishing areas. The villages were located on valley bottoms, along streams or the coast near the mountain ranges, and were never totally abandoned at any given time. The shelters of the Acjachemem were domed-shaped, and were made of bent poles and covered with reeds, grass, or bark.

During the year, groups made trips into the surrounding foothills to gather resources that were particular to the area. Some men would go out to quarry rock from the outcrop in a canyon. Several women might travel to a ridge crest to gather basketry materials. Autumn was a good time for women and children to

go into the hills and canyons to collect acorns. People would spend much of the late summer and fall filling the granaries near their houses with acorns, storing them for the rest of the year. Seeds were collected during the summer and stored in baskets in their shelters.

Acorns were the single most important food source for the Acjachemem. Acorns contain a bitter-tasting substance called tannic acid. The Indians removed the tannic acid by leaching the ground acorn meal. The nuts were ground into a fine powder, or meal, using a handstone on a shallow rock. The meal was put into baskets in the sand, and warm water was poured through the powder. The powder was made into biscuits or bread.

There were other kinds of food that were hunted and gathered by the Acjachemem. Deer, rabbit, woodrat, quail, and duck were hunted with bows and arrows or trapped using snares. Coyote, bear, eagle, and raven were not eaten. Manzanita, chia, lemonade berry, pine, and sage seeds were collected. They also ate miner's lettuce, white sage, and yucca blossoms. The women collected most of the plants, while the men did most of the hunting.

Because the Southern California climate was so mild, the Acjachemem wore very little clothing most of the year. Women wore small aprons. The men wore nothing. Sandals were made of yucca fiber. During the colder weather, both men and women dressed in cloaks made of rabbit fur, deer, or otter skin. Jewelry was made of a variety of materials, including bone, clay, stone, or shell.

Children began working alongside the adults while they were still very young. They watched their parents and learned by example. The older women and older girls cared for the youngest children. Stories and games that taught necessary skills and about their culture were an important part of a child's education.

Life at Mission San Juan Capistrano

The ringing of the church bells strictly regulated daily life at Mission San Juan Capistrano. As with all the other California missions, the church bells ushered in each new day, announced all meals, *siestas*, work periods, and signaled the arrival of all parish guests and dignitaries.

The priests would begin their day by rising before dawn to assure that the bells would be rung at sunrise, calling the parish community to worship. All neophytes who were nine years of age and older were expected to attend this early mass. After the service, everyone would gather at the mission kitchen, the *pozolera*, where grace was said, and they were given their ration of *atole*—gruel made of ground corn. The neophytes carried their gruel back to their huts in earthen jars and had 45 minutes to eat their breakfast before they were summoned back to the mission plaza for their work assignments.

The division of labor at the Mission was traditional in nature, and tasks were organized in such a way as to make the most self-sufficient community possible. Young women would spend their days weaving clothing, blankets, and baskets, while the older women were busy making candles and soap from tallow, scraping hides, grinding corn into meal, and crushing olives. The older boys and men were assigned the tasks of picking fruit, weeding and watering the mission gardens, and harvesting the wheat and barley from the mission fields. In addition, the men of the parish were responsible for maintaining, nurturing, and protecting the Mission's cattle, its most important industry.

Cattle provided the community with food, clothing, candles, soap as well as the hides and tallow for trade. The Mission used both hides and tallow to barter for the much-needed supplies that the parish could not produce for itself. It was from the supply and trading ships that the missions got most of their tools, glass, furniture, nails, hardware, cooking utensils, and musical instruments. It is interesting to note that the missions could not legally trade with any ships but those from Spain.

What the missions could not obtain from the ships or other traders, they made for themselves. Each mission was designed as an agricultural and industrial complex with a series of workrooms. The neophytes would make special leather items, adobe bricks and tiles, and forge metal in the mission

furnace. While one of the mission priests was busy working along side the neophytes, the other was teaching the children. All of the children that were between the ages of five and nine were taught in the mission school.

After about three hours of labor, the community gathered for lunch that was generally *pozole*—a stew, made of meat, wheat, beans, corn, peas, and lentils. When lunch was over, everyone settled down for an afternoon *siesta* that lasted until 2:00 PM. From 2:00 until 5:00, the neophytes went back to their work. The priests spent their afternoon visiting the parish ill, praying, studying Latin breviaries, as well as checking mission produce, taking inventory, examining new buildings, and receiving reports from the outlying areas.

At about 5:00 PM, the mission bells summoned everyone back to the Chapel where the congregation recited the rosary and listened to a short homily. Supper was at 6:00, and was generally more *atole*. Supper was followed by several hours of group singing, dancing, socializing, and game playing. At 8:00, the Poor Souls' bell rang, announcing the evening's curfew and the end of another day.

Life on a California Rancho

"A rancho gets his supplies by bartering with 'leather dollars'-cow hides dried, scraped, beaten, and salted at the rancho, and then brought to the Pacific cliffs and hurled to the beach. There sailors load them into their ships' rowboats. Captains collect hides from ranchos and some missions and sell them to boot and shoe factories back in New England."

Story of the Great American West, page 147

In the beginning, the ranchos were used by the Spanish as one way to settle California. Some of the Spanish families that came to California were given land by the king of Spain. Later, the Mexican government granted enormous parcels of land to individual people. According to the Spanish, and later the Mexicans, the land was granted conditionally, which meant that the rancheros did not have to pay for it. Instead, they were required to build a house and use the land for raising animals and crops.

Homes were built out of adobe, which was ideally suited for the Californian climate. They were warm in the winter and cool in the summer. Many of the rancho homes were built around a patio that was used to cook and to host fiestas.

A day on a rancho began with prayer. Everyone went to breakfast after prayer. The Indian women who had been trained at the missions did the cooking. After breakfast, everyone went to work.

The rancho rode out to check his land and cattle. Vaqueros were Indians that were trained by, and released from, the missions to work at the rancho. Every year, the Vaqueros would round up and count all of the cattle on the rancho. This time of year was called the rodeo.

The wealth of a rancho was a matter of cattle. The more cows that one owned, the richer one was. The rancheros used the meat and the hides. The hides were called "leather dollars" and were used to barter for with the ships that came to trade supplies. In exchange for hides and tallow, they gave cloth, tools, window glass, beds, dishes, and much more.

Running the rancho required many servants—one for each of the rancho's children, two for his wife, some to grind corn, and many to prepare the meals. There were washerwomen and a dozen spinners and seamstresses who made cloth from sheep's wool. These were all Indians that came from the missions.

The rancho ruled his family as the eldest male. His son ran the rancho and had many children, but he had to have his father's approval for all major decisions. Children were strictly raised. When they went indoors, they had to ask permission to sit down. There were no schools, so the children learned from watching their parents.

CALIFORNIA ECOLOGY AND NATURAL HISTORY

The Chaparral Ecosystem

The plants and animals of the chaparral ecosystem thrive in the hot dry climate of Southern California. This ecosystem is found on the sunny side of mountains and hills. The soil is rocky and lacks abundant nutrients. The plants in the chaparral remain small, requiring less water than larger plants. Many plants, like chamise, have small leaves to reduce water loss. The leaves of white sage are light colored and reflect strong sunlight. The shrub called toyon has hard waxy leaves that seal in precious water.

Animals that live in the chaparral, like coyotes, mountain lions, and woodrats, survive the hot climate by hunting at night. Some small mammals can get the water they need from their food, rather than drinking. The large ears of rabbits have evolved to dissipate heat (rather than to increase hearing abilities.)

Common Animals

scrub jay
woodrat
red-tailed hawk
wrentit
yucca moth
anna's hummingbird
western rattlesnake

Common Plants

scrub oak
toyon
yucca
chamise
laurel sumac
white sage
dodder

The Riparian Ecosystem

Large trees, moist cool air, and sandy soil characterize the riparian (streamside) ecosystem. These trees, such as the white alder and western sycamore, require a great deal of water to survive. The sycamore has deep roots and can drink 400 gallons of water a day! The roots of the white alder must always be in contact with water for the tree to survive. Many riparian plants, such as blackberry and arroyo willow, have large leaves to help collect sunlight in this shady environment. Mule deer and rabbits will not eat plants like wild rose because of the thorns on the stems.

Animals depend on the stream for many reasons. Raccoons, opossums, and garter snakes are among the animals that search for food and water along the stream. Birds, like the black phoebe and hummingbirds, feed on the plentiful flying insects found around the stream. The young of many of these insects (like dragonflies and caddisflies) develop in the stream and spend their adult lives on land. Other insects, such as the giant water bug and the diving beetle, spend their entire lives in the stream.

Common Animals

pacific tree frog
California newt
black phoebe
raccoon
dragonfly
diving beetle
giant water bug

Common Plants

white alder
blackberry
wild mint
western sycamore
arroyo willow
mule fat
fern

The Oak Woodland Ecosystem

The oak woodland ecosystem is found on the shady side of mountains and hills. The most outstanding feature of this environment is the large coast live oak trees. These enormous trees shade the ground below with a wide canopy of branches. Many of the plants in the oak woodland have adapted to living in

the shade of the oak trees. These plants usually have larger leaves than chaparral plants. The large leaves are an adaptation to the lower amounts of sunlight.

Many animals make their home in the oak woodland. A common reptile is the fence lizard. The sandy color and blotchy pattern help this lizard blend into its environment and avoid predators, like the gopher snake. Red-shouldered hawks hunt for ground squirrels and other small mammals. A ground squirrel can warn other squirrels of a hawk's presence by sending out a high-pitched single note call. Skunks defend themselves by spraying predators with bad smelling oil. Great horned owls, however, can swoop noiselessly down to catch a skunk without being sprayed.

Common Animals

western fence lizard
red-tailed hawk
ground squirrel
raccoon
great horned owl
gall wasp
acorn woodpecker

Common Plants

coast live oak
lichen
poison oak
coffeeberry
milkmaids
horehound
alder

The Intertidal Ecosystem

The intertidal ecosystem is found along the seashore between the highest and lowest of tides. Plants and animals living in this region must survive the force of waves, exposure to air and heat during low tides, and competition for space to live.

Plants of the intertidal are different from terrestrial plants. Most intertidal plants (for example, sea palms, feather boa kelp, and codium) have a rubbery texture well suited to moving with the waves. Plants in the intertidal have no roots. Instead, nutrients are absorbed throughout the entire plant. Many plants in this ecosystem remain extremely small and may appear as "fur" on the rocks.

Animals, like barnacles and mussels actually glue themselves to rocks to survive the force of large waves. These animals, while attached, filter the seawater for microscopic organisms. Crabs are scavengers and eat anything they can find. They avoid waves by hiding in the cracks in rocks. Many clams burrow deep into the sand to avoid being washed away. Like plants, most intertidal animals remain small.

Common Animals

limpet
sea urchin
bat star
chiton
mussel
striped shore crab

Common Plants

feather boa kelp
codium
sea palm
rock weed
coralline algae
sea grass

The Pelagic Ecosystem

The pelagic ecosystem describes the plants and animals that live in the open ocean. The most outstanding physical feature of this environment is the water itself. Plants and animals that live in this environment must adapt to strong currents, sunlight penetration of less than 300 meters, and vast amounts of space.

Most plants in this pelagic ecosystem are microscopic and drift freely with the ocean currents. These plants, called phytoplankton, float near the surface of the water where sunlight is plentiful.

There are a variety of animals found in the pelagic ecosystem. Microscopic animals called zooplankton float in large numbers with the currents. Some animals, like crabs, and barnacles, spend a part of their lives as zooplankton. Jellyfish drift around the ocean capturing small fish in their tentacles. Whales, sea lions, fish, and squid have streamlined bodies to swim against of the ocean currents. Sea lions and mackerel can swim swiftly after their prey.

Common Animals*copepod**jellies**mackerel**common dolphin**sea lion**squid***Common Plants***diatoms**dinoflagellates*

The Way Things Were

Indians told legends to explain the world around them. Read the following legends. What do you learn about the Indians from their legends?

Write a legend that explains one of the following natural events: lightening, fire, changing phases of the moon, earthquakes, or the stars.

AN INDIAN BUTTERFLY MYTH

The Great Spirit created the mountains, the streams, the valleys, and the plains so that there would be a suitable place for people to live when he created them. He created a huge pile of pebbles that were painted with marvelous colors borrowed from the rainbow and scattered them in beds of streams. So moved was the Great Spirit by their beauty that he asked South Wind to breathe life into them. The pebbles that South Wind touched rose slowly and flew away on beautiful rainbow wings to be called Butterflies and Moths. But South Wind missed some of the pebbles. And still they await searchers who seek out the earth's hidden wonders.

THE RAINBOW BRIDGE

The first Chumash people were created on Santa Cruz Island. The Earth Goddess, whose name was *Hutash*, made them from the seeds of a Magic Plant.

Hutash was married to the Sky Snake, the Milky Way. He could make lightening bolts with his tongue. One day, he decided to make a gift to the Chumash people. He sent down a bolt of lightening, and this started a fire. After this, people kept fires burning so that they could keep warm and so that they could cook their food.

After Sky Snake gave them fire, the Chumash people lived more comfortably. More people were born each year, and their villages got bigger and bigger. The island was getting crowded. And the noise that the people made was beginning to annoy *Hutash*. It kept her awake at night. So, finally, she decided that some of the people would have to move off the island. They would have to go to the Mainland, where there were not any people living in those days.

But how were the people going to get across the water to the Mainland? Finally, *Hutash* had the idea of making a bridge out of a rainbow. She made a very long, very high rainbow, which stretched from the tallest mountain on the Santa Cruz Island all the way to the tall mountains near Carpintera.

Hutash told the people to go across the Rainbow Bridge and fill the whole world with people. So the Chumash people started to go across the bridge. Some of them got across safely, but some people made the mistake of looking down. It was a long way down to the water, and the fog was swirling around. They got so dizzy that some of them fell off the Rainbow Bridge, down, down, through the fog, into the ocean. *Hutash* felt very bad about this because she had told them to cross the bridge. She did not want them to drown. Instead, she turned them into dolphins. So the Chumash always said the dolphins were their brothers.

As told by Russell Ruiz to Ros Perry in 1990
Printed in *The Chumash People*

Recipes for a Fiesta

Fiestas were a celebration that was held on a rancho. *Fiestas* included games (*piñatas* and *cascarones*), music, dances, food, and drink. The following are recipes that can be used to make the food for a fiesta.

BUNUELOS

Fried Sweet Tortillas

These unusual sweet treats are formed like cookie balls, pressed out like tortillas, fried like fritters, and served with a sweet syrup.

3 cups flour	1 tbsp. sugar
½ tsp. salt	1 egg
1 tsp. baking powder	½ cup milk
2 cups fat	

Sift flour, baking powder and sugar into a bowl. Add well-beaten egg and milk, a little at a time. Turn onto a well-floured board and knead until elastic. Divide dough into 2-inch balls and roll out into thin cakes about 5 inches in diameter. Prick with fork. Fry in deep fat one at a time until golden in color. Serve with sauce as follows:

1 cup sugar	2 cups water
2 tsp. aniseed	

Bring water and aniseed to a boil. Add sugar, stir until dissolved and boil until slightly thickened.

TAMALES

This recipe has been made in Mexico for centuries and arrived in California via the Spanish explorers and the Mexican colonists. The basic ingredient is masa with a variety of meat or cheese fillings steamed in corn husk wrappers.

5 pounds corn	2 quarts water
2 tbsp. lime	2 tbsp. lard
1 tsp. salt	corn husks

Boil corn in limewater until tender. Wash thoroughly. Mash to mushy consistency and add lard and salt.

Filling:

5 pounds beef	25 green chilies
1 clove garlic, minced	1 pound raisins
1 onion, chopped	1 quart olives, chopped

Cut meat in small pieces, add water to cover, and cook until tender. Steam chilies, remove pulp, and discard seeds and skin. Add pulp, garlic, raisins, onion, and olives to meat. Spread masa on cornhusks, using three leaves for each tamale. Place a large spoonful of meat on the corn layer and roll the husks tightly. Tie both ends with strips of husks. Steam one to two hours.

FRIJOLES

Beans, or *frijoles*, were no more foreign to the Mexican *ranchero* than they are to Mexican food today and they easily found their way into almost every meal, in one form or another. *Frijoles* often refer to the popular pink bean used today, the pinto bean. This recipe is a way to prepare the dried beans.

Pick over 2 cups of pink beans, discarding imperfect ones. Wash well. Place in a deep kettle and add cold water to cover with three inches to spare. Simmer for 3 hours or until beans are soft, adding water when needed to cover beans. Mash beans with fork, leaving part of them whole. If beans are dry, a little broth may be added.

CHAMPURRADO

A TRADITIONAL GRUEL-LIKE Mexican drink is concocted of masa, rich cream, and chocolate.

1 pound masa
1 cup brown sugar
5 cups water
1 square Mexican chocolate, crushed
1 tsp. Crushed cinnamon
¼ tsp. Salt
1 2/3 cups rich cream

Dissolve masa and sugar in water, mix in chocolate, then strain. Add cinnamon and salt, place over low heat and stir until mixture boils. Add cream and simmer for 5 minutes, stirring constantly.

Biotic vs. Abiotic

Group Size: Teams of 3-4, plus individual homework extension

Time: 60 minutes in class, with a homework extension activity

BIG IDEA

Ecosystems are made up of **biotic** (living) and **abiotic** (nonliving) factors. Changes in the abiotic factors in an ecosystem affect whether or not the biotic factors can successfully survive there.

ACTIVITY OVERVIEW

1. Students discover the difference between **biotic** and **abiotic** factors by making observations about mystery objects and classifying them as biotic or abiotic based upon their observations. Using their observations, they then define the terms **biotic** and **abiotic**.
2. For homework, students analyze the **ecosystem** of a room at their house, coming up with a list of biotic and abiotic factors. They predict how changes in an abiotic factor might affect the biotic factors that live in that room.

SCIENCE STANDARDS

Grade 4

- 3.a Students know ecosystems can be characterized by their living and nonliving components.

Grade 6

- 5.e Students know the number and types of organisms an ecosystem can support depends on the resources available and on abiotic factors, such as quantities of light and water, a range of temperatures, and soil composition.

LEARNING OBJECTIVES

Students will be able to:

1. define the terms *biotic* and *abiotic*.
2. identify different abiotic factors that are present in an ecosystem.
3. predict how changes in abiotic factors affect the biotic plants and animals that live in an ecosystem.

MATERIALS

Classroom Investigation

- KWL Chart
- (10) Small boxes
- (10) Mystery objects
- (1) Observation sheet per group

Homework

- (1) *Home Ecosystem* worksheet per student

ADVANCED PREPARATION

1. Prepare a KWL chart for the classroom.
2. Select 10 mystery objects in advance. They should be a mix of biotic and abiotic factors. It is recommended that they be analogous to biotic and abiotic factors found within a real

ecosystem. Some items to use include a bowl of soil, a bowl of water, ice, a high-powered fan, a heating pad, a flashlight, a living plant, live insects (worms or crickets work well), an acorn or seed, a piece of wood, and an animal skin or rabbit foot.

3. Put each “Mystery Object” inside a box. (Shoebboxes work well.) Cut a hole in the box so that students can reach inside without seeing the object. Black cloth can be stapled over the opening to further obscure vision. Label the containers 1-10.
4. Place boxes around classroom on the day of the lesson.
5. Make enough copies of the observation sheet (1 per group) and the *Home Ecosystem* worksheet (1 per student).

PROCEDURE

1. When students arrive, begin by starting the KWL chart. Ask students what they know about ecosystems. What are some examples of different ecosystems? What is found within them? What would they like to know about ecosystems?
2. If it does not come up during the KWL chart, bring up the idea of *biotic* (anything that is living or was once alive) and *abiotic* (anything that is nonliving and has never been alive) factors. Ask students to individually write down a definition of each word, and share these to come up with a class definition. (Some students may still be confused on the definition of biotic and abiotic. Do not worry about getting a precise definition yet – that will come at the end of the lesson!)
3. Give students their challenge: “We are now going to study biotic and abiotic factors in depth, to see if we can come up with a better definition. You will be divided into research teams. Scattered around the room are ten mystery boxes. Each box has a mystery object inside that you will not be able to see. Your research team will be given an observation sheet to complete as you visit each of the ten mystery boxes. When you visit each box, please make two observations about the object inside, guess what it is, and predict whether it is *biotic* or *abiotic*. Do not look inside the box – you must only use your sense of touch to make your observations!”
4. Allow students time to complete the observation. Each group should follow the directions on their observation sheet.
5. At the end of the lesson, bring students back together. Pair up two research teams to compare their observations and share how they classified the biotic and abiotic objects.
6. When the teams have had time to discuss their findings and debate any inconsistencies, go over the classifications of the mystery objects as one entire class. Point out how some (for instance, the flashlight) might represent something different in an ecosystem (sunlight).
7. Tell students that they are now experts in biotic and abiotic factors. Give them the chance to refine or amend the definition of biotic and abiotic that they came up with earlier.

Biotic: Any living or once-living organism or object found within an ecosystem.

Abiotic: Anything found within an ecosystem that is not and never has been alive. This includes wind, sunlight, temperature, etc.

8. Have students apply what they have just experienced by asking them to think of an ecosystem.
 - What are some examples of biotic factors that they might find in an ecosystem? (*Plants, animals, fungi, bacteria, algae, etc.*)

- What are some examples of abiotic factors that they might find in an ecosystem? *(Sunlight, temperature, water, wind, humidity, soil, rocks.)*
- How could some of these abiotic factors affect the biotic factors? What happens if they are taken away? *(Sunlight provides energy for plants to grow and perform photosynthesis, and soil gives them needed nutrients. Plants get water from rain, groundwater, and fog; animals get necessary water from streams. Plants and animals alike have to deal with varying temperatures; ecosystems that are too hot or too cold present challenges that they must adapt to. If necessary abiotic factors vanish or change, it can be devastating to all of the biotic plants and animals that live there.)*

HOMEWORK EXTENSION

Give students a copy of the “Home Ecosystem” worksheet.

For homework, they will be analyzing the “ecosystem” of one of the rooms at their house. They must select a room to analyze and draw a picture illustrating that room. Within the picture, students must then identify biotic and abiotic factors present in the “ecosystem,” and analyze how that ecosystem would change if some of the abiotic factors were altered.

Team Members: _____

Date: _____

Mystery Object Classification: Biotic or Abiotic?

Procedure:

1. Visit each of the mystery boxes around the room.
2. At each box, choose a team member to reach inside and feel the mystery object inside. **Do not look into the box! You may only use your sense of touch.**
3. Make two observations about the mystery object based on what you can feel. Decide if you think that it is *biotic* or *abiotic*. Complete the chart below.

#	Observation 1	Observation 2	Biotic or Abiotic?	What is it?
1				
2				
3				
4				
5				
6				

#	Observation 1	Observation 2	Biotic or Abiotic?	What is it?
7				
8				
9				
10				

Analysis and Conclusions

- What are some examples of *biotic* objects that your team found inside the Mystery Boxes?
- What are some examples of *abiotic* objects that your team found inside the Mystery Boxes?
- What does the word *biotic* mean? What makes something biotic?
- What does the word *abiotic* mean? What makes something abiotic?

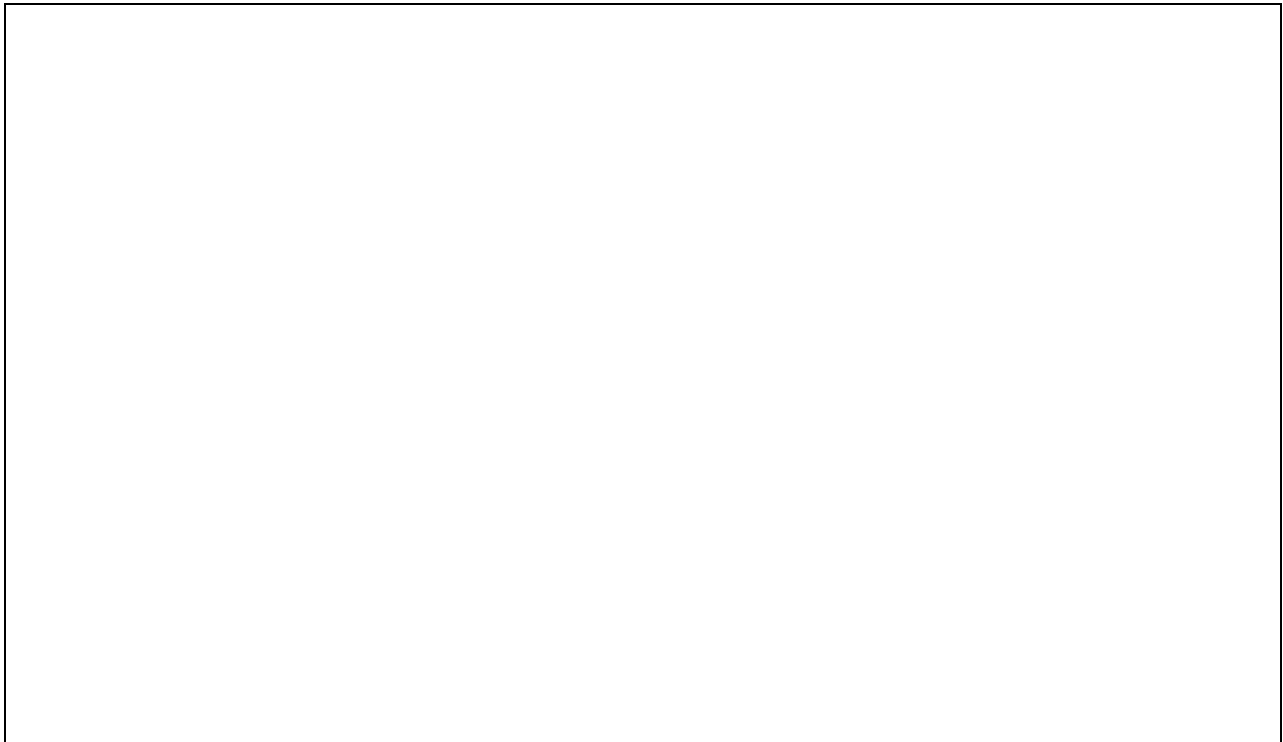
Name: _____

Date: _____

Home Ecosystem

Believe it or not, ecosystems are not just found in the great outdoors! Even the places we visit every day can have their own ecosystem.

Directions: Choose a room in your house to analyze as an “ecosystem.” Draw a picture in the box below showing how it looks. Make sure to show any **abiotic** or **biotic** factors that might be present!

**Abiotic Factors:**

- 1.
- 2.
- 3.
- 4.
- 5.
- 6.
- 7.
- 8.

Biotic Factors:

- 1.
- 2.
- 3.
- 4.
- 5.
- 6.
- 7.
- 8.

Extension Questions

- What is the *temperature* in this ecosystem usually like?
- If the average temperature dropped to 30 degrees Fahrenheit, how would that affect the biotic factors that live in the ecosystem? Predict how they might adapt.
- If the average temperature increased to 115 degrees Fahrenheit, how would that affect the biotic factors that live in the ecosystem? Predict how they might adapt.
- Where is *water* present in the ecosystem?
- If there were a drought and all the water evaporated, what would happen to the biotic factors that live in the ecosystem? Predict how they might adapt.
- Choose another *abiotic factor* that you identified in the ecosystem. Describe a way that it might change. How would that affect the biotic factors that live there? Predict how they might adapt.

Ecosystem Vacation Destination

Group Size: Individual or Teams

Time: Varies; can be done as a homework assignment or during class

BIG IDEA

The most common ecosystems in southern California are the chaparral, the oak woodland, and the riparian. Off the shore lie the intertidal, pelagic, and benthic ecosystems. Each of these ecosystems has distinct abiotic characteristics and different organisms that have best adapted to survive there.

ACTIVITY OVERVIEW

1. Students research one of the ecosystems that they will encounter on their fieldtrip.
2. After completing their research, students design a travel brochure or poster advertising their ecosystem as a vacation destination.

SCIENCE STANDARDS

Grade 4

- 3.b Students know that in any particular environment, some kinds of plants and animals survive well, some survive less well, and some cannot survive at all.

Grade 6

- 5.e Students know the number and types of organisms an ecosystem can support depends on the resources available and on abiotic factors, such as quantities of light and water, a range of temperatures, and soil composition.

LEARNING OBJECTIVES

Students will be able to:

1. describe the basic characteristics of one of the six ecosystems that they will visit on their Chaparral-to-Ocean Science School.
2. explain how the abiotic factors in that ecosystem affect the plants and animals that live there.
3. list specific ways that the native plants and animals have adapted to survive.
4. create a travel brochure or poster that includes accurate information about their ecosystem.

MATERIALS

- (1) *Ecosystem Research Project* worksheet per student
- (1) *Ecosystem Vacation Destination* worksheet per student
- Research materials (library, field guides, internet, background articles, etc.)
- White paper or poster board
- Colored pencils, crayons, etc.

ADVANCED PREPARATION

1. Prepare enough copies of the *Ecosystem Research Project* and *Ecosystem Vacation Destination* worksheets.

2. Gather any background materials that are available for research or make arrangements for students to use computer lab. This assignment can also be started as homework, allowing students to find research materials on their own.
3. Gather any additional supplies for the travel brochure portion of the activity.

PROCEDURE

1. Return to the KWL chart started in the last lesson. Ask students what they have learned about ecosystems so far. What do they still want to know?
2. Tell students that they will now be given the opportunity to begin investigating one of the ecosystems that they will visit on their trip to the Lazy W Ranch (Chaparral, Riparian, Oak Woodland, Intertidal, Pelagic, and Benthic). You may divide them into teams or ask them to research their ecosystem individually.
3. Pass out the *Ecosystem Research Project* worksheets. Give students time to complete their research in the library, at the computer lab, or at home.
4. Once the research has been completed, give students the second part of their challenge: "Now that you have researched an ecosystem, you have been contacted by a company called California Dreamin', a travel company that wants to encourage people to take unique vacations in California. California Dreamin' has asked you to design a travel brochure (or poster) that advertises your ecosystem as a unique travel destination. You must highlight the unique attractions in your ecosystem and create testimonials to convince your classmates to travel there!"
5. Pass out the *Ecosystem Vacation Destination* worksheet to help prompt students. They can work on their project individually or in groups. This can also be assigned for homework.
6. After students have completed the worksheet, give them time to create either a tri-folded brochure or a poster "advertising" their ecosystem to vacationers. Students can also write and perform a commercial to present their work to the class.

Name: _____

Date: _____

Ecosystem Research Project

Ecosystem Name: _____

Where is the ecosystem located?

Circle all of the words that describe the ecosystem:

Hot air	Dry	Rocky	Strong currents	Windy
Cool air	Moist	Muddy soil	Waves	Sheltered
Shady	Wet	Sandy soil	Riverbed	Salty

Add three words of your own: _____

List five abiotic factors found in the ecosystem. Explain in a sentence how each abiotic factor affects the biotic factors (plants and animals) that live there.

- | <u>Abiotic Factor</u> | <u>Effect on Biotic Factors</u> |
|-----------------------|---------------------------------|
| 1. | |
| 2. | |
| 3. | |
| 4. | |
| 5. | |

List four plants that are commonly found in the ecosystem. Describe one way that each plant has adapted to survive in the ecosystem. (Example: Cactus – has thick stems to hold water to help it survive in the dry desert.)

<u>Plant Name</u>	<u>Adaptation</u>
1.	
2.	
3.	
4.	

List three animals, insects, or birds that are commonly found in the ecosystem. Describe what their role is in the ecosystem (Primary Consumer, Secondary Consumer, Scavenger, Decomposer), and one way that each animal has adapted to survive in that ecosystem.

<u>Animal Name</u>	<u>Role in Ecosystem</u>	<u>Adaptation</u>
1.		
2.		
3.		

How have humans affected your ecosystem? Describe any threats to it, and predict what we can do to protect it in the future.

Name: _____

Date: _____

Ecosystem Vacation Destination

You and your ecosystem research team have been contacted by a company called California Dreamin'. California Dreamin' is a travel group that encourages people from around the world to take vacations in California. They have asked you to design a travel brochure to convince vacationers to visit that ecosystem.

Answer the follow questions, and use them to help you put together your brochure. Remember to make everything sound exciting so that people will want to visit!

Choose a title for your brochure:

Write a paragraph describing your ecosystem for vacationers. Describe where it is located, what it looks like, and what the abiotic conditions are like. (Is it hot and sunny so that visitors can get a great tan, or cool and shady so that they can relax by the riverbed?)

Describe the top attraction in the ecosystem. What is the one thing that visitors will want to be sure not to miss?

Describe the plant and animal life in the ecosystem. What exciting biotic factors might visitors see if they come to visit?

Choose an animal that lives in the ecosystem, and write a testimonial from its point of view. Have it explain why that ecosystem is the only place it would want to live. (Example: "Some forest creatures might say the Chaparral is too hot, but I love it here! My nice big ears keep me happy and cool on a scorching summer's day." -- Jackie Jackrabbit)

List 3 "Smart Visitor" tips that vacationers should follow if they visit the ecosystem. What can visitors do to protect the ecosystem and keep it safe?

1.

2.

3.

Vascular and Nonvascular Plants

Group Size: Research Teams

Time: 45 minutes on Day 1, 30 minutes on Day 2

BIG IDEA

Plants can be classified as **nonvascular** or **vascular**, depending on whether or not they have specialized structures to help transport nutrients. Nonvascular plants, like moss, have no specialized structures and instead rely upon osmosis and diffusion to transport materials. Vascular plants have specialized structures (such as xylem and phloem) that aid in transport, allowing them to grow much larger in size.

ACTIVITY OVERVIEW

1. Students experiment with *vascular* and *nonvascular* forms of transportation to investigate how easily the different methods move liquid from one place to another.
2. Students use colored water and plant stems to observe vascular transportation in action and to determine what other factors aid in vascular transportation.

SCIENCE STANDARDS

Grade 5

- 2.a Students know many multicellular organisms have specialized structures to support the transport of materials.
- 2.e Students know how sugar, water, and minerals are transported in a vascular plant.

LEARNING OBJECTIVES

Students will be able to:

1. define the terms *vascular* and *nonvascular*.
2. explain how water and nutrients are transported in a vascular plant, and compare this to the process that occurs in a nonvascular plant.

MATERIALS

Vascular / Nonvascular Race

- (10) Yellow sponges per two teams
- (10) Straws per two teams
- (1) Bowl of water or colored punch per research team
- Masking tape
- Scotch tape or other method of attachment

Vascular Transportation Experiment

- (1) *Vascular Transportation Experiment* sheet per research team
- (2) Plastic cups per research team
- (2) Stem cuttings per research team
- Water
- Blue or red food coloring
- (1) Mixing spoon per group
- (1) Metric ruler per group
- (1) X-ACTO® knife or utility blade (optional)
- Hand lenses or microscopes (optional)

ADVANCED PREPARATION

1. Set out all materials for the Vascular / Nonvascular Race. Each team will get a bowl of water. (If possible, colored punch may work better than water because it is easier to see it travel, but this can get messy and sticky.) Each team will either be given material representing nonvascular transportation (yellow sponges) or vascular transportation (straws and tape).
2. Set up the race course. Two desks pushed together form the “track.” Use the masking tape to mark a starting line on one end, and place the bowl of water behind it. Tape a finish line on the other end of the desk. Students will need to transport the water from the bowl to the finish line without moving the bowl past the starting line. **Make sure not to put too much water in the bowl.** It should be just enough to be siphoned across the finish line using a long straw, but not enough that it will spread to the finish line in a puddle if poured on the table.
3. Prepare stems for the Vascular Transportation experiment. Each group should get two similar stems, one with leaves and one without leaves. Make sure to test the stem types in advance to make sure that they will be effective in the experiment – celery or herbaceous stems often work best!
4. Cut across the stems at a diagonal to ensure a clean opening in the xylem. Do not do this too far in advance, or the stem will start to die and will close up.
5. Set out all of the other necessary equipment for the Vascular Transportation experiment.

PROCEDURE: Introduction and Vascular / Nonvascular Race

1. Tell students that they will soon be visiting the Lazy W Ranch to participate in the Chaparral-to-Ocean Science School. While there, they will learn all about different ecosystems. What are some of the biotic factors that they expect to encounter in the ecosystems? (*Plants and animals.*)
2. Inform the group that at the Lazy W Ranch, they will encounter many different types of plants. Ask them to name the two main categories of plants. (*Vascular and nonvascular.*) Show them the picture of the stream.
 - Which plants in the picture are nonvascular? (*The mosses.*)
 - Which are vascular? (*Everything else – the trees, the grasses, the shrubs, etc.*)
 - What is different between the two different types of plants? (*The vascular plants are much bigger. They have defined parts, like stems, branches, roots, and leaves. Nonvascular plants are much smaller and much more homogenous, like moss. They do not appear to have any specialized parts or structures.*)
3. Tell students that there are more differences between vascular and nonvascular plants than just what they can see. Vascular plants have specialized structures inside their stems to help them transport water, sugar, and nutrients. Nonvascular plants, however, do not have specialized structures. They must rely on the process of diffusion to transport water, sugar, and nutrients throughout the plant.
4. Ask students to predict which method can more easily transport water over long distances: vascular transportation (with specialized structures) or nonvascular transportation (with no specialized structures)? (*Answers will vary.*) Tell students that they will be able to test their predictions by doing an activity.
5. Divide students into their research teams. Pair each team with another. Assign one team to be the “Vascular” team and give them the straws and tape. Assign the other team to be the “Nonvascular” team and give them the sponges.

6. Give them the challenge for the **Vascular / Nonvascular Race**: “Each research team will be given one bowl of water (or punch), set up behind a starting line. You may not move the bowl past the starting line, although you can pick it up. Your challenge is to use your method of transportation to move the water past the finish line. The first team to successfully move the water past the finish line using either Vascular or Nonvascular Transportation wins!”
7. Allow the teams 5-10 minutes to “compete.” The Vascular teams should be able to tape the straws together, and then suck on one end of a giant straw to siphon the water past the finish line. The Nonvascular teams should have trouble getting the water to diffuse very far, even when it is poured on their sponges.
8. After the Vascular teams have won, gather the class back together.
 - Which method of transportation was more effective for transporting water over long distances, vascular or nonvascular? (*Vascular.*)
 - Why can vascular plants like trees can grow so tall, while nonvascular plants like mosses stay fairly small? (*The specialized structures in vascular plants can transport water, nutrients, and sugar over longer distances. The process of diffusion that occurs in nonvascular plants can only transport materials so far!*)

PROCEDURE: Vascular Transportation Experiment

1. Ask students the following question: “You have seen why vascular transportation is so effective, but we have only looked at half the story. In our race, vascular transportation worked better because someone was sucking on the straw at the end. Why does it work in plants?” (*Answers will vary.*)
2. Tell students that we will be investigating vascular transportation in plant stems. Divide them back into the research teams and give them the new challenge: “Your challenge is to follow the experiment procedure to determine what factors affect vascular transportation in plants.”
3. Pass out the necessary materials for the experiment, including the Investigation Worksheet, 2 plant stems, 2 cups, and food coloring. **They should be given one stem without leaves, and one stem with leaves.** Encourage students to follow directions to set up their cups and begin their experiments.
4. At the very end of the day or the next morning, have students measure how far up the stem the colored water has traveled. (They may need to hold it up to the light or slice it open to see. Be prepared to assist with an Exact-o knife.) Let them complete the rest of the Investigation Worksheet.
5. Bring the class back together and lead a discussion to help them apply what they just observed.
 - What is a vascular plant? (*A vascular plant has specialized structures inside of it to help transport sugar, water, and nutrients.*) What is a nonvascular plant? (*A nonvascular plant, like moss, has no specialized structures and relies upon diffusion to help it transport materials.*)
 - Why do vascular plants grow taller than nonvascular plants? (*Vascular systems are more effective at transporting materials over long distances. This allows vascular plants to grow taller, because they can transport water, sugar, and nutrients even in a large plant.*)
 - What did you observe in your experiment? (*The colored water traveled farther up the stem with leaves than it did the stem without leaves.*)
 - Why did the water travel farther in the stem with leaves? (*The leaves have tiny openings called stomata, which connect to the plant’s vascular system. Water evaporates out of the*

*stomata, creating a vacuum pull much like sucking on a straw. This vacuum draws water up the stem more quickly than would occur in a stem without leaves. This process is called **transpiration.**)*

6. **EXTENSION:** If you have extra time, or would like to extend the activity, have the students use Exact-o knives to cut small slivers of their dyed stems. They can use hand lenses or microscopes to observe these slivers up close. The food coloring from the water will clearly show a cutaway of the plant's vascular system.

Vascular and Nonvascular Plants



Which of the plants in this photograph are vascular, and which are nonvascular?

Team Members: _____

Date: _____

Vascular Transportation Experiment

Directions: You will be conducting an experiment to further explore how transportation works in a vascular plant. Observe each plant stem that you have been given for your experiment. When you start your experiment, you will place each stem in a cup of colored water and leaving it there for a fixed period of time. Use your knowledge of vascular plants to make a **prediction** about which stem the water will travel up the farthest in that fixed amount of time.

Testable Question: If each plant stem is put in colored water for a set amount of time, which stem will water travel farther up?

Prediction: I predict that _____

Materials:

- (2) Plastic cups
- (2) stems – one with leaves, one without leaves
- Water
- Mixing spoon
- Food coloring (red or blue)
- Ruler

Procedure:

1. Fill each cup halfway with water. Make sure that the levels are even. There should be the same amount of water in each cup.
2. Add three drops of food coloring to each cup. Mix it carefully with the spoon until it is spread evenly throughout the water.
3. Look at the two stems. Use the ruler to measure their length in centimeters. Record this number below.

Length of Stem with Leaves: _____ cm

Length of Stem without Leaves: _____ cm

4. Observe the physical appearance of the two stems. On the next page, write a physical description of the two stems. If you can, identify the plant species.

Stem	Physical Description
With Leaves	
Without Leaves	

5. Put each stem in a cup of water.
6. After putting each stem in a cup of water, immediately use a clock or wristwatch to check the time. Record this as the “Starting Time” in the Data Chart. Make sure to record whether it is AM or PM.
7. Let one minute pass.
8. Look at the stem, and use the ruler to measure how far the water has traveled up the stem in centimeters. Record this number in your data chart.
9. Wait at least three hours. (Your teacher will tell you how long to wait.)
10. When your teacher tells you that it is time to check your stems again, look at the clock. Record this time as the “Ending Time” in the Data Chart.
11. Take your stems out of the water. Use the ruler to measure how far the water has traveled up the stem in centimeters. (If you cannot see it through the stem, you may need to use a knife to carefully split the stem open to observe the vascular system.) Record this number in the Data Chart.

Data Chart

Stem	Starting Time	Distance Traveled Up Stem	Ending Time	Distance Traveled Up Stem
With Leaves				
Without Leaves				

How many hours did you leave the stems in the water? _____

12. Use subtraction to calculate how far the water traveled up the stem with leaves and the stem without leaves. Subtract the Starting Distance from the Final Distance. Record this number for each stem below.

How far did the water travel up the stem with leaves? _____ cm

How far did the water travel up the stem without leaves? _____ cm

Which stem did the water travel farther up? Was your prediction correct?

13. Share your data with the rest of your class. Take a tally of how many groups saw more water movement in the stem with leaves, and how many saw more water movement in the stem without leaves. Record this overall data in the chart below.

Stem	# of Groups
With Leaves	
Without Leaves	

CONCLUSION

1. For the majority of the class, did the water travel further up the stem with leaves or the stem without leaves?

2. Did your stem come from a vascular plant or a nonvascular plant? How does that particular type of plant transport water?

3. When you observed how far the colored water had traveled up the stems, did you see any evidence of a vascular system? If yes, describe what it looked like.

4. When you participated in the **Vascular / Nonvascular Race** with the straws and sponges, which material represented the vascular plants? Which material represented the nonvascular plants?

5. During the race, what did the vascular plant teams have to do to move the water, aside from just putting the building material together?

6. Based on your observations in this experiment, and the observations of the rest of the class, does the presence of leaves help move water through a plant's vascular system? Why or why not? Why do you think this happens?

Rules to Live By

Group Size: Individual

Time: 30 minutes; can be assigned as homework

BIG IDEA

To keep everyone safe while visiting the Lazy W Ranch, there are specific safety rules that students will need to follow while at camp.

OVERVIEW OF ACTIVITY

1. Students complete a worksheet to familiarize themselves with the safety rules that they will need to follow at the Lazy W Ranch.

LEARNING OBJECTIVES

Students will be able to:

1. Describe the most important Wilderness Safety Rules that they must follow at the Lazy W Ranch.
2. Explain why each rule is necessary to keep them safe.

MATERIALS

- (1) Worksheet per student

ADVANCED PREPARATION

1. Prepare enough copies of the “Safety Rules at the Lazy W Ranch” worksheet.
2. Take time to familiarize yourself with the Safety Rules that must be followed at the Lazy W Ranch so that you can answer any questions that the students might have. If necessary, please feel free to contact the Outdoor Education Program Director with questions!

PROCEDURE

1. Tell students that they will soon be departing on an exciting field trip to the Lazy W Ranch. While at the Lazy W, there are some important safety rules that they must follow.
2. Go over the list of safety rules with them. Talk through each and ask students what they think the reason for each rule is. Emphasize that these rules must be followed to keep them safe while at camp and to ensure that everyone has fun!
3. Pass out the “Safety Rules at the Lazy W Ranch” worksheet. Ask students to fill it out to reinforce the Safety Rules that they must follow while at camp!

Wilderness Safety Rules at the Lazy W Ranch

Visual Contact Rule: All students must remain in sight of an instructor or chaperone at all times.

Buddy Rule: Students must always have another student with them as a “buddy” while at camp. Students may never go anywhere alone.

Sandwich Rule: While hiking on the trail, two adults will accompany each activity group. An Ocean Institute instructor will lead the group (forming the first piece of bread in the “sandwich”) and a designated chaperone will follow at the end of the group (forming the last piece of bread in the “sandwich”). All students must stay between them.

Respect Rule: While visiting the Lazy W Ranch, please remember to be respectful of your fellow students, chaperones, teachers, Ocean Institute instructors, and the Lazy W Ranch itself!

- Students and chaperones must stay with their instructor on established trails.
- Closed-toed shoes must be worn at all times (except for sleeping and showering). Students are required to wear long pants on trails.
- Littering is not tolerated.
- Students may not touch any of the camp animals or pets, including the cats and dogs.
- The stream area is off limits unless accompanied by an instructor during an organized activity.
- Students are expected to follow all established classroom rules while at camp.
- Students must report any injury or illness to an instructor or chaperone immediately.

Cabin Rules at the Lazy W Ranch

- Cabin raiding is not allowed.
- Food (including gum and candy) is not allowed in the cabins or on the trails.
- Only students from the cabin group are allowed in the cabin. Students may not visit cabins other than their own.
- Doors should be kept shut and lights turned off when no one is in the cabin.
- Only the chaperone may operate the heater in the cabin. Please do not set anything on the heater!
- Students must remain in their cabins from “lights out” until 7:00 AM, except for bathroom visits. Chaperones will accompany students on night bathroom visits.

Name: _____

Date: _____

Rules to Live By at the Lazy W Ranch

The Sandwich Rule, the Buddy Rule, and the Visual Contact Rule are the three most important safety rules at the Lazy W Ranch! Match each rule to its definition.

Sandwich Rule	Students visiting the Lazy W must never go anywhere alone. Always make sure that you have a buddy with you!
Buddy Rule	While at the Lazy W Ranch, students must always stay within sight of an adult chaperone or teacher.
Visual Contact Rule	When hiking on the trails, students will be part of a "sandwich." The instructor will be at the front of the line, forming the first piece of "bread." Adult chaperones form the second piece of "bread" at the end of the line. Students must stay behind their instructor and in front of the chaperones.

At the Lazy W Ranch, you must wear closed-toed shoes and long pants at all times. How does this keep you safe?

While at camp, all of the rules from your classroom at school must still be followed. One rule that you will especially want to follow is the **Respect** Rule. Please list five different people, places, or things that you should show respect for while at camp!

1.

2.

3.

4.

5.