

## Teacher Information and Guidelines

### Scientific Method Combo

#### Overview

The Scientific Method Combo program is a multiple-exposure program that combines a field trip and two in-class visits (“Inland Voyages”) which build upon each other to deepen students’ experiences and create opportunities for cross-cutting between concepts. Over the course of these experiences, students gain a more concrete understanding of the scientific process by actively participating in all steps of a scientific experiment.

During every pre-visit students are introduced to the scientific method. They learn about a habitat, observe live animals and artifacts from that habitat, form a question, create a hypothesis, and learn the skills needed to collect scientific data. Students venture out to collect data, which is analyzed during the post-field trip visit in the classroom; students review the data they collected to create a graph, interpret their findings, and present their conclusions to the class.

MSI offers 3 program options that introduce the practice of the scientific method, each option focuses on a different habitat.

#### **Option 1: Discovery Voyage on San Francisco Bay (4<sup>th</sup> Grade and up)**

This option is split between the student’s own school and MSI’s *R/V Robert G. Brownlee*. It consists of a 60-minute introductory Scientific Method program (Inland Voyage) in the student’s own school, a 4-hour hands-on Discovery Voyage aboard our 90-foot research vessel, and a 60-minute Scientific Method Analysis program (Inland Voyage) in the student’s own school.

#### **Option 2: Marsh and Beach Exploration of Pescadero Beach (3<sup>rd</sup> Grade and up)**

This option is split between the student’s own school and Pescadero State Beach. It consists of a 60-minute introductory Scientific Method program (Inland Voyage) in the student’s own school, a 2.5-hour hands-on Marsh and Beach Exploration at Pescadero State Beach, and a 60-minute Scientific Method Analysis program (Inland Voyage) in the student’s own school.

#### **Option 3: Tidepool Expedition at Pillar Point**

This option is split between the student’s own school and Pillar Point. It consists of a 60-minute introductory Scientific Method program (Inland Voyage) in the student’s own school, a 2.5-hour hands-on Tidepool Expedition at Pillar Point, and a 60-minute Scientific Method Analysis program (Inland Voyage) in the student’s own school.

## Option 1: Discovery Voyage on San Francisco Bay (4<sup>th</sup> Grade and up)

### Inland Voyage (in school) Pre-Visit Checklist

- **Please review the invoice.** Note the deposit due date; your deposit must be received by that date in order to hold your reservations. A purchase order will be accepted in lieu of a deposit.
- **Make sure you understand the cancellation policy.**
- **Make sure program balance is paid.**
- **Complete and return the Student Assessment Sheet.** Fax, email, or mail the Student Assessment Form a few days prior to your voyage.
- **Complete and return the Inland Voyage Parking and Set-up Form.** Fax, email, or mail the Inland Voyage Parking and Set-up Form a few days prior to your voyage.
- **Notify MSI if there are any special needs** (e.g. students in wheelchairs or crutches).
- **Use pre-activities and background information.** This helps prepare your students for the visit and can be found on the MSI website [www.sfbaymsi.org](http://www.sfbaymsi.org)

### Inland Voyage (in school) Day-of Visit Checklist

- **School office is aware of where MSI will be setting up and the room/space is available.**

### Discovery Voyage Pre-Visit Checklist

- **Please review the invoice.** Note the deposit due date; your deposit must be received by that date in order to hold your reservations. A purchase order will be accepted in lieu of a deposit.
- **Make sure you understand the cancellation policy.**
- **Make sure program balance is paid.**
- **Arrange for chaperones.** MSI requires the assistance of **one adult per fifteen students.** These adults will assist the students at each station. They do not need to have a science background, but they should be enthusiastic and interested.
- **Complete and return the Student Assessment Sheet.** Fax, email, or mail the Student Assessment Form a few days prior to your voyage.
- **Create list of student groups.** Divide your students into three groups
- **Notify MSI if there are any special needs** (e.g. students in wheelchairs or crutches).
- **Fill out the manifest (emergency phone list)** include both student and adult names and numbers on the form.
- **Use pre-activities and background information.** This helps prepare your students for the voyage and can be found on the MSI website [www.sfbaymsi.org](http://www.sfbaymsi.org)
- **Arrange transportation.** Book buses or arrange for carpools. We recommend booking buses as early as possible to ensure they are available for the times that you need them.

### Discovery Voyage Day-of Visit Checklist

- **Arrive 20 minutes prior to departure.** AM Voyages run from 8:00 am to 12:00 noon. PM voyages run from 1:00 pm to 5:00 pm.

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- **Bring 2 copies of your updated manifest (emergency phone list) on the day of your program.** Include both student and adult names and emergency contact numbers on the form.
- **Dress in layers.** Students will be handling sediment samples and live fish, so their clothes may get wet and dirty. If the forecast calls for rain, please have your students bring rain gear.
- **For safety reasons closed-toed shoes are mandatory for all passengers.** No open toed shoes will be permitted, including on adults.
- **Make sure driver(s) have directions to the dock.** You will find directions to the Institute on our website at: [www.sfbaymsi.org](http://www.sfbaymsi.org) If you will be traveling via carpool to Redwood City, please make sure parent drivers know to park in MSI's dirt lot only, and not in Stanford's lot.
- **Bring non crumbly Snack**

### Post-Visit Checklist

- **Send in Thank You to Sponsors to MSI.** If artwork is involved this also enters the students into MSI's Translating the Tides Competition. See below for more details.
- **Use post-activities** This helps solidify your students grasp of knowledge they gained on the voyage and can be found on the MSI website [www.sfbaymsi.org](http://www.sfbaymsi.org)
- **Make sure program balance is paid.**
- **Book for next year.** We take bookings a year in advance, so book early if you want specific times of year or dates.

## Program Logistics

### Location Considerations

#### Inland Voyage (in school):

The Inland Voyage program is delivered to a school, library or camp by an MSI vehicle, a truck or van that pulls a trailer-mounted, mobile aquarium behind it. Since this unit is both transport and life support for the marine organisms, the programs are presented outside or inside and close to the MSI vehicle. We need an area accessible to the vehicle that is large enough to set up for up to 30 students. This area can be grassy or paved, and shade is always appreciated. If an indoor space is used, it should be accessible without using stairs, have tables and a non-carpeted floor. If the area is separated from recess activities or any other traffic, the students will be more focused and attentive. Ultimately they will get more out of the experience if these factors are considered.

#### Discovery Voyage:

The *R/V Robert G Brownlee* uses 4 different docks. In March-October the ship is docked at the home port in Redwood City, CA. In late October/November the ship is docked at Marina Bay Yacht Harbor in Richmond, CA. The ship moves to Pier 40 in San Francisco, CA in November. The *Brownlee* returns to Redwood City, CA for the month of December. In January and February the ship does a modified Delta Program in Antioch, CA.

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## **Program Length and Student Participation**

### First Inland Voyage (in school):

The program allows one class of up to 30 students to participate at a time. The two instructors will give a 20-minute introduction and then the class will divide into groups, with each group participating in a data collection practice. The program will wrap up with a 10-minute closing discussion. We also schedule a ten-minute window between programs. The ten-minute intermission is essential to the well-being of the animals and enables staff to set-up for the next program.

### Discovery Voyage:

The Discovery Voyage will be a full four-hour program. The program allows a group of up to 45 students, in the 5<sup>th</sup> grade to university level, to participate. We require at least 3 adults, so that each may chaperone one of three groups during the Voyage. In order to keep the activities truly “hands-on”, we must limit the group size to 45 students. The group should be split into 3 cooperative learning groups prior to your arrival. Please have your students wear color-coded name tags for the program.

### Second Inland Voyage (in school):

The program allows one class of up to 30 students to participate at a time. The two instructors will give a 20-minute introduction and then the class will divide into groups, with each group participating in graphing and analyzing the data they collected. The program will wrap up with a 10-minute closing discussion. We also schedule a ten-minute window between programs. The ten-minute intermission is essential for the staff to set-up for the next program.

## **Weather and Clothing Considerations**

### Inland Voyage (in school):

If cold or rainy weather is forecasted, please plan on providing an indoor space for the programs.

### Discovery Voyage:

The weather on the Estuary can change very quickly from one minute to the next. Please warn students to wear clothes that are appropriate for a variety of weather conditions. Layered clothing that can be easily removed and put back on is the best to wear. Let students and adults know they should wear old clothing that they won't mind getting wet and muddy, because salt water and mud may ruin any good clothing. The deck of the ship will be wet, so appropriate rubber soled shoes or boots are recommended. **Sandals, open-toed shoes, or high-heels are not acceptable.** We are on deck for most of the Voyage, so sunscreen and sunglasses are recommended. Caps are not recommended, since the wind may blow them overboard. We are equipped with rain gear for everyone onboard, but students may be most comfortable in their own clothing and gear. For safety reasons, umbrellas are not allowed. Old towels can be brought to dry your hands, but please do not bring paper towels, since they create a lot of garbage.

## **Snack and Lunch**

### Inland Voyage (in school):

Because of the short duration of the presentations, there is no time for snack or lunches to be scheduled during the presentation. When scheduling your Inland Voyage program, please schedule around recesses and lunches.

**RESTRICTION:** For the animal's safety, no hand sanitizer or food near the animals.

### Discovery Voyage:

Snack time is available if you speak with the crew before the program begins. It is best if the snack is separated from the rest of their belongings so it is easy to access. Teachers may supply a **group snack** for their students during the program on the ship. MSI also recommends that each student brings a bottle of water. We require non-messy food that is easy to eat and is not crumbly (please **do not** bring chips, crackers, crunchy granola bars, etc.). There is not time for lunch during the voyage but you can have lunch on land after a morning trip or before an afternoon trip. Space is available for your class to eat lunch on the grounds of the Institute. MSI has a no trash policy, so please encourage your students to bring "no trash lunches". MSI does not have the facilities to accommodate all the trash generated by participating students so please bring a plastic bag so you can take any garbage back with you. If needed a garbage bag can be requested from the Institute.

**RESTRICTION:** No hand sanitizer, no food near animals(the only eating area is inside the main classroom).

## **Sponsor Acknowledgement and Translating the Tides**

Translating the Tides is a creative contest run by Marine Science Institute (MSI) for students in grades kindergarten through college who participate in MSI's hands-on marine science education programs. Translating the Tides is a wonderful opportunity for students to express, in their own voices and styles, what they have learned and what they want others to know about our aquatic environments. All submissions count as sponsor acknowledgement. Winning entries are selected and may be published on the MSI web site, in our newsletter BayLines, on our monthly desktop calendar and other promotional materials. For more details see [www.sfbaymsi.org/translating-the-tides](http://www.sfbaymsi.org/translating-the-tides)

## **Role of Assisting Adults**

### Inland Voyage (in school):

In order to keep program costs at a minimum, we require the participation of at least one classroom teacher or adult. Each group of students will be working with one instructor and any available adults. At each station, the groups will break into smaller groups to study individual organisms. Our method of teaching is to ask thought-provoking questions that will lead students to their own answers. We ask that adults do not provide answers to the students, but let them discover the answers on their own.

### Discovery Voyage:

Minimum number of adults is 3 and maximum number of adults is 10 for the voyage. For safety reasons and in order to keep costs at a minimum, we require the participation of all adults on the Voyage. We ask that you choose chaperones who will help motivate and excite the students. The role of the adults will be to assist in maintaining group continuity and to help

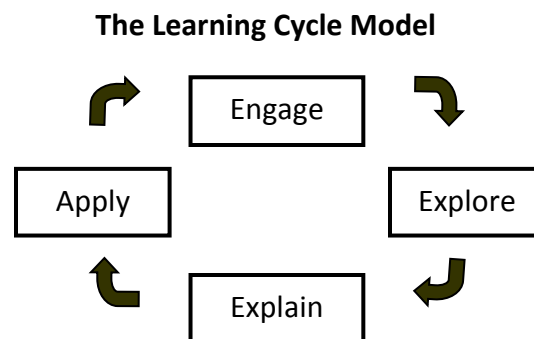
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keep students on task. At each station, the group will break into three or four smaller groups to study the individual organisms. At least one adult will be assigned to each group to actively assist their students in observing, identifying, classifying and analyzing the organisms through the use of keys and charts. Our method of teaching is to ask thought-provoking questions that will lead the students to their own answers. We ask that adults do not provide answers to the students, but let them discover the answers on their own. Adults will also assist with overall group organization and safety. All adults will be briefed by our Captain at the beginning of the program.

### **Student Assessment and Learning Cycle**

Since 1970, MSI has tailored science activities to meet the needs of teachers' curriculum. Students and teachers present themselves to our programs with a wide range of interdisciplinary science understandings and skills. Our marine science educators are specially trained to teach all ages with interesting and innovative methods that encourage interaction and problem solving. We encourage you to tailor your program by telling us about a particular theme that your class has been studying. Please fill out the Student Assessment Sheet you received to let us know.

MSI has modified our working educational philosophy to respond to this broad range and to help teachers and students get the most from our programs. What you do before, during, and after the day of the program will determine to a very large extent how strong a partner MSI will be in helping you meet your learning objectives. As you plan a visit to MSI, please consider how this opportunity fits within your overall instructional objective. What learning outcomes do you desire from this experience? How well is the class positioned to move your desired outcomes toward a reality? Please use the following description of the learning cycle to assess your students.



**Engage – Students are just beginning to generate interest in marine science.**

*“The MSI program will be the hook from which I launch my unit and introduce my class to the excitement of marine science. I’m willing to come into this trip a bit cold...my main objective is to generate curiosity and get the students raising questions.”*

**Explore – Students are ready to actively experience, form predictions, and make observations.**

*“My students are already hooked on marine science. I’m bringing them to the MSI program with basic understandings and tools... They know a bit about the Bay and are ready to actively*

*explore it. My objectives are for my students to make observations and to collect and record data. I'd like to see them make informed predictions and to begin framing their own critical questions."*

**Explain – Students have been developing understanding for some time, and are now ready to speak the language of marine science.**

*"By the time we participate in our MSI program my students will have conducted serious investigations of topics related to the San Francisco Bay. My objective is to see them using the language of marine science... I'd like them to begin exploring important concepts and to comprehend and analyze other explanations."*

**Apply – Students have a mature understanding of marine science, perhaps including aspects that are far afield from the San Francisco Bay area, and now are ready to relate that knowledge to their own backyard.**

*"My group has a good handle on the major learning objectives I have set for marine science. MSI's program is going to provide new scenarios for them to consider and address. My objective is to see my students using and applying their new knowledge in a different context."*

## **Scientific Method Combo Discovery Voyage Program Description**

The Scientific Method Combo Discovery Voyage Program includes an in-class introductory visit, a voyage aboard Marine Science Institute's research vessel, and an in-class analysis visit. In the first classroom visit students are introduced to the scientific method and practice identifying and taking data on live fish. During the 4 hour voyage students study plankton, invertebrates, and fishes using scientific methods and tools. The Discovery Voyage program focuses on the fish populations in San Francisco Bay. Students gain a sense of connection to this habitat and understand patterns of change that influence life in the bay. The culmination of the program is the second classroom visit where the students graph and analyze the data the collected and present their findings to the class.

### **Program Objectives**

- To provide an exciting educational experience that shows students how marine biologists study in the field; i.e. using oceanographic equipment such as an otter trawl and mud grab; identifying and analyzing live specimens.
- To relate physical and behavioral adaptations of marine invertebrates to this unique environment called an estuary.
- To emphasize how all the living organisms are interconnected in the marine food web, and also how they relate to the physical environment.
- To gain an understanding, appreciation, and respect for marine ecosystems, and understand the special responsibilities of humans in the natural world.
- To gain a basic understanding of the principles of the scientific method and how they relate to hands on research.

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## **Arrival Times**

### Discovery Voyage:

Two, four-hour Voyages are scheduled on most days. They depart from the dock at 8:00 a.m. and 1:00 p.m. (Exception being programs run from the Antioch dock.) We suggest you plan to be at the dock 20-30 minutes prior to departure to allow time for using the shore restroom, getting into lifejackets, and if on an afternoon voyage eating lunch on shore. There will not be time to eat lunch during the program.

The ship has one head (toilet). Due to the nature of marine heads, sometimes it does not work. We have emergency plans as necessary for problems, but we urge you and your group to use the toilet on land before boarding. Please let your students know this beforehand, so if your group is running late, they know to get off the bus and head immediately to the restrooms.

## **About the Research Vessel**

- The *R/V Robert G. Brownlee* is a 90-foot research vessel that is documented and inspected by the U.S. Coast Guard as an OCEANOGRAPHIC VESSEL.
- The Captain is licensed by the U.S. Coast Guard for 100-ton vessels.
- All instructors have been trained as deck hands; handling the lines is part of their duties.
- The Institute carries liability insurance in excess of School District requirements.
- A more than adequate supply of life jackets is kept on board, including plenty for both youths and adults. The introductory talk explains the procedures for when and how to put them on.
- Motion sickness medication that causes drowsiness is not recommended; the *Brownlee* is large enough so that it does not roll much during normal weather. If someone becomes queasy during the Voyage, a few soda crackers will usually suffice.

**THERE IS NO SMOKING ABOARD THE SHIP!!**

## **Rescheduling**

### Discovery Voyage:

Generally, the boat operates regardless of the weather. Rain gear is available for everyone. The Voyage will be rescheduled at no additional cost to the school if we have to cancel the program before the boat leaves the dock. Program cancellation will be at the Captain's discretion. If the Captain decides to return to the dock early due to unsafe weather conditions on the Bay, we will continue the program at the dock.

## **Program Format**

### First Inland Voyage (in school):

Students prepare to study fish populations by gaining background information and practicing identification and measuring procedure using live fishes. They complete the first steps of the scientific method: question, research, and hypothesis. The instructors will lead an introduction to the scientific method and to the procedures that will be used to study the fish populations in San Francisco Bay. The students will then be broken into small groups to practice the data

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collection methods on live fish. The visit will conclude with a review of the different steps in research and of what to expect in the next phase of the Discovery Voyage.

### Discovery Voyage:

The Scientific Method Combo Discovery Voyage program is set up with three main stations: Ichthyology, Plankton Ecology/Hydrology and Benthic Ecology. After an introduction, the group will divide in three groups (each with one instructor), and go to one of the stations. After rotating through the three approximately 55-minute stations, a closing activity helps students apply all the new information they have learned. Throughout the program MSI instructors and adults will provide guidance and encouragement. Students can expect to handle and touch a variety of organisms as part of their observations.

### *Station Overview*

#### Introduction:

Students will be briefed on safety procedures and some facts about the San Francisco Bay Estuary. The scientific method will be reviewed and the students will be asked to think about why the Estuary is vitally important to the fish and wildlife in the area. Also discussed is our location, the program format, and the boat layout.

#### Ichthyology (Fish) Station:

Students deploy a 16-foot otter trawl (fish net) to catch fish. The students then collect data according to the procedure practiced during the first in-class visit. This part of the program completes the hypothesis testing, data collection, experiment, and procedure part of the scientific method.

#### Benthic Ecology (Mud/Invertebrate) Station:

Students deploy a Peterson benthic grab to gather a bottom sediment sample. The sample is rinsed through screens to wash away sediment, leaving invertebrates to be collected and placed in buckets for closer study. Concepts about the invertebrates such as adaptations for predator/prey relationships, food strategies, or origin are introduced. The group breaks into smaller work groups.

#### Plankton Ecology Station Hydrology Station:

Students collect a plankton sample and examine it under a video microscope. Students collect top and bottom water samples, and analyze physical factors such as salinity, temperature and density.

#### Closing:

This time will be spent consolidating the data they collected so that it can be brought into the classroom for further analysis.

\*Snack time is available during the hydrology station if you speak with the crew before the program begins. All of the students must have a snack with them. We encourage non-messy food that is easy to eat and is not crumbly (please **do not** bring chips, crackers, crunchy granola bars, etc.)

### *Possible Timeline*

- 7:40 or 12:40 Arrival: Group uses restrooms, and prepares to board the ship. Chaperones are briefed on their role in the program.
- 8:00 or 1:00 Students board vessel and assemble in main cabin. Introduction
- 8:55 or 1:55 First Station begins
- 9:50 or 2:50 Second station begins.
- 10:45 or 3:45 Third station begins.
- 11:40 or 4:40 Closing begins:
- 12:00 or 5:00 Ship arrives back at the dock.

### Second Inland Voyage (in school):

In the culminating experience, Marine Science Institute instructors return to the classroom to lead students in analyzing the data collected during their Discovery Voyage. Students develop graphs to represent their data and make presentations to their classmates, completing the scientific method with data analysis, conclusion, and communication.

## **Option 2: Marsh and Beach Exploration of Pescadero Beach (3<sup>rd</sup> Grade and up)**

### **Inland Voyage (in school) Pre-Visit Checklist**

- **Please review the invoice.** Note the deposit due date; your deposit must be received by that date in order to hold your reservations. A purchase order will be accepted in lieu of a deposit.
- **Make sure you understand the cancellation policy.**
- **Make sure program balance is paid.**
- **Complete and return the Student Assessment Sheet.** Fax, email, or mail the Student Assessment Form a few days prior to your voyage.
- **Complete and return the Inland Voyage Parking and Set-up Form.** Fax, email, or mail the Inland Voyage Parking and Set-up Form a few days prior to your voyage.
- **Notify MSI if there are any special needs** (e.g. students in wheelchairs or crutches).
- **Use pre-activities and background information.** This helps prepare your students for the visit and can be found on the MSI website [www.sfbaymsi.org](http://www.sfbaymsi.org)

### **Inland Voyage (in school) Day-of Visit Checklist**

- **School office is aware of where MSI will be setting up and the room/space is available.**

### **Marsh and Beach Exploration Pre-Visit Checklist**

- **Please review the invoice.** Note the deposit due date; your deposit must be received by that date in order to hold your reservations. A purchase order will be accepted in lieu of a deposit.

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- **Make sure you understand the cancellation policy.**
- **Make sure program balance is paid.**
- **Arrange for chaperones.** MSI requires the assistance of **one adult per ten students.** These adults will assist the students in each group. They do not need to have a science background, but they should be enthusiastic and interested.
- **Complete and return the Student Assessment Sheet.** Fax, email, or mail the Student Assessment Form a few days prior to your voyage.
- **Create list of student groups.** Divide your students into groups. Two groups for 1-30 students, three groups for 31-45 students, and four groups for 46-60 students.
- **Notify MSI if there are any special needs** (e.g. students in wheelchairs or crutches).
- **Use pre-activities and background information.** This helps prepare your students for the voyage and can be found on the MSI website: [www.sfbaymsi.org](http://www.sfbaymsi.org).
- **Arrange transportation.** Book buses or arrange for carpools. We recommend booking buses as early as possible to ensure they are available for the times that you need them.

### Marsh and Beach Exploration Day-of Visit Checklist

- **Arrive 20 minutes prior to the start of your program.** This allows time to use the restrooms and have a snack before your program begins. The beach is approximately a 15 minute walk from the parking lot, so all students are encouraged to use the bathroom on site before the program begins.
- **Dress in layers.** Students will be exploring the marsh and beach habitats on the coast. The coast is often colder than inland areas, so please encourage students to wear layers. If the forecast calls for rain, please have students bring rain gear.
- **For safety reasons, close toed shoes are mandatory.** Because students will be hiking through the marsh, closed toed shoes are required.
- **Make sure driver(s) have directions to Pescadero State Beach.** You will find directions to the Pescadero State Beach parking lot on our website at: [www.sfbaymsi.org](http://www.sfbaymsi.org).
- **Bring snacks and lunches if you plan on eating on site.** If you would like a snack break during your program, please notify the instructional staff at the start of the program so that they can add it to the schedule.
- **Bring a trash bag.** There are trash cans in the parking lot, but Pescadero State Beach does not have any trash receptacles near the beach. If you plan on eating lunch on the beach, please have students pack their own trash, or bring a trash bag to bring trash back to the parking lot.

### Post-Visit Checklist

- **Send in Thank You to Sponsors to MSI.** If artwork is involved this also enters the students into MSI's Translating the Tides Competition. See below for more details.
- **Use post-activities.** This helps solidify your students' grasp of knowledge they gained on the voyage and can be found on the MSI website [www.sfbaymsi.org](http://www.sfbaymsi.org).
- **Make sure program balance is paid.**
- **Book for next year.** We take bookings a year in advance, so book early if you want specific times of year or dates.

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## Program Logistics

### **Location Considerations**

#### Inland Voyage (in school):

The Inland Voyage program is delivered to a school, library or camp by an MSI vehicle, a truck or van that pulls a trailer-mounted, mobile aquarium behind it. Since this unit is both transport and life support for the marine organisms, the programs are presented outside or inside and close to the MSI vehicle. We need an area accessible to the vehicle that is large enough to set up for up to 30 students. This area can be grassy or paved, and shade is always appreciated. If an indoor space is used, it should be accessible without using stairs, have tables and a non-carpeted floor. If the area is separated from recess activities or any other traffic, the students will be more focused and attentive. Ultimately they will get more out of the experience if these factors are considered.

#### Marsh & Beach Exploration:

There are three Pescadero State Beach parking lots. The Marsh and Beach program departs from the central parking lot. Please make sure that you understand where the parking lot is located and that all drivers have directions to the correct location. You will find directions to the Institute on our website at: [www.sfbaymsi.org](http://www.sfbaymsi.org). There is one toilet located in the parking lot. Please advise your students to use the restroom before the program starts, because there are no restroom facilities once they walk out to the marsh and beach areas. There are trash cans in the parking lot, but Pescadero State Beach does not have any trash receptacles near the beach. Because of the exposed coastal location, Pescadero State Beach is often colder and breezier than much of the Bay Area.

### **Program Length and Student Participation**

#### First Inland Voyage (in school):

The program allows one class of up to 30 students to participate at a time. The two instructors will give a 20-minute introduction and then the class will divide into groups, with each group participating in a data collection practice. The program will wrap up with a 10-minute closing discussion. We also schedule a ten-minute window between programs. The ten-minute intermission is essential to the well-being of the animals and enables staff to set-up for the next program.

#### Marsh & Beach Exploration:

This program is two and a half hours long and is for grades 3 and up. The Marsh and Beach program can accommodate up to 60 students, who will be split into smaller learning groups in order to work more closely with the instructors. Please divide your students into smaller groups prior to your arrival. Two groups for 1-30 students, three groups for 31-45 students, and four groups for 46-60 students. Think about cooperative working groups and learning levels when dividing your class. Please have your students wear name tags for this program.

### Second Inland Voyage (in school):

The program allows one class of up to 30 students to participate at a time. The two instructors will give a 20-minute introduction and then the class will divide into groups, with each group participating in graphing and analyzing the data they collected. The program will wrap up with a 10-minute closing discussion. We also schedule a ten-minute window between programs. The ten-minute intermission is essential for the staff to set-up for the next program.

### **Weather and Clothing Considerations**

#### Inland Voyage (in school):

If cold or rainy weather is forecasted, please plan on providing an indoor space for the programs.

#### Marsh & Beach Exploration:

Students will be working as scientists in the field. They should wear clothing and closed-toed shoes that they do not mind getting wet. If the forecast calls for rain, please have students bring rain gear - we will conduct programs rain or shine. Even if it is warm and sunny in most of the Bay Area, it is often cool and cloudy on the coast. Layered clothing, windbreaker, hat, and sunscreen are recommended.

### **Snack and Lunch**

#### Inland Voyage (in school):

Because of the short duration of the presentations, there is no time for snack or lunches to be scheduled during the presentation. When scheduling your Inland Voyage program, please schedule around recesses and lunches.

**RESTRICTION:** For the animal's safety, no hand sanitizer or food near the animals.

#### Marsh & Beach Exploration:

If you would like a snack break either before or during your program, please notify the instructional staff at the start of the program so that they can add it to the schedule. There are trash cans in the parking lot, but Pescadero State Beach does not have any trash receptacles near the beach. If you plan on eating lunch on the beach, please have students pack their own trash, or bring a trash bag to bring trash back to the parking lot.

### **Sponsor Acknowledgement and Translating the Tides**

Translating the Tides is a creative contest run by Marine Science Institute (MSI) for students in grades kindergarten through college who participate in MSI's hands-on marine science education programs. Translating the Tides is a wonderful opportunity for students to express, in their own voices and styles, what they have learned and what they want others to know about our aquatic environments. All submissions count as sponsor acknowledgement. Winning entries are selected and may be published on the MSI web site, in our newsletter BayLines, on our monthly desktop calendar and other promotional materials. For more details see [www.sfbaymsi.org/translating-the-tides](http://www.sfbaymsi.org/translating-the-tides)

## **Role of Assisting Adults**

### Inland Voyage (in school):

In order to keep program costs at a minimum, we require the participation of at least one classroom teacher or adult. Each group of students will be working with one instructor and any available adults. At each station, the groups will break into smaller groups to study individual organisms or practice collection techniques. Our method of teaching is to ask thought-provoking questions that will lead students to their own answers. We ask that adults do not provide answers to the students, but let them discover the answers on their own.

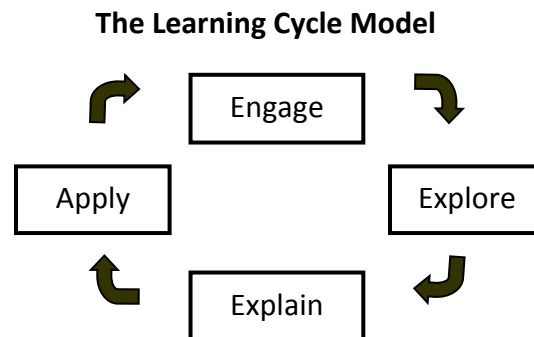
### Marsh & Beach Exploration:

For safety reasons, we require the participation of one adult per group of students. It is most helpful if the assisting adults/chaperones help monitor safety and keep all of the students together in a group with their instructor. Our method of teaching is to ask thought-provoking questions that will lead students to their own answers. We ask that adults do not provide answers to the students, but help them to discover the answers on their own. All adults will be briefed by our instructors at the beginning of the program.

## **Student Assessment and Learning Cycle**

Since 1970, MSI has tailored science activities to meet the needs of teachers' curriculum. Students and teachers present themselves to our programs with a wide range of interdisciplinary science understandings and skills. Our marine science educators are specially trained to teach all ages with interesting and innovative methods that encourage interaction and problem solving. We encourage you to tailor your program by telling us about a particular theme that your class has been studying. Please fill out the Student Assessment Sheet you received to let us know.

MSI has modified our working educational philosophy to respond to this broad range and to help teachers and students get the most from our programs. What you do before, during, and after the day of the program will determine to a very large extent how strong a partner MSI will be in helping you meet your learning objectives. As you plan a visit to MSI, please consider how this opportunity fits within your overall instructional objective. What learning outcomes do you desire from this experience? How well is the class positioned to move your desired outcomes toward a reality? Please use the following description of the learning cycle to assess your students.



**Engage – Students are just beginning to generate interest in marine science.**

*“The MSI program will be the hook from which I launch my unit and introduce my class to the excitement of marine science. I’m willing to come into this trip a bit cold...my main objective is to generate curiosity and get the students raising questions.”*

**Explore – Students are ready to actively experience, form predictions, and make observations.**

*“My students are already hooked on marine science. I’m bringing them to the MSI program with basic understandings and tools... They know a bit about the Bay and are ready to actively explore it. My objectives are for my students to make observations and to collect and record data. I’d like to see them make informed predictions and to begin framing their own critical questions.”*

**Explain – Students have been developing understanding for some time, and are now ready to speak the language of marine science.**

*“By the time we participate in our MSI program my students will have conducted serious investigations of topics related to the San Francisco Bay. My objective is to see them using the language of marine science... I’d like them to begin exploring important concepts and to comprehend and analyze other explanations.”*

**Apply – Students have a mature understanding of marine science, perhaps including aspects that are far afield from the San Francisco Bay area, and now are ready to relate that knowledge to their own backyard.**

*“My group has a good handle on the major learning objectives I have set for marine science. MSI’s program is going to provide new scenarios for them to consider and address. My objective is to see my students using and applying their new knowledge in a different context.”*

## **Scientific Method Combo Marsh and Beach Exploration Program Description**

The Scientific Method Combo Marsh and Beach Exploration Program includes an in-class introductory visit, an exploration of Pescadero State Beach, and an in-class analysis visit. In the first classroom visit students are introduced to the scientific method, learn how to take data on the wrackline contents, and learn background information on the animals that live on the beach. During the 2.5 hour beach exploration students follow the procedure and apply skills and knowledge from their first in-class visit to collect data at Pescadero State Beach. They also explore the marsh with binoculars and guidebooks to bird-watch and identify indigenous & invasive flora of California's coastline. Students gain an understanding of the formation and interactions between beaches, marshes while completing the hypothesis testing/data collection/experiment part of the scientific method. The culmination of the program is the second classroom visit where the students graph and analyze the data they collected and present their findings to the class.

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## Program Objectives

- To provide an exciting educational experience that shows students how scientists study in the field.
- To introduce students to two unique and adjacent environments, the sandy beach and the salt marsh.
- To gain an understanding, appreciation, and respect for marine ecosystems, and understand the special responsibilities of humans in the natural world.
- To gain a basic understanding of the principles of the scientific method and how they relate to hands on research.

## Program Format

### First Inland Voyage (in school):

Students prepare to study the wrackline by gaining background information on the animals that utilize the beach and practicing the procedures used to collect data. They complete the first steps of the scientific method: question, research, and hypothesis. The instructors will lead an introduction to the scientific method and to the procedures that will be used to study the wrackline of Pescadero Beach. The students will then be broken into small groups to practice the data collection methods and observe live animals. The visit will conclude with a review of the different steps in research and of what to expect in the next phase of the Marsh and Beach Exploration.

### Marsh & Beach Exploration:

The Scientific Method Combo Marsh and Beach Exploration will begin at the Pescadero State Beach parking lot, the group will be greeted by an MSI instructor. After the students have a chance to use the restrooms in the parking lot, the Marsh and Beach Exploration begins with a 10-15 minute walk to the beach. Students will receive an introduction to the program where they learn about the marsh and beach habitats. Your group will then divide into two to four groups (dependent on the amount of students) and be assigned an instructor. The students will spend half of their time hiking through the marsh, and half of their time collecting data from the wrackline on the beach. Under the guidance and supervision of MSI instructors, students will explore these habitats in search of interesting plants, animals, and geological features. Afterwards, all groups will converge back onto the beach for a closing activity.

### *Arrival Times*

Please arrive 20 minutes prior to the start of your program to allow time to use the restrooms and have a snack before your program begins.

### *Marsh and Beach Safety Rules*

Every year the coast is visited by millions of people, and our presence can have an impact on this vulnerable environment. We try to lessen our impact while keeping program participants safe by following these rules:

- **Do not throw sand or pick up sticks.**
- **Always stay with your instructor.** There are often other groups exploring the area, so it is important to stay with your MSI instructor.
- **No getting wet.** Students should not be close enough to the lake or ocean to get wet.

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- **Do not enter the driftwood forts.** These are built by hobbyists, and MSI cannot guarantee the structural safety of these forts.
- **Stay on the trail.** Avoid stray from the trail and disturbing ecological areas that may be more sensitive to disturbances.
- **No collecting.** Take only trash from the marsh and beach area.

### *Station Overview*

#### Introduction:

Once the group is settled, an instructor will introduce the salt marsh and sandy beach habitats. They will discuss the characteristics of each habitat, and review their similarities and differences. How tides work will be discussed and a tide stick will be used to show students the incoming/receding tides. Responsible marsh and beach etiquette and safety rules will also be reviewed. At the same time, a second instructor will brief the adults on their role in the program. When the introduction is over, the group will divide into two to four groups (dependent on the amount of students) and be assigned an instructor.

#### *Sandy Beach Habitat:*

In this habitat, the students will use the procedures learned in their in-class visit to collect data from the wrackline to complete the hypothesis testing/data collection/experiment part of the scientific method. They will study the different components of the wrackline including kelp, animal remains, other natural products, trash, and plastic.

#### *Salt Marsh Habitat:*

This habitat consists of two different activities: marsh birds and marsh plants. Instructors will lead students on a hike through the marsh while helping students to identify various species of birds and plants using provided guides. They will emphasize the importance of the marsh habitat to plants and animals, especially migrating birds. Students will discuss the importance of native species, and how many non-native plants have impacted the salt marsh habitat.

#### *Closing:*

The closing activity may take place either as a large group or in the smaller working groups (depending on the amount of students). An instructor will first check the tide stick and discuss changes that occurred over the course of the program. They will then review the habitats and activities with the students. The group will discuss how humans impact the marine environment and solutions for affecting change.

#### Second Inland Voyage (in school):

In the culminating experience, Marine Science Institute instructors return to the classroom to lead students in analyzing the data collected during their Marsh and Beach Exploration. Students develop graphs to represent their data and make presentations to their classmates, completing the scientific method with data analysis, conclusion, and communication.

## Option 3: Tidepool Expedition at Pillar Point

### Inland Voyage (in school) Pre-Visit Checklist

- **Please review the invoice.** Note the deposit due date; your deposit must be received by that date in order to hold your reservations. A purchase order will be accepted in lieu of a deposit.
- **Make sure you understand the cancellation policy.**
- **Make sure program balance is paid.**
- **Complete and return the Student Assessment Sheet.** Fax, email, or mail the Student Assessment Form a few days prior to your voyage.
- **Complete and return the Inland Voyage Parking and Set-up Form.** Fax, email, or mail the Inland Voyage Parking and Set-up Form a few days prior to your voyage.
- **Notify MSI if there are any special needs** (e.g. students in wheelchairs or crutches).
- **Use pre-activities and background information.** This helps prepare your students for the visit and can be found on the MSI website [www.sfbaymsi.org](http://www.sfbaymsi.org)

### Inland Voyage (in school) Day-of Visit Checklist

- **School office is aware of where MSI will be setting up and the room/space is available.**

### Tidepool Expedition Pre-Visit Checklist

- **Please review the invoice.** Note the deposit due date; your deposit must be received by that date in order to hold your reservations. A purchase order will be accepted in lieu of a deposit.
- **Make sure you understand the cancellation policy.**
- **Make sure program balance is paid.**
- **Arrange for chaperones.** MSI requires the assistance of **one adult per ten students.** These adults will assist the students in each group. They do not need to have a science background, but they should be enthusiastic and interested.
- **Complete and return the Student Assessment Sheet.** Fax, email, or mail the Student Assessment Form a few days prior to your voyage.
- **Create list of student groups.** Divide your students into groups. Two groups for 1-30 students, three groups for 31-45 students, four groups for 46-60 students, and five groups for 61-75 students.
- **Notify MSI if there are any special needs** (e.g. students in wheelchairs or crutches).
- **Use pre-activities and background information.** This helps prepare your students for the voyage and can be found on the MSI website: [www.sfbaymsi.org](http://www.sfbaymsi.org).
- **Arrange transportation.** Book buses or arrange for carpools. We recommend booking buses as early as possible to ensure they are available for the times that you need them.

### Tidepool Expedition Day-of Visit Checklist

- **Arrive 20 minutes prior to the start of your program.** This allows time to use the restrooms and have a snack before your program begins. The tidepools are approximately a 20 minute walk from the parking lot, so all students are encouraged to use the portable bathrooms on site before the program begins.

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- **Dress in layers.** Students will be exploring the tidepools on the coast, and although we discourage getting wet it sometimes does happen. The coast is often colder than inland areas, so please encourage students to wear layers. If the forecast calls for rain, please have students bring rain gear.
- **For safety reasons, close toed shoes are mandatory.** Because of the rocky terrain of the tidepools, closed toed shoes are required. Rain boots are recommended.
- **Make sure driver(s) have directions to Pillar Point.** You will find directions to the tidepool parking lot on our website at: [www.sfbaymsi.org](http://www.sfbaymsi.org).
- **Bring snacks and lunches if you plan on eating on site.** If you would like a snack break during your program, please notify the instructional staff at the start of the program so that they can add it to the schedule.
- **Bring a trash bag.** There are trash cans in the parking lot, but Pillar Point does not have any trash receptacles near the beach. If you plan on eating lunch on the beach, please have students pack their own trash, or bring a trash bag to bring trash back to the parking lot.

### Post-Visit Checklist

- **Send in Thank You to Sponsors to MSI.** If artwork is involved this also enters the students into MSI's Translating the Tides Competition. See below for more details.
- **Use post-activities.** This helps solidify your students' grasp of knowledge they gained on the voyage and can be found on the MSI website [www.sfbaymsi.org](http://www.sfbaymsi.org).
- **Make sure program balance is paid.**
- **Book for next year.** We take bookings a year in advance, so book early if you want specific times of year or dates.

## Program Logistics

### Location Considerations

#### Inland Voyage (in school):

The Inland Voyage program is delivered to a school, library or camp by an MSI vehicle, a truck or van that pulls a trailer-mounted, mobile aquarium behind it. Since this unit is both transport and life support for the marine organisms, the programs are presented outside or inside and close to the MSI vehicle. We need an area accessible to the vehicle that is large enough to set up for up to 30 students. This area can be grassy or paved, and shade is always appreciated. If an indoor space is used, it should be accessible without using stairs, have tables and a non-carpeted floor. If the area is separated from recess activities or any other traffic, the students will be more focused and attentive. Ultimately they will get more out of the experience if these factors are considered.

#### Tidepool Expedition:

Parking is fairly limited (especially on sunny days). It is best to travel by bus or to carpool. There is one pit toilet and two portable toilets located at the end of the parking lot. Please advise your students that there are no restroom facilities once we walk out to the tidepool area. There are trash cans in the parking lot, but Pillar Point does not have any trash receptacles near the

beach. Because of the exposed coastal location, Pillar Point is often colder and breezier than much of the Bay Area.

### **Program Length and Student Participation**

#### First Inland Voyage (in school):

The program allows one class of up to 30 students to participate at a time. The two instructors will give a 20-minute introduction and then the class will divide into groups, with each group participating in a data collection practice. The program will wrap up with a 10-minute closing discussion. We also schedule a ten-minute window between programs. The ten-minute intermission is essential to the well-being of the animals and enables staff to set-up for the next program.

#### Tidepool Expedition:

This program is two and a half hours long and is for grades 3 and up. The Tidepool program can accommodate up to 75 students, who will be split into smaller learning groups in order to work more closely with the instructors. Please divide your students into smaller groups prior to your arrival. Two groups for 1-30 students, three groups for 31-45 students, four groups for 46-60 students, and five groups for 61-75 students. Think about cooperative working groups and learning levels when dividing your class. Please have your students wear name tags for this program.

#### Second Inland Voyage (in school):

The program allows one class of up to 30 students to participate at a time. The two instructors will give a 20-minute introduction and then the class will divide into groups, with each group participating in graphing and analyzing the data they collected. The program will wrap up with a 10-minute closing discussion. We also schedule a ten-minute window between programs. The ten-minute intermission is essential for the staff to set-up for the next program.

### **Weather and Clothing Considerations**

#### Inland Voyage (in school):

If cold or rainy weather is forecasted, please plan on providing an indoor space for the programs.

#### Tidepool Expedition:

Students will be working as scientists in the field. They should wear clothing and closed-toed shoes that they do not mind getting wet, and should bring an extra pair of shoes and socks for the ride home. Rain boots are highly recommended. If the forecast calls for rain, please have students bring rain gear - we will go tidepooling rain or shine. Even if it is warm and sunny in most of the Bay Area, it is often cool and cloudy on the coast. Layered clothing, windbreaker, hat, and sunscreen are recommended.

### **Snack and Lunch**

#### Inland Voyage (in school):

Because of the short duration of the presentations, there is no time for snack or lunches to be scheduled during the presentation. When scheduling your Inland Voyage program, please schedule around recesses and lunches.

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**RESTRICTION:** For the animal's safety, no hand sanitizer or food near the animals.

Tidepool Expedition:

If you would like a snack break either before or during your program, please notify the instructional staff at the start of the program so that they can add it to the schedule. There are trash cans in the parking lot, but Pillar Point does not have any trash receptacles near the beach. If you plan on eating lunch on the beach, please have students pack their own trash, or bring a trash bag to bring trash back to the parking lot.

**Sponsor Acknowledgement and Translating the Tides**

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**Role of Assisting Adults**

Inland Voyage (in school):

In order to keep program costs at a minimum, we require the participation of at least one classroom teacher or adult. Each group of students will be working with one instructor and any available adults. At each station, the groups will break into smaller groups to study individual organisms. Our method of teaching is to ask thought-provoking questions that will lead students to their own answers. We ask that adults do not provide answers to the students, but let them discover the answers on their own.

Tidepool Expedition:

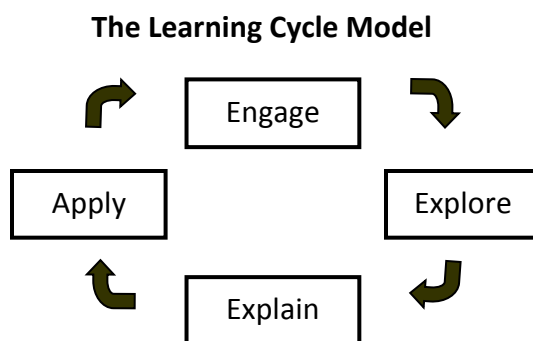
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**Student Assessment and Learning Cycle**

Since 1970, MSI has tailored science activities to meet the needs of teachers' curriculum. Students and teachers present themselves to our programs with a wide range of interdisciplinary science understandings and skills. Our marine science educators are specially trained to teach all ages with interesting and innovative methods that encourage interaction and problem solving. We encourage you to tailor your program by telling us about a particular theme that your class has been studying. Please fill out the Student Assessment Sheet you received to let us know.

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MSI has modified our working educational philosophy to respond to this broad range and to help teachers and students get the most from our programs. What you do before, during, and after the day of the program will determine to a very large extent how strong a partner MSI will be in helping you meet your learning objectives. As you plan a visit to MSI, please consider how this opportunity fits within your overall instructional objective. What learning outcomes do you desire from this experience? How well is the class positioned to move your desired outcomes toward a reality? Please use the following description of the learning cycle to assess your students.



**Engage – Students are just beginning to generate interest in marine science.**

*“The MSI program will be the hook from which I launch my unit and introduce my class to the excitement of marine science. I’m willing to come into this trip a bit cold...my main objective is to generate curiosity and get the students raising questions.”*

**Explore – Students are ready to actively experience, form predictions, and make observations.**

*“My students are already hooked on marine science. I’m bringing them to the MSI program with basic understandings and tools... They know a bit about the Bay and are ready to actively explore it. My objectives are for my students to make observations and to collect and record data. I’d like to see them make informed predictions and to begin framing their own critical questions.”*

**Explain – Students have been developing understanding for some time, and are now ready to speak the language of marine science.**

*“By the time we participate in our MSI program my students will have conducted serious investigations of topics related to the San Francisco Bay. My objective is to see them using the language of marine science... I’d like them to begin exploring important concepts and to comprehend and analyze other explanations.”*

**Apply – Students have a mature understanding of marine science, perhaps including aspects that are far afield from the San Francisco Bay area, and now are ready to relate that knowledge to their own backyard.**

*“My group has a good handle on the major learning objectives I have set for marine science.”*

*MSI's program is going to provide new scenarios for them to consider and address. My objective is to see my students using and applying their new knowledge in a different context."*

## **Scientific Method Combo Tidepool Expedition Program Description**

The Scientific Method Combo Tidepool Expedition Program includes an in-class introductory visit, an exploration of Pillar Point tidepools, and an in-class analysis visit. In the first classroom visit students are introduced to the scientific method, learn how to take data on the life found in the rocky shore, and learn background information on the animals that live in the tidepools. During the 2.5 hour Tidepool Expedition students follow the procedure and apply skills and knowledge from their first in-class visit to collect data at Pillar Point. The Tidepool Expedition portion allows students an opportunity to explore and survey the biodiversity in the tidepools. Students gain a better understanding of the habitat and its communities by studying the tidal zonation of species while completing the hypothesis testing/data collection/experiment part of the scientific method. The culmination of the program is the second classroom visit where the students graph and analyze the data they collected and present their findings to the class.

### **Program Objectives**

1. To provide an exciting educational experience that shows students how marine biologists study in the field.
2. To introduce students to the intertidal environment and identify the stresses of life in the different intertidal zones.
3. To relate physical and behavioral adaptations of marine animals to their environment.
4. To emphasize how the tidepool organisms are interconnected in the marine food web.
5. To gain an understanding, appreciation, and respect for marine ecosystems, and understand the special responsibilities of humans in the natural world.
6. To gain a basic understanding of the principles of the scientific method and how they relate to hands on research.

### **Program Format**

#### First Inland Voyage (in school):

Students prepare to study the zonation of the rocky shore by gaining background information and practicing identification of the animals and use of the transects. They complete the first steps of the scientific method: question, research, and hypothesis. The instructors will lead an introduction to the scientific method and to the procedures that will be used to study the animals found in the rocky shore. The students will then be broken into small groups to practice the data collection methods and also to study live tidepool animals. The visit will conclude with a review of the different steps in research and of what to expect in the next phase at the Tidepool Expedition at Pillar Point.

#### Tidepool Expedition:

##### *Arrival Times*

Please arrive 20 minutes prior to the start of your program to allow time to use the restrooms and have a snack before your program begins.

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### *Tidepool and Safety Rules*

Every year the coast is visited by millions of people, and our presence can have an impact on this vulnerable environment. We try to lessen our impact while keeping program participants safe by following these rules:

- **Always walk**, and do not jump between rocks or into the tidepools. The rocky intertidal can be slippery, and caution is needed when navigating around the pools.
- **Always stay behind your instructor**. Your MSI instructor knows the safest paths to explore the tidepools. Follow their path and stay close to the instructor.
- **Never face your back towards the ocean**. Keep an eye on the tide as it may come in quickly.
- **Watch where you walk** and step cautiously. Many organisms are very well camouflaged, and it can be easy to step on them.
- **Put animals back where they were found**. When searching for animals, replace any seaweed or anything else covering the animals. Only instructors should turn over large rocks. They will replace the rocks in the same manner that they were found to prevent exposure of the underside to the sun or other elements.
- **Avoid disturbing ecological areas** that may be more sensitive to disturbances.
- **No collecting**. Take only trash from the tidepool and beach area. It is illegal to collect animals without a permit.

### *Station Overview*

Introduction:

At the arrival to the Pillar Point parking lot, the class will be greeted by an MSI instructor. After the students have a chance to use the restrooms in the parking lot, the Tidepool Expedition begins with a 10-15 minute walk to the beach. Students will receive an introduction to the program where they review the rocky intertidal habitat, what tides are, and how animals are specially adapted to live there. Responsible tidepool practices and safety rules will be discussed. At the same time, a second instructor will brief the adults on their role in the program. The students will then be divided into two to five groups (dependent on the amount of students) and assigned an instructor.

Tidepool Exploration:

The students will go with their instructor to use transects to collect data on the animals found in the different zonations of the rocky shore. After collecting 2 sets of data they will have time for tidepool exploration with their instructor. They will likely begin at the lowest exposed tidal zone and continue toward the beach, depending on tidal conditions. Students will explore the different rocky intertidal zones, noticing how the zones vary while observing organisms in their natural setting. Each group will be supplied with a field guide, dip net, and bucket to allow for closer examination of animals. All animals will be replaced where they were found once the group has finished their observations. During the exploration, instructors will discuss the characteristics of the tidal zones as well as the different adaptations the animals have acquired for living in this environment.

Closing:

The closing activity may take place either as a large group or in the smaller working groups (depending on the amount of students). An instructor will briefly review the animals that were found, the tidal zones in which they live, adaptations of the animals, etc. Then, depending on



the age of the students, the instructor may choose to do the “Trash Timeline” activity, which focuses on how long different items take to decompose in the ocean. The group will discuss how humans impact the marine environment and solutions for affecting change. The program generally ends with a beach clean-up as we walk back to the parking lot.

Second Inland Voyage (in school):

In the culminating experience, Marine Science Institute instructors return to the classroom to lead students in analyzing the data collected during their Tidepool Expedition. Students develop graphs to represent their data and make presentations to their classmates, completing the scientific method with data analysis, conclusion, and communication.