

Science Lessons at a Long Island Sound Field Site



Low tide at Hammonasset State Park in Madison, Connecticut reveals a rocky field site ideal for finding Asian shore crabs.

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The following six learning stations allow students to ask questions and gather data for authentic inquiry investigations at a rocky beach and sandy beach environment at Long Island Sound. The stations can be combined to encourage students to spend a day investigating and collecting evidence in a variety of beach areas or each station can stand alone. Protocols at each station have been used over the course of many years with hundreds of students, teachers and adult volunteers. The stations are organized to help students work

as scientists to find evidence that supports answers to questions they have generated about the survival of life and physical changes noticed in Long Island Sound. As students collect, record, compile and analyze data, they can make a contribution to an ongoing inventory of life and physical changes on the shores of Long Island Sound.

It is recommended that these studies be conducted twice each school year, first in the fall and then in the spring. Doing so will give students a broader picture of life and changes in Long Island Sound. This will create opportunities for them to collect comparative data, allowing them to design and conduct authentic scientific investigations.

All stations described in the following lessons take place at Meigs Point, Hammonasset State Park, in Madison, Connecticut. These inquiry stations can be adapted for use in any comparable state park that has a rocky beach and a sandy beach as well as bathroom facilities and picnic tables (see Alternatives on page 78).

Students work in small groups as they cycle through each station. Students carry their own clipboard, pencil, and packet of simple data collection sheets. The data collection sheets become an integral part of the students' personal science journals. While teachers and students get organized at the beginning of the day (bathrooms, lunch storage, group assignments, etc.), materials are quickly set up in suitable locations by adult volunteers and other teachers and staff who are assigned specific stations. Those adults are responsible for overseeing each station, guiding the learning that takes place, encouraging students to explore, ask questions, collect data or evidence and seek answers to their questions. The adults remain at their assigned station for the day, becoming experts at managing their learning station. This provides consistency for students and ensures a smooth flow of students through the stations.

Teacher preparation:

It is suggested that this field trip be scheduled as an extended school day. Low tide is the best time to collect specimens at the rocky beach. Tide tables are available online, or at outdoor recreation and boating stores. Depending on the time of low tide you may wish to schedule your students to arrive at school earlier than usual and return to school during regular dismissal time or you may want to have students arrive at the usual school start time and return to school later than regular school dismissal time.

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Assign at least one adult volunteer or teacher to each station. It is best for students if you include teachers from a variety of disciplines such as art, language arts, math, and physical education. Prior to departure, adults should be given a copy of the lesson plan which includes objectives, materials, procedures, and resources. It is interesting to note that each adult may have a certain expertise or interest that influences their approach to learning at their selected station; this is fine! Although the lessons may seem to have specific directions, there is latitude and flexibility in the execution of the lesson plan, depending on the adult in charge and the interest and level of the students. Each class of students has raised questions to which they seek answers. The inquiry questions each class has determined should be clearly stated because they will provide a focus for the stations.

At school, use the checklists to prepare and pack materials for the stations, being sure to keep materials for each station together. Label all items needed for the rocky beach and, similarly, label all items needed for the sandy beach. When unloading equipment at the site use the checklists again to ensure that all necessary materials and equipment are brought to the designated stations.

For the sandy beach stations, divide each class of approximately twenty-two students into four groups. Recruit an adult to be the timekeeper so rotations occur in a timely manner.

Use the following extended day timetable and rotation schedule as an example for two classes of twenty-two students rotating through morning and afternoon stations at the sandy beach and rocky beach. This schedule can be adapted for use with larger groups.

7:15 a.m.	Students arrive at school via parents. Load equipment onto the bus and/or into personal vehicles.
7:30 a.m.	Leave school.
8:30 a.m.	Arrive at the pavilion at Meigs Point, Hammonasset. Separate the equipment needed for each station, and enlist the aid of students and adults to bring the equipment to the stations. It is suggested that the group going to the rocky beach first should use the bathroom facilities at this time, since they will be away from the pavilion for the morning. Backpacks, lunches, etc., may be left under a picnic table in the pavilion, but students should bring along drinking water. Hand out clipboards, pencils and packets.
8:45-10:45 a.m.	Students in one class (Class A) bring equipment needed for the rocky beach station (Crab Study and Beach Sample) and proceed to that area. Students in Class B divide into the four predetermined groups and proceed to their first of four stations (Seining, Beach Lab, Sifting Sands and Shifting Tides, Aesthetic Connection). Rotate stations approximately every half hour.

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8:45-10:45 a.m.	<p><i>Morning - Class A</i></p> <p>Crab Study station for large group. A small group of students can break out for a short period of time to record weather observations and collect samples from the beach.</p>
8:45-10:45 a.m.	<p><i>Morning - Class B</i></p> <p>Four stations for small groups: Seining, Beach Lab-Marine Biology Field Station, Sifting Sands and Shifting Tides, Aesthetic Connection.</p>
8:45-9:15 a.m.	Class B first rotation
9:15-9:45 a.m.	Class B second rotation
9:45-10:15 a.m.	Class B third rotation
10:15-10:45 a.m.	Class B fourth rotation
11:00-11:40 a.m.	All students and adults meet at the pavilion for lunch.
11:45-1:45 p.m.	<p><i>Afternoon - Class B</i></p> <p>Crab study station for large group. A small group of students can break out for a short period of time to record weather observations and collect samples from the beach.</p>
11:45-1:45 p.m.	<p><i>Afternoon - Class A</i></p> <p>Four stations for small groups: Seining, Beach Lab-Marine Biology Field Station, Sifting Sands and Shifting Tides, Aesthetic Connection.</p>
11:45-12:15 p.m.	Class A first rotation
12:15-12:45 p.m.	Class A second rotation
12:45-1:15 p.m.	Class A third rotation
1:15-1:45 p.m.	Class A fourth rotation
1:45-2:00 p.m.	All groups gather equipment and personal belongings. The lead teacher is the only person who can give permission to take specific living things back to school. Classroom teachers collect clipboards and student packets. Load equipment onto the bus or other vehicles.
2:00 p.m.	Depart from Hammonasset State Park.
3:00 p.m.	Arrive back at school and unload and clean equipment. Place all specimens in prepared school tanks.
3:20 p.m.	Students take their customary form of transportation home from school.

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Important note regarding specimens:

You must obtain a specimen permit to collect living things from Connecticut or New York. To collect in Connecticut, contact the Connecticut Department of Environmental Protection (DEP) by calling (860) 424-3000 or download the form at www.ct.gov/dep/lib/dep/fishing/fishing_forms/scicoll.pdf. A sample of this permit is provided on page 120. To collect in New York, contact the New York State Department of Environmental Conservation (DEC) by calling (518) 402-8985 or download the form at www.dec.ny.gov/docs/wildlife_pdf/lcp.pdf.

If living specimens are to be brought back to school, use a cooler for transport. Prepare the salt water tanks for these specimens before the field trip by using a simple aquarium air and filter system and use Instant Ocean salt mixture purchased at a pet store. No special refrigeration system is needed for most Long Island Sound species. Small silverside fish, jellyfish and most shellfish (mussels, clams) will NOT survive in most school tanks. Try to start your tank with Asian shore crabs, green crabs, hermit crabs, mummichogs, killifish, blackfish or eels. With exceptional attention you may become successful with flounder or pipefish and other animals. Start with a SMALL number of organisms, especially if you do not know what types of organisms will survive in your tank.

Alternatives:

The following lessons have been written specific to Hammonasset Beach State Park in Madison, Connecticut. However, as mentioned previously, these same techniques can be done at any shore or park that fit the criteria of having both a sandy beach environment and a rocky shore environment as well as restrooms.

Information about coastal access in Connecticut can be found at the Connecticut DEP coastal access guide web site. www.lisrc.uconn.edu/coastalaccess/. A list of facilities and environmental settings is provided for each site. To see a list of New York state parks and use/permit information, visit <http://nysparks.state.ny.us> or www.dec.ny.gov.

The East Hartford/Glastonbury Elementary Magnet School's science teacher, Donna Rand, assisted by physical educator Donna DuBaldo, developed the protocols for each station, which have been used over the course of many years with hundreds of students, teachers and adult volunteers.

Crab Study and Beach Sample Station

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Focus

Design and conduct an authentic scientific biological inventory and/or an investigation.

Focus Questions

What life can be found in a rocky beach area of Long Island Sound today? What is an invasive species? How do matter and energy flow through ecosystems? How are organisms structured to ensure efficiency and survival?

Learning Objectives

- Students will generate their own questions about crabs living in a rocky beach environment of Long Island Sound.
- Students will seek answers to their questions about crabs by using an established scientific protocol to collect and categorize crabs.
- Students will record, compile and analyze pertinent data and then contribute their findings to a state-wide database of information on an invasive crab species.

Materials

- Permit to collect specimens
- 10-12 buckets for collecting crabs
- 6 large containers for sorting crabs (basins or under bed plastic storage containers work well). Mark the containers or use laminated cards to indicate the following:
 - Male Large - larger than 18 mm
 - Male Medium - 9-18 mm
 - Male Small - smaller than 9 mm
 - Female Large - larger than 18 mm
 - Female Medium - 9.1-18.0 mm
 - Female Small - smaller than 9 mm
- Whistle to signal the beginning and end of collection time
- Stopwatch to time the collection period
- Small plastic mm rulers for each person
- Clipboard and pencil for group leader, including Crab Study Station Crab Count Data Sheet (page 86)
- 1-2 calculators

- For each student, copy of each: Beach Sample Station Data Sheets (page 85) and Crab Study Station Crab Count Data Sheet (page 86)
- Optional: cooler to take specimens back to school

For breakout groups:

- Wind meters
- Thermometers to measure air, water, and sand temperatures
- Transect square ("quadrat") - any size
- 50 meter tape measure or rope line attached to a stake
- Plastic zip lock bags to collect small samples of the rocky beach
- Permanent marker to label bags

Logistics

Remember to check the tides prior to the trip and plan accordingly.

Rocks covered in seaweed can be slippery and footing uneven. Wear appropriate footwear and use caution when walking in the rocky intertidal zone.

Teaching Time

2 hours

Seating Arrangement

Group discussion and planning - sit as a group on the beach

Crab collecting - students spread out in teams or individually along a designated rocky beach area

Sorting and measuring - each group determines an effective and efficient method and arrangement to sort and measure crabs.

Breakout groups - small groups work with an adult in the designated area.

Crab Study and Beach Sample Station

Key Words

Asian shore crab (grapsid crab/ Japanese shore crab/ Pacific shore crab)

Ballast

Carapace

Clutch

Competition

Habitat

Intertidal zone

Invasive species

Native crab

Non-native species

Background Information

Background information about various species of native crabs found on a rocky beach at Long Island Sound may be located in the Sea Grant resources listed under The Sea Grant Connection, and in the leader packet.

More than 20 years ago, spider crabs, calico crabs and green crabs could easily be found on the rocky beach at Hammonasset by turning over rocks and looking in tide pools. Now, at the same beach a class-size number of students (~22) can usually find over 500 Asian shore crabs in 20 minutes. Students may find zero to ten green crabs on a given day at Hammonasset; the rest will be Asian shore crabs, a non-native species that was introduced 100 years ago to Long Island Sound.

The Asian shore crabs, also known as grapsid crabs, Japanese shore crabs, Pacific shore crabs, or *Hemigrapsus sanguineus* were first discovered on the shores of Cape May, New Jersey by a group of high school students and their teacher in 1988. It is believed that the crabs, in adult or larval state, were present in the Japanese waters taken in to balance cargo ships bound for the U.S. Upon arrival on the Atlantic coast, the ballast water was discharged, thereby introducing the species to a new habitat. Eventually the Asian shore crab population flourished in Cape May, New Jersey

and the crabs reproduced and extended their territory northward. These crab invaders can now to be found as far north as southern Maine.

By studying and recording information on the Asian shore crabs in Long Island Sound, your students will be part of a student network that is providing baseline invasive species data for scientists in New England, the

Long Island Sound Network (LISN) Email drand@crec.org for more information.

Students should be able to do the following:

- Safely pick up a crab
- Measure a crab (across the carapace at the widest spot) to the nearest millimeter
- Distinguish between male and female crabs (see page 10.20 in *Marine Animals of Southern New England and New York* by Howard M. Weiss)
- Identify a female crab bearing eggs
- Students in breakout groups should be able to use a wind meter and a thermometer.

Learning Procedure

Teacher Preparation

- Send for Long Island Sound resources from Sea Grant.
- Read and/or copy articles on invasive species including "Invasive Shore Crabs Give Kids Lesson" *Hartford Courant*, Friday, Oct. 13, 2006 - reproduced on pages 121-122, courtesy of the *Hartford Courant*.

Learning Procedure

At the beach

Whole group discussion and planning with students seated on the beach along with teacher and adult volunteers:

- Students will focus on the class question they have chosen to investigate (e.g.,

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how many crabs will they find on the rocky beach, will there be more males than females, will they find more large crabs than small crabs?)

- Students will make observations and collect their own data about the crab population living on the rocky shore of Long Island Sound on the specific day of their field trip.
- Students and teacher all identify and agree on boundaries for the collection area.
- Students and teacher agree on collection methods and have plenty of collection buckets near students to reduce the walking distance to deposit a collected crab.
- Students and teacher review safety strategies for handling rocks and walking near a water environment.
- Students and teacher agree on a timekeeper for the 20 minute collection period.

Twenty minutes to collect crabs

- Teams or individuals carrying buckets disperse into the designated collection area. Turn over rocks, check in pools of water and collect as many crabs as possible.
- While collection is taking place, an assigned person can set out in an organized manner the large, labeled containers for sorting crabs. Place a bit of sea water in each container.

One hour to measure and sort collected crabs (whole group)

- **IMPORTANT:** Choose a person to be responsible for recording official class data on the Crab Study Station Total Crab Count Data Sheet (page 86) and returning the data to school. This person should receive all final data tallies for every observed crab category in each session of crab collecting.

- Divide the work. Sort the crabs into the large containers or basins by gender and carapace size: small (<9mm), medium (9.1mm-1.8mm) and large (>1.8 mm).
- When all crabs have been sorted, count the number of crabs in each category and record this on the data sheet. Make note of females with eggs. Also record the total number of crabs caught. Indicate any other species of crabs collected.
- When the sorting, counting and tallying is completed, students should carefully return the animals to the approximate area from which they were taken

Breakout groups

These are especially good for students who choose to give up the opportunity to pick up crabs and are more interested in collecting additional data that is very valuable to the investigation. Retain this data for further reference back in the classroom.

Assign an adult volunteer to help with these small groups and record the information on the Beach Sample Station Data Sheet (page 85).

Weather group

- These students use wind meters and thermometers to record air, water and sand temperatures and general weather and water conditions.
- Record data on the Rocky Beach Sample Station Data Sheet.

Beach sample group

- A member of this small breakout group will place a stake at the edge of the water, then extend the rope or tape measure up to the highest point on the beach. Note this on the Rocky Shore Environment Map (page 119). This is the transect line.
- Place the quadrat at various intervals of noticeable biological or physical

Crab Study and Beach Sample Station

changes along the transect line.

- Note the composition of living and non living things that fill the quadrat and use the zip lock bags to collect small samples of the beach at each interval.
- Label each bag with: sample collector's name (and class or school), date, and height on shore (meter mark collected at).
- Number and mark the collection areas on the map.
- If desired, retain the samples for further study or comparison with other locations. Use this evidence to help students answer additional questions they may have about the environment of the Asian shore crabs.

Data collected on the rocky beach should be shared with the Long Island Sound Network (LISN email: drand@cresc.org) and/or student or community newspapers. It should also be saved on a classroom or school computer server where the data can be retrieved and used for comparison in future studies

Learning procedure follow-up:

- Students generate questions about plant and animal life in Long Island Sound, and record these in their science journals.
- Students generate questions about animal life along the rocky shore of Long Island Sound and choose a class question they would like to investigate by making actual observations and collecting data at a rocky beach.
- Identify questions that can be answered by collecting data on a return trip to the same beach in the spring.
- Develop an if...then statement to support a research question you would like to investigate when you return to Long Island Sound in the spring.
- Use the beach samples and weather and water data to help support conclusions.
- Identify sources of error found in student data collection techniques.

The Sea Grant Connection

Exotic Aquatics on the Move - Indiana-Illinois Sea Grant www.iisgcp.org/edk-12/exoticsp/Japanese_Shore_Crab.htm

Invasive Species of Long Island Sound poster-Connecticut Sea Grant

Long Island Sound Educational Resources CD including *Sound Facts: Fun Facts About Long Island Sound* and *Living Treasures: Plants and Animals of Long Island Sound* - Connecticut Sea Grant

Marine Bioinvaders - MIT Sea Grant <http://massbay.mit.edu/exoticspecies/index.html>

Nab the Aquatic Invader - Sea Grant Network www.sgnis.org/kids

Visual Guide: Long Island Sound Marine Invasive Species with comparison to some native species - waterproof field guide/flip book - Connecticut Sea Grant

The "Me" Connection

Are there invasive species in my own backyard? Are there any other invasive species in the ocean or lakes?

Do I or people I know contribute to spreading invasive species from place to place?

Do invasive species matter to you? Why or why not? How important will this problem be to you in the future?

Do you think invasive species should be eradicated? Why or why not?

How can I learn more about invasive species?

Connection to Other Subjects

Art; Language arts; Math

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Evaluation

Student journals and written reflection, student news articles and PowerPoint presentations, student products, quiz, response to articles and research

Extensions

- Email invasive crab data to the Long Island Sound Student Network to drand@cresc.org.
- Photograph individual specimens.
- Design a bulletin board or Power Point presentation depicting the environment and location where the specimens were found.
- Write an editorial to the newspaper about why life in Long Island Sound should be protected.
- Compare beach samples with samples from the sandy beach or with samples collected from other sites.
- Write an article in the school or town newspaper or website about this study and/or invasive species.
- Write an editorial in the school or town newspaper or website about this study and/or invasive species.
- Research Asian shore crabs and other invasive species.
- Create a bumper sticker that generates awareness of invasive species.
- Teach families or younger students about your findings at Long Island Sound.
- Analyze and graph data collected and compare crab data with data available from other student studies during past years.

Resources

Exotic Aquatics on the Move - Indiana-Illinois Sea Grant www.iisgcp.org/edk-12/exoticsp/Japanese_Shore_Crab.htm

Marine Animals of Southern New England and New York by Howard M. Weiss - CT DEP

Marine Bioinvaders - MIT Sea Grant:

<http://massbay.mit.edu/exoticspecies/invaders/hemi.html>

Nab the Aquatic Invader- Sea Grant Network

www.sgnis.org/kids

Salem Sound Coastwatch Marine Introduced Species identification card:

www.salemsound.org/mis/MISHemigrapsus.pdf

USGS invasive species information:

<http://nas.er.usgs.gov/queries/FactSheet.asp?speciesID=183>

Connecticut Science Frameworks

Grades K-2

K.2 Many different kinds of living things inhabit the earth.

K.3 Weather conditions vary daily and seasonally.

1.2 Living things have different structures and behaviors that allow them to meet their basic needs.

1.3 Organisms change their form and behavior as part of their life cycles.

1.4 The properties of materials and organisms can be described more accurately through the use of standard measuring units.

Grades 3-5

3.2 Organisms can survive and reproduce only in environments that meet their basic needs.

4.2 All organisms depend on living and nonliving features of the environment for survival.

4.3 Water has a major role in shaping the Earth's surface.

Grades 6-8

6.2 An ecosystem is composed of all the populations living a certain space and the physical factors with which they interact.

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Grades 9-10

10.5 Evolution and biodiversity are the result of genetic changes that occur over time in constantly changing environments.

10.6 Living organisms have the capacity to produce populations of unlimited size, but the environment can support only a limited number of individuals from each species.

New York Science Standards

Living Environment Key Idea 5: Organisms maintain a dynamic equilibrium that sustains life.

Living Environment Key Idea 6: Plants and animals depend on each other and their physical environment.

National Science Education Standards

Content Standard A: Science as Inquiry

- Abilities necessary to do scientific inquiry
- Understandings about scientific inquiry

Content Standard C: Life Science

- The characteristics of organisms (K-4)
- Life cycles of organisms (K-4)
- Regulation and behavior (5-8)
- Populations and ecosystems (5-8)
- Diversity & adaptations of organisms (5-8)
- Biological evolution (9-12)
- Interdependence of organisms (9-12)
- Behavior of organisms (9-12)

Ocean Literacy Essential Principles and Fundamental Concepts

Essential Principle 5: The Ocean supports a great diversity of life and ecosystems

Fundamental concept d: Ocean biology provides many unique examples of life cycles, adaptations and important relationships among organisms (symbiosis, predator-prey dynamics and energy transfer) that do not occur on land.

Fundamental concept f: Ocean habitats are defined by environmental factors. Due to interactions of abiotic factors such

as salinity, temperature, oxygen, pH, light, nutrients, pressure, substrate and circulation, ocean life is not evenly distributed temporally or spatially, i.e., it is “patchy”. Some regions of the ocean support more diverse and abundant life than anywhere on Earth, while much of the ocean is considered a desert.

Fundamental concept h: Tides, waves and predation cause vertical zonation patterns along the shore, influencing the distribution and diversity of organisms.

Fundamental concept i: Estuaries provide important and productive nursery areas for many marine and aquatic species.

Essential Principle 7: The Ocean is largely unexplored.

Fundamental concept b: Understanding the ocean is more than a matter of curiosity. Exploration, inquiry and study are required to better understand ocean systems and processes.

Asian shore crabs (right) are easy to find in great numbers under intertidal rocks at Hammonasset (below) during low tide.



Rocky Beach Sample Station

Data Sheet

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Scientist's Name: _____ Class: _____

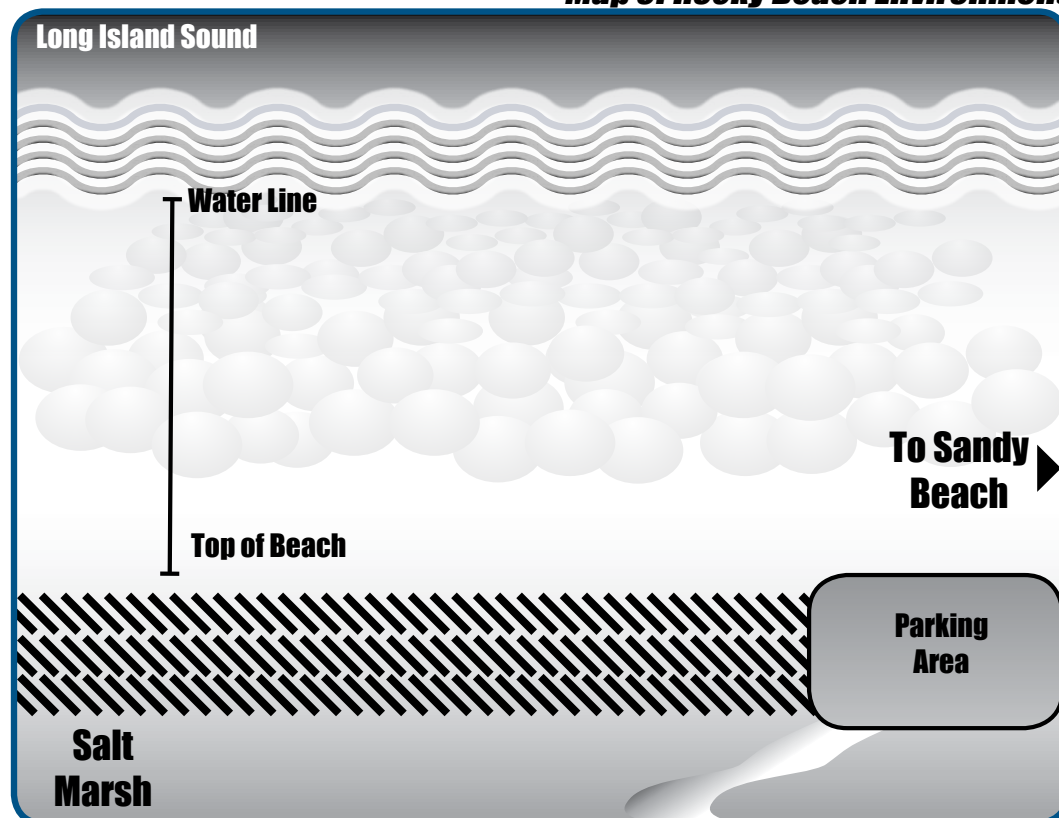
Date:	Time:	Location:
Tide: high mid low	Wind speed:	Wind direction:
Air temperature:	Water temperature:	Sand temperature:

General weather conditions:

Water conditions:

Any additional observations:

Map of Rocky Beach Environment



Crab Study Station

Crab Count Data Sheet

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Scientist: _____ Date: _____ Time of Low Tide: _____

All numbers are for Asian Shore Crabs unless otherwise mentioned.

Report data to Long Island Sound Student Network (LISSN): drand@crec.org

Morning Data


Time: _____


Type of crab	Small <9mm	Medium 9mm-18mm	Large >18mm	Total
Females				
Females with eggs				
Males				
Other (describe)				
Other (describe)				
Totals				

Afternoon Data

Time: _____

Type of crab	Small <9mm	Medium 9mm-18mm	Large >18mm	Total
Females				
Females with eggs				
Males				
Other (describe)				
Other (describe)				
Totals				

 *It is your turn to use this data to help answer your own question!*
What question did you ask? How can you explain to others what you found out?

 Use these data along with graphs, text and pictures to explain your thinking. You may add any additional information to help explain your story such as graphs and tables, drawings, habitat photos, real samples, wind and water information, etc.

Seining

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Focus

Diversity of marine life in the shallow waters of a sandy beach in Long Island Sound

Focus Questions

What do you think you will find living here today? How can we find out what is living in the water of Long Island Sound? How are organisms structured to ensure efficiency and survival?

Learning Objectives

Working as a team, students will use a seine net and other tools to collect specimens and gather data in order to help them investigate a question about life in the shallow water of a sandy beach environment in Long Island Sound.

Materials

- Seine net and poles (2 sets recommended)
- Five-gallon buckets (4 or more)
- Chest waders - carry these in a large plastic tub or crate
- Life jackets
- Beach towel
- For each student:
 - Seining Data Sheet
 - Clipboard and pencil
- Weather and water equipment:
 - Hand-held wind speed indicator
 - Thermometers with probes
- Compass
- Digital camera with fresh batteries and memory card

Logistics

Water safety is a prime concern. An adult with strong swimming and life-saving experience should remain at this station throughout the day. If the water is warm enough, no waders are necessary when seining. Life jackets must be worn by **all** people in the water, if they are wearing waders or not. Even a strong swimmer can

be pulled underwater if waders fill with water. It is essential that, at all times, those on the shore carefully watch the participants in the water.

To facilitate the exchange of waders and life jackets, it is helpful to use the carrying crate as a bench for those changing into the waders. Use a beach towel underfoot to eliminate sand being brought into the waders.

The degree of adult help varies depending on the size and strength of the student seiners. One method is to have an adult stand behind each student seiner, with both holding the poles. Be aware that the out-seiner pair will be going deeper in the water. To avoid water getting in the waders, be certain that the water level and waves are below chest high.

Another method is to have a student seiner (with or without adult help) as the in-seiner and an adult as the out-seiner. At least one adult should be responsible for each seine net and set of seiners.

For efficiency, bring several waders of varying sizes, and have students geared up and ready for their turn in the water.

Teaching Time

Each small group of students (6-8 per group) rotates to this station every 30 minutes.

Seating Arrangement

Each group of students is involved in using and monitoring the seine net, taking weather and water measurements, recording an inventory of what is collected in the net and placing living specimens gently into the collection bucket.

Key Words

Air temperature	Seine net
Biodiversity	Seining

Seining

Biological inventory	Species
Environment	Specimen
Living	Water temperature
Organism	Wave height
Parallel	Wind direction
Perpendicular	Wind speed

Background Information

A 20-30 foot seine net is an excellent tool to collect organisms in the shallow waters of a sandy beach area. You will collect more netted specimens in the early fall season, September to mid-October, when the ocean is still warm in Long Island Sound.

Learning Procedure

Teacher Preparation

Prior to trip:

- Adults should be familiar with seining technique. One proven technique is described in the learning procedure section.
- Time can be saved by teaching students the seining technique prior to their visit to the beach. This can be made into an enjoyable physical education activity by having students seine for stuffed animals, small balls and other objects scattered on the gymnasium floor.

Preparation on site:

- Collection buckets partially filled with seawater are placed on the sand close to the water where seining will occur. These buckets will hold specimens for further study, and can be carried to the Beach Lab station.
- Place all equipment on dry sand near the water's edge.

Learning Procedure

- The two people using each seine net will wear life jackets and, if the water is cool, chest waders. Life jackets should be worn by all people in the water, with or without

waders. The taller adult should be in the deeper water.

- The other members of this group should help to tie the net to the poles, set the net straight ensuring that the floaters are on top and the weights are on the bottom, and help the seiners prepare to enter the water.
- Seiners enter the water perpendicular to the beach with the taller person (the out-seiner) in the deeper water and the shorter person (the in-seiner) closer to the shore. The out-seiner should go no farther into the water than just below chest level.
- The seiners then pull the net smoothly as they walk backwards, parallel to the beach, yet keeping the net perpendicular to the beach. Each pole should be held at a slight angle so the bottom of the pole is close to the sand near the seiner's feet, and the top of the pole is tipped away from the seiner. This position is optimal for catching sea creatures, and prevents the creatures from swimming out under the net.
- When the seine net has been pulled far enough, the in-seiner "plants" the pole and holds it in place. The out-seiner then pulls the net toward the shore, forming a horseshoe shape.
- When the two seiners are an even distance from the shore, they pull the net toward the beach, closing the net slightly if necessary, continuing to keep the poles tipped.
- The group helps to pull the seine net up onto the sandy beach where it is stretched out flat; everyone helps to take specimens from the net and gently place them into the collection bucket.
- One person from each group should be responsible for recording on their data sheet the approximate number and types of organisms found in the seine net hauls.
- While the seining is going on, one or two

students in each group may be assigned to record weather observations and water conditions.

- The collection bucket is carried to the Beach Lab Station at the end of each seining group. Specimens collected will be examined at the Beach Lab-Marine Biology Field Station. Someone also has to be available to return the buckets from the Beach Lab-Marine Biology Field Station to the Seining Station for refilling.

The Sea Grant Connection

Beachcomber's Companion© - Woods Hole Oceanographic Institute Sea Grant
www.beachcomberscompanion.net

Living Treasures: The Plants and Animals of Long Island Sound - Connecticut Sea Grant.

Long Island Sound Educational Resources CD including *Sound Facts: Fun Facts About Long Island Sound* and *Living Treasures: Plants and Animals of Long Island Sound* - Connecticut Sea Grant

Seaweeds of Long Island Sound by Margaret "Peg" Van Patten - Connecticut Sea Grant

The "Me" Connection

What did it feel like to be part of a seining team? What did you notice about the specimens you collected? What are you still wondering about? Were you surprised to find the number and/or the variety of organisms you found today in the net? What was most interesting to you at this station?

Connection to Other Subjects

Art; Language arts

Evaluation

Student data sheets, student journals and written reflection, quiz

Extensions

Photograph individual specimens. Develop a field guide for classroom use.

Design a bulletin board or Power Point presentation depicting the environment and location where the specimens were found.

Seaweeds collected may be formed into a collage or design, or preserved according to the techniques presented in the publication *Seaweeds of Long Island Sound* (reproduced on page 125).

Write an essay describing why life in Long Island Sound should be protected. Submit your essay to your local newspaper.

Resources

Beachcomber's Companion© - Woods Hole Oceanographic Institute Sea Grant
www.beachcomberscompanion.net

Beachcomber's Guide to the North Atlantic Seashore - Massachusetts Audubon Society

Living Treasures: The Plants and Animals of Long Island Sound - Connecticut Sea Grant

Long Island Sound Educational Resources CD including *Sound Facts: Fun Facts About Long Island Sound* and *Living Treasures: Plants and Animals of Long Island Sound* - Connecticut Sea Grant

Marine Animals of Southern New England and New York by Howard M. Weiss - CT DEP

Seaweeds of Long Island Sound by Margaret "Peg" Van Patten - Connecticut Sea Grant

Visual Guide: Long Island Sound Marine Invasive Species with comparison to some native species waterproof field guide/flip book - Connecticut Sea Grant

****There are no frameworks, standards, or principles for this activity.**

Seining



◀ To begin, the out-seiner walks the net out into the water until it is stretched out between the out-seiner and the in-seiner and the net is mostly submerged at both ends.

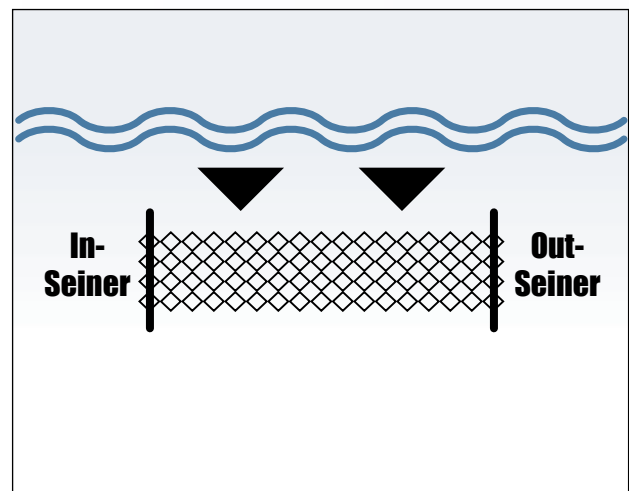
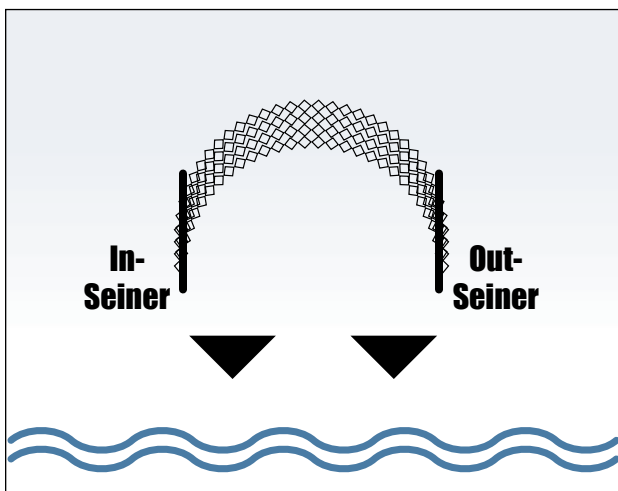
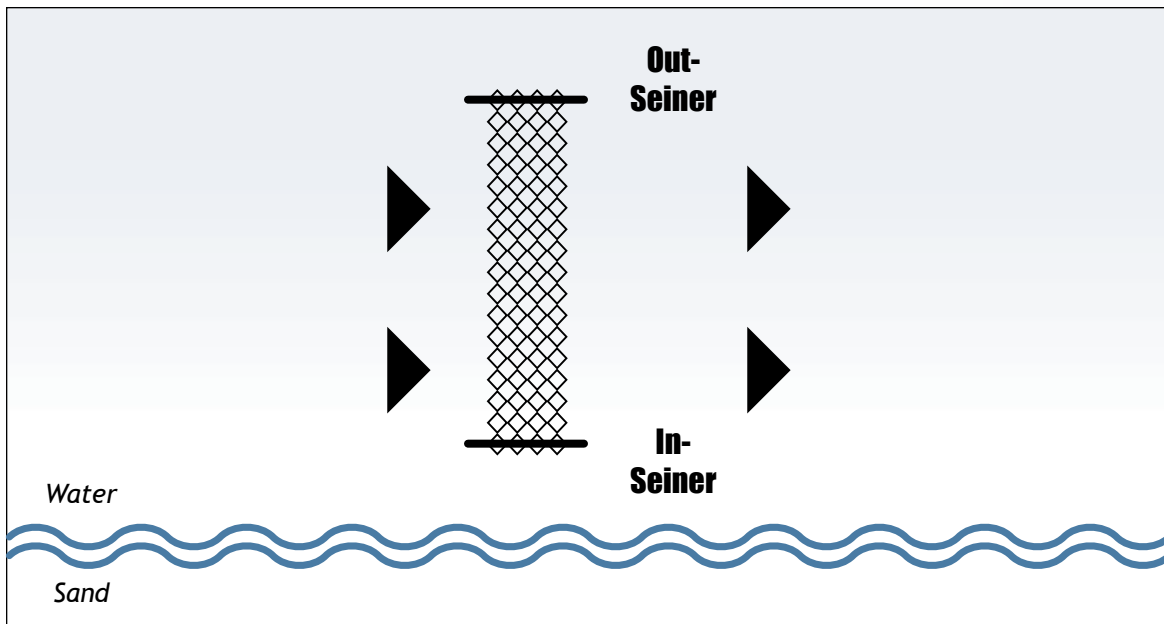
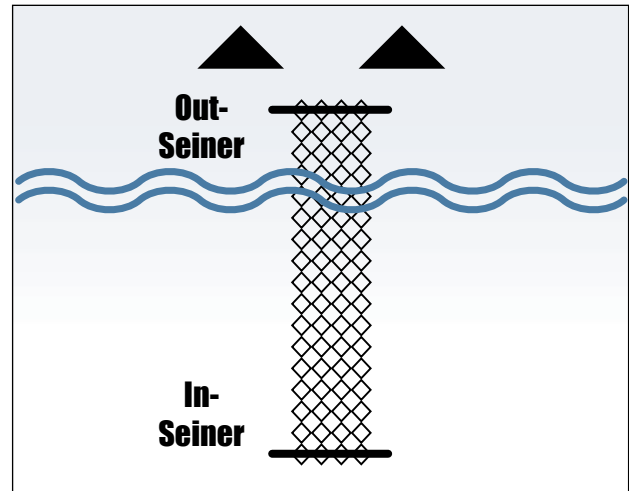
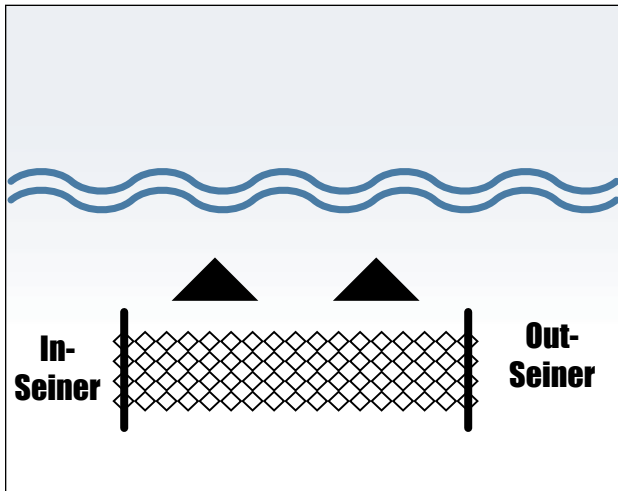
Once the net is brought out into the water the out-seiner and in-seiner walk in sync, drawing the net in one direction while keeping the net tilted. ▶



▶ When the net is ready to be brought to shore, the in-seiner remains stationary as the out-seiner brings the outer end of the net shoreward.

The net is stretched out when brought back to shore and the sorting can begin. ▶





Seining Data Sheet

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Scientist's Names:

Class:

Date:	Time:	Location:
Tide: high mid low	Wind speed:	Wind direction:
Air temperature:	Water temperature:	Sand temperature:

General weather conditions:

Water conditions:

What was found in the net?

(If you are unsure of the name of the organism, just describe it as well as you can.)

Type of Life	Approximate Number Found

Beach Lab - Marine Biology Field Station

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Focus

Structure and function: organisms are structured to ensure efficiency and survival.

Focus Questions

What life can be found in the water of Long Island Sound? How does life survive between the tides? What structures and systems help these living things sense their underwater world?

Learning Objectives

- Students will use microscopes, hand lenses, resource guides, and appropriate handling techniques to observe and investigate organisms collected in a seine net.
- Students will gather information to help them identify structures the organisms use for surviving and sensing their environment.
- Students will identify several animals and plants that live in the water of Long Island Sound.

Materials

- Magnifiers
- Dissection microscopes
- Petri dishes
- Variety of plastic containers
- Basin
- Eye droppers
- Millimeter rulers
- Sharp pencils
- Beach Lab - Marine Biology Field Station Data Sheets (pages 97-98)
- Clipboards
- Extra paper
- Camera with fresh batteries & memory card
- Small fish net or strainer
- Battery operated bubbler (optional) - available in bait shops and pet stores
- Five-gallon buckets (4 or more)
- Fold-up table if none is available on site

- Optional: cooler to take specimens back to school
- Resources and field guides
 - *Beachcomber's Companion*© - Woods Hole Oceanographic Institute Sea Grant
 - *Beachcomber's Guide to the North Atlantic Seashore* - Massachusetts Audubon Society
 - *Connecticut College Bulletin No. 34- Tidal Marshes of Long Island Sound Ecology, History, and Restoration*
 - *Living Treasures: The Plants and Animals of Long Island Sound* - Connecticut Sea Grant
 - *Marine Animals of Southern New England and New York* by Howard M. Weiss - CT DEP
 - *Seaweeds of Long Island Sound* by Margaret "Peg" Van Patten - Connecticut Sea Grant
 - *Visual Guide: Long Island Sound Marine Invasive Species with comparison to some native species* waterproof field guide/flip book - Connecticut Sea Grant

Logistics

If this is the first station of the day, while other students are seining, students at this station set up equipment. Make sure to get the specimens from the first seine net pulled of the day.

Make sure that the microscopes are positioned so that the Sun may be used as a light source. Place resources and utensils within reach of the microscopes.

By using battery operated bubblers in buckets, most specimens can be kept at this station for several hours.

If specimens are to be taken back to school for further study, prepare the salt water tank at least one day in advance. See Important Note Regarding Specimens, page 78.

Beach Lab - Marine Biology Field Station

Teaching Time

Each small group of students rotates to this station for twenty to thirty minutes.

Seating Arrangement

A picnic table with microscopes (facing sunlight if possible) and work space set up as a biology observation station for each group of 6-8 students.

Key Words

Behavior	Lateral line
Brain	Locomotion
Camouflage	Millimeter
Centimeter	Nerves
Environment	Non-living
Eggs	Observation
Field Guide	Organism
Fins	Sessile
Gills	Structure
Holdfast	Vibrations

Background Information

Life survives between the tides. All organisms need food and have different methods and structures for obtaining food. Organisms also need to get rid of wastes.

All organisms use a structure or system to obtain oxygen in a water environment.

All organisms need protection from predators. This protection may be camouflage, special body parts, a heavy protective outer layer, etc.

All organisms need to reproduce. Organisms may or may not need to move around. Some organisms are sessile, or immobile, and only move in their larval stage. Once the adult phase is reached the organism stays in one place. The diverse animals found in the water reveal a wide range of structures and methods for locomotion or staying in one place.

Certain structures help living things sense the underwater world. Some organisms show sensitivity to light, shadows, vibrations, sound, touch, smell, taste, or movement of the water.

Learning Procedure

Teacher Preparation

- At school, gather and pack equipment and materials for the Beach Lab - Marine Biology Field Station.
- At the beach, set up equipment and resources at a picnic table or bring a fold-up table
- Just prior to this activity, students use a seine net to collect specimens of marine plants and animals. Specimens are placed in a large bucket of seawater for easy transport to the Beach Lab - Marine Biology Field Station. See the Seining lesson on page 87 for collecting specimens.

Learning Procedure

- A student gently scoops a specimen from the collection bucket and places the organism with seawater in an appropriate size plastic container or Petri dish for observation.
- Students look at a variety of specimens collected and choose one specimen to observe closely. Students use their own senses, magnifiers, microscopes, rulers, and field guides to identify structures and systems that help the organism survive in Long Island Sound. They record questions and observations in their Beach Lab - Marine Biology Field Station Data Sheets. Special attention is given to answering questions about how this organism uses its senses and survives in Long Island Sound.
- Students also identify the organism, record information and create a sketch on their data sheet. On location, students use the resources provided, and

Beach Lab - Marine Biology Field Station

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record their findings in their journals. To identify the organism in the classroom, students use the recommended resources along with the information and drawings they recorded in their journals while at the beach lab to identify the organism.

- Optional: photograph and/or video-tape the variety of specimens collected. Photographs can be used for further study at the school.

The Sea Grant Connection

Beachcomber's Companion© - Woods Hole Oceanographic Institute Sea Grant
www.beachcomberscompanion.net

Living Treasures: The Plants and Animals of Long Island Sound - Connecticut Sea Grant

Long Island Sound Educational Resources CD including *Sound Facts: Fun Facts About Long Island Sound* and *Living Treasures: Plants and Animals of Long Island Sound* - Connecticut Sea Grant

Seaweeds of Long Island Sound by Margaret "Peg" Van Patten - Connecticut Sea Grant

The "Me" Connection

What structures or systems do we as humans use to survive in our environments?

Why is it important to establish a data base or animal and plant inventory of Long Island Sound? How will this help future scientists?

Connection to Other Subjects

Art; Language arts

Evaluation

Student data sheets, student science journals, written reflection, quiz.

Extensions

- Photograph individual specimens.
Develop a field guide or podcast for

classroom use or produce a movie of animal movement and response to stimuli.

- Design a bulletin board or Power Point presentation depicting the environment and location where the specimens were found.
- Form a collage or design from seaweeds collected and preserved according to the techniques presented in *Seaweeds of Long Island Sound* (reproduced on page 125).
- Write an article or editorial to the newspaper about why life in Long Island Sound should be protected.

Resources

Beachcomber's Companion© - Woods Hole Oceanographic Institute Sea Grant
www.beachcomberscompanion.net

Beachcomber's Guide to the North Atlantic Seashore from Massachusetts Audubon Society

Connecticut College Bulletin No. 34 - Tidal Marshes of Long Island Sound - Ecology, History, and Restoration

Living Treasures: The Plants and Animals of Long Island Sound - Connecticut Sea Grant

Marine Animals of Southern New England and New York by Howard M. Weiss - CT DEP

Seaweeds of Long Island Sound by Margaret "Peg" Van Patten - Connecticut Sea Grant

Connecticut Science Frameworks

Grades K-2

K.2 Many different kinds of living things inhabit the earth.

1.2 Living things have different structures and behaviors that allow them to meet their basic needs.

1.3 Organisms change their form and behavior as part of their life cycles.

1.4 The properties of materials and organisms can be described more

Beach Lab - Marine Biology Station

accurately through the use of standard measuring units.

Grades 3-5

3.2 Organisms can survive and reproduce only in environments that meet their basic needs.

4.2 All organisms depend on living and non-living features of the environment for survival.

4.3 Water has a major role in shaping the Earth's surface.

Grades 6-8

6.2 An ecosystem is composed of all the populations living in a certain space and the physical factors with which they interact.

Grades 9-10

10.5 Evolution and biodiversity are the result of genetic changes that occur over time in constantly changing environments.

10.6 Living organisms have the capacity to produce populations of unlimited size, but the environment can support only a limited number of individuals from each species.

New York Science Standards

Living Environment Key Idea 5: Organisms maintain a dynamic equilibrium that sustains life.

Living Environment Key Idea 6: Plants and animals depend on each other and their physical environment.

National Science Education Standards

Content Standard A: Science as Inquiry

- Abilities necessary to do scientific inquiry
- Understanding about scientific inquiry

Content Standard C: Life Science

- The characteristics of organisms (K-4)
- Life cycles of organisms (K-4)
- Regulation and behavior (5-8)

- Populations and ecosystems (5-8)
- Diversity & adaptations of organisms (5-8)
- Biological evolution (9-12)
- Interdependence of organisms (9-12)
- Behavior of organisms (9-12)

Ocean Literacy Essential Principles and Fundamental Concepts

Essential Principle 5: The Ocean supports a great diversity of life and ecosystems.

Fundamental concept a: Ocean life ranges in size from the smallest virus to the largest animal that has lived on Earth, the blue whale.

Fundamental concept c: Some major groups are found exclusively in the ocean. The diversity of major groups of organisms is much greater in the ocean than on land.

Fundamental concept d: Ocean biology provides many unique examples of life cycles, adaptations and important relationships among organisms (symbiosis, predator-prey dynamics and energy transfer) that do not occur on land.

Fundamental concept e: The Ocean is three-dimensional, offering vast living space and diverse habitats from the surface through the water column to the seafloor. Most of the living space on Earth is in the ocean.

Fundamental concept h: Tides, waves and predation cause vertical zonation patterns along the shore, influencing the distribution and diversity of organisms.

Fundamental concept i: Estuaries provide important and productive nursery areas for many marine and aquatic species.

Beach Lab - Marine Biology Station

Data Sheet

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Scientist's Name: _____ Date: _____

Directions: After observing several specimens, choose one to study more closely. Draw and label it here (include measurements).

Beach Lab - Marine Biology Station

Data Sheet

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In your drawing, identify and label the structures the organism uses to eat, breathe, protect itself, move, or stay in one place.



If this is an animal, think about how you use your senses (sight, smell, hearing, taste, touch) to survive and to react to your environment. Then notice which senses *this organism* uses to respond to changes in its water environment.



In your drawing, identify and label the structures that the organism uses to sense its environment. Write your observations and conclusions below. Here are some suggestions and questions to guide you: Is this living thing sensitive to light or to shadow? Does it respond to vibrations? Slight touch? Movement of the water? Sound? Where does this sensor seem to be located? What does this sensor look like?



What do you notice about the movement (or lack of movement) of this organism?



What questions do you have about your specimen?



Which books or guides did you use to identify this organism? What is its common name? Scientific name?



What is the most interesting feature this organism has which distinguishes it from other types of organisms?

Sifting Sands and Shifting Tides

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Focus

Energy in the Earth's Systems -Erosion, weathering, and glaciation change the Earth's surface by moving earth materials from place to place.

Water, wind and the moon's affect on tide levels will produce changes in a beach over a relatively short time, seasonally, and also over a long period of time or a longer geologic timeframe.

Focus Questions

What makes up a beach? Is a beach a pile of sand? Does a beach ever change?

Learning Objectives

Students will compare and contrast beach samples and look for patterns and clues that may indicate changes to the beach over a relatively short time and a long time.

Materials

- Four-piece or five-piece geology sieve
- Metric measuring containers in various sizes (largest must be able to hold 300ml)
- 100 meter measuring tape or a marked rope
- Wood stakes to mark distances at water line, mid-beach, bottom of dune (Optional: more stakes to mark more sample places)
- Sand gauge or mm rulers to compare grain sizes
- Zip lock plastic bags to collect sand samples
- Permanent markers to label bags
- Sheets of contact paper cut in 6-inch squares to collect sand samples
- Clipboards
- Pencils
- Sifting Sands and Shifting Tides Data Sheets (page 103) and Sifting Sands and Shifting Tides Sand Sampling sheets (page 104)

Logistics

- This activity works best on a stretch of sandy beach with several meters of beach between the wrack line and the dunes.
- Be sure to do the waterline section first as this will change with the tide.
- Check tide charts and weather prior to going out to the field site.

Teaching Time

A small group of students rotates to this station for 20-30 minutes.

Seating Arrangement

On location at the beach, students are in small groups (6-8 students).

Key Words

Dune grass	Sand dune
High water mark	Sand grain
Liter	Sieve
Milliliter	Tide
Particle size	Wrack Line

Background Information

Many students will assume that a beach is a homogeneous environment; lots of sand or rocks. By asking students to take a close look at a beach environment as they walk from the water line to the dune they will begin to observe patterns in beach composition such as sand grain and particle size, structure, and whether they find evidence to support life. On closer observation, sand and rocks can also be sorted by shape of particles such as rough edges or whether the samples have been rounded down over a long period of time.

Be sure students understand that the water line changes with the ebb and flow of the tides. Materials carried in the water are carried out onto the beach where they settle, creating a wrack line of material deposited at the high tide mark. At low tide, the area of the beach between high and low tide marks

Sifting Sands and Shifting Tides

(the intertidal area) is exposed to the air; at high tide this area is under water. Heavier objects tend to remain closer to the water line, whereas the forces of wind bring lighter particles of sand and dried plant and animal material higher up the beach where they are stopped by the dune and plants.

Water, wind and the moon's effect on tide levels will produce visible changes in a beach over a period of 24 hours. Seasonally, winter storms can make dramatic changes to a beach. Over a geologic timeframe the beach has changed during the periods of past glaciations (see the Connecticut Department of Environmental Protection's Hammonasset Geologic History article on page 114). Based on evidence they observe, students may want to make predictions about future changes to the beach environment.

Plants growing on sand dunes are vital and delicate. Students should know to stay off the plants growing on any sand dune as any human impact can damage or kill plants that serve to hold the sand on the dune and minimize beach erosion.

Learning Procedure

- Upon arrival, the first small group lays out the measuring tape from the water line or zero meter mark to the base of the sand dune (remind students not to step on the plants growing on the dune). Use a rock to pound a stake into the beach at the waterline. Record the time of day.
- Students next make observations about where they see changes in the beach and they pound stakes at those points on the beach (the stakes can also be placed at

Low tide reveals wrack lines of debris left by successive high water lines (left) and occasionally a deliniation of different sediment sizes and types (right).



Sifting Sands and Shifting Tides

101

- regular 10 meter intervals.)
- Complete the Sifting Sands and Shifting Tides Data Sheet (page 103).
 - The first small group of students selects one staked area to study. Usually the first spot chosen is at the waterline as the tide coming in may cause the first stake to be under water later in the day. Other groups select other points along the rope or tape measure and they follow the same procedure.
 - Collect 300 ml of sand. Use the sand sieve to sort according to grain size. Use the volume containers to measure the amount of sand in each section of the sieve.
 - Ask the students what they notice about the sand in each of the sieve sections. Use the sand gauge or mm ruler to compare grain sizes, shape and composition. Discuss and complete the Sand Sampling (page 104). This information can be further analyzed back at your school.
 - Place each of the samples labeled with the collection location in a zip lock bag to bring back to school for further investigation.
 - AND/OR Take a piece of contact paper, hold the sticky side down on the sand and rub the smooth side with your hand to press sand grains onto the sticky paper at each collection location.
 - Take a photo of each collection location (optional).

The Sea Grant Connection

Long Island Sound Educational Resources CD including *Sound Facts: Fun Facts About Long Island Sound* and *Living Treasures: Plants and Animals of Long Island Sound* - Connecticut Sea Grant

The "Me" Connection

How do you think this beach will change

during your lifetime? What evidence do you see to support this idea?

How have humans influenced this beach environment? How have you affected this beach environment today?

Would this beach environment be a good place to build a house? A hotel? A theme park?

Connection to Other Subjects

Art; Language Arts; Math; Social Studies

Evaluation

Student recorded observations, data collected on student data sheets

Extensions

In the classroom or lab, compare and contrast samples taken at various points on the beach to find evidence which support original focus questions.

Recreate the beach study on a bulletin board using the actual sand samples and/or contact paper samples.

Hold a debate based on an article about beach erosion and \$2 million restoration project at Hammonasset State Beach: www.ct.gov/governorrell/cwp/view.asp?A=1761&Q=290464

Go at a different time of year and compare results.

Resources

Tides and Water Levels - NOAA Ocean Service Education <http://oceanservice.noaa.gov/education/kits/tides/welcome.html>

Long Island Sound Educational Resources CD including *Sound Facts: Fun Facts About Long Island Sound* and *Living Treasures: Plants and Animals of Long Island Sound* - Connecticut Sea Grant

Sifting Sands and Shifting Tides

Connecticut Science Frameworks

Grades 3-5

4.3: Water has a major role in shaping the Earth's surface.

Grades 6-8

7.3: Landforms are the result of the interaction of constructive and destructive forces over time.

New York Science Standards

Standard 6: Interconnectedness: Common

Themes: **SYSTEMS THINKING:** Through systems thinking, people can recognize the communalities that exist among all systems and how parts of a system interrelate and combine to perform specific functions.

National Science Education Standards

Content Standard D: Earth and Space Science

- Structure of the Earth System

Ocean Literacy Essential Principles and Fundamental Concepts

Essential Principle 2: The ocean and life in the ocean shape the features of the Earth.

Fundamental concept c: Erosion—the wearing away of rock, soil and other biotic and abiotic earth materials—occurs in coastal areas as wind, waves, and currents in rivers and the ocean move sediments.

Fundamental concept d: Sand consists of tiny bits of animals, plants, rocks and minerals. Most beach sand is eroded from land sources and carried to the coast by rivers, but sand is also eroded from coastal sources by surf. Sand is redistributed by waves and coastal currents seasonally.

A set of sieves is used to sort the sediments into different size classes.



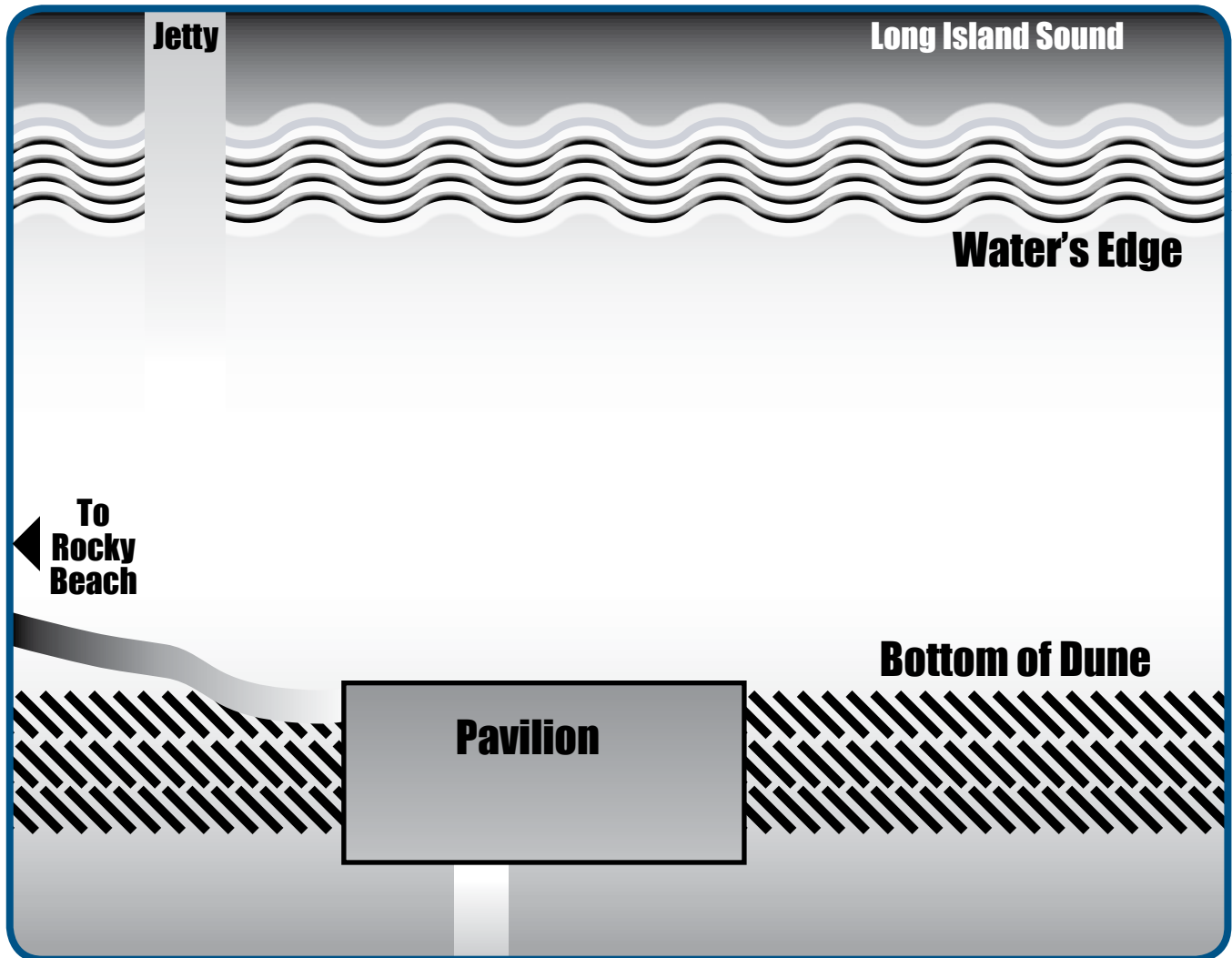
Sifting Sands and Shifting Tides

Data Sheet

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Scientist's Name: _____ Date: _____

Time: _____ Tide: High Mid Low



As a group, RECORD THE TIME, MEASURE (approximately) on land AND MARK on the map your answers to the following questions:

- 1) About how far is it from the water line to the base of the grassy sand dune?
- 2) About how far is it from the water line to the first wrack line you come to?
- 3) How many wrack lines do you see on the beach today?
- 4) What do you notice about the changes in the sand? Color? Texture? Size?
- 5) Do you find anything else in the wrack line besides sand?

Sifting Sands and Shifting Tides

Sand Sampling

104

Scientist's Name: _____ Date: _____

Sand sample location (estimate distance from the bottom of the sand dune): _____

Additional comments about the location:

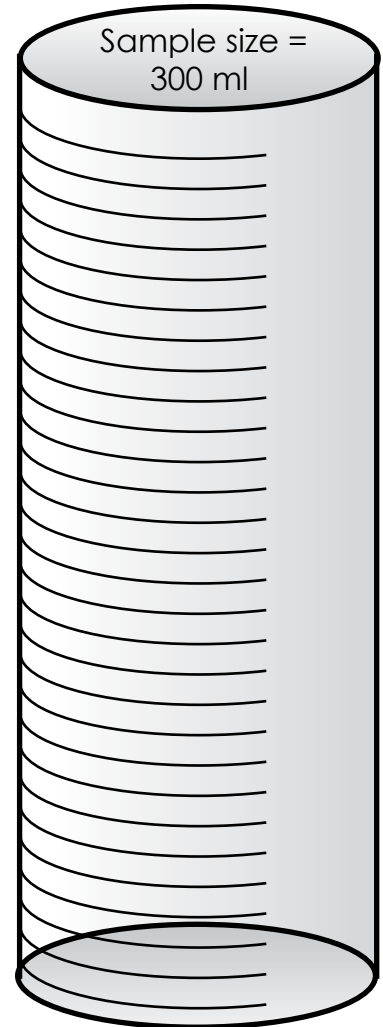
_____ ml _____ grain size

_____ ml _____ grain size

_____ ml _____ grain size

_____ ml _____ grain size

_____ ml _____ grain size



What do you notice about your sand sample?

Where do you think this sand came from?

Where do you think this sand is going next?

Compare the sand in your sample to the sand in another location.

What do you wonder about this comparison?

Aesthetic Connection to Long Island Sound

105

Focus

Long Island Sound provides a wealth of opportunities to help students make positive connections to the natural world. As students develop an appreciation for the environment through personal artistic expression they are developing an important foundation and motivation for future study.

Four activities are explained here. It is recommended that one activity be chosen for each field trip to Long Island Sound.

Focus Questions

How can I express what I see and feel at this ocean environment? In what ways can I demonstrate my creativity and thoughts about the Long Island Sound environment?

Learning Objectives

Artistic Overview - drawing:

Students will create a three-dimensional drawing depicting the environment.

Aesthetic Overview - creative writing:

Students will use language arts techniques as a means of self-expression and communication regarding the environment at Long Island Sound.

Seaweed Collage:

Students will create a collage made from seaweed collected on site.

Photo Montage:

Students will create a photogram using photosensitive paper and objects from nature.

Materials

Artistic Overview - drawing (for each person):

- Aesthetic Connection to Long Island Sound Drawing Template (page 109)
- Drawing pencil, eraser
- Clipboard or backer board
- Tape and scissors for a group leader if completing the project on site

Aesthetic Overview - writing (for each person):

- Several sheets of writing paper
- Pencil or pen
- Clipboard

Seaweed Collage (for each person):

- Several sheets of stiff paper, 80 lb weight. Glossy, stiff paper works well.
- Basin large enough to accommodate paper, seawater and seaweed specimen
- A variety of seaweeds collected on site - Keep these in a bucket of seawater until ready to use.

Photo Montage (for each person):

- One or more sheets of photosensitive paper (Nature Print), found in craft stores
- Cardboard
- Small pieces of masking tape
- Objects from nature collected onsite
- Box with cover to protect completed montages
- Black construction paper cut to the size of the photosensitive paper - to separate the montages in the box
- Stopwatch or timer

Logistics

- For the seaweed collage and photo montage, items must be collected from the site.
- When collecting seaweed for the seaweed collage, try to use fresh material from the wrack or drift to avoid disturbing natural populations.
- Know that the weather conditions and time of year may affect the experience. Warmer weather brings more visitors to field sites and seasonal variations bring changes in flora, fauna, and beach appearance.
- Establish boundaries and time limits for students prior to dispersal.

Teaching Time

Each small group of students rotates to this station for 20-30 minutes.

Aesthetic Connection to Long Island Sound

Seating Arrangement

Artistic and Aesthetic Overviews:

Random seating within stated boundaries.

Seaweed Collage and Photo Montage:

Form a circle for ease of viewing.

Key Words

Aesthetic
Collage
Free write
Horizon
Montage
Photosensitive

Background Information

An important aspect of Long Island Sound is its recreational use. People come to the Sound to enjoy the beach, to bird watch, and to escape from the pressures of everyday life. Although not often mentioned, the aesthetic and inspirational attraction of Long Island Sound is difficult to place a value on.

Learning Procedure

Artistic Overview- drawing

- Distribute pencil, clipboard or backboard and Aesthetic Connection to Long Island Sound Drawing Template.
- Assignment is given - within the designated boundaries, select an area from which you will draw what you observe. In the small triangle, sketch what you see from your location to the horizon line. Draw the sand, shells, plants, etc. Avoid drawing in the X area.
- In the large triangle, record the larger view by sketching what you see at and above the horizon.
- If completing the work on site, cut the square out when finished and then cut along the dotted line. Bring the two corners (marked *) of the paper together and overlap them. Doing so will cause the top of the paper to stand up, creating a three dimensional diorama-like display. Secure with tape.

- If following up in a subsequent class, use watercolor or colored pencils to complete the artwork. Then overlap the two lower corners as described above and secure with tape.

Aesthetic Overview -Writing

- Distribute writing materials to the students.
- Students are encouraged to pause and become aware of all of their senses. They are asked to take “snapshots” or “thoughtshots” of the area and consider what they want to remember when returning home. Depending on what students are learning in their language arts classes they can be asked to write a poem, a haiku, or even to free write. Illustrations are encouraged.
- Students can disperse into the assigned area to work.
- Their writings can be shared on site or in the classroom.

Seaweed Collage

- Prepare a basin with seawater at the selected site.
- Students collect seaweed specimens in water-filled buckets, then gather around the basin.
- Place one sheet of paper in the basin, making sure that it becomes coated with seawater.
- Float a seaweed specimen out in the seawater on the paper and arrange in an appealing manner.
- Slowly lift the paper at a gentle slope, allowing water to drip off.
- Arrange or adjust the seaweed further if necessary to spread it out and be sure that it is not too clumped.
- Set the seaweed-paper ensemble aside to dry. The seaweed will adhere to the paper because it contains a natural binding substance. No glue is needed.
- If desired, several specimens can be layered or arranged on the paper to form an abstract or representational design.

Aesthetic Connection to Long Island Sound

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- Another option: Use the preservation method described in *Seaweeds of Long Island Sound*, by Margaret “Peg” Van Patten, reproduced on page 125.

Photo Montage

- Staying within the stated boundaries, each student collects several objects from nature, looking for variety in texture, shape and translucency. Bring the collections together.
- With back to the sun so each student is working in a shady space, individuals arrange their objects in a pleasing design on the cardboard.
- Quickly distribute the photosensitive paper. If conditions are windy, you may want to use small pieces of tape to secure the paper to the cardboard. Reproduce the arrangement on the photosensitive paper.
- Students move so their work is now in the sunlight. Process the montage in the sun according to package directions - anywhere from several seconds to several minutes.
- Remove the objects and place the papers in the box, separated by black paper until the processing and setting of the arrangement is complete.

The Sea Grant Connection

Seaweeds of Long Island Sound by Margaret “Peg” Van Patten - Connecticut Sea Grant

The “Me” Connection

- What is your overall impression of this area?
- Do you feel different when you are at the shore than when you are at home? In what ways?
- How can I share my enjoyment of Long Island Sound with others?
- What is my part in keeping this environment clean?

Connection to Other Subjects

Art; Language Arts

Evaluation

Teachers use their own rubrics to assess student work. Artwork and writing produced at this station can enhance the presentation of student science work.

Extensions

Use the artwork created at this station to support presentations of student science work.

Set your poem to music.

Include a display of the shore-related artwork at an all-school sharing of the Long Island Sound adventure.

Combine the writings, illustrations and photographs into a booklet.

Resources

Seaweeds of Long Island Sound by Margaret “Peg” Van Patten - Connecticut Sea Grant

How to Preserve Seaweed instructions (page 125)

Connecticut Science Frameworks

Grades K-2

- K.2 Many different kinds of living things inhabit the earth.
- 1.2 Living things have different structures and behaviors that allow them to meet their basic needs.
- 1.3 Organisms change their form and behavior as part of their life cycles.

Grades 3-5

- 4.2 All organisms depend on living and nonliving features of the environment for survival.

Aesthetic Connection to Long Island Sound

New York Science Standards

Living Environment Key Idea 6: Plants and animals depend on each other and their physical environment.

National Science Education Standards

Content Standard G: History of Nature and Science

- Science as a human endeavor

Ocean Literacy Essential Principles and Fundamental Concepts

Essential Principle 6: The ocean and humans are inextricably interconnected.

Fundamental concept c: The ocean is a source of inspiration, recreation, rejuvenation and discovery. It is also an important element in the heritage of many cultures.

Fundamental concept e: Humans affect the ocean in a variety of ways. Laws,

regulations and resource management affect what is taken out and put into the ocean. Human development and activity leads to pollution (point source, non-point source, and noise pollution) and physical modifications (changes to beaches, shores and rivers). In addition, humans have removed most of the large vertebrates from the ocean.

Fundamental concept g: Everyone is responsible for caring for the ocean. The ocean sustains life on Earth and humans must live in ways that sustain the ocean. Individual and collective actions are needed to effectively manage ocean resources for all.

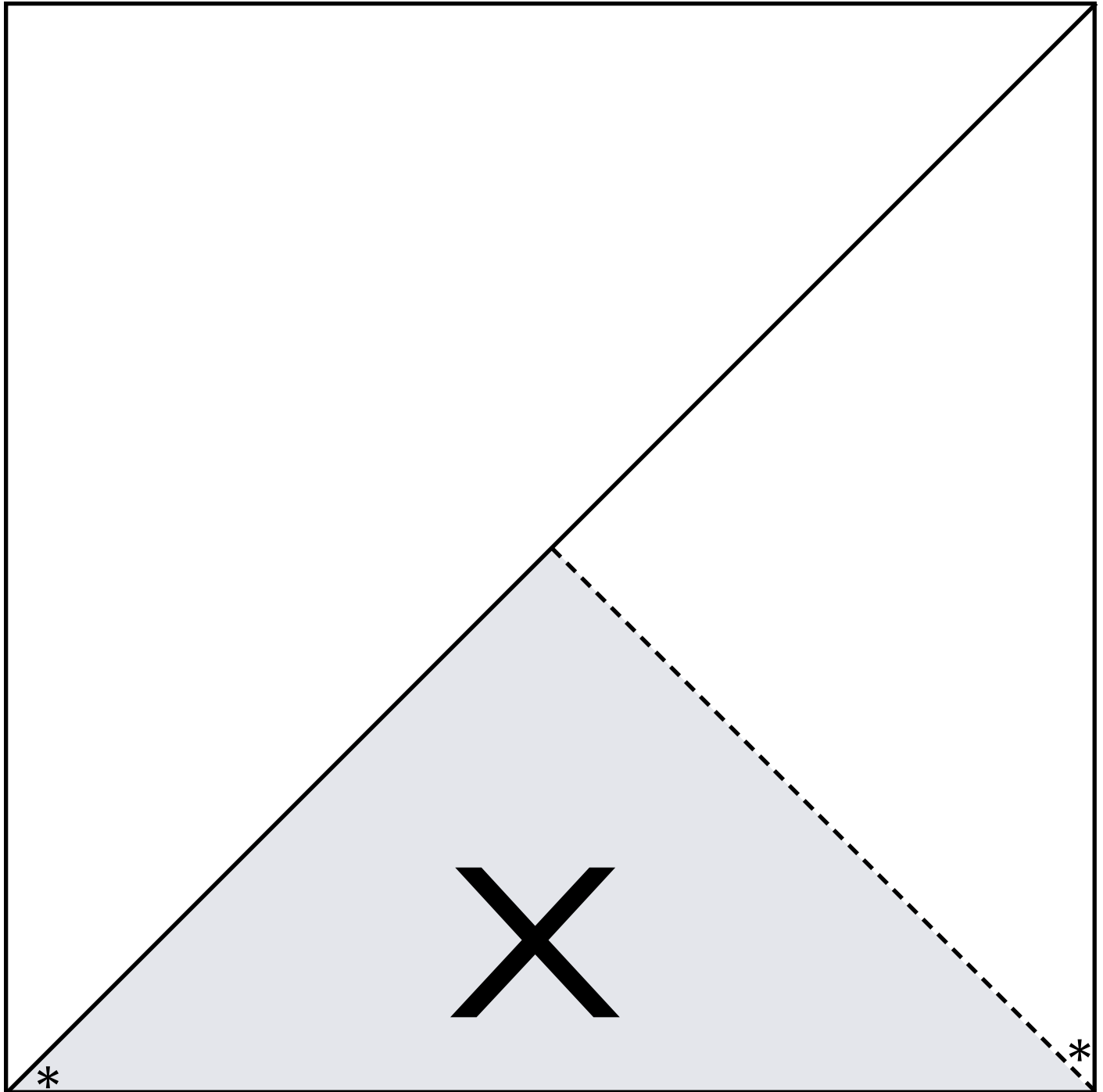
Special thanks to Dan Kaplan, Art teacher, East Hartford/Glastonbury Elementary Magnet School.



Aesthetic Connection to Long Island Sound Drawing Template

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In the small triangle, with the long side on the bottom, draw everything you see in the foreground *below the horizon*. In the large triangle, with the long side on the bottom, draw everything you see *on and above the horizon*. Avoid drawing in the shaded triangle.



When your drawing is complete, cut along the dotted line. Bring the two * together, overlapping the shaded triangle. Secure with tape.

LEADER PACKET

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Science Lessons at a Long Island Sound Field Site

The following pages include information necessary and helpful for conducting the Science Lessons at a Long Island Sound Field Site. Important information including maps, fee and permit specifications, as well as sources for materials have been added to facilitate the process of arranging for and conducting these lessons. While some of the information is specific for Hammonasset State Park in Connecticut, the rest is still relevant to any appropriate field site at Long Island Sound.



Science Lessons at a Long Island Sound Field Site - Leader Packet

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Contents:

111	Directions to Hammonasset State Park	
112	Map of Hammonasset State Park	
113	Permits and Fees	
114	Geology of Hammonasset State Park	
116	Master checklist of materials	
118	Where do we get all that gear?	
119	Map of Rocky Shore Environment	
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120	Sample Scientific Collector Permit for Aquatic Species	
121	“Invasive Shore Crabs Give Kids Lesson” from the <i>Hartford Courant</i>	
76	Schedule of the day*	<i>*This item is not in this section but should be included when making copies for instructors and helpers.</i>
125	How to Preserve Seaweed*	

Directions to Hammonasset State Park

www.ct.gov/dep

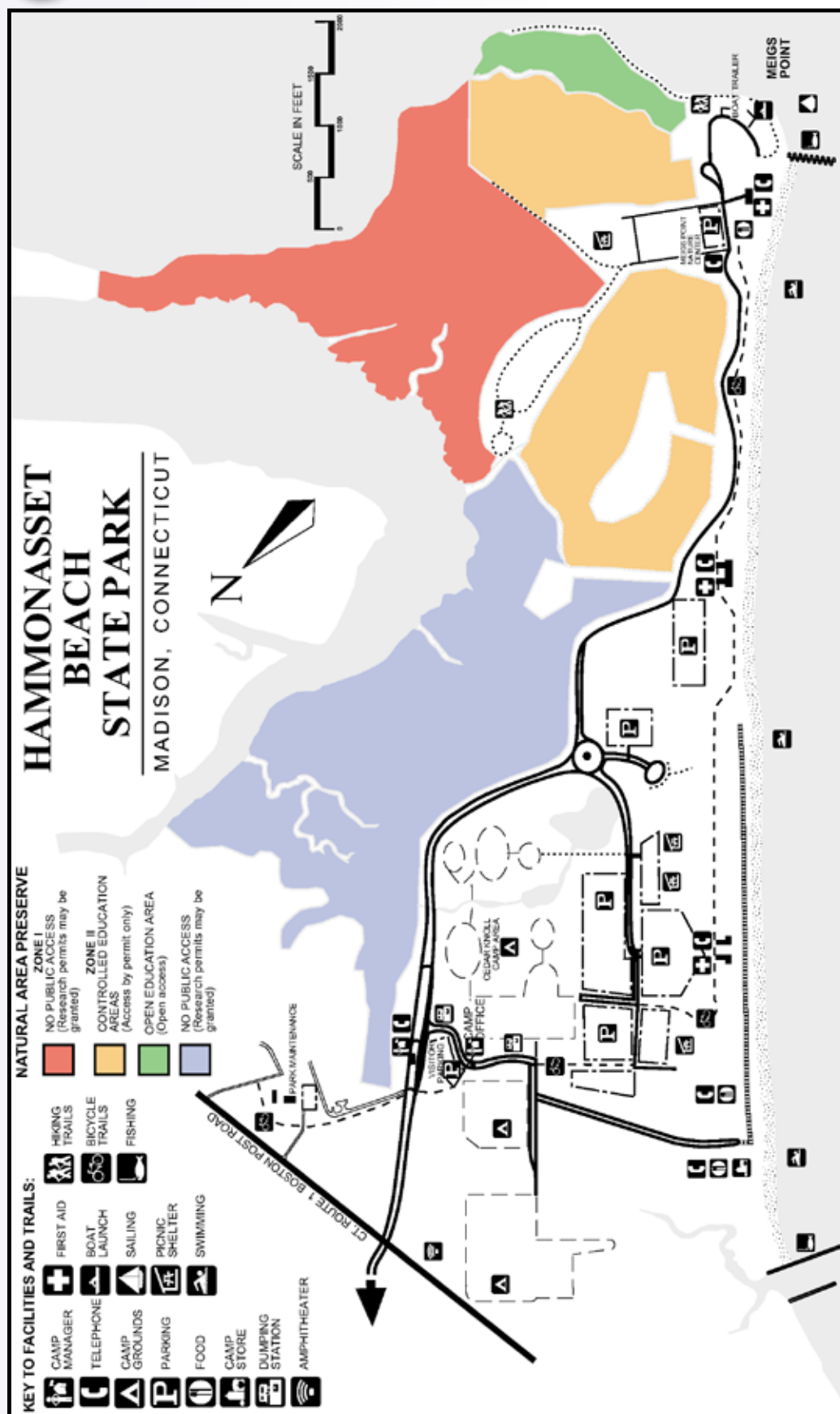
From the north/Hartford area: take I-91 south to Route 9 south. Off Route 9, take Exit 9. Turn right (south) onto Route 81; continue down Route 81 until you run into I-95. Turn right onto I-95 entrance ramp and go approximately 1 mile to Exit 62, then turn left off the exit. Head south 1 mile down Hammonasset connector, go straight through the light crossing Route 1 (Boston Post Road) into the park.

From the south area: take I-95 north, Exit 62. Take a right off the exit ramp onto Hammonasset I-95 connector. Park entrance will be 1 mile ahead.

From the east/Rhode Island area: take I-395 south onto I-95 south, Exit 62. Take a left off the exit and go approximately 1 mile. Go straight through the traffic light crossing Route 1 (Boston Post Road).

From the west/New York area: take I-95 north, Exit 62. Take a right off the exit and go approximately 1 mile. Go straight through the traffic light crossing Route 1 (Boston Post Road) into the park.

Science Lessons at a Long Island Sound Field Site - LEADER PACKET



◀ **Rocky Shore Environment**

◀ **Sandy Beach Environment**

Map courtesy of Connecticut DEP

Science Lessons at a Long Island Sound Field Site - LEADER PACKET

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Permits and Fees

www.ct.gov/dep

Bus permits are issued on a first come/first served basis. A limited number of permits are available for each Park or Recreation Area.

Requests for a bus permit must be made by mail, email or telephone at least fourteen (14) days prior to the intended visit and should be sent to:

CT DEP State Parks Division
79 Elm Street
Hartford, CT 06106-5127
Phone: 860-424-3200
Email: dep.stateparks@ct.gov

Requests can be submitted after February 1st each year and must include:

- Name of the park or recreation area requested.
- Name and address of organization.
- Date of arrival.
- Name, address and phone number of person responsible for, and accompanying bus or buses.
- Number of buses.

Once a permit has been issued, it will be mailed to the organization that has submitted the request. The permit must be brought to the recreation area with the bus it was assigned to.

A separate permit is required for each bus.

Buses **MUST** remain at the recreation area at all times in case of inclement weather or the need for an emergency evacuation.

Bus Fees

Fees are waived for buses carrying Connecticut senior citizens and public school students on officially authorized trips between the beginning of the school year and June 30th.

From Memorial Day Weekend through Labor Day **ONLY** there are separate weekend/holiday and weekday parking fees. On weekends from April 20 through May 20 and again from September 8 through September 23, the weekday rate for parking will be in effect. For additional information on bus permits and

Connecticut State Parks and Recreation Areas Which Require Bus Permits:

Black Rock	Lake Waramaug
Bluff Point	Mansfield Hollow
Burr Pond	Mashamoquet Brook
Chatfield Hollow	Mount Tom
Day Pond	People's Forest
Devil's Hopyard	Quaddick
Gay City	Rocky Neck
Gillette Castle	Sherwood Island
Hammonasset Beach	Silver Sands
Harkness Memorial	Sleeping Giant
Hopeville Pond	Squantz Pond
Indian Well	Stratton Brook
Kent Falls	Wadsworth Falls
Kettletown	Wharton Brook

Science Lessons at a Long Island Sound Field Site - LEADER PACKET

fees, please contact the State Parks Division at (860) 424-3200 Monday through Friday from 8:30 am to 4:30 pm or at dep.stateparks@ct.gov.

Specimen Permit

Please obtain an educational collecting permit from the state park if you will be taking any living specimens back to school. The telephone number of Hammonasset is 203-245-2785.

Geology of Hammonasset State Park

www.ct.gov/dep

Rock Types Found on Main Trail: None

Rock Units: None

Minerals of Interest: None

Interesting Geologic Features: End Moraine, Huge Glacial Erratics

Bedrock (also called ledge) is not exposed anywhere in this park. Bedrock is the rock that is attached to the Earth - it can be seen in road cuts along I-95 and many other roads in Connecticut. The rocks at Hammonasset are all loose sediments, transported here by moving ice. They range in size from fine silt to large boulders. Large rocks appear at the surface only in two places in the park, along the shore at Meigs Point and in the woods to the north of the Meigs Point Nature Center, on the north side of the picnic area. The Cedar Island and Meigs Point trails follow along both of these sites.

Connecticut and Long Island Sound were covered with glacial ice at least a mile thick about 21,000 years ago. That ice continually moved south from its origin near Hudson's Bay in Canada. As it moved, the ice picked up loose material on the Earth's surface, from dust to house-sized boulders. The ice moved continually, though very slowly. By the time the ice moved as far south as Long Island, NY, the temperature was warm enough that the front of the ice melted as fast as the ice advanced. Loose material frozen into the ice was dumped as the ice melted. This created a long east-west ridge of unsorted sediments, called a moraine. As the climate warmed, the ice melted faster than it advanced, so the ice front gradually withdrew north. About 19,500 years ago the ice front became stationary again as the climate temporarily cooled. This formed another moraine. Those two moraines now make up Long Island. The second one, the Harbor Hill-Fishers Island-Charlestown moraine, extended across what is now the mouth of Long Island Sound. As the ice again started melting to the north, the water collected behind this moraine to make Glacial Lake Connecticut, where Long Island Sound is today. When the water level became high enough, a natural spillway developed from the lake where the Race is today.

Then, about 17,500 years ago the climate cooled for a while, so that the ice front stayed along a line from Hammonasset through Ledyard to Queens River, RI. The ice was still moving south, but it was melting at the same rate, so sediments piled up along the front. This formed the Hammonasset-Ledyard-Queens River moraine. It is a double moraine, meaning there are two parallel moraines close together.

Science Lessons at a Long Island Sound Field Site - LEADER PACKET

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This happened because a short, warmer period melted the ice farther back to the north again, then a cooler period stopped the melting for a short period, before the ice again melted back to the north. Here in the park the Meigs Point Trail rocks are the older moraine, the Cedar Island Trail rocks are the younger one.

As the glacier was melting back, large amounts of water were flowing downhill from it, washing finer sediments into low-lying areas. This has resulted in sand and gravel deposits in the valleys of Connecticut, where lots of water was moving. On hilltops and flat areas the undisturbed glacial sediments are a mixture of all sized materials, called till. Here at Hammonasset, till underlies the soil at Meigs Point Nature Center, the picnic area behind the center and probably also the salt marsh. Willard Island and the other smaller islands in the marsh are thicker areas of till. All of the campground east of Tom's Creek is underlain by sand, while west of the creek there is more till.

The most obvious sediments are the large boulders along the shore at the east end of the beach at Meigs Point. These are the coarser materials left from the moraine after the waves have been attacking it for a few thousand years. The finer materials near the water have washed out into the Sound, helping to make the beaches, while the huge boulders remain. But farther from the shore the fines still remain in the moraine, supporting a variety of vegetation. A close look at these rocks while walking along the Meigs Point trail will reveal a variety of rock types. Many are striped with light and dark minerals. These are called gneiss. Some of these bands are folded. These metamorphic rocks were once buried deeply, where they were subjected to intense pressure at high temperatures. Some rocks are pink and gray or black, with the large grains randomly arranged. These are granite, a rock which was once melted, then cooled slowly at some depth below the surface.

After walking through the boulders, head toward the trail where it is high above the rocks. In some places you will see the undisturbed moraine mixture of all sizes of material.

A walk along the Cedar Island Trail through the woods leads to a boardwalk that ends in the marsh. Along the trail you will see occasional boulders. The marsh has several large boulders visible above the grass. This chain of boulders continues on out into the water. All of these are part of the north moraine.

Currents moving along the shore constantly move sand along the beach. At Hammonasset, the longshore currents carry sand to the southeast. This is obvious at the jetty, where the sands extend farther out on the northwest side of the rocks than on the southeast side. The waves drop their sand load on the northwest side when they encounter the stone jetty, then remove sand from the southeast side. Thus Hammonasset beach sand currently comes from the areas to the northwest of the beaches.



Science Lessons at a Long Island Sound Field Site - LEADER PACKET

Master Materials Checklist for Science Lessons at a Long Island Sound Field Site

Crab Study and Beach Sample Station

- ☐ Permit to collect specimens
- ☐ 10-12 buckets for collecting crabs
- ☐ 6 large containers for sorting crabs (basins or under bed plastic storage containers work well). Mark the containers or use laminated cards to indicate the following:
 - ☐ Male Large - larger than 18 mm
 - ☐ Male Medium - 9-18 mm
 - ☐ Male Small - smaller than 9 mm
 - ☐ Female Large - larger than 18 mm
 - ☐ Female Medium - 9.1-18.0 mm
 - ☐ Female Small - smaller than 9 mm
- ☐ Whistle to signal the beginning and end of collection time
- ☐ Stopwatch to time the collection period
- ☐ Small plastic mm rulers for each person
- ☐ Clipboard and pencil for group leader, including Crab Study Station Crab Count
- ☐ Data Sheet (page 86)
- ☐ 1-2 calculators
- ☐ For each student, copy of each: Beach Sample Station Data Sheets (page 85) and Crab Study Station Crab Count Data Sheet (page 86)
- ☐ Optional: cooler to take specimens back to school

For breakout groups:

- ☐ Wind meters
- ☐ Thermometers to measure air, water, and sand temperatures
- ☐ Transect square ("quadrat") - any size
- ☐ 50 meter tape measure or rope line attached to a stake
- ☐ Plastic zip lock bags to collect small samples of the rocky beach
- ☐ Permanent marker to label bags

Seining

- ☐ Seine net and poles (2 sets recommended)
- ☐ Five-gallon buckets (4 or more)
- ☐ Chest waders - carry these in a large plastic tub or crate
- ☐ Life jackets
- ☐ Beach towel
- ☐ For each student:
 - ☐ Seining Data Sheet (page 92)
 - ☐ Clipboard and pencil
- ☐ Weather and water equipment:
 - ☐ Hand-held wind speed indicator
 - ☐ Thermometers with probes
- ☐ Compass
- ☐ Digital camera with fresh batteries and memory card

Beach Lab-Marine Biology Field Station

- ☐ Magnifiers
- ☐ Dissection microscopes
- ☐ Petri dishes
- ☐ Variety of plastic containers
- ☐ Basin
- ☐ Eye droppers
- ☐ Millimeter rulers
- ☐ Sharp pencils
- ☐ Beach Lab - Marine Biology Field Station Data Sheets (pages 97-98)
- ☐ Clipboards
- ☐ Extra paper
- ☐ Camera with fresh batteries & memory card
- ☐ Small fish net or strainer
- ☐ Battery operated bubbler (optional) - available in bait shops and pet stores
- ☐ Five-gallon buckets (4 or more)
- ☐ Fold-up table if none is available on site
- ☐ Optional: cooler to take specimens back to school

Science Lessons at a Long Island Sound Field Site - LEADER PACKET

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Beach Lab-Marine Biology Field Station FIELD GUIDES AND RESOURCES

- ☐ *Beachcomber's Companion*© - Woods Hole Oceanographic Institute Sea Grant
- ☐ *Beachcomber's Guide to the North Atlantic Seashore* - Massachusetts Audubon Society
- ☐ *Connecticut College Bulletin No. 34 -Tidal Marshes of Long Island Sound Ecology, History, and Restoration*
- ☐ *Living Treasures: The Plants and Animals of Long Island Sound* - Connecticut Sea Grant
- ☐ *Marine Animals of Southern New England and New York* by Howard M. Weiss - CT DEP
- ☐ *Seaweeds of Long Island Sound* by Margaret "Peg" Van Patten - Connecticut Sea Grant
- ☐ *Visual Guide: Long Island Sound Marine Invasive Species with comparison to some native species* waterproof field guide/flip book - Connecticut Sea Grant

Shifting Sands and Shifting Tides

- ☐ Four-piece or five-piece geology sieve
- ☐ Metric measuring containers in various sizes (largest must be able to hold 300ml)
- ☐ 100 meter measuring tape or a marked rope
- ☐ A wood stake to mark distances at water line, mid-beach, bottom of dune (Optional: more stakes to mark more sample places)
- ☐ Sand gauge or mm rulers to compare grain sizes
- ☐ Zip lock plastic bags to collect sand samples
- ☐ Permanent markers to label bags
- ☐ Sheets of contact paper cut in 6-inch squares to collect sand samples
- ☐ Clipboards
- ☐ Pencils
- ☐ Sifting Sands and Shifting Tides Data Sheets (page 103) and Sifting Sands and Shifting Tides Sand Sampling sheets (page 104)

Artistic Overview - drawing (for each person):

- ☐ Aesthetic Connection to Long Island Sound Drawing Template (page 109)
- ☐ Drawing pencil, eraser
- ☐ Clipboard or backer board
- ☐ Tape and scissors for group leader

Aesthetic Overview - writing (for each person):

- ☐ Several sheets of writing paper
- ☐ Pencil or pen
- ☐ Clipboard

Seaweed Collage (for each person):

- ☐ Several sheets of stiff paper, 80 lb weight. Glossy, stiff paper works well.
- ☐ Basin large enough to accommodate paper, seawater and seaweed specimen
- ☐ A variety of seaweeds collected on site - Keep these in a bucket of seawater until ready to use.

Photo Montage (for each person):

- ☐ One or more sheets of photosensitive paper (Nature Print), found in craft stores
- ☐ Cardboard
- ☐ Small pieces of masking tape
- ☐ Objects from nature collected on site
- ☐ Box with cover to protect completed montages
- ☐ Black construction paper cut to the size of the photosensitive paper - to separate the montages in the box
- ☐ Stopwatch or timer

Science Lessons at a Long Island Sound Field Site - LEADER PACKET**Where can we get all that gear?**

Vendor	Item*
www.Forestry-suppliers.com 800.752.8460 customer service 800.647.5368 sales 800.543.4203 fax	<ul style="list-style-type: none"> Hubbard #3076 Four screen sieve kit item # 53716 \$57.95 (five screen available) Sand gauge item # 77332 \$6.95 Chest waders & suspenders \$45.95, \$8.50
Fisher scientific www.fishersci.com	<ul style="list-style-type: none"> 1" deep Petri dishes 150x25 mm item # 08-757-10E
Farr's Sporting Goods 2 Main Street, Manchester, CT 06040 860.643.7111 contact = Debbie	<ul style="list-style-type: none"> Seine net (provide your own poles) item # MSF 4x20 \$34.95 Minnow trap \$9.99
Edmund Scientifics 60 Pearce Ave., Tonawanda, NY 14150 800.728.6999 www.scientificsonline.com	<ul style="list-style-type: none"> Digital hand-held thermometer, item # 3105400 \$29.95
Dwyer Instruments, Inc. P.O. Box 373 - 102 Indiana Highway 212 Michigan City, Indiana 46361-0373 219.879.8000 sales only 219.879.8868 general office www.dwyer-inst.com	<ul style="list-style-type: none"> Hand-held Dwyer wind meter (mph) \$21.75
Connecticut DEP Bookstore 79 Elm St. Hartford, CT 06106-5127 860.424.3555 or 860.424.3692 Fax: 860.424.4088 dep.store@ct.gov www.ctdepstore.com	<ul style="list-style-type: none"> <i>Connecticut College Bulletin No. 34 - Tidal Marshes of LIS Ecology, History and Restoration</i> <i>Marine Animals of Southern New England and New York</i> by Howard M Weiss <i>Beachcombers Guide to the North Atlantic Seashore</i> pamphlet - Massachusetts Audubon Society
Connecticut Sea Grant 1080 Shennecossett Rd. Groton, CT 06340 860.405.9128 860.405.9109 fax web2.uconn.edu/seagrants	<ul style="list-style-type: none"> <i>Sound Facts, Living Treasures The Plants and Animals of LIS</i> - These are combined, enhanced and published by Sea Grant as a CD entitled Long Island Sound Educational Resources <i>Seaweeds of Long Island Sound</i> by Margaret "Peg" Van Patten

*Prices accurate as of June 2008.



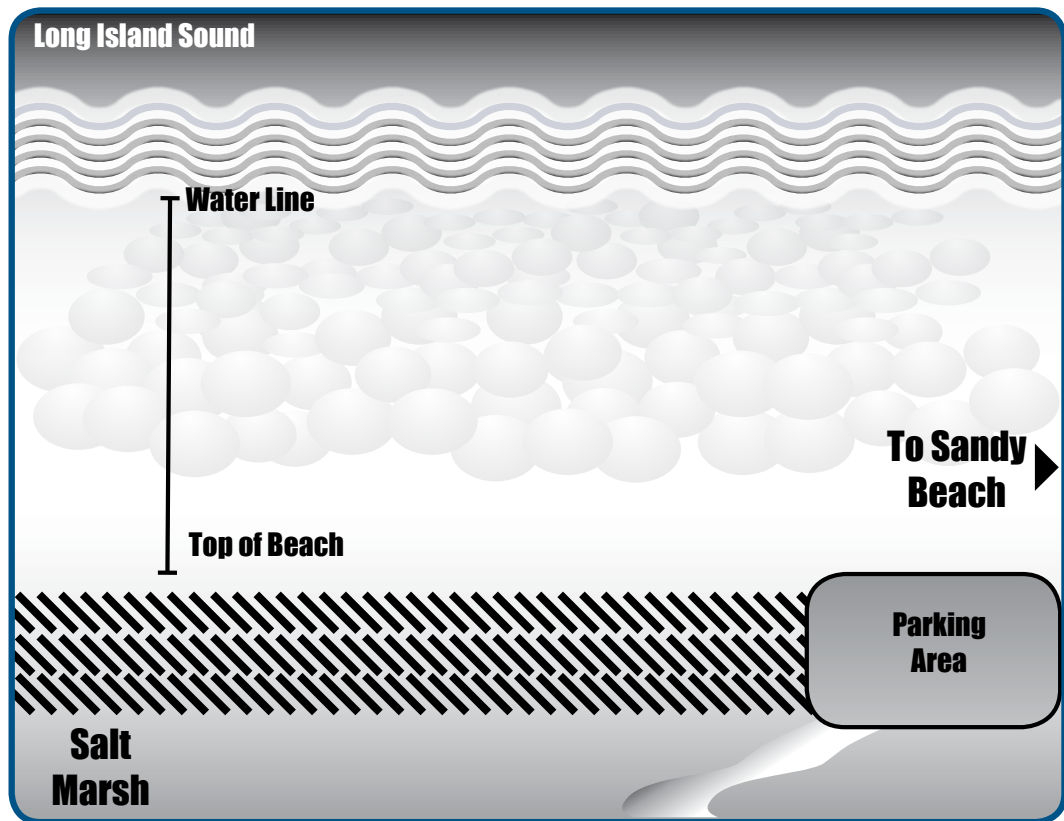
Science Lessons at a Long Island Sound Field Site - LEADER PACKET

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Crab Study Area: Rocky Shore Environment

Time of Day:

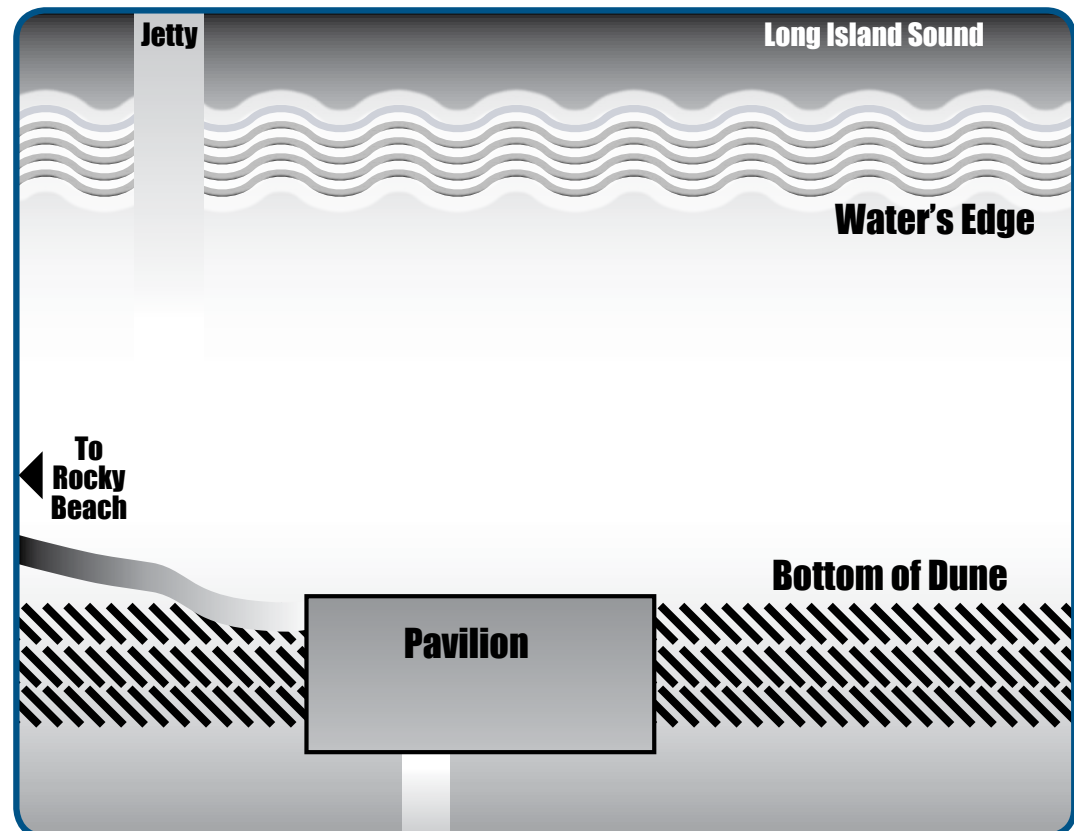
Tide:
high mid low



Sandy Beach Environment

Time of Day:

Tide:
high mid low



Science Lessons at a Long Island Sound Field Site - LEADER PACKET

Sample Scientific Collector Permit for Aquatic Species

This form can be downloaded directly from the Connecticut Department of Environmental Protection web site at www.ct.gov/dep/lib/dep/fishing/fishing_forms/scicoll.pdf.



Department of Environmental Protection
79 Elm Street
Hartford, CT 06106-5127

Permit # _____
Flag # _____
Official Use Only

BUREAU OF NATURAL RESOURCES - FISHERIES DIVISION SCIENTIFIC COLLECTOR PERMIT APPLICATION

Connecticut Public Act 91-3 specifies that an annual fee of \$20.00 will be charged for the issuance of a COLLECTOR PERMIT. Please submit the appropriate amount with this application.

APPLICANT Name: _____ Affiliation: _____ Street Address: _____ City: _____ State: _____ Zip: _____ Telephone: _____ Office _____ Home _____	VESSEL (if applicable) (Use additional sheet for additional vessels) Vessel Name: _____ Home Port: _____ Reg. No./Document No.: _____ Hull Material: _____ Hull Color: _____ Propulsion: _____
Type of collection requested: (Check all that apply) <input type="checkbox"/> Aquatic species in the Inland District <input type="checkbox"/> Aquatic species in the Marine District <input type="checkbox"/> Wildlife species	This permit is requested for the period from: _____ Date _____ to _____ Date _____ Note: A Collector Permit may be issued for a period of up to three years.

COLLECTING DETAILS

Type of collecting gear to be used:

Species and numbers of each to be collected:

Purpose of collection:

Specific areas of the State where collections are to be made:

Specimens will be deposited at:

If collecting program involves tag and release studies, describe in detail. Include tag design, legend and numbers or series. (Use additional sheet if necessary.)

Persons authorized to collect under this permit: (Use additional sheet if necessary.)

Mail To:
Dept. Of Environmental Protection
Fisheries Division
79 Elm Street
Hartford, CT 06106-5127

Signature _____
Applicant

Science Lessons at a Long Island Sound Field Site - LEADER PACKET

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CONNECTICUT

WWW.COURANT.COM

FRIDAY, OCTOBER 13, 2006

IN★ THE HARTFORD COURANT SECTION B



KEEPING COUNT OF CRABS

FIFTH-GRADER Jennifer Paradis of East Hartford, left, shows off the only green crab found by fifth-graders from East Hartford-Glastonbury Elementary Magnet School, during a field trip to Hammonasset Beach State Park in Madison Thursday. Above, fifth-grader Dustin Murray-Simmons of East Hartford and science teacher Donna Rand watch several small Japanese shore crabs scurry away after turning over a rock at the park. The shore crabs were plentiful. See story, **Page B5**.

PHOTOS BY BOB MACDONNELL | THE HARTFORD COURANT

Science Lessons at a Long Island Sound Field Site - LEADER PACKET

B5
IN ★ THE HARTFORD COURANT • FRIDAY, OCTOBER 13, 2006

INVASIVE SHORE CRABS GIVE KIDS LESSON

Peter Marteka is branching out from the hills of eastern Connecticut to the mountains and trails west of the Connecticut River and along the state's shoreline. His new column, "Nature's Path," debuts next Friday in the Town News section.



PETER MARTEKA
THE PATH LESS TRAVELED

As a light breeze barely ruffled the surface of Long Island Sound Thursday, children wearing boots and old sneakers tipped over slick, weed covered rocks along Meigs Point at Hammonasset Beach State Park in Madison.

"I found a big one! Ow! Ow! OK, hurting!" cries one boy as a large crab held onto his finger with a claw.

"I'm picking them up like crazy," says another. "Oh, he's trying to run to the ocean."

Welcome to the annual crab study by fifth-grade students at the East Hartford-Glastonbury Elementary Magnet School. During a visit to the state park Thursday, on a day that felt more like summer than fall, students spent 20 minutes along Rock Beach collecting all the crabs they could find. The tally at the end was 474 Japanese shore crabs and one green crab.

"The results are similar to what we've been finding year after year," says Donna Rand, a science and technology teacher at the school. "We find one or two green crabs and the rest shore crabs."

Years ago, Rand would visit the beach and find rock crabs, calico crabs, blue crabs and green crabs hidden beneath rocks. Since 1998, the students have been collecting 700 to 1,000 of the

shore crabs — an invader from East Asia — and not much else.

That's because the shore crab — a very aggressive and voracious predator — has become the bully of the intertidal and subtidal areas of the Sound. Although only 2 to 3 inches wide, shore crabs will attack and kill green crabs — invaders themselves a century ago — twice their size. The invasive creatures also go after shellfish and lobster.

"The world is becoming smaller," Rand says. "It's unbelievable how hardy they are and how quickly they reproduce. Invasive species as a whole are a very big problem."

Although Rand says the green crabs were also invaders, they found their own niche in the ecosystem. Now it seems one invader is being replaced by another.

"But the Japanese shore crabs are so dominant they have absolutely taken over the ecosystem," she says. "It puts everything out of balance. ... Invasive species are a part of everyday life now, whether it is plants or these crabs. It's important for children to learn about them at a young age so they become more aware of them and the damage they cause."

Penny Howell, a fisheries biologist with the state Department of Environmental Protection, said Wednesday that there's not

"The crabs were a little iffy for me."

ALEYAH SEABROOK,
EAST HARTFORD

enough staff to study the crabs, adding it was low on the priority list. She says that although the crabs are dominating the shallow areas, they are becoming more appetizing to fish deeper out.

"I understand they are not as successful when they move out, so there is some sort of limit out there," she said. "The tautog love crabs and we are finding shore crabs in them. So some of the tautog, although they prefer the other species, are learning how to eat the new prey."

After the search, the students spent the rest of the morning taking inventory of the species by separating them by gender and size. While inventorying and counting, the students noted that the crabs are feisty and the males outnumber the females.

"At first I was scared to pick one up," said Aleyah Seabrook of East Hartford. "The crabs were a little iffy for me. But once you got one in your hand, you couldn't stop picking them up. You are not only hunting for them, you are learning about them at the same time."

Principal Glen Peterson, who donned hip waders and joined the students Thursday, says the situation is "an important issue everyone should know about."

"These days if we find one or two native species [of crab], it's a miracle," he said. "Our main theme is science and having kids