

Summer on the Marsh

Training Handbook

June 2015

NEOSEC

New England
Ocean Science
Education Collaborative



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Additional Materials on the Participant Thumbdrive:

- 2015 Summer on the Marsh science protocol
- 2015 Summer on the Marsh data sheets
- Summer on the Marsh activity guide, compiled by Seacoast Science Center
- Copy of 2015 training manual

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1 Program Introduction

The summer camp experience for youth has changed dramatically over the past several years. Gone are the days when campers spent hours preparing elaborate works of macramé as proof of a successful summer. Camps are increasingly offering more ambitious and in-depth programs that not only challenge campers, but also give campers a taste of real world opportunities.

The *Summer on the Marsh* program, a collaborative project of the New England Ocean Science Education Collaborative and funded by the Environmental Protection Agency, builds on the highly successful three-year *Summer Science in New England* program, generously funded through NOAA. During Summer Science, youth ages 14-19 were engaged in citizen science in coastal zones across the Northeast.

More than 1,000 campers between 9 and 12 years old will be served in this two-year project, with thousands more benefiting in future years as camps continue using the monitoring protocol. Participants will learn how salt marshes connect to their own homes (the watersheds where they live), how marsh health affects human health, and how monitoring can help measure how healthy a salt marsh is. Collecting data themselves that is then used in real studies, young campers will feel ownership of the project. Understanding what's required for a salt marsh to be healthy, young people will be motivated to help protect this ecosystem. Camps will build capacity by offering a new element in their environmental education programming: hands-on citizen science activities.

The institutional partners in *Summer on the Marsh* are members of the New England Ocean Science Education Collaborative (NEOSEC). Six member institutions are taking part in the first year. An additional two will take part in the second year. Camps include Mystic Aquarium (MyAq) and Project Oceanology (Project O) in Connecticut; Narragansett Bay National Estuarine Research Reserve (NBNERR) in Rhode Island; Waquoit Bay National Estuarine Research Reserve (WBNERR), Buttonwood Park Zoo (BPZ), Maritime Gloucester (MG) and NEAq in Massachusetts; Seacoast Science Center (SSC) in New Hampshire.

Participating camps will work alongside research scientists to engage campers, ages 9-12, in data collection in the salt marsh. This unique opportunity provides a citizen science experience for teens across a wide geographical area, supports and trains informal science center staff to incorporate citizen science into existing camp programming, and offers opportunities for all participants, educators and scientists – to share findings with peers at annual regional forums.

Establishing a science protocol based on rapid assessments developed by the U.S. Geological Survey, data gathered by teen camp participants will be incorporated into a larger dataset and used by researchers around the world into the future. If the program is successful, it is expected that camper participants will continue to act in ways that protect and nurture our natural resources through an increased awareness of ocean literacy.

The primary goal of the program is to enhance the capacity of marine science centers to engage youth ages 9-12 in field-based citizen science for protection of coastal waters

Objectives:

- Develop a replicable model for education-focused citizen science

- Increase regional capacity for cross region information sharing and collaboration through NEOSEC.
- Provide young people with tools, context and follow-up to understand the significance of monitoring salt marsh health, especially as it relates to human health.
- Provide career development to scientists and educators through joint professional development, and to participating youth through contact with those practitioners
- Increase awareness of connections between human health and the environment.

Opportunities for Collaboration and Reflection

Each fall, campers from each partnering institution will gather virtually in a moderated regional Virtual Youth Summit. October 2014 will mark the pilot of this innovative method for building community and sharing results. The youth Ocean Summit serves as the culmination of the campers' experience, and will engage their families in their learning and an opportunity to be part of regional scientific exploration.

The 2015 Youth Summit will be Sept 20, 2015.

In 2014, camp directors and scientists attended NEOSEC's Ocean Literacy Summit. The OL Summit is a biennial event organized by NEOSEC members, funded to date by NOAA, in-kind donations, and the National Science Foundation (through the Centers for Ocean Sciences Education Excellence). Each Summit takes as its theme an Ocean Literacy Principle. The next one will be in fall of 2016.

Ocean Literacy:

In October 2005, several national organizations (National Geographic Society, National Oceanic and Atmospheric Administration, Centers for Ocean Sciences Education Excellence, College of Exploration, and National Marine Educators' Association) published a list of seven Essential Principles and 44 Fundamental Concepts that define Ocean Literacy (OL). The product of discussions among 100 scientists and educators, these Principles serve as a national standard for ocean science education. Visit the national OL website (<http://oceanliteracy.wp2.coexploration.org/>) for more information.

Someone who is ocean literate:

- Understands the essential principles and fundamental concepts about the functioning of the ocean.
- Can communicate about the ocean in a meaningful way.
- Is able to make informed and responsible decisions regarding the ocean and its resources.

OCEAN LITERACY

Seven Essential Principles

- 1 The Earth has one big ocean.*
- 2 The ocean shapes the Earth.*
- 3 The ocean is a major influence on weather and climate.*
- 4 The ocean makes Earth habitable.*
- 5 The ocean supports diversity of life and ecosystems.*
- 6 The ocean and humans are interconnected.*
- 7 The ocean is largely unexplored.*

The Seven Essential Principles of Ocean Literacy were developed through a national conversation sponsored by National Geographic, the National Oceanic and Atmospheric Administration, the Centers for Ocean Sciences Education Excellence, the National Marine Sanctuary Foundation, the College of Exploration, University of Southern California Sea Grant and the National Marine Educators Association. For more information, visit: www.coexploration.org/oceanliteracy.



New England
Aquarium



CENSUS
OF MARINE LIFE



CENTERS FOR OCEAN SCIENCES
EDUCATION EXCELLENCE

NEOSEC

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The New England Ocean Science Education Collaborative (NEOSEC) leverages and strengthens the region's extraordinary ocean science and educational assets to advance understanding of the vital connections between people and the ocean. To support this mission, member institutions:

- Expand their collective capacity to bring ocean science to the public by working together and learning from each other.
- Create and deliver programs to diverse audiences by working in partnership with people and organizations who share our mission.
- Create and disseminate materials and programs that enable people of all ages, from diverse backgrounds and experience, to learn about the ocean.
- Model innovative and effective methods for integrating ocean sciences and scientists into education and outreach efforts.

Member Institutions (June 2015)

Bigelow Laboratory for Ocean Science	New England Aquarium
Buttonwood Park Zoo	New England Science & Sailing
Center for Coastal Studies	North American Marine Environment Protection Association (NAMEPA)
Coastal Studies for Girls	Northeast Underwater Research Technology and Education Center (NURTEC)
Center for Ocean Sciences Education Excellence (COSEE) Ocean Systems	Northeast Regional Association of Coastal and Ocean Observing Systems (NERACOOS)
Connecticut Sea Grant	Northeastern University, Marine Science Center
Downeast Institute for Applied Marine Research and Education	Oceanic Research Group
Great Bay National Estuarine Research Reserve	Project Oceanology
Gulf of Maine Marine Education Association	Salem Sound Coastwatch
Gulf of Maine Research Institute	Sea Education Association
Gundalow Company	Seacoast Science Center
Herring Gut Learning Center	Shoals Marine Laboratory
Hurricane Island Foundation's Center for Science and Leadership	South Eastern New England Marine Educators
Maine Coastal Program	Stellwagen Bank National Marine Sanctuary
Maine State Aquarium	Suffolk University
Marine Studies Program, University of Rhode Island Graduate School of Oceanography	University of Massachusetts Boston
Maritime Gloucester	University of New Hampshire
Massachusetts Audubon, Joppa Flats Education Center	University of Rhode Island W. Alton Jones Camp
Massachusetts Bays Program	University of Rhode Island Inner Space Center
Massachusetts Division of Marine Fisheries	Waquoit Bay National Estuarine Research Reserve
Massachusetts Institute of Technology Sea Grant	Wells National Estuarine Research Reserve
Massachusetts Marine Educators	Woods Hole Oceanographic Institution
Merrowhawke	Woods Hole Science and Technology Education Partnership
Mystic Aquarium/Sea Research Foundation	Zephyr Education Foundation
Narragansett Bay National Estuarine Research Reserve	

Programmatic Activities

2016 Ocean Literacy Summit

NEOSEC hosts a biennial conference to advance ocean literacy in New England. The Ocean Literacy Summit brings together educators and scientists from across New England for the purpose of sharing new marine science and oceanographic developments along with new approaches and successful programs for teaching ocean science in both school and informal educational settings. Our next summit will be **November 3 & 4, 2016 in Portland, ME**. Please save the dates and plan to join us in exploring ocean literacy principle #3: the ocean is a major influence on weather and climate.

Citizen Science

Summer on the Marsh is a camp-based citizen science program funded by the Environmental Protection Agency (EPA) focused on teaching people about the marsh ecosystem and the importance of marshes for human health. *Summer on the Marsh* supports environmental education centers in meaningfully engaging kids ages 9-12 in field-based citizen science. Eight camp programs at New England Aquarium, Seacoast Science Center, Mystic Aquarium, Naragansett Bay National Estuarine Research Reserve (NERR), Waquoit Bay NERR, Project Oceanology, Maritime Gloucester, and Buttonwood Park Zoo form a regional network that will serve 18 educators and scientists and 500 youth over two years. By supporting collaboration and training for informal science center staff and partner scientists, the project has enabled partner organizations to share activities and expand their knowledge. The program has also established new monitoring sites using a kid-friendly protocol for monitoring marsh health that was developed specifically for the program to encourage understanding about the purpose of monitoring and to teach about the importance of salt marsh health. Camp kids and families come back together in the fall in a virtual Youth Summit to share their learning.

Past Projects

Summer Science in New England: Ocean Education through Informal Science Centers, funded by a NOAA Environmental Education grant, was NEOSEC's first citizen science project. A lead scientist and representatives from 12 summer camps worked together over three years to refine an intertidal monitoring curriculum for youth age 14 and up. Campers learned field protocols, identification of intertidal inhabitants, and uploaded their data to the international Ocean Biogeographic Information System, all the while led by trained camp counselors and accompanied by working scientists.

Get WET in New England: Ocean Literacy through Watershed Education and Training was a NOAA-funded program through which NEOSEC partners provided professional development to teachers allowing them to lead their own field experiences and follow-up activities for students, facilitating longer-term meaningful watershed education experiences without external expertise.

The NOAA-funded *Families by the Seaside: Building Community-based Outdoor Ocean Science Learning Experiences* was a 3-year program focused on increasing participation of underserved audiences. It included facilitated partnerships between NEOSEC members and community-based organizations, visits to the shore by families based on audience focus groups, and incorporated technologies for continuing learning.

Additional information is available at www.neosec.org



United States Environmental Protection Agency

5 United States Environmental Protection Agency

Summer on the Marsh: Citizen Science Goes to Camp is generously funded by the U.S. Environmental Protection Agency Environmental Education Grant Program.

Function

The mission of EPA is to protect human health and the environment.

EPA's purpose is to ensure that:

- all Americans are protected from significant risks to human health and the environment where they live, learn and work;
- national efforts to reduce environmental risk are based on the best available scientific information;
- federal laws protecting human health and the environment are enforced fairly and effectively;
- environmental protection is an integral consideration in U.S. policies concerning natural resources, human health, economic growth, energy, transportation, agriculture, industry, and international trade, and these factors are similarly considered in establishing environmental policy;
- all parts of society -- communities, individuals, businesses, and state, local and tribal governments -- have access to accurate information sufficient to effectively participate in managing human health and environmental risks;
- environmental protection contributes to making our communities and ecosystems diverse, sustainable and economically productive; and
- the United States plays a leadership role in working with other nations to protect the global environment.

The Office of Education also offers competitive grant programs at the national and regional level to promote environmental literacy efforts through collaboration with external partners.

Overview

The purpose of the Environmental Education Model Grants Program is to provide money to support environmental education projects that increase the public's awareness about environmental issues and provide them with the skills to take responsible actions to protect the environment.

Since 1992, EPA has received between \$2 and \$3 million in grant funding per year and has awarded more than 3,500 grants. Under this program EPA seeks grant proposals from eligible applicants to support environmental education projects that promote environmental stewardship and help develop knowledgeable and responsible students, teachers, and citizens. This grant program provides financial support for projects that design, demonstrate, and/or disseminate environmental education practices, methods, or techniques, and that will serve as models that can be replicated in a variety of settings.

<http://www2.epa.gov/aboutepa>

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2015 Project Science Advisor:



Dr. Meagan Eagle Gonneea is a Mendenhall Postdoctoral Fellow at the USGS Woods Hole Coastal and Marine Science Center. Her current research is focused on the impact of sea level rise on salt marsh ecosystems and carbon storage as well as chemical exchange between coastal wetlands and the ocean. She has worked in a wide range of coastal systems, including mangroves, coral reefs and salt marshes, to understand both the transport of terrestrial materials into coastal waters and the biogeochemical transformations that occur at the coastal zone. She has a B.S. and M.S. from Stanford University and a Ph.D. from the Massachusetts Institute of Technology/Woods Hole Oceanographic Institution Joint Program. Meagan served as the Summer on the Marsh scientist at Waquoit Bay National Estuarine Research Reserve in 2014 and is the project scientist for 2015. Her love of the ocean stems from her childhood spent sailing in the Pacific Ocean from Alaska to Australia!

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Powered by the People: A Citizen Science Sampler - The below series of short vignettes was published April 28th, 2014. This is an extended version of an article that appeared in the May/June 2014 issue of Dimensions magazine. See section below about Summer on the Marsh, written by New England Aquarium staffer Heather Deschenes.



By Lila Higgins, manager of citizen science and live animals, Natural History Museum of Los Angeles County, Los Angeles

Many people think that cities, especially ones as large and stereotyped as Los Angeles, are devoid of nature, and certainly devoid of any nature worth studying. Scientists at the Natural History Museum of Los Angeles County (NHM) think otherwise. “We are just as likely to find a new species of insect in Los Angeles as in the forests of Costa Rica and Brazil—that is, 100%,” said Brian Brown, NHM entomology curator. In fact, Los Angeles is located in a biodiversity hotspot, one of 34 scientifically recognized places on Earth that are home to an incredibly high level of biodiversity and that suffer high threat from human actions.

But how do you study biodiversity in a vast metropolis where much of the land is private and thousands of observations and specimens are needed? “Citizen science is the only feasible answer,” said Greg Pauly, NHM herpetology curator and project leader for Reptiles and Amphibians of Southern California (RASCals). The public has the time, capacity, and access to private lands (such as backyards and schoolyards) that scientists do not. The fact that scientists have a real need for help is not lost on participants. As it turns out, it is a key motivator. One participant in RASCals noted, “If I didn’t contribute, then your map of distribution would have had less data. I had to make sure that Woodland Hills [a neighborhood in Los Angeles] was represented!”

Unfortunately, not all urban residents feel comfortable in nature, let alone equipped to collect data on lizards, ladybugs, bees, or dare we mention snakes—something museum educators and evaluator Heidi Ballard discovered while observing visitors participating in citizen science activities. In an effort to facilitate positive first experiences in nature, NHM educators designed programs that gradually introduced nature to those unfamiliar with it. For instance, before inviting visitors to survey insects in the museum’s new 3½-acre Nature Gardens, educators slowly acclimated participants to their surroundings—the plants and wildlife—allowing time for wonder and discovery. They found it much easier to teach visitors how to collect insect specimens (especially those of the stinging variety) after creating positive experiences with those creatures and their habitat.

Participation in programs that bring people closer to both nature and scientific research is key to many natural history museums’ goals for ideal visitor experiences. But what are the wider impacts? Karen Wise, NHM vice president of education and exhibits, reported that “after participating in our programs [people] understand the term [biodiversity] and the importance of studying it, and they also have an increased belief in their ability to understand and do science.” But it is more than just an impact on an individual. “By understanding urban biodiversity in Los Angeles, we can better

design our city,” Brown said. “We can plan for a city that maximizes the diversity of life around us, and hopefully this will influence urban planning around the world.”

[Citizen science programming](#) at NHM is supported in part by Time Warner Cable.

By Cindy H. Encarnación, director of life sciences, Saint Louis Science Center, Missouri:

Recent interest in alternative sources of energy inspired the [Saint Louis Science Center](#) and the Donald Danforth Plant Science Center in St. Louis, Missouri, to collaborate on Backyard Biofuels. Funded by the (U.S.) Department of Energy and National Science Foundation (IOS-0701919), the project brought public attention to the significance of algae in biofuels production. Combining the science center’s reach to over 900,000 visitors yearly with the Danforth Center’s scientific expertise, a unique opportunity was created, enabling the general public to participate in biofuels research by contributing algae samples found in their homes, backyards, and communities.

In 2010 and 2011, staff distributed more than 2,000 kits containing materials and instructions for collecting algae, along with data sheets for recording collection site information. Over 400 algae samples were collected throughout the St. Louis metropolitan area; a few came from as far as New Hampshire and Alaska.

Science center staff cultured the algae samples and sent the ones that grew successfully to the Danforth Center for lipid analysis and DNA sequencing. Participants kept track of their samples online throughout the study. From samples submitted, 10 species were identified as good oil producers and are currently being used in intensive biofuels research.

The success of Backyard Biofuels was two-fold—not only did it educate the public about algae, biofuels, and renewable energy, but it also enabled the public to make significant scientific contributions. One participant stated, “Our region, and indeed, our nation, needs more projects such as Backyard Biofuels if we want more young people to become interested in science and technology to help solve the challenges facing our global community in the 21st century and beyond.” Indeed, the project’s success serves as an inspiration to scientists and educators to recruit the public in scientific pursuits and encourage in them a lifelong passion for scientific discovery.

By Virginia Teige, Ph.D. candidate, and Ronald C. Cohen, professor, University of California, Berkeley; Carlin Hsueh, science instructor, and Etta Heber, director of education, Chabot Space & Science Center, Oakland, California:

Teaching science, technology, engineering, and math (STEM) skills to kids is not a new idea; the current challenge is finding ways to integrate the four discrete disciplines. Chabot Space & Science Center in Oakland, California, in partnership with Professor Ronald C. Cohen’s atmospheric research laboratory at the University of California, Berkeley, has embraced this challenge by immersing students and teachers in real-world, problem-based learning at the boundaries of these four disciplines, where they naturally overlap.

The Berkeley Atmospheric CO₂ Observation Network ([BeACON](#)) seeks to identify sources of pollution at the same scale that most people see every day; that is, at the neighborhood scale rather than

citywide. By placing observations in neighborhoods, Cohen hopes to inspire members of the community to take action to change the CO₂ they emit.

Scientists have installed “sensors in a box,” or nodes, in more than 20 locations around the San Francisco Bay area—many of them on school buildings. Students and teachers get firsthand experience hosting a node and designing experiments using data from their own sites and other locations, as well as data they collect with handheld weather meters, CO₂ sensors, and global positioning system (GPS) units that Chabot lends to participating teachers.

The project aims to provide students with tools and resources to think critically about the data they collect at their schools and neighborhoods and the results they communicate to the community. Teachers are supported throughout the program through professional development workshops and forums hosted at Chabot. Chabot also connects students and teachers with the project scientists, who work alongside them in near-real time to collect and interpret data. Connecting students and teachers to science role models also gives scientists valuable experience communicating complex science research to the public, a skill commonly overlooked in academia. The program culminates in scientists’ visits to participating schools as well as a student field trip to university laboratories led by the graduate researchers themselves.

Held in August each year, [National Science Week](#) is Australia’s largest festival, with 1.5 million people attending more than 1,800 events that are contributed by organizations from all over the country.

An important component of the week each year is a national online citizen science project coordinated by the science unit at the Australian Broadcasting Corporation, Australia’s public broadcaster.

Last year, the project was [Explore the Seafloor](#), where members of the public were asked to identify kelp or sea urchins in images taken by autonomous underwater vehicles. More than 300,000 images from around Australia’s coastline were processed by 9,300 people. This work is usually done by research assistants and is both laborious and expensive. The images are used by researchers to determine the health and migration of kelp beds and also to monitor urchin population explosions.

By Geoff Crane, manager of National Science Week, Questacon, Australia’s National Science and Technology Centre, Canberra:

In previous years the projects have been more about people contributing data about themselves by answering surveys or doing tests. For example, in 2012, the project [Sound Check Australia](#) collected data for the National Acoustic Laboratories on environmental noise exposure. The scientists were very happy with the results. One stated, “Almost 7,500 people . . . took the time to complete the Sound Check Australia survey. Given the length of the survey, that’s around 3,750 hours spent providing data!”

The projects are rewarding for the participants too. They reported: “Your project has made science come to life for my class”; “I have a daughter and feel like the Earth is under our watch now. Citizen

science allows me to contribute to something positive”; and “A great way to give people ownership over their environment and contribute positively.”

By Heather Deschenes, manager of youth development programs, New England Aquarium, Boston:

The New England Ocean Science Education Collaborative ([NEOSEC](#)) recently completed a (U.S.) National Oceanic and Atmospheric Administration–supported citizen science project that established a new regional network of summer camp programs for ages 11 to 14, where campers collect biodiversity census data along the rocky intertidal zone. Key components of the project included

- Establishing a community of practice. The three-year initiative started with a planning workshop that focused on refining the parameters of the monitoring project, logistics, and protocol. Participants included personnel from Boston’s New England Aquarium (lead project partner, principal investigator, project director, instructors, and scientists); leads at partnering science center camps at 12 coastal sites from Connecticut to Maine; and a representative from the Census of Marine Life (COML).
- Contributing to the Ocean Biogeographic Information System (OBIS). Science advisor Tom Trott, a COML researcher and associate professor at Suffolk University, provided oversight to partner-scientists at each camp to ensure that COML’s Natural Geography in Shore Areas (NaGISA) near-shore biomonitoring protocol was followed. Data from at least one field day per year, per camp were provided to OBIS as part of a 10-year study to measure biodiversity in the ocean.
- Increasing ocean literacy among campers. Robust training—pre-, during, and postfield monitoring—provided context for participating youth. External evaluation found that participants’ ocean literacy improved and that they felt empowered and proud of contributing to a real science project.
- Supporting peer-to-peer exchange of information. Participants had opportunities to present their experiences to their peers at regional meetings (NEOSEC’s Ocean Literacy Summit, National Marine Educators Association Chapter conferences, and regional ocean science meetings). Camps also received funding to bring participating teens to a Fall Teen Ocean Summit, designed in collaboration with the teens themselves, including an experience similar to a scientific poster session.

The team will be building upon these successes in the follow-up project Summer on the Marsh, engaging younger camp kids in salt marsh exploration and citizen science data collection over the next two years.

Stewardship Outcomes Assessment Rubric*

Stewardship Outcome	Program Goal (What we hope to achieve)	Approach (examples of what we provide)	Measures (How we will measure our progress toward outcomes)
Constituency building	Increase numbers of people engaged, increase diversity of people engaged	<p>Ongoing outreach programming to institutions that work primarily groups under-represented among our audiences</p> <p>We periodically reach out to new groups and seek to understand their needs and how our offerings may be useful.</p>	<ul style="list-style-type: none"> • We track the numbers of participants in our programs and activities and demographic data and analyze it. • We track indicators of interest/demand to participate. • We find ways to ask participants how many other people they encouraged to participate in an NEAq program or a similar program, and we track results. • We find ways to ask how many close associates participants have who they consider to be people who care for oceans.
Inspired	Promote enthusiasm, wonder, appreciation, caring, and motivation to protect the ocean	Positive affective experiences with interesting places, habitats, species and information.	<p>We find ways to ask</p> <ul style="list-style-type: none"> • Did this experience increase your appreciation for the ocean or ocean animals? • Did this experience leave you feeling excited or motivated to do or to learn more?
Informed	<p>Build knowledge awareness, understanding</p> <p>Make information meaningful and relevant to the audience</p>	<p>Experiences that promote learning, inquiry, and critical thinking.</p> <p>Programs and resources for ongoing learning</p> <p>Immersive outdoor learning</p>	<p>We find ways to ask</p> <ul style="list-style-type: none"> • What is one thing you learned about the ocean today? • What surprised you? • What new question do you have now? • How well informed do you feel about ocean issues? • How is your life connected to what you learned today? • How will you learn more? • What steps could your or others take to help oceans be healthier?

(continued on next page)

**Developed by New England Aquarium*

Stewardship Outcomes Assessment Rubric (continued from previous page)

Stewardship Outcome	Program Goal (What we hope to achieve)	Approach (What we provide)	Measures (How we will measure our progress toward outcomes)
Empowered	<p>Develop action skills (individual, social/community, political/policy)</p> <p>Create a sense of self-efficacy (“recognizing your potential”, self-confidence)</p>	<p>Practical training in action strategies</p> <p>Team building</p> <p>Encouragement and celebration of success</p> <p>Presentation skills</p> <p>Positive role models</p> <p>Career awareness</p>	<p>We find ways to ask</p> <ul style="list-style-type: none"> • How confident are you in your ability to help the ocean? • What skills have you learned that will enable you to help the ocean? • How likely are you to increase what you do to help the ocean as a result of your experience?
Active	<p>Individual actions to help the ocean</p> <p>Ongoing participation, career path</p> <p>Commitment to ongoing learning and action</p>	<p>Live Blue initiative</p> <p>Program ladder</p> <p>Service learning</p>	<p>We find ways to ask</p> <ul style="list-style-type: none"> • What new steps will you take to support ocean health as a result of your experiences with us? • How likely are you to participate in another experience or program?
Mobilized	<p>Activate social network, family and friends</p> <p>Civic engagement</p> <p>Become an environmental leader</p>	<p>Facilitate social networking</p> <p>Leadership training</p> <p>Ongoing mentoring and supportive relationships</p>	<p>We find ways to ask</p> <ul style="list-style-type: none"> • How frequently have you talked with friends or family in the past about how you can all help support healthy oceans vs how frequently ? • How frequently do you expect to talk with family and friends in the future about issues of ocean health? • What invitation to action do you anticipate sharing? With whom? With how many people? How (in person, by email, by text, on facebook, other)?

A Wetland is a Pillow!

What Wetlands Are and What They Do

By Donna Love

Not too long ago, wetlands were misunderstood and undervalued. Swamps, bogs, and marshes were often viewed as unsightly, mucky, and stinky. Farmers and ranchers thought of them as unproductive areas that could be better used for crops or grazing. Land developers thought of them as areas where new businesses and homes could be built. This led to wide spread destruction of millions of acres of wetlands. Today we recognize the ecological importance of wetlands. And, yes, in some instances they are unsightly (in the eye of the beholder), mucky, and sometimes stinky. But what is a wetland?

Technically speaking, the federally recognized definition of a wetland is those areas that are inundated or saturated by surface or groundwater at a frequency or duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions.

In other words, for a wetland to be a wetland it must have water, wetland plants, and wetland soil. But why are they important and what do they do? Wetland educators have developed wetland metaphors to help explain the importance of a wetland. Here are a few.

A wetland is a pillow. The slow moving water in a wetland provides perfect resting spots for many species of migrating birds where they can find food or wait out a storm.

A wetland is a sponge. Gravel, fine sand, and peat (which is decaying plants and animals) under a wetland form a giant reserve like an underground sponge, where a great amount of water can be soaked up before being released. This helps control floodwater and slows stream erosion.

A wetland is an antacid. Algae in wetland soil and plants act as an antacid to remove toxic poisons from water by absorbing the poison. A chemical reaction inside the plants neutralizes the poison. Then the toxic substance is released back into the water as a less toxic substance.

A wetland is a mixer. Fish and other aquatic animals breathe dissolved oxygen gas. Some of the oxygen gas comes from the air near the surface of the water. Much of the oxygen gas comes from plants. Plants grow through a process known as photosynthesis and a by-product of photosynthesis is oxygen gas that mixes in the water when it is expelled from the plant.

A wetland is a cradle. A wetland is a perfect place for baby animals. Many hide in the wetlands thick plants until they are bigger. In addition, a wetlands slow moving water is warmer with fewer temperature fluctuations than fast moving water. This keeps the air around the wetland warmer, which is perfect for

newborns.

A wetland is a box of cereal. When wetland plants die and decompose, the plant matter is released into the water, which provides important food for many invertebrates (animals that don't have backbones, like insects, worms, and shrimp). These in turn are excellent food for larger animals like fish, ducks, and mammals, such as muskrat. They in turn are food for many animals such as great blue herons, foxes, and bears that love to eat fish.

A wetland is a watering can. In summer, water stored underground in a wetland is slowly released into streams that otherwise might dry up during hot weather or in times of drought. This provides water for plants and animals downstream. It also fills aquifers, which are underwater wells that store drinking water for people.

A wetland is a bar of soap. A wetland has a large amount of good bacteria trapped in its soil and vegetation. This bacterium scrubs or breaks down the pollution, eliminating it from the environment.

A wetland is a filter. A wetland filters suspended or floating solids, such as leaves and stems from the water. Water flowing out of the wetland is free of floating debris.

A wetland is a strainer. When a river reaches a wetland, the water slows, and sediments that the water carries drop and settle. This prevents the dangerous build up of gill clogging and egg damaging silt to fish downstream. This is especially important during flooding when the river is carrying more sediments than usual.

As you can see, wetlands perform some very important functions. So next time you go by an unsightly, mucky, stinky swamp, bog, or marsh, just remember, a wetland is a pillow!



Donna Love is the author of the upcoming Sylvan Dell release [Henry the Impatient Heron](#). To learn more about wetlands, get your own copy of Henry in Spring 09 or check out Kevin Kurtz's [A Day in the Salt Marsh](#) also from Sylvan Dell.



Reinforcer Activities for the Classroom

The following classroom activities were designed to reinforce the salt marsh concepts and subject matter presented in this guide. The activities can be done before or after your field trip to the marsh. Grade level appropriateness is indicated for each activity, but many activities can be modified to meet your students' needs.

Salt Marsh Metaphors

(Grades K-4)

Objective

This activity will teach students the important functions of salt marshes through the use of symbolic objects and pictures.

Materials

large sponge
coffee filters or a strainer
picture of a cradle or a nursery
picture of a house
picture of a crop farm
picture of a wall or barrier

Method

Each object or picture is a symbol of an important function of the salt marsh. Have students look at each symbol and think, "A salt marsh is like a (*symbol*) because..." Students can either write down their ideas about each symbol or present their ideas in a class discussion. Students should also think and talk about the consequences of filling in, changing and destroying salt marshes.

Discussion

(Symbols are placed after appropriate function.)

A salt marsh is an extremely valuable resource. It provides a home (*house*) for many unique plants and animals and is among the most productive land areas in the world. One acre of salt marsh produces food resources just as an acre of rich farmland does (*crop farm*). Salt marshes are also nurseries (*cradle, nursery*) for lobsters, shrimp, clams, oysters, mussels and various kinds of fish. These animals spend all or part of their lives in the salt marsh. The extensive root systems of salt marshes serve as natural filtering systems for ground water. Sewage and toxic wastes are neutralized and the water is cleaned (*filter or strainer*). Salt marshes also help control floods by absorbing floodwaters (*sponge*). Finally, salt marshes serve as a buffer between the ocean and the uplands, protecting the uplands against heavy wave action during sea storms (*wall, barrier*).

NEOSEC

New England
Ocean Science
Education Collaborative

Summer on the Marsh
Youth Symposium
Sept 20, 2015 12 pm- 3 pm
Overview and Expectations

Overview:

The 2015 *Summer on the Marsh* youth summit will be Sunday, Sept 20th, 2015. Following the success of the youth summit of Summer Science in New England, this event will bring together youth and staff from partner institutions; with this project and this event, NEOSEC will pilot virtual technology as a means for building regional connection.

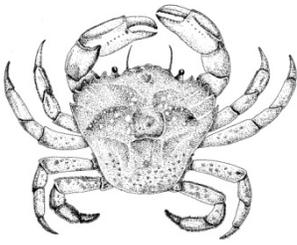
The Youth Summit of *Summer on the Marsh* is a vital component of the overall project, advancing the following overall project goals (see front material in handbook).

To the end, the desired outcomes of the event are to:

1. Provide a “downstream” opportunity to the youth and staff for reflection following their citizen science experience, so as to further absorb and apply learning
2. Build deeper learning regarding the state of marshes in New England and human impact on those marshes
3. Foster a sense of being part of a greater regional picture for citizen science, and strengthen their sense of contribution
4. Celebrate the work that was accomplished
5. Reestablish ties between scientists and educators
6. Experiment with technology as a mode of connection among regional partners

Staff Expectations of Partner Institutions

- All partner institutions are expected to attend via virtual technology from their site or a colleague’s site. You will need a camera and project system and microphone.
- Staff will be expected to build an overall event at their site, and develop the site-specific activities as determined by the agenda
- Participate fully via technology with regional components as will be determined by the agenda in advance of the event, encouraging youth participation and controlling distraction as best as possible
- Complete evaluation at your location and contribute
- Families should be invited to the event – Materials should be handed out at camp mentioning this date.
- Arrange to have food available for lunch, and plan an icebreaker for the group



**Summer on the Marsh
2015 Youth Summit
September 20, 2015
12PM-3PM**



With optional outside time afterwards

Join us at a virtual youth summit connecting the eight camps that participated in “Summer on the Marsh”. Campers and families are invited back to play games, Summit-wide trivia, and learn about the significance of the marsh. There will also be live virtual sessions with the other camps across New England to share the data that was collected across the Northeast! This event allows campers to share their research with other campers, their family, and friends! The Summit will teach you about the importance of your data and the impact we have on marshes. Meet back at your camp to participate and plan for a day of fun!

PLEASE remember to save the date! We would like as many campers and their families at this event as possible!

Summer on the Marsh Evaluation Overview RMC Research

The *Summer on the Marsh* evaluation plan is designed to understand the extent the Summer on the Marsh program reached its expected outcomes:

- Establish new and stronger partnerships between marine scientists and environmental institutions
- Increase awareness among partners regarding their roles in promoting environmental stewardship in youth
- Increase knowledge and intent to take action on water protection among youth

RMC Data Collection Plan

Activities	Methods	Purpose
2014 & 2015 Training (June)	Survey of partners & scientists (electronic)	Baseline data on scientists & educators working together; usefulness of training, preparedness for camp session.
2014 & 2015 Summer Camp (July & August)	Survey of campers (paper & pencil)	Pre- Post knowledge & understanding of salt marshes; interest in science & data collection; consideration to take further action.
2014 & 2015 Virtual Symposium (Fall)	Survey of partners (electronic)	Feedback on scientists & educators working together; reflection on the success of the summer program; suggestions for future.
	Survey of campers (electronic)	Knowledge & understanding of salt marshes; reflection about summer camp & learning about marshes; consideration & interest to take further action.
	2015: Interview 3-4 partners who participated both years	Changes in understanding & promoting stewardship as staff and conveying to students; lessons learned; suggestions for future.
	2015: interview subset of students who attended both years	Knowledge & understanding of salt marshes; reflective feedback about summer camp and learning about marshes; consideration & interest to take further action.

Disseminating Survey of Campers

Science camp educators are responsible for handing out surveys to campers, collecting them, and returning to Susan Frankel at RMC Research Corporation

- Prior to the session on summer marshes you will receive a packet of surveys; Sarah will inform Susan (RMC) of the session dates of each camp and expected number of students
 - Extra surveys will be provided
 - Surveys will include the name of your camp (i.e., Seacoast Science Center, Mystic Aquarium)
 - Have plenty of pencils available for campers to use
- Just before the session on marshes, hand out the surveys and ask campers to complete them
 - Allow 30 minutes to complete the survey, including handing out & collecting surveys
 - Make sure campers are in a location where they have space and hard surface to complete the survey by themselves
 - Tell campers that you are interested in knowing what they already know and think about marshes and collecting data
 - Explain to campers how to fill in their answers (by circling correct answers or drawing lines to correct words)
 - Make sure each campers puts his/her name on the survey
 - Please tell the camper(s) that if they do not understand the question to leave it blank
- When done, have campers submit the surveys to you
 - Place the completed surveys in a postage-paid envelope addressed to RMC, this envelope will be included with the packet of surveys
 - As soon as possible, mail the envelope
- This process will be repeated with post-surveys just after you finish the session on salt marshes
 - Pre surveys and post-surveys will be different colors
 - Two return envelopes will be provided, one for pre-surveys and one for post-surveys

SUMMER ON THE MARSH
CAMPER PRE-SURVEY

PRE

Name: _____

Camp: _____

What five words do you think of when you hear the word marsh? (check **5** words)



- | | | |
|-----------------------------------|--------------------------------------|---------------------------------|
| <input type="checkbox"/> barrier | <input type="checkbox"/> food source | <input type="checkbox"/> muddy |
| <input type="checkbox"/> buggy | <input type="checkbox"/> fragile | <input type="checkbox"/> smelly |
| <input type="checkbox"/> exciting | <input type="checkbox"/> home | <input type="checkbox"/> useful |
| <input type="checkbox"/> filter | <input type="checkbox"/> important | <input type="checkbox"/> wet |

Have you ever visited a salt marsh before?

- YES** **NO**

If you have visited a salt marsh, who did you go with? (check **all** that apply)



- | | | |
|-------------------------------|----------------------------------|--------------------------------------|
| <input type="checkbox"/> camp | <input type="checkbox"/> family | <input type="checkbox"/> school trip |
| <input type="checkbox"/> club | <input type="checkbox"/> friends | <input type="checkbox"/> scouts |



Pick **3** words from the list to complete the sentences. You may use the same words more than once.

amazed	excited	important	sad
annoyed	gloomy	interested	silly
bored	grumpy	nervous	smart
clueless	happy	powerful	uncomfortable
curious	helpful	responsible	useless



Learning about salt marshes makes me feel: (Use **3** words from list



Visiting a salt marsh makes me feel: (Use **3** words from list above)



When I think about protecting the environment, including places like salt marshes, I feel: (Use **3** words from list above)

I think I can help protect the environment.

 YES **NO** **MAYBE**

For a salt marsh to be a salt marsh, it needs: (*circle the correct*

birds

fish

plants

soil

deer

insects

salt water

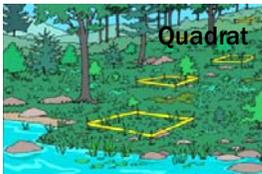
tides

Tools for Collecting Data (*Draw lines to match the tools on the left with their scientific purpose.*)



GPS

A small plot used in ecology and geography to isolate a standard unit of area for study of the distribution of an item over a large area.



Quadrat

Measures the temperature of the marsh soil, air, and water vary at different points, which helps scientists gauge how healthy a marsh is and more.

Refractometer

Used to distinctly identify a scientific study site by universal coordinates, so that you can find it again, compare data from other sources, and more.



Thermometer

Measures salinity of the water because how much salt is in the water changes at different points in the marsh.





What five words do you think of when you hear the word science?
(check **5** words)

boring

hard

scary

dangerous

important

smart

exciting

interesting

unhappy

fun

messy

useful

Have you ever collected science data before?

YES

NO

SUMMER ON THE MARSH
CAMPER **POST**-SURVEY

POST

Name:

Camp:

What five words do you think of when you hear the word marsh? (*check 5 words*)



- | | | |
|-----------------------------------|--------------------------------------|---------------------------------|
| <input type="checkbox"/> barrier | <input type="checkbox"/> food source | <input type="checkbox"/> muddy |
| <input type="checkbox"/> buggy | <input type="checkbox"/> fragile | <input type="checkbox"/> smelly |
| <input type="checkbox"/> exciting | <input type="checkbox"/> home | <input type="checkbox"/> useful |
| <input type="checkbox"/> filter | <input type="checkbox"/> important | <input type="checkbox"/> wet |

Would you go back to a salt marsh?

- YES** **NO**

If yes, who would you go with? (*check **all** that apply*)



- | | | |
|-------------------------------|----------------------------------|--------------------------------------|
| <input type="checkbox"/> camp | <input type="checkbox"/> family | <input type="checkbox"/> school trip |
| <input type="checkbox"/> club | <input type="checkbox"/> friends | <input type="checkbox"/> scouts |



Pick **3** words from the list to complete the sentences. You may use the same words more than once.

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clueless
curious

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responsible

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silly
smart
uncomfortable
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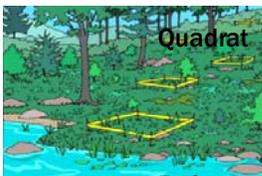
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METAPHORS



A salt marsh is like a:

Because...

cradle	It provides resting spot for migratory birds
filter	Absorbs water
sponge	Provides safe shelter for baby fish
pillow	Releases water into dry areas
watering can	Captures floating items such as leaves and stems



What five words do you think of when you hear the word science? (check **5** words)

- | | | |
|------------------------------------|--------------------------------------|----------------------------------|
| <input type="checkbox"/> boring | <input type="checkbox"/> hard | <input type="checkbox"/> scary |
| <input type="checkbox"/> dangerous | <input type="checkbox"/> important | <input type="checkbox"/> smart |
| <input type="checkbox"/> exciting | <input type="checkbox"/> interesting | <input type="checkbox"/> unhappy |
| <input type="checkbox"/> fun | <input type="checkbox"/> messy | <input type="checkbox"/> useful |

My favorite part about collecting data on the marsh was: _____

