

Gundalow Company

Volunteer Manual

Updated Jan 2018



Protecting the Piscataqua Region's Maritime Heritage and Environment through Education and Action

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Welcome aboard!

On a rainy day in June, 1982, the replica gundalow *CAPTAIN EDWARD H. ADAMS* was launched into the Piscataqua River while several hundred people lined the banks to watch this historic event. It took an impressive community effort to build the 70' replica on the grounds of Strawberry Banke Museum, with a group of dedicated shipwrights and volunteers led by local legendary boat builder Bud McIntosh. This event celebrated the hundreds of cargo-carrying gundalows built in the Piscataqua Region starting in 1650. At the same time, it celebrated the 20th-century creation of a unique teaching platform that travelled to Piscataqua region riverfront towns carrying a message that raised awareness of this region's maritime heritage and the environmental threats to our rivers.

For just over 25 years, the *ADAMS* was used as a dock-side attraction so people could learn about the role of gundalows in this region's economic development as well as hundreds of years of human impact on the estuary. When the Gundalow Company inherited the *ADAMS* from Strawberry Banke Museum in 2002, the opportunity to build a new gundalow that could sail with students and the public became a priority, and for the next decade, we continued the programs on the *ADAMS* while pursuing the vision to build a gundalow that could be more than a dock-side attraction.

In 2011 we built PISCATAQUA - a new traditional gundalow - on the grounds of Strawberry Banke, using time-honored methods and materials. However, unlike the *ADAMS*, PISCATAQUA is designed to take students and the public sailing! The programs onboard PISCATAQUA weave together environmental science, history, and maritime heritage, providing a unique educational experience for students of all ages. The strategic decision to build a gundalow certified by the US Coast Guard means that, for the first time, the public is able to sail on a regionally-significant historic vessel.

Today, the nonprofit Gundalow Company's mission "to protect the Piscataqua Region's maritime heritage and environment through education and action" is more important than ever. Thousands of students each year spend a few hours sailing onboard the world's only Piscataqua Gundalow. They learn how gundalows were built here to carry lumber, salt marsh hay, oysters, bricks, pipe staves and coal on the shallow rivers where big ships could not go. Through a series of hands-on activities, students get a glimpse of the past 300 years on the working waterfront, and explore issues like water quality, habitat protection, stewardship, navigation.

It is our belief that the Gundalow Company is well-positioned to collaborate with partners to generate publicity, awareness, and action relating to the health of the Piscataqua Maritime Region and the Great Bay Estuary. Looking ahead, the Gundalow Company aims to be a leader in efforts to inspire stewardship of the Piscataqua Region's environmental and maritime legacies. Our strategic alliances with a number of organizations within the Piscataqua Watershed serve to protect its "sense of place."

As a gundalow volunteer you join a group of people who care about PISCATAQUA and who share our enthusiasm for using this local icon to celebrate the past and future of the Piscataqua Region. Your contribution of time, passion, and energy will directly support our educational programs and make it possible for PISCATAQUA to become the flagship for the next generation of river and bay stewards.

Many thanks!

Molly Bolster

Executive Director, The Gundalow Company



ORGANIZATION OVERVIEW

Mission: *Protecting the Piscataqua Region's maritime heritage and environment through education and action*

Core values that represent priorities in Gundalow Company's culture and are embraced by staff, crew, board, and volunteers in order to achieve our mission:

- Preservation of our rivers, bays, estuaries, and watershed is a collective responsibility of all who live here now and in the future. Gundalow Company can contribute to cultivating local stewardship by providing opportunities for place-based and meaningful programs, onboard PISCATAQUA and onshore in multiple locations.
- Gundalow Company strives to set an example of behavior consistent with sound environmental and best management practices, and to be an inspiration for creating the next generation of river and bay stewards.
- Gundalow Company serves a broad audience and seeks participation of board, staff, and volunteers who reflect the region's diversity.
- Our education programs for school groups and campers are experiential, interdisciplinary and incorporate Environmental Literacy and Ocean Literacy standards.
- Educational messages during public sails are based on ongoing research and sound science.
- Lead by example such as: Prevent marine debris. Aim for zero-waste on the boat, in the office, and at events. Reduce use of single-use plastic bags and use non-toxic cleaning products onboard and in the office and store.
- Maintaining financial stability, adhering to the mission and achieving sustainability are main criteria that guide all decisions.
- Ensure growth and security of the Fund for the Future (for unanticipated emergency expenditures).

Gundalow Company History

Gundalow Company was founded in 2002 in response to an announcement made by Strawberry Banke that the replica gundalow CAPTAIN EDWARD H. ADAMS was being de-accessioned from the museum's collection. A group of colleagues and friends, including Molly Bolster, had just completed publication of the book *Cross-grained & Wily Waters; a guide to the Piscataqua Maritime Region*, and they saw an opportunity to "save the ADAMS," which led to the formation of a new nonprofit and the Gundalow Company was born. It was a hale and hearty gang.

With a lot of enthusiasm and very little money, the group attracted like-minded individuals who shared a passion for wooden boats, an appreciation for sense of place, and a belief that the best way to get people to care about coastal environmental issues and human impact on this estuary is to take them out on the river in a historically significant vessel. The NH Coastal Program and the Great Bay Discovery Center were the first sources of grant funding. Board members, led by chairman Joey Donnelly, always brought their check books to meetings. Cy and Bobbie Sweet made a significant contribution to the Bud McIntosh fund at the NH Charitable Foundation. The annual dividends from that fund were intended to

cover most of the expenses of the Gundalow Company at the time. Volunteer labor plus adrenalin covered the rest.

For the first five years, the nonprofit gradually and intentionally increased its base for support. A dedicated and generous group of contributors supported the modest budget, and expenses were kept to a minimum. The group of volunteers (including many of the board members) willing to care for the ADAMS grew exponentially, and the number of students and teachers willing to come aboard the ADAMS for a 45 minute “dockside” program grew as well. By 2010, the ADAMS was towed (either by Capt. Steve Root and his red Tow Boat U.S. or Capt. Paul Pelletier and the UNH R/V GULF CHALLENGER) to as many as 14 river front locations for dockside programs with 4th graders, river festivals, music with Kent Allyn and others, Contemporary Coastal Issues presentations, and numerous river celebrations with donors fueled by ancient bottles of port from Cynthia Raymond’s “cellar” and hard tack.

Lurking in the back of everyone’s mind was the reality that the ADAMS would never be approved by the USCG to carry passengers, and was therefore strictly – and legally - limited to offering FREE dockside programs. No sailing around the bend in the river with a group of eager 4th graders. No casting off the lines with a group of curious residents or tourists to set the sail and imagine what the old gundalows did. That was a privilege enjoyed only by a handful of loyal volunteers, and it always seemed unfair to all the others who might have enjoyed the chance to get out on the rivers and learn about the rich history of this place from the deck of a gundalow and to witness for themselves the evidence of 400 years or more of human impact.

Meanwhile, the ADAMS was aging rapidly. While the old gundalows may have had a life expectancy of about 5 to 10 years, the ADAMS turned 25 in 2007 and began to show some impossible - to - ignore signs of hogging. The leaks that seemed harmless at first became overwhelming at times. The winter routine required to keep the bilge free of ice and the pumps running constantly was difficult to say the least, and while there was a group of heroic people willing to do what was necessary, it was pretty obvious that it was not going to work for much longer.

Spending money on the ADAMS was never going to bring her up to USCG safety standards, nor was it a path towards organizational sustainability. Everyone agreed that the project to build the ADAMS in 1982 as a museum exhibit was worthwhile on many levels, and thousands of school kids and the public experienced free “dockside” programs between 1982 and 2012. Her presence along the river front was an important tangible reminder of the region’s maritime history. And yet, we all imagined that experiential programs on a new gundalow built to meet the USCG regulations would have a much greater potential to inspire action and stewardship. By 2008, the organization had taken on a life of its own with serious stakeholders, dozens of volunteers, generous and gregarious donors, numerous collaborating partners, and a growing reputation in the community that hinted at the recognition that this “old boat” was iconic. Gundalows suddenly had the potential to represent the past, present, and future of the Piscataqua Region.

By 2008, the dream of building a new gundalow began to take hold. The new gundalow was envisioned to be certified by the USCG to carry paying passengers (imagine – a source of revenue!). There were numerous meetings and focus groups with stakeholders and potential funders. There were those who thought it was an excellent idea and there were those who were just as sure we had gone around the bend. We were just gaining momentum when the stock market took a nosedive, and the thought of raising a million dollars to build a wooden boat went out the window.

And then, right about that time, there was a letter written to the editor of the *Portsmouth Herald* by a group of prominent scientists on the faculty at UNH. The letter was a cry for help - an alarming assessment that water quality in Great Bay was declining faster than we had thought. The nitrogen level was increasing and eel grass and oysters were dying, and it seemed everyone was talking about saving Great Bay.

This gave the Gundalow Company a golden opportunity to be heard by those who were concerned about the declining water quality. Suddenly there was a sense of urgency. We already had been framing our intent to build a gundalow within the context of using a regionally and historically significant vessel to tell the story of this region's heritage. We wanted to create a platform that would be the sailing classroom to carry thousands of residents and tourists out on the rivers in a memorable way. The new gundalow (not yet built) came to be seen as the catalyst that just might get people energized to take action and to be the stewards to protect the Piscataqua region's maritime heritage and environment.

The Gundalow Company persevered, and the financial obstacles were overcome. Strawberry Banke gave permission to build the gundalow on the museum grounds out in full view to passers-by. We hired shipwright Harold Burnham to do preliminary drawings and he built a half-model based on the 1886 FANNIE M. with a six-foot section removed from the center to keep the new gundalow under 65 feet.

When we started looking for a shipwright we went to one of Bud McIntosh's most successful apprentices - Paul Rollins - who had been building boats for many years in his well-established shop in York, ME. Paul was unable to say "yes" the first time we asked him to build the new gundalow, so we waited while he finished building the LOIS McCLURE, and then asked him again. He became the lead shipwright. Nate Piper agreed to be the Project Manager. Ned McIntosh became the honorary shipwright and visited the temporary shipyard often, and shared his many years of wisdom with the crew. A group of talented boat builders was assembled, with a flock of unstoppable volunteers. Jeff Taylor was the chairman of the board during the Capital Campaign and he was indefatigable. At times he questioned how we were ever going to pull this off, but he always knew this project would have tremendous impact if we could just get her built.

It took about a year to gather the wood – and it came from some surprising places including hackmatack knees from Nova Scotia, pine for the deck from Three Rivers Farm that used to belong to Paul Rollins ancestors, and live oak knees from Georgia that were harvested by

the Navy as spare parts for the USS CONSTITUTION and then spent 100 years buried the Charlestown Navy Yard.

Construction started in March of 2011 and nine months later PISCATAQUA was launched at Peirce Island before a crowd of 1,000 enthusiastic onlookers on December 10th, 2011. We were on schedule and on budget—and had no debt. While PISCATAQUA was being built, and then during the winter of 2012 after the launching, Barbara Maurer corralled a group of teachers, UNH Marine Docents, and volunteers to help with curriculum development. One of the volunteers was Megan Glenn, who we later hired to be our Onboard Educator. The Place Based Environmental Education Collaborative helped create the logic model that defined program content and desired outcomes. We hired an excellent crew of Educator/Deckhands -Sue Kaufmann, Frank Stewart, and Heather Hastings Froumy, and a couple years later Rick Kaye-Schiess, and all four of them have returned every year. Teachers and students from Little Harbor, New Franklin, and Dondero did our pilot programs, funded by the Dorr Foundation.

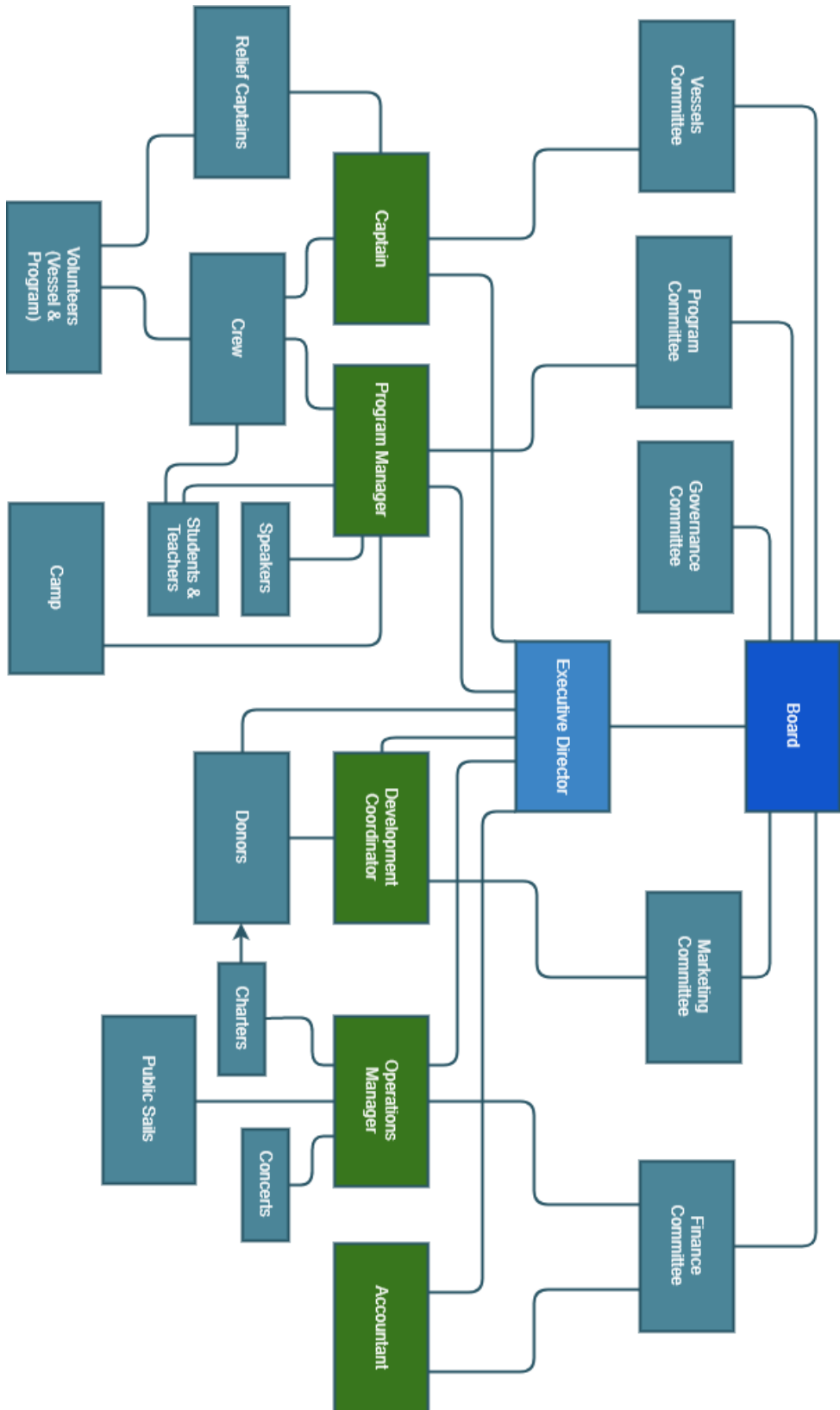
We hired Captain Matt Glenn shortly after the launching, and he has been our year-round Captain ever since, bringing years of relevant experience on other vessels and establishing a stellar reputation for the PISCATAQUA and the organization on the Portsmouth waterfront and beyond. Jeff Little, Gundalow Company board member since 2009 and chair from 2012-2016, has taken the Gundalow Company through a meteoric growth spurt in the past five years. The budget increased from \$120,000 in 2011 to \$450,000 in 2016 and the size of the staff went from 1 FT and 2 PT employees in 2011 to 2 FT and 13 PT or Seasonal employees in 2015.

Gundalow Company is well positioned to expand its education programs, increase its base of support, become the “must do” experience for residents and tourists, and adhere to best-management practices in its governance.

The vision from 2002 has become a reality.

Note about the CAPTAIN EDWARD H. ADAMS: *For the first year after PISCATAQUA was launched, we continued to use the ADAMS for dockside programs, but only at the Prescott Park dock to minimize the wear and tear caused by towing her around the area. In 2013, the ADAMS failed a USCG mandated hull inspection and we were no longer able to provide even dockside programs. In 2014, Gundalow Company donated the ADAMS to the city of Dover, where she will eventually be on display (high and dry) in Henry Law Park next to the Cochecho River and the Children’s Museum. We all believe this is a fine solution and look forward to bringing the PISCATAQUA up the Cochecho River in 2017 for the ribbon cutting celebration of the new playground with the ADAMS as the centerpiece.*

Structure of Gundalow Company



Gundalow Board, Staff and Crew (as of Jan 2018)

Board of Directors

Catharine Newick (Board Chair)

Janet Dinan

Peter Driscoll

Jill Farrell

Robert B. Field, Jr.

Cynthia Hosmer

John Lamson

Jeffrey Little

Jeanne Rosadina

George Samuels

Brenda Schwechheimer

Nancy Winthrop

Staff

Molly Bolster *director*

Kait Braseth *Development Coordinator*

Gretchen Carlson *Program Manager*

Matt Glenn *Captain*

Andy Goodell *Operations Manager*

Crew

Jeff Bolster, Relief Captain

Tom Klodenski, Relief Captain

Paul Pelletier, Relief Captain

T.C. Sheridan, Relief Captain

Heather Hastings Froumy, Educator/Deckhand

Sue Kaufmann, Educator/Deckhand

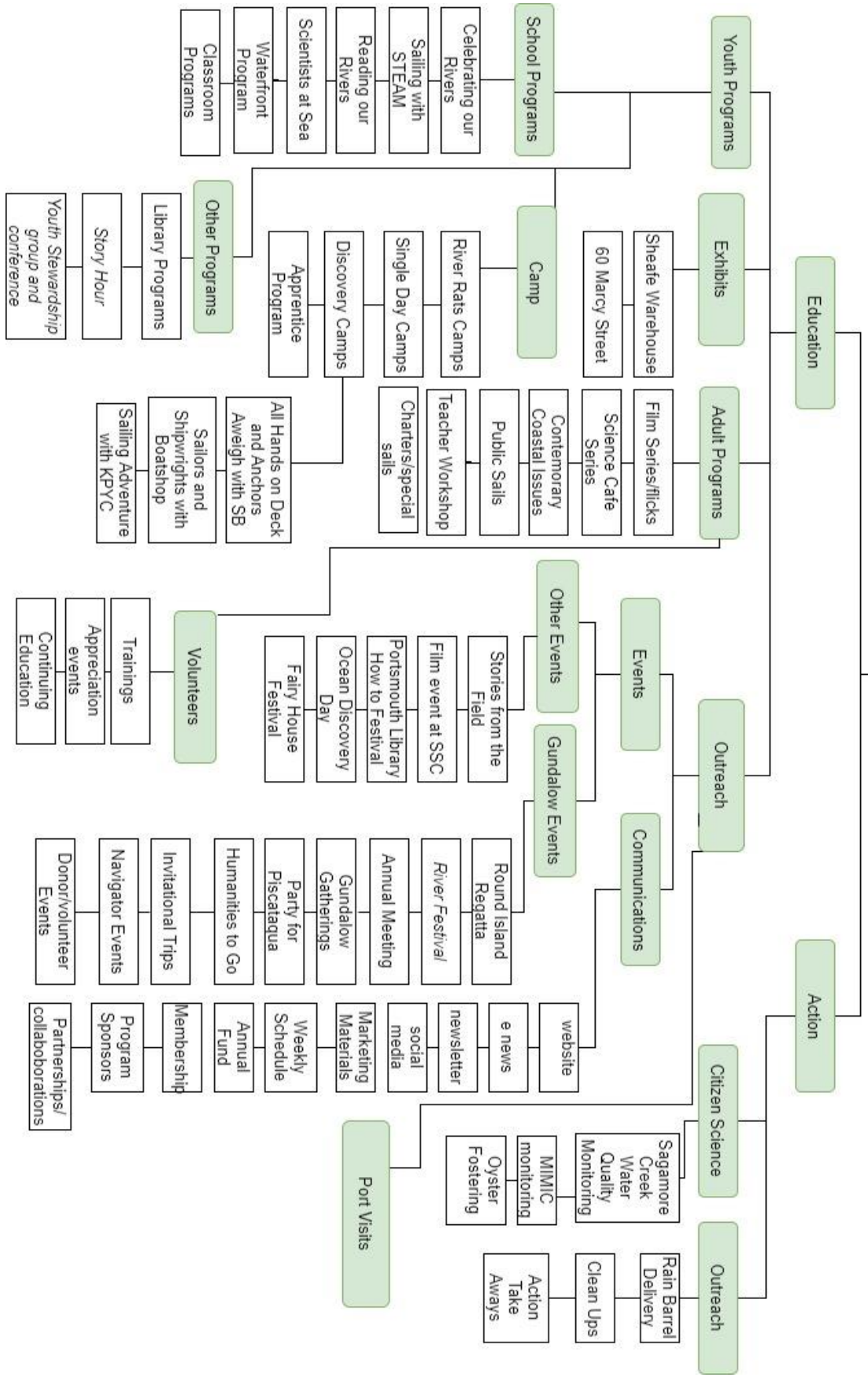
Rick Kaye-Schiess, Educator/Deckhand

Frank Stewart, Educator/Deckhand



Programs
2018

Mission: Protecting the Piscataqua Region's Maritime Heritage and Environment Through
Education and Action



Public Sails on the PISCATAQUA

Our public sailing programs introduce families, groups, and individuals to the Piscataqua Region through a relaxed sail on the tidal waters of the Piscataqua River or Great Bay. While aboard the PISCATAQUA, passengers enjoy a short presentation by our professional crew that connects the onboard experience with our mission. Each presentation touches on key take away messages and is often catered to the interest of the passengers. We also offer private charters throughout the season.

We offer multiple public sails options including:

- History Sails
- Discovery Sails (with a specific topic)
- Music Sails
- Speaker Sails
- Sunset Sails
- Bridge Sails
- Great Bay Sails

During the summer sailing season we sail up to 3 times a day, 7 days a week, sailing primarily from our dock in Prescott Park to the mouth of the Piscataqua River. During the summer of 2017 the Gundalow sailed 273 times with over 4,700 passengers.

School Programs on PISCATAQUA

Celebrating Our Rivers (grades 4-adult)

Youth educational sails onboard PISCATAQUA provide a transforming experience for students of all ages. While onboard, they explore environmental science and maritime heritage at interactive learning stations and join the crew to set the sail, steer and navigate. Students rotate through 3 learning stations on every trip, and participate in a group session of quiet observation and reflection. Our stations include human impact, plankton and marine animals, and sense of place/navigation.

Sailing with STEM (grades 6+)

To enhance the STEM-based learning on the Gundalow, a math activity, engineering, and water quality station is also available as a station choice. Students actively measuring, estimating, calculating and comparing as they work to figure the cargo-carrying capacity and/or speed of PISCATAQUA.

Reading our Rivers (grades 9-adult)

This upper level history program uses the places we see and the places we sail to tell the story of human settlement in the Piscataqua Region.

Scientists at Sea (grade 8-12)

By exploring the scientific process and using student's own knowledge and curiosity, students work in small groups to design a scientific hypothesis. These hypotheses become the guide for planning their scientific exploration on the Gundalow.

Waterfront programs

Our waterfront (or shore) programs are offered as an add-on to the sailing programs. Teachers can extend the sailing field trip into a full day of programs. Our waterfront programs take place in Prescott Park and Sheafe Warehouse and emphasize hands on learning. Currently we offer several options for learning programs including Piscataqua People (a historic role playing game), simple machines, water quality, a history walk, tidepooling and drawing.

River Rats Camp and other Camps

During the summer of 2017 we expanded our summer camp program by increasing the number of weeks, the age range of campers, and the summer camp staff. During each week of camp, youth spent time on PISCATAQUA, on our small boats, and on land at Creek Farm, with time on the Gundalow increasing as campers got older. Campers connect to the Piscataqua Region through games, activities and simply 'messing about in boats.'

Some of the highlights of Gundalow Camp 2017 included: sailing to Adams Point, rowing with volunteers in the wherries, exploring islands, building giant cardboard boats, doing a local food delivery to Black Trumpet in Portsmouth, building sea chests, singing songs, performing skits, using the sit on kayaks, and exploring the shoreline at Creek Farm.

During 2018 we will be partnering with Strawberry Banke, Kittery Point Yacht Club and the Boatshop at Strawberry Banke for our discovery camp programs.

Events

Each year Gundalow Company offers several special events separate from our program. These events are designed to meet our mission and spread the message of Gundalow Company

River Festival – This event is new for 2018, but will build off of the River Festivals we've hosted in various towns in the past. This event will include a wooden boat show, music, food, and activities for families.

Round Island Regatta – This on the water event is a relaxed boat race including kayaks, canoes, sailboat, rowboats, paddleboard, and other floating vessels. Followed by a picnic, this fun event gets people out enjoying the water.

Film Series – During the fall and spring, we offer a film series in Sheafe Warehouse where we share stories from around the world about environmental issues and maritime heritage.

Science Cafes – Our science café series takes place at the Portsmouth Brewery and encourages lively conversation about a number of topics related to the marine environment. These cafés bring experts in for an interactive Q and A session.

Action

Each year we work hard to fulfill the action part of our mission. This means we find times throughout the year where we can get our hands dirty and make a direct difference on our rivers. We work with many partners throughout the year including Piscataqua Region Estuaries Partnership (PREP) and the Great Bay Piscataqua Water Keeper.

Some of the ways we take action include:

Citizen Science - working with our volunteers, we monitor water quality at Sagamore Creek and marine invasive species at 4 locations on the seacoast.

Clean-Up Efforts – we frequently partner with other organizations to take part in clean-up efforts around the watershed.

Rain Barrel Delivery – Historically, gundalows were used to carry cargo. In an effort to capitalize on the historic aspect and highlight action, we often offer rain barrels for sale and deliver them to towns by gundalow.



GENERAL ORIENTATION

GUNDALOW HISTORY - SOURCE

Events in the Piscataqua region before the industrial revolution were shaped by the environment and the development of the gundalow is no exception. The earliest settlements, such as Strawberry Banke near the deep water port of Portsmouth, and Odiorne Point on the coast, were accessible to large boats. A vessel that could navigate up river became necessary when the growing population spread inland. The gundalow, with its shallow draft and flat bottom, was ideally suited for transporting local cargo (such as lumber, cordwood, salt hay, bricks and live stock) as well as imported goods, in the narrow, shallow rivers. This craft became an essential link in the region's trade network.

Travel by water was the logical choice in an area with an extensive system of rivers bounded by forests. While New Hampshire has only 18 miles of coastline, there are 150 miles of "inland shores" inundated with salt water twice a day. The tributaries of the Great Bay (the Squamscott or Exeter River, the Lamprey, the Bellamy and the Oyster) along with the Cocheco and Salmon Falls all drain into the Piscataqua. For this reason, the Piscataqua was aptly named by the Indians to mean 'meeting of the rivers'. All that water flowing into the Piscataqua and out to sea makes it the second fastest river in the country. This strong current facilitated river transportation, and was the primary means of propulsion for the gundalow. Today the Piscataqua serves as a boundary between Maine and New Hampshire, whereas previously the river and its tributaries unified the region by providing a natural highway.

The vessel that could best take advantage of the entire river network was the gundalow. In its crudest stage, the gundalow had square ends and an open deck, no sail. This version was crewed by men rowing with the long oars called sweeps while riding with the tide. The primary cargos were wood, salt, hay and farm products. As the region continued to prosper and develop, stimulating demand for a larger, more efficient cargo carrier, the gundalow responded by adding a deck and a square sail. Rounding the stern, and adding a 'spoon-shaped bow' made it more streamlined, but it was not until around 1800, when bridges started spanning the rivers, that the distinctive lateen sail was added. The pivoting rig allowed the spar to be lowered, a maneuver called 'shooting a bridge'. Developments in the gundalow during this era were a reaction to the prospering economy, which was still based on the natural resources of this unique region. Salt marsh hay, wood and bricks were local products involved in the trade pattern.

Salt hay grew in large quantities along the coastal area of Seabrook, Hampton and Rye. According to John Foss's detailed account, salt hay was a good crop because it always did well, and there was little cost or care involved. Another advantage was the great demand for the crop, most commonly as fodder for cows and other livestock, but also as mulch, or banking to insulate along the foundation of a house. Harvesting the hay began in the late summer and extended into autumn, a process that involved cutting it with scythes, stacking it into haycocks, and loading it onto gundalows that would transport it.

From the forests around the Great Bay came cordwood that was loaded on gundalows and taken to brickyards to fire the kilns. Those bricks were made from the blue clay taken from the banks of the rivers and estuary. While some bricks were used locally, many were taken to Portsmouth, loaded onto a ship bound for Boston, and used in the construction of homes on Beacon Hill and in the Fens.

Gundalows were not limited to carrying salt hay, wood and bricks, although those goods did make up the bulk of their cargo. This all-purpose craft provided diverse services, such as supplying ballast for the Portsmouth Shipyard, shuttling children to Sunday services and spreading news to river towns.

Versatility characterized the vessel and the men who used them. Most gundalowmen were also farmers. Out of necessity they possessed numerous skills, one of which was boatbuilding. A more accurate description of their method would be that they applied common sense and ingenuity to their basic carpentry skills. The resulting product was a crudely built but useful boat. As John Gardner stated:

In colonial America and in fact until well along in the nineteenth century there were only a few boatbuilders strictly speaking, but a great many people who occasionally built boats. Those who needed boats appear very often to have built them themselves. To a large extent, and particularly outside the urban centers, boatbuilding was not carried on as a specialized trade, but as occasional employment combined with part time occupations.

This versatility was not limited to boatbuilding, it was characteristic of many jobs before the industrial revolution. Most craftsmen often did work on both ships and houses; overlapping jobs accounted for shared techniques and results. The wooden pegs (trunnels) that fasten gundalows together could be found in both barns and homes. The naturally shaped knees which form the ribs of the gundalow were also used in barns, mills and covered bridges.

Labor specialization accompanied the industrial revolution. National trends, not local concerns or natural surroundings, dictated economic choices. Traditional practices like fishing and boatbuilding were supplemented by new industries, most notably the mills. Roads and railways reduced isolation by connecting one region to another and at the same time destroyed what made each area unique. Although trucks and railroads would eventually replace them, gundalows enjoyed their greatest popularity during the early to mid-1800's when hundreds of the vessels plied the Piscataqua.

After more than 250 years of service in the estuary, the gundalows were replaced, for they could no longer compete with motor-powered vehicles. Captain Adam's Fannie M. was the finest and last working gundalow. The boat was retired from duty in the early 1900's and by the 1920's little remained of the boat or its proud heritage.

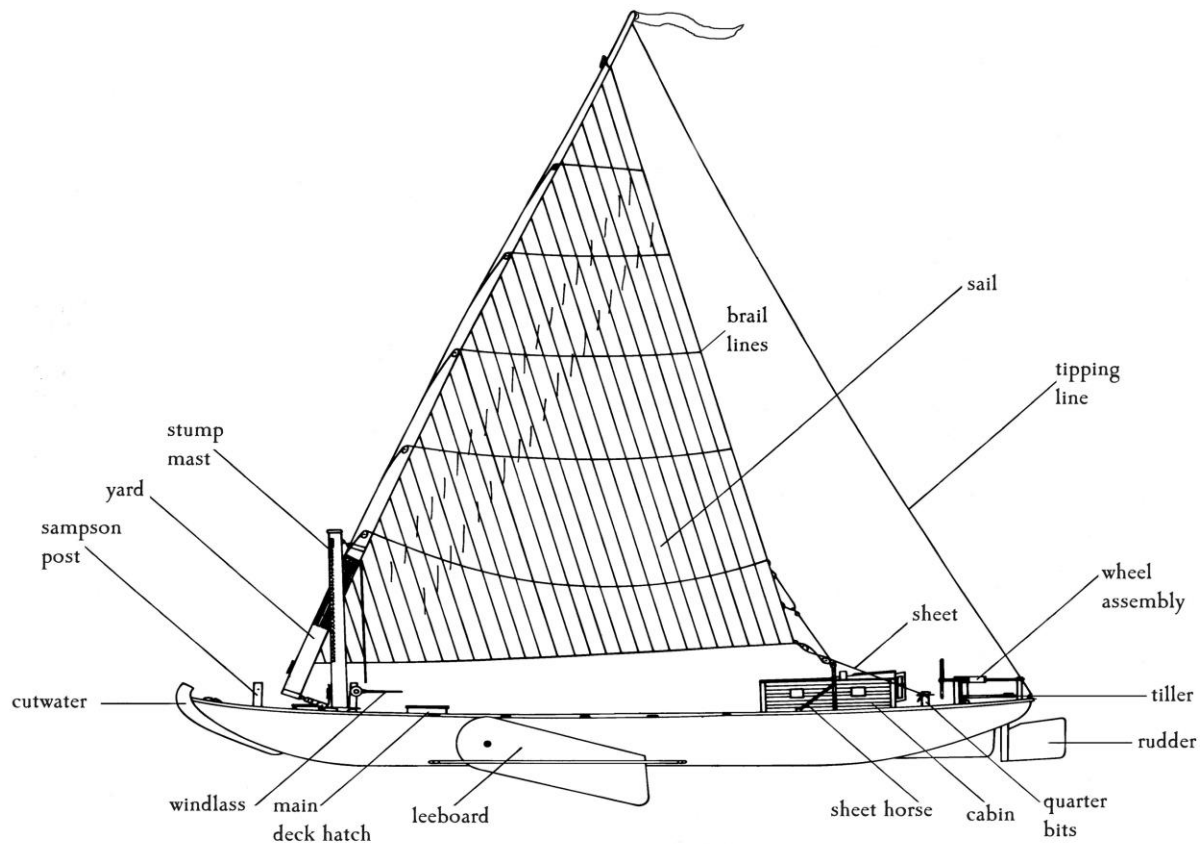
To try to revive interest in the gundalow and the estuary it served, Captain Edward Adams began building a recreational gundalow named the Driftwood. Edward and his son Cass worked on the boat for 20 years, taking frequent breaks to chat with visitors. A big celebration marked Captain Adam's 90th birthday and the coinciding launch of

Driftwood, an event that successfully stirred a renewed interest in gundalows. Unfortunately, soon after its launch the Driftwood, like its forbearer the Fannie M., was allowed to rot at Adams Point and was destroyed in 1968 when it was set afire.

Had the Driftwood received the care it deserved, there would not have been a need to build a replica. Because it did not, in 1978 the Piscataqua Gundalow Project was organized, based on Albert Hickey's idea to build a replica of the Fannie M. and name it the Captain Edward H Adams. Bud McIntosh, a well-known Dover Point boatbuilder, served as consultant, while Bob Eger, Elias Rowe and Bob Simpson completed most of the actual work assisted by apprentices and volunteers.

Sources: Richard E. Winslow III, The Piscataqua Gundalow: Workhorse for a Tidal Basin Empire (Portsmouth, N.H.: Portsmouth Marine Society, 1983); William G. Saltonstall, Ports of Piscataqua (Cambridge, Mass: Harvard University Press, 1941); D.F. Taylor, The Piscataqua River Gundalow (unpublished typescript, Merchant Marine Survey, Smithsonian Institution, 1937).

Gundalow with labels



FAST FACTS ABOUT GUNDALOWS

- Gundalows of various sizes were common on our tidal rivers for 250 years (1650-1900).
- Gundalows provided a vital link between the “deep water port” and inland towns.
- Gundalows were designed for the skinny, tidal rivers in the Piscataqua Region.
- Gundalows were initially built by farmers, over the winter, using available, local timber.
- Early gundalows (1600s) were small, undecked vessels with square ends - - no sail, no cabin.
- The lateen rig - added in the mid-1800s - allowed gundalows to shoot under newly built bridges.
- This rig resembled that on vessels sailing the Nile River when Cleopatra was Queen of Egypt.
- In December, 1774, colonists used gundalows to transport gunpowder seized during a raid on Fort William & Mary in New Castle (formerly Fort Point, now Fort Constitution).
- With spoon bows, gundalows could pull up on shore and wait for low tide to drain the bilge.
- When sails were added, lateen rigs were used so the yard could be dropped to go under bridges.
- Early gundalows were caulked with rags dipped in rancid salt pork grease.
- A typical gundalow would only last about 10 years; parts were re-used for new construction.

Overview of the Piscataqua Maritime Region



“Arranged like 5 spindling fingers, five rivers – The Squamscott, Lamprey, Oyster, Bellamy, and Salmon Falls – flow together from different part of the hinterland, mingling their waters in an inland system that transforms New Hampshire’s tiny stretch of shoreline into a maritime center of beauty and importance.”-John P Adams

(and of course the Cochecho)

Fast Fun Facts to Share About our Maritime Region

Maritime Heritage

- Native Americans hunted and fished in the area for thousands of years, including Algonquin- speaking Abenaki tribes.
- The first European explorer we know of was Martin Pring who sailed up the river looking for sassafrass in 1603.
- The English established the first fishing villages in the Piscataqua Region in 1623 at both Odiorne Point and Hilton (Dover) Point.
- Human impact on the region's environment greatly increased once the colonists settled here.
- By 1700 there were approximately 90 sawmills operating on our tidal rivers.
- Sawdust was an early pollutant, with 40 bushels produced for every 1,000 feet of lumber milled.
- In 1705 the Piscataqua Region was one of the world's most densely industrialized areas.
- In the 1800s there were 70 active brickyards in the region, producing 54 million bricks in 1880.
- For several hundred years the rivers were just like our roads, gundalows like our trucks.
- Gundalows were once as common a sight as the tractor trailers are today

Great Bay Estuary

- The Great Bay Estuary, a drowned river valley, begins at the mouth of the Piscataqua River.
- Great Bay contains approximately 17 billion gallons of water and includes 7 rivers that drain a 930 square mile watershed, through 42 towns.
- There are 5 major habitats: eelgrass, mudflats, salt marsh, rocky intertidal, channel bottom.
- The estuary adds over 150 miles of tidal shoreline to the Piscataqua Region.
- The Piscataqua River watershed crosses state boundaries: 25% is located in Maine.
- Great Bay is one of several estuaries connecting to the Gulf of Maine.
- At low tide, approximately 50% of Great Bay is mudflats.
- The salinity in the bay averages 23 ppt, compared to 32 ppt in the ocean.
- It takes approximately 18 days for water to cycle through the Great Bay Estuary.

Estuarine Environment

- The rivers, bays, and ocean waters are all connected in the Piscataqua basin.
- Acre for acre, an estuary produces 10 times as much organic matter as an Iowa cornfield.
- Shellfish was once so plentiful it was used as fertilizer and feed for livestock.
- Phytoplankton in the estuary produces 60% of our available oxygen.
- 52 species of fish and shellfish are commercially harvested in the Gulf of Maine.
- An estimated 70% of these species use the estuary as a food source and breeding ground.
- An oyster can filter up to 20 gallons of water a day.
- It once took a few days to filter all the water in the bay, it now takes 450 days due to the decline in the oyster population.
- The biggest threat to estuaries is now nonpoint source pollution - - runoff from roads, parking lots, construction sites, and cultivated lawns and fields

The Current State of our Estuary

Every five years, PREP produces a State of Our Estuaries Report that examines environmental indicators of estuarine health, such as bacteria levels, nutrient concentrations, toxic contaminant levels, abundance of shellfish, and land use in the coastal watershed. By examining long-term data sets compiled from a variety of organizations, the report describes the current status of Southeastern New Hampshire and Southern Maine's estuaries and suggests trends for the future. The report is designed to provide readers with an accurate understanding of environmental trends for the Great Bay and Hampton-Seabrook estuaries so that they may make informed land use and resource management decisions.

The following pages are an overview of the indicators in the 2018 State of the Estuaries Report. To see the complete report, visit:
<http://www.stateofourestuaries.org/>

INDICATOR TABLE

Indicators are things we measure to characterize pressures on our estuaries, the conditions in our estuaries, and the steps we are taking to respond to challenges in our estuaries. The indicators PREP monitors are tied with PREP's Comprehensive Conservation and Management Plan (CCMP) and many include goals for management associated with them. Indicators do not stand alone, and many impact each other. To learn more about these important interactions refer to the *Estuarine Health: Stress and Resilience* section

on p. 7. This report is organized with pressure indicators first, then condition indicators, followed by response indicators, and for the first time, it now includes social indicators. This list of indicators is not exhaustive and does not reflect every pressure, condition, response, or social factor that does or could exist for our estuaries. However, the list of indicators covers the major issues and provides a reasonably complete picture of the State of Our Estuaries.

PRESSURE INDICATORS

These measure some of the key human stresses on our estuaries.

CONDITION INDICATORS

These measure the current state of conditions in our estuaries.

RESPONSE INDICATORS

These track some key actions we are taking to restore our estuaries.

SOCIAL INDICATORS

These measure the social landscape that could impact environmental indicators.

TRENDS

Trends and their associated color drops are based on the entire data set for the indicator, and will vary by indicator.

The trend or status of the indicator demonstrates improving conditions, generally good conditions, or substantial progress relative to the management goal.



The trend or status of the indicator demonstrates possibly deteriorating conditions, a mixture of positive and negative trends, or moderate progress relative to the management goal.



The trend or status of the indicator demonstrates deteriorating conditions, generally poor conditions, or minimal progress relative to the management goal.



Demonstrates indicators that are too new to establish trends of any kind.



Impervious Surfaces		In 2015, 5.6% of the land area of the Piscataqua Region watershed was covered by impervious surfaces. This is an increase of 1,257 acres of impervious cover or 0.2% of the land area since 2010.	14
Total Suspended Solids		Suspended solids at Adams Point have increased since 1989, but they have decreased at the Great Bay Station since 2002.	15
Nutrient Loading (Point-Sources)		Significant reductions in point source nitrogen loading have and are continuing to occur at municipal wastewater treatment facilities.	16
Nutrient Loading (Non-Point Sources)		Non-point source loading has decreased, but low rainfall is a contributing factor.	16
Nutrient Concentration		Total nitrogen decreased at Adams Point but increased at the Chapman's Landing and Lamprey River stations. DIN decreased at the Oyster River and Upper Piscataqua stations while Chapman's Landing indicates an increasing trend.	18
Phytoplankton		Based on monthly sampling at low tide, four of the eight stations periodically—though infrequently—exhibit high (>20 ug/L) levels for chlorophyll-a. There are no statistically significant trends.	19
Seaweeds		At limited intertidal sampling sites, green and red seaweeds increased from 8% percent cover to 19% between 1980 and 2016. Two new invasive species are now the dominant red seaweeds.	21
Dissolved Oxygen		In 2015, at the Great Bay and Coastal Marine Laboratory datasondes, dissolved oxygen levels never fell below 6 mg/L. Low dissolved oxygen events occur in all the tidal rivers. There are no clear trends.	22
Eelgrass		Eelgrass acreage in the Great Bay is 31% less than when first mapped in 1981.	23
Salt Marsh		Between the early 1900s and 2010, over a thousand acres of salt marsh area was lost in the Piscataqua Region watershed. As of 2017, approximately 5,521 acres of salt marsh habitat remain.	25
Bacteria		Between 1989 and 2016, dry weather concentrations of bacterial indicators of fecal pollution in the Great Bay Estuary have typically fallen 67% to 93% due to pollution control efforts in most, but not all areas.	27
Shellfish Harvest Opportunities		The percentage of possible acre-days between 2012 and 2016 was 80% and 66% for the Great Bay and Hampton-Seabrook estuaries, respectively, continuing the long-term trend of gradual increase in acre-days.	28
Beach Advisories		Across the 17 tidal beaches in the Piscataqua Region watershed, beach advisory days occurred less than 1% of beach-days from 2012 to 2016. There are no statistically significant trends.	29
Toxic Contaminants		Most concentrations of measured metals and organic chemicals in blue mussel tissue from 1991-2016 are declining or not changing. Mercury and PCB levels remain high enough to merit continued concern. Many emerging contaminants are not yet monitored consistently.	30
Oysters		The number of adult oysters decreased from over 25 million in 1993 to 1.2 million in 2000. Since 2012, the population has averaged 2.1 million oysters, which is 28% of the PREP goal.	32
Clams		The clam population in 2015 was 1.4 million and the percentage of clams infected by disease has significantly increased.	33
Migratory Fish		Migratory river herring returns to the Great Bay Estuary increased 69% between 2012 and 2016; however, river herring returns have sharply declined for the Oyster and Taylor Rivers. No statistically significant trends.	34
Conservation Lands (General)		As of May 2017, 130,302 acres have been conserved (15.5% of the total land area) representing an increase of 5% in new land area coming under conservation (41,555 acres) since 2011.	35
Conservation Lands (Focus Areas)		In 2017, 34.4% of Conservation Focus Areas (CFAs) in New Hampshire and 14.2% of CFAs in Maine were conserved, for a combined impact of 40.9% of progress toward the PREP goal.	37
Oyster Restoration		More than 26 acres of oyster restoration efforts have taken place since 2011. For recent efforts, the actual area covered by oyster shell has decreased by an average of 63%, while one site increased by 30%.	38
Migratory Fish Restoration		In 2016, 42% of the historical distribution for river herring in the Piscataqua Region has been restored. Additionally, removal of the Great Dam in Exeter in July 2016 has improved/enhanced river herring passage on the Exeter River.	39
Housing Permit Approvals		There were a total of 19,483 multi-family and single-family permits issued between 2000-2015 for the 42 New Hampshire watershed towns. There were 331 permits issued for the 10 Maine watershed towns in 2015.	41
Stormwater Management Effort		As of July 2017, of the 42 NH watershed towns - 8 have adopted the complete set of standards, 7 are in the process of adoption, 5 have partial or different, and 22 have not adopted. The 10 ME towns adhere to a state-level standard.	44
Stewardship Behavior		In 2016 there were 38,878 volunteer hours logged in the watershed through the work of six selected New Hampshire-based groups. In 2016, there were 524 people who signed up for 96 events through the Stewardship Network New England.	46

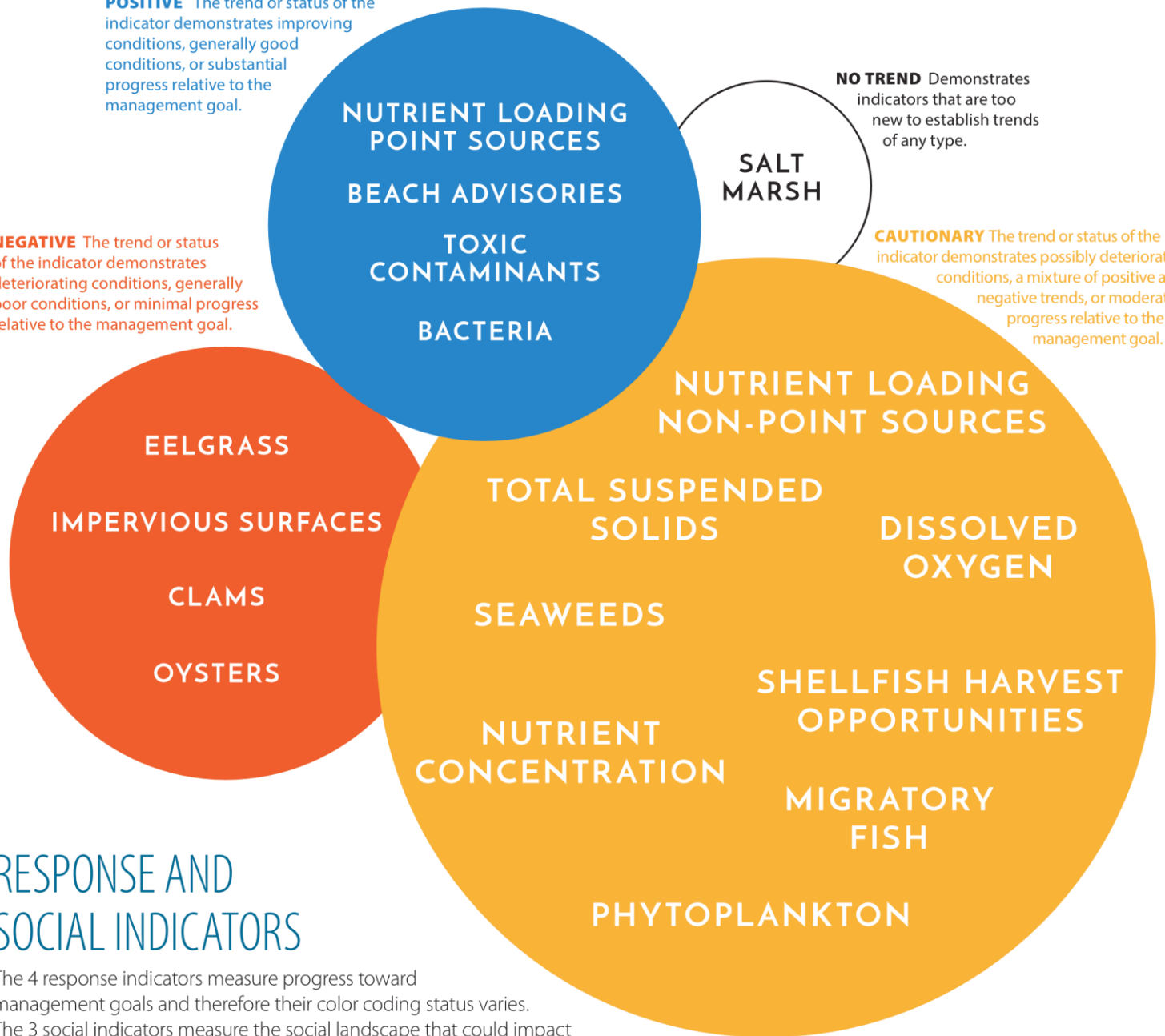
INDICATOR SUMMARY

POSITIVE The trend or status of the indicator demonstrates improving conditions, generally good conditions, or substantial progress relative to the management goal.

NEGATIVE The trend or status of the indicator demonstrates deteriorating conditions, generally poor conditions, or minimal progress relative to the management goal.






NO TREND Demonstrates indicators that are too new to establish trends of any type.

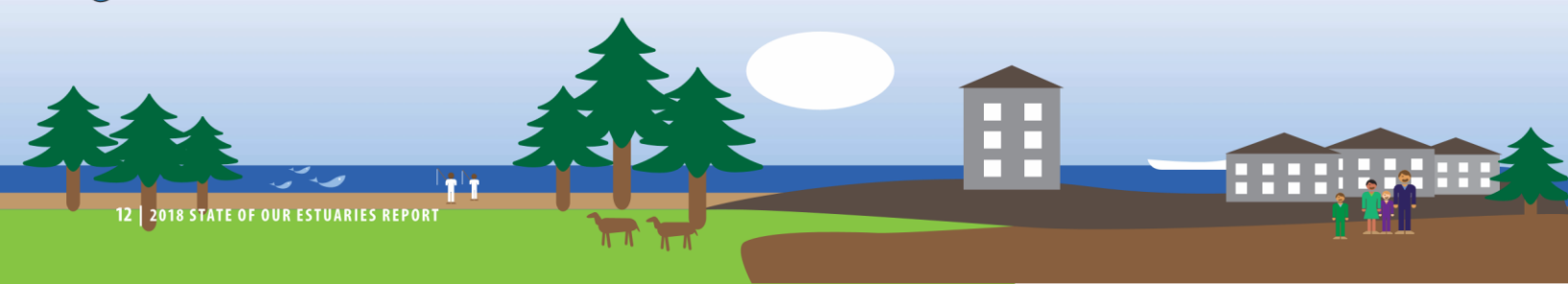
CAUTIONARY The trend or status of the indicator demonstrates possibly deteriorating conditions, a mixture of positive and negative trends, or moderate progress relative to the management goal.



RESPONSE AND SOCIAL INDICATORS

The 4 response indicators measure progress toward management goals and therefore their color coding status varies. The 3 social indicators measure the social landscape that could impact environmental indicators.

-  CONSERVATION LANDS (GENERAL)
-  HOUSING PERMIT APPROVALS
-  CONSERVATION LANDS (FOCUS AREA)
-  STORMWATER MANAGEMENT EFFORT
-  OYSTER RESTORATION
-  STEWARDSHIP BEHAVIOR
-  MIGRATORY FISH RESTORATION



Gundalow Company Fulfilling its Mission of Taking Action for Our Rivers

Small changes can have a huge impact for making the water in our rivers clean. Here are 5 ways we recommend taking action for our environment.

1. Reduce the plastic that ends up in the ocean by avoiding products with microbeads, minimizing your use of single-use plastics and disposing of trash and recycling properly
2. Get involved in your watershed by teaching others about the environment, helping with clean up and monitoring projects and becoming involved on your town planning and zoning boards
3. Maintain an eco-friendly home by selecting green cleaning products, composting, and making your house more energy efficient
4. Create an earth friendly yard by setting your lawn mower on a higher blade setting, growing your own food, reducing your use of pesticides and fertilizers and collecting water in rain barrels and through landscape design
5. Take care out on the water by properly pumping waste, avoiding spills, taking care of trash, and following local regulations



Frequently Asked Passenger Questions

As a Gundalow Company volunteer you will be spending time interacting with the public in a variety of ways. Here are some of the questions our volunteers get asked the most!

What's the best place for (feel free to fill in your own favorite spots!)

Lobster - Warrens, Surf

Seafood - Surf, Jumpin Jay's, Franklin Oyster

Chowder - Geno's, Sanders, River House

A sandwich - Ceres, Googies, Fig Tree

A cup of coffee - Ceres, von Sollen, Breaking New Grounds, Fig Tree

Ice Cream - Izzy's, Clark's Creamery

Picnic Supplies – Ceres, Googies, Fig Tree, Napoli, Pickwick's

About the boat

How tall is the mast? 22 ft off the water

How tall is the yard? 62 ft long and 60 ft off the water

How long is the gundalow? Just over 64 ft

How wide is it? (Beam) 18 ft

What is the draft (depth below the water)? 2 ½ ft, or up to 8 ft with the leeboard down

What kind of wood is the boat made from? Oak frames and planking, white pine deck, hackmatack and live oak knees, white oak mast, laminated spruce yard

How old is the boat? Built 2011

What is the Engine Horsepower? 230hp Cummins six cylinder diesel

What is the Engine fuel type and tank capacity? Diesel, 450 gallon tank. We burn around a gallon per trip.

How Many people can it carry? 46 guests, or up to about 27 students

How fast can the boat go? 8kts, or, more typically, 2 or 3 knots. How fast do you want to row, or, how fast is the tide moving right now?

Who built it? Master shipwright Paul Rollins Sr. and a team of about 8 professional boatbuilders and dozens of volunteers. It took 100's of donors to pay for it.

Where was it built? Across Marcy St on the grounds of Strawberry Banke.

How much did it cost to build? We raised \$1.2 million for the capital campaign - around \$850,000 to build the vessel and the remainder covered operating expenses for the first year.

When was the last one built/retired? The last working one we know of, *Fanny M*, was built in 1886 and retired about 30 years later. Our previous replica gundalow, Captain *Edward H Adams*, was built in 1982 and retired to a park in Dover in 2014.

Is the PISCATAQUA certified by the coast guard? Yes, the Coast Guard was closely involved during the construction phase, and does ongoing hull inspections every five years. The Coast Guard also does annual inspections on safety equipment, systems, manning, and drills.

What qualification/certification does the Captain need to run the Gundalow? Captains are required to hold a minimum 100 ton inland master's license with sail endorsement, issued by the Coast Guard, and to renew every five years. Our captains all have additional years of experience on other vessels large and small.

Other Questions

Why can't the Piscataqua go further out of the harbor? While *Piscataqua* has great stability, because of the unique nature of her design and rig she is limited to carrying passengers on rivers and bays. In good weather we have transited to the Shoals and up and down the coast as they did in the past.

How far upriver does the PISCATAUQA go? She has been as far as Newmarket, to Dover, and part way up the tidal Bellamy, Oyster, and Salmon Falls rivers. Several times a year we sail from Adams Point on Great Bay and Little Bay, and on alternate Sundays we go upriver past Dover Point to turn back around Sturgeon Creek (around 7 miles).

Does Piscataqua ever sail from other places? We have sailed from York, Newburyport and Amesbury (on the Merrimack), Durham, and Dover, as well as other docks in the lower harbor.

How many subs are at the PNSY? Usually about four at a time-- ask others if the three drydocks are full, and if any are visible alongside the wharves.

How big are the subs and their crews? The Los Angeles and Virginia class subs are around 360 ft long with a complement around 130.

How deep is the river? Up to 80 feet near the prison. The shipping channel (as far as the top of Newington) is maintained at a minimum of 35 ft at low tide, but it rarely requires dredging. Many places upriver uncover at low tide.

What are the future plans for the jail? None, although the navy will occasionally request proposals. They are using a small portion for storage at the moment.

Why can't they convert the jail into something else? Huge expense, hazardous materials, and security limitations.

How fast is the river? Averages 3 kts on the flood, 4 on the ebb, but at times in certain places it can get up to 6 kts or more.

What is the tidal range? Averages 8 ½ ft, but can be anywhere from 6 to 11 ft.

How long is the river? About 15 miles to Dover, about 24 to Exeter. Our dock is about 3 miles from the mouth.

When is high/low tide? Check the whiteboard in the cuddy cabin hatchway.

Which way is the tide going? Look at which way the buoys lean or the boats swing on moorings around you.

Where is the state border? The middle of the river, in two places conveniently shown by the ship ranges. It has been disputed at different times, especially by lobstermen.

Can I charter the boat? (who do I talk to?) Yes! Contact Andy in the office at 603-433-9505 or info@gundalow.org

How many volunteers are there? Are more needed? (who do I talk to?) We have over 100 active volunteers at Gundalow Company and are always looking for new volunteers. Contact Gretchen at education@gundalow.org for more info.

What can you tell me about the seals that I see? Harbor seals are the most common species seen in New Hampshire. Males are generally larger than females, measuring approximately 5 feet and weighing up to 245 pounds. Females give birth in our area May-June and pups wean from their mother after 3-4 weeks. Harbor seal pups can swim shortly after birth and can dive for up to 2 minutes when they are just 2-3 days old. Gray seals and others are less commonly seen.

How many prisoners were in the navy prison? Maximum occupancy reached 3,088 in 1945.



INSERT PAGE OF PHOTOS AND BRIEF DESCRIPTION OF WHAT WE SEE ON THE WATER

THE ROLE OF VOLUNTEERS

Volunteers are the heart of our organization and we could not meet our mission without the countless hours of work and time that volunteers give to us every year. From an operational viewpoint, volunteers allow us to operate the PISCATAQUA safely and better serve the public. With volunteers we can welcome 2,000 students and over 6,000 people from the public on the boat every year.

In addition to helping operate our programs, volunteers are our best ambassadors and make a huge difference in the lives of the people we serve. Whether your passion is boats, history, or the environment, each volunteers' knowledge and enthusiasm for our mission and organization is what sets Gundalow Company apart. Making an impact to protect the Piscataqua Region is a group effort and we couldn't do it without our volunteers!

Volunteers, Staff and Crew

Volunteers serve an important role at the Gundalow Company and work alongside staff, crew, and other volunteers in many ways. The following is a break-down of the responsibilities of these different positions.

Staff are responsible for the 'behind the scenes' work such as scheduling charters, organizing programs, supporting crew and volunteers, marketing, fundraising, scheduling maintenance, promoting events, and more. There are 5 staff positions: Director, Operations Manager, Development Coordinator, Programs Manager and Captain. Staff work different hours throughout the entire year and often spend time working onboard PISCATAQUA.

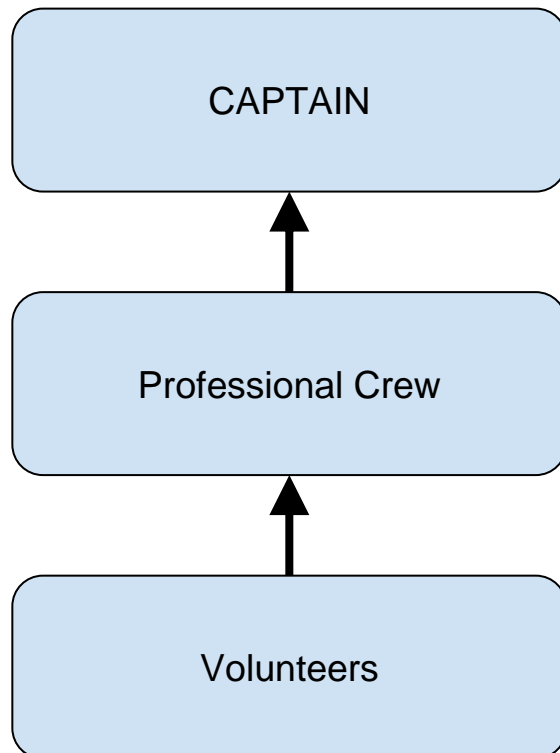
Professional Crew are our professionally trained employees that run our programs. This includes deckhand educators on the PISCATAQUA as well as ticket sales and outreach and our summer camp counselors. Depending on the position, our crew is drug-tested and certified in first aid and CPR.

Volunteers are an integral part of our organization and serve as deckhands, educators, office assistants, interpreters, board and committee members and citizen science monitors. Volunteers receive training each year and work closely with the professional crew, captain and program manager.

Chain of Command

When working onboard any vessel it is important to have a clear chain of command for daily operations as well as for times of emergency. On the PISCATAQUA this chain of command allows us to better train and respond to the needs of everyone on the boat. As a volunteer, you report to the professional crew. If you have a shipboard question, please take your question directly to the professional crew. The professional crew receives ongoing training and can either answer your question or will take your question to the Captain.

If you have a question or concern that does not apply to shipboard operations the best way to address it is to touch base with the Captain or Program Manager when the boat or program is not operating.



Volunteer Roles at Gundalow Company

All Volunteers interact with the public and work in various ways to promote our mission: Protecting the maritime heritage and marine environment of the region through education and action. While general information will go out to all volunteers, if you are interested in becoming involved in a specific role listed below, please email education@gundalow.org

Deckhands

- Assist the crew and captain onboard the PISCATAQUA before, during and after sails with vessel operations
- Help with projects onboard the PISCATAQUA as needed
- Interacting with passengers before, during and after sails
- Learn how to respond to emergency situations onboard

Stewards

Potential projects include:

- Collecting data throughout the year as part of our citizen science monitoring projects
- Helping organize and run clean up events
- Spreading the 'action' message of our mission

Educators

- Assist professional crew during onboard education programs and public sails
- Teach during our shore side education programs or in the classroom
- Volunteer as educators during our summer camp programs

Maintenance

- Help with projects onboard the PISCATAQUA as needed, especially during rig-up, down-rig, and annual haul-out
- Help remove the cover at the start of the season and cover PISCATAQUA at the end of the season
- Assist with additional maintenance projects on the docks and small boats as needed

Interpreters

- Assist in our Welcome Center, Maritime Learning Center, or at our dock sharing the story of gundalows and our mission with the public.

Office Assistance and Marketing

- Assist in the office as needed for data entry and office assistant tasks
- Help with marketing by distributing flyers around the seacoast area
- Help promote our mission during festivals and fairs

Welcoming Volunteers From all Walks of Life

Gundalow Company is committed to welcoming and working with a diverse set of volunteers from a variety of backgrounds, experiences, and skills. Some tasks that we ask volunteers to perform may involve lifting or other physical requirements. We ask volunteers to inform us of any limitations and reserve the right to ask you to perform a more appropriate task based on your physical condition.

Apprentice program

Gundalow Company offers 2 apprentice programs to youth ages 15-17. These young people receive additional training and will spend time working alongside our volunteers. Our Gundalow Apprentice program focuses on working aboard the Gundalow and communicating our message and mission to the public. Our Camp Apprentice program provides training and guidance in running on the water and waterfront camp programs.



Photo by Lynn Abbott

VOLUNTEER EXPECTATIONS

Process for Becoming a Volunteer

Becoming a volunteer for Gundalow Company varies based on the specific task you will be performing.

Every volunteer must:

- Submit an application
- Meet with the Program Manager or other staff to discuss volunteer opportunities and your skills
- Sign the Volunteer Policy Form (in the appendix)
- Read the Volunteer Handbook

If you are interested in a specific volunteer role, here are the additional steps volunteers need to complete:

Deckhands

- Attend a training session
 - These are held several times a year. If you miss a session, you can still sign up as a training volunteer, but should plan to attend the next training session.
- Complete volunteer deckhand skills checklist
 - This checklist must be completed every year and signed off by a crew member. You can work on your checklist during sails when crew is available, during specific checkoff times listed on the calendar or before/after sails based on the crew's availability. Please see the volunteer checklist in the appendix.
- Sign up as a 'training' volunteer at least 3 times or until you are comfortable and have been signed off by the crew or captain

Educators

- Attend a volunteer educator training session
- Sign up with the program manager to observe several education programs

Stewards

- Based on the project you're interested in, attend a training session
- Sign up to monitor with an experienced volunteer

Interpreters

- Attend a volunteer training
- Read through background material

Other Volunteer Roles

- Check with the program manager or other staff member

Volunteer Logistics

What to Wear during Programs

Please come dressed in Gundalow logo wear. Every volunteer is issued 1 blue volunteer shirt and may purchase additional shirts or other logo wear. When it is cold, there are gundalow sweatshirts that volunteers can borrow on the boat. Please wear shoes that capture your heel (no flip flops). All clothing should be free of rips and stains and shorts should not be too short. If your pants have a tendency to fall down, wear a belt. Please do not wear other logos. When you arrive on the boat, a name tag will be provided for you. If you are volunteering on PISCATAUQA don't forget the sunscreen, hat, and warm layers!

When to arrive for a program

If you are coming for a meeting, monitoring session or other specific activity, please arrive at the scheduled time. For education programs or if you are sailing as a volunteer deckhand please arrive 30 minutes before departure time for the first sail of the day and 20 minutes prior for subsequent sails. Please plan to stay after the program if it is the last of the day for as long as it takes to put away supplies and close down the boat.

Opening and Closing the Boat (for volunteer deckhands)

Volunteers and professional crew work together to get the boat ready in the morning and close the boat up in the evening. When you arrive please check in with the crew and use the opening/closing checklist in the appendix to complete tasks. If you don't know how to do something or feel unable to physically complete a task, don't hesitate to talk to the crew.

Signing up for Shifts on the Boat (or other Programs)

Gundalow Company uses an online spreadsheet to sign up as a volunteer. The exact link changes from year to year and will be emailed at the beginning of the season and throughout the year via email.

Please follow the guidelines below when choosing your sailing dates:

- Sign up in 1 of the 2 volunteer slots (or one of the training slots if you are a volunteer-in-training)
- Please be respectful of other people when signing up: do not sign up for all the music sails or all the speaker sails so others will have a chance to get on these fun sails

- If you need to change your schedule within 1 week of your scheduled date – please call the office – DO NOT just remove your name or we may miss it and not have people onboard

If you are signing up to monitor or to do an education program with us, please see the separate tabs at the bottom of the spreadsheet.

Inclement Weather Policy

As salty sailors we like to sail in all kinds of weather. That said we will not sail in dangerous conditions or unpleasant rainstorms, very strong wind, etc. The Captain makes the final decision on shipboard programs and the office makes the final decision on events and other programs roughly 2 hours before the start of the program. If we cancel a program, we will cross it out on the schedule and attempt to contact crew and volunteers by email or phone. If you have any doubt, please call the office before you head to the boat. Below is our official weather cancellation policy:

Weather cancellation policy:

In the event of inclement weather, the captain has sole discretion over the decision to sail or not. Passenger safety is naturally the top priority. This decision will take into account:

- High winds, which may make docking, undocking, and maneuvering underway difficult, or create overly choppy conditions on the river
- Fog or the threat of fog, which may reduce visibility on the river below one nautical mile
- Thunderstorms in the area

While every effort is made to cancel and notify passengers at least one hour before a sail, the captain can make the “no-go” decision at any time and can also determine to return to the dock early.

Our cancellation policy (for passengers) can be found here:

<http://www.gundalow.org/sail-with-us/cancellation-refund-policy>

Environmental Ethic

Gundalow Company works hard to promote environmental stewardship and we ask our crew and volunteers to do the same when aboard the PISCATAQUA. We always strive to be zero waste and encourage volunteers to bring a reusable water bottle and act as stewardship models for school groups and the public.

Where to park

Since we operate primarily in Portsmouth, parking is difficult. We will email you throughout the season with updates on parking.

Sail Passes and Merchandise discount

Every volunteer will get 2 sail passes worth the equivalent of \$70, and a 10% discount on gundalow merchandise. To get your sail pass, please see the Program Manager or come into the office.

Time Sheets

It is very important to keep track of volunteer hours for some of the grants we receive. Please record your volunteer hours in the logbook on the boat, in the office or by email to the program manager - education@gundalow.org.

Membership

We encourage all volunteers to become members of the Gundalow Company. Membership helps support our programs and allows us to meet our mission. Your membership fee directly supports the education programs on Piscataqua each season. You can also help spread the message by encouraging passengers to join as member by talking to the professional crew.



“One trip at a time through our waterways, the gundalow PISCATAQUA stitches everything together - - people and nature, history and science, the past with the present and the future. This unique experience offers a rich sense of place . . . to local residents, visitors, and particularly to students. My membership helps to create caring and informed stewards of the Piscataqua region. I’m proud to be a member of the Gundalow Company”

- Susan Kaufmann

Important Things to Know as a Volunteer

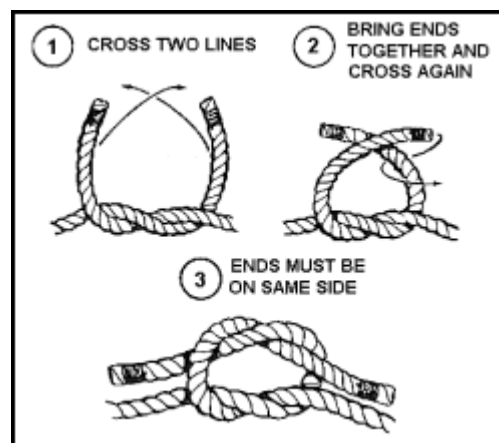
The following tips and pointers were designed to help make the volunteering process easier. Not every section below applies to every volunteer

A Few Pointers

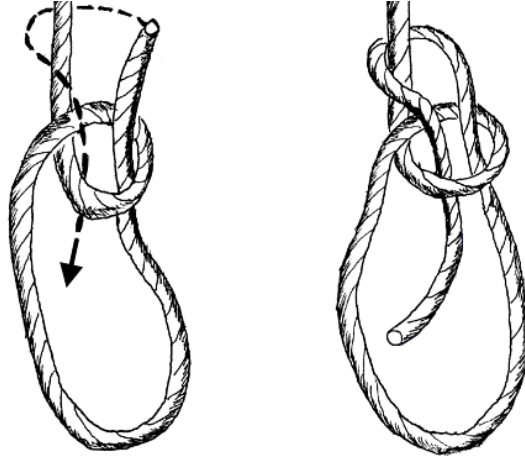
- Safety is #1 - always be aware of what is happening around you and always ask if you are unsure
- Dock lines and other lines can come under tremendous pressure. Be extremely careful not to get your finger or other body parts wrapped in or under lines.
- Always coil lines clockwise
- We do not use a locking hitch on cleats (except the pennant)
- When you are volunteering as a deckhand, please check-in throughout the sail with the captain and crew
- We always encourage volunteers to share what they know with the passengers, but please be honest if you're not sure of an answer and please refrain from giving the entire history talk before the crew does their presentation.
- If you are a timekeeper, please give each educator a **10, 5 and 1 minute??** warning without disrupting the station

Knots to Know

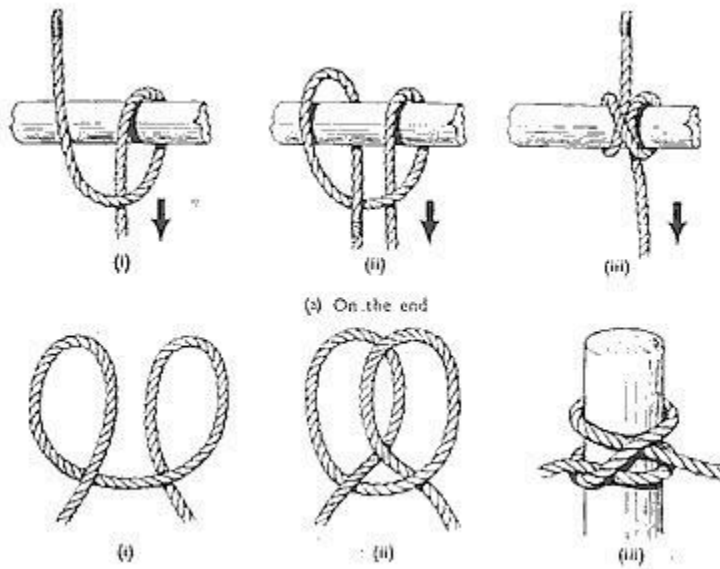
Square Knot



Bowline (useful but not required)



Clove Hitch (for attaching fenders)



Gundalow Glossary

bow – the front of the boat

stern – the back of the boat

forward - towards the bow

aft – towards the stern

port – the left side of the boat when facing forward

starboard– the right side of the boat when facing forward

midships – at the center of the boat

cuddy cabin – below deck accommodations (usually near the stern)

hold – an interior cargo space

head – a toilet on a boat

forepeak –small compartment near the bow of the boat

lazarette - small compartment near the stern of the boat

make fast (or belay) – to fix a line around a cleat; to secure it

avast-- stop!

line - any rope aboard ship that has a purpose

brail – a small line used to draw in a sail

mainsheet -- a line that controls the trim of the sail

traveler horse -- a bar across the cuddy cabin for the mainsheet to slide across

leeboard -- a large board which can be lowered to improve maneuverability

rudder – a flat piece of wood or metal off the stern that is shifted side to side for steering

spar -- a thick strong pole used for rigging

stump mast – a short heavy spar that stands vertically

yard – a long spar attached to the mast that holds the sail

yard tackles—lines that secure the yard side to side on the bow

cleats, quarter bitts, H-bitts -- various attachment points for docklines

sweeps – large one-man oars

tack (or come about) – to turn the bow toward the wind until the wind is coming over the opposite side

jibe (gybe) – to turn the bow away from the wind until the wind is coming over the opposite side

WORKPLACE SAFETY

Safety

The Gundalow Company considers accident prevention and control to be a primary objective. The Gundalow Company is dedicated to providing all reasonable safeguards to ensure safe and healthy working conditions. These safeguards include, but are not limited to, providing a neat and well-maintained working environment, maintenance of all equipment, and requisite job-related safety training. Volunteers must report all injuries to Gundalow Company within 24 hours and fill out an accident report form.

Emergencies on the Boat

The PISCATAQUA is a Coast Guard inspected vessel, and our Captain and professional crew take part in frequent safety drills and training to be prepared in case of emergencies. Please find details of our Emergency Instruction for onboard emergencies in the appendix. During an emergency, volunteers should follow the chain of command, assist in calming and containing passengers and be prepared to assist as needed. Volunteers are not asked to be primary emergency responders or to fill safety-sensitive roles.

Disabilities

The Gundalow Company is committed to providing equal opportunities to qualified individuals with disabilities, which includes providing reasonable accommodation to qualified applicants to allow them to volunteer. All medical information will be treated as confidential in accordance with applicable laws.

The Gundalow Company will take all requests for accommodations seriously and will promptly determine whether the volunteer is a qualified individual with a disability and whether a reasonable accommodation exists which would allow the volunteer to perform the essential functions of the job without imposing an undue hardship on the Gundalow Company or employees.

Sexual and Other Unlawful Harassment

The Gundalow Company is committed to providing an environment that is free from all forms of discrimination and conduct that can be considered harassing, coercive, or disruptive, including sexual harassment. Actions, words, jokes, or comments based on an individual's sex, race, color, national origin, age, religion, disability, or any other legally protected characteristic will not be tolerated. Sexual and other forms of harassment based on the above classifications are unlawful and will not be tolerated by the Gundalow Company and will be considered grounds for dismissal.

Sexual harassment is defined as unwanted sexual advances, or visual, verbal, or

physical conduct of a sexual nature, and includes gender-based harassment. This definition includes many forms of offensive behavior and includes gender-based harassment of a person of the same sex as the harasser. The following is a partial list of sexual harassment examples:

- Unwanted sexual touching, advances, or propositions.
- Offering employment benefits in exchange for sexual favors.
- Making or threatening reprisals after a negative response to sexual advances
- Visual conduct that includes leering or making sexual gestures.
- Displaying of sexually suggestive objects or pictures, cartoons or posters.
- Verbal conduct that includes making or using derogatory comments, epithets, slurs, or jokes.
- Verbal sexual advances or propositions.
- Verbal abuse of a sexual nature, graphic verbal commentaries about an individual's body, sexually degrading words used to describe an individual, or suggestive or obscene letters, notes, or invitations.
- Physical conduct that includes touching, assaulting, or impeding or blocking movements.

Unwelcome sexual advances (either verbal or physical), requests for sexual favors, and other verbal or physical conduct of a sexual nature constitute sexual harassment when: (1) submission to such conduct is made either explicitly or implicitly a term or condition of volunteering; (2) submission or rejection of the conduct is used as a basis for making volunteer decisions; or, (3) the conduct has the purpose or effect of interfering with work performance or creating an intimidating, hostile, or offensive environment.

If you experience or witness sexual or other unlawful harassment report it immediately to the Captain, Program Manager or Director. You can raise concerns and make reports without fear of reprisal or retaliation.

Smoking

The Gundalow Company promotes a smoke free environment for your good health. There is no smoking allowed in any area of any Gundalow Company's buildings and vessels per the Gundalow Company's policy and State law.

Security

Do not remove any Gundalow Company property from any Gundalow Company location without permission from the Executive Director or Captain. Doing so without permission is considered theft and will be dealt with accordingly. We are not responsible for personal property that you leave in the building or on the boat.

Drugs and Alcohol

In compliance with the Drug-Free Workplace Act of 1988, and the US Coast Guard requirement (Title 46 Code of Federal Regulations – CFR – Parts 4 and 16) the

Gundalow Company maintains a drug free workplace. This policy prohibits the non-prescriptive use, sale, possession, distribution, manufacture or transfer of illegal drugs, controlled substances and alcohol on Gundalow Company property, including Gundalow Company's vessels and vehicles, at any time and while on Gundalow Company time. Gundalow Company time is considered to be the hours assigned to volunteer work including break and meals. The Gundalow Company also prohibits volunteers from reporting to work or working under the influence of alcohol, illegal or illegal use of drugs, or other controlled substances for which no valid prescription has been issued.

Media

Only the Executive Director or his/her designee may address matters related to the Gundalow Company to the media.

NH Good Samaritan Law

Good Samaritan Law: 508:12 Emergency care: If any person, in good faith, renders emergency care at the place of the happening on an emergency, or while in transit in an ambulance or rescue vehicle to a person who is in urgent need of care as a result of the emergency, and if the acts of care are made in good faith and without willful or wanton negligence, the person who renders the care is not liable in civil damages for his acts or omissions in rendering the care as long as he receives no compensation for the care from or on behalf of the person cared for, and provided further that any person rendering emergency care shall have the duty to place the injured person under the care of a physician, nurse, or other person qualified to care for such person as soon as possible and to obey the instructions of such qualified person.

Supervision & Support

Confidentiality of Volunteer & Staff Personal Information

Gundalow Company does not share personal information pertaining to volunteers and we expect volunteers not to share Gundalow Company personal information with others.

Grievance and Complaint Procedure

Gundalow Company works hard to address all grievance and complaints. When possible, we encourage volunteers to first attempt to personally address the issue. If this does not address the issue, please speak directly with the Captain or Program Manager or Director.



PROGRAM OVERVIEW

GOALS

To use the gundalow as a catalyst for:

- Understanding the maritime heritage of the Piscataqua Region and/or individual towns
- Appreciating the unique environment of the Piscataqua Region, including the rivers and estuary
- Realizing the importance of the gundalows' role in the development of the Piscataqua Region

OBJECTIVES

Students/visitors will be able to identify:

- how and why this region was settled
- how everything is connected by water
- the Piscataqua Region and its watershed
- their own place in the watershed
- the valuable natural resources in our watershed
- historical uses along the rivers and estuary
- environmental changes through the years
- the current major threats to the estuary
- ten things they can do to make a difference

Students/visitors will be able to explain:

- what a gundalow is
- why gundalows played such a vital role in the region's development
- how gundalows were designed and constructed
- types of cargo carried to various towns
- how simple machines help us in our daily lives
- technological advances that eliminated the need for gundalows
- how we're all connected to the water
- how water quality is affected by what we do on the land



Onboard School Programs

CELEBRATING OUR RIVERS

PLACE-BASED EDUCATION UNDER SAIL ON *PISCATAQUA*

This educational sail onboard a traditional wooden vessel provides a transforming experience for students of all ages. They'll explore environmental science and maritime heritage at interactive learning stations and will join the crew to set the sail, steer and navigate.

Students will rotate through 3 learning stations on every trip, and participate in a group session of quiet observation and reflection. Human Impact is offered on every trip; teachers and group leaders will choose the other two topics.

To enhance the STEM-based learning on the gundalow, a math activity is also available as a station choice. Students will be actively measuring, estimating, calculating and comparing as they work to figure the cargo-carrying capacity and/or speed of PISCATAQUA.

Engineering is evident everywhere on the gundalow, and group leaders can also choose to have a discussion of engineering included as a group activity.

The following station descriptions are condensed from a more detailed document; this is meant as a brief content overview of our school sail.

1. SCIENCE ON DECK

Essential for life, water has unique properties. The underlying themes for the science station are clean water and healthy watersheds. This is inquiry-based, with gundalow educators ensuring that students are engaged with both formulating and answering questions, as well as handling the scientific equipment.

Choices for the science station include towing for plankton or sampling the water quality. While the number of hands-on activities will depend on available time, students will work in small teams to tow for plankton or collect and test a water sample. They will make observations, conduct investigations and compare results. Live specimens will be used to tie together concepts.

Onboard educators will assign roles and tasks, and guide students in using the equipment. The equipment we use includes a plankton net, Discovery Scopes, a vanDorn bottle, refractometers, a dissolved oxygen kit, a pH kit and thermometers.

TAKE AWAY MESSAGES

1. Water is essential to all living things

2. All the water we have on earth is all the water we've ever had or ever will have
3. Certain parameters can be measured to determine if water is clean and healthy
4. Everything we do on land affects the quality of our water
5. Plankton is the base of our food web
6. Plankton provides a large portion of the oxygen we breathe
7. Every living thing – including plankton – requires certain water conditions and qualities

2. HUMAN IMPACT

Through a series of hands-on activities students will investigate the impact of land use change and begin to understand how these changes affect organisms – including humans – as the water travels “from the mountains to the sea.

The focus here is on human impact over centuries of settlement and development. Students of all ages will be engaged with our 3-dimensional watershed model that demonstrates how humans impact the health of the water and watershed.

This model is highly interactive and will help students make connections between what we do on land and water pollution, both historically and current. Using natural materials such as colored salt as possible pollutants, they'll see how easily our actions affect bodies of water and will discuss how we can prevent problems. Through questioning, students will identify some of the sources of non-point source pollution and run-off in their own towns, and how this affects the entire watershed.

Several options are possible at this station and onboard educators will determine the most appropriate presentation based on grade level and curriculum needs of the group. Both historical (social studies) and environmental (science) issues are highlighted.

TAKE AWAY MESSAGES

1. All the water on earth is connected
2. Everything we do on land affects the quality of the water
3. Water pollution originates on land
4. There are things we can all do to help protect water quality
5. There is no such thing as “away”
6. We all live in a watershed
7. Humans have impacted the water for hundreds of years

3. SENSE OF PLACE

Geography, navigation and maritime heritage are combined to create a sense of place. Students will learn about gundalows, navigation, estuaries, waterways and the use of the rivers in the region's development. This provides an opportunity to observe surroundings, make connections and understand how we fit into the environment.

Correlations will be easily made between the Piscataqua River watershed where the gundalow sails and the watershed where your school or organization is located.

Students will use hand-bearing compasses, compare maps and charts, learn the basics of simple navigation, and observe their locations using landmarks and binoculars.

TAKE AWAY MESSAGES

1. We are **intrinsically** connected to our environment
2. The watershed has shaped how humans lived here
3. The region was settled and developed because of natural resources
4. An estuary is where salt water and fresh water mix together
5. The estuary begins at the mouth of the river
6. Navigation is – in its simplest form – finding our way

Sailing with STEAM

Grades 6-12

Every sail on the Gundalow incorporates elements of STEAM into the program, but our Sailing with STEAM sails challenge students to go deeper with additional learning opportunities in engineering, math, technology, art or science. During each 2.5-hour sail, teachers select from a variety of STEAM learning stations that help connect the classroom curriculum to the experience out on the water.

The gundalow, *Piscataqua*, serves as a unique floating classroom and lab, sailing on the tidal waters of New Hampshire and southern Maine. Our Sailing with STEAM Sails use hands on and inquiry-based learning strategies to engage students. Our STEAM station options include: learning to navigate and use a compass, exploring marine life through a plankton tow and touch tank, using our 3D watershed model to talk about human impact on the watershed, testing water quality with a variety of oceanographic tools, looking at examples of engineering and simple machines onboard, calculating cargo capacity and speed, and using your senses for drawing.

Scientists at Sea

Grade 8 - Adult

Each Scientists at Sea Program starts with a 1-hour classroom visit where students gain background knowledge needed to plan their experiment. By exploring the scientific process and using students own knowledge and curiosity, students work in small groups to design a scientific hypothesis. These hypotheses become the guide for planning their scientific exploration on the Gundalow.

During the 3-hour sail on the Gundalow, students work in 3 watch groups to gather data for their scientific research projects. Our staff use the time onboard to engage students in deploying the scientific equipment and analyzing the results. In addition to the deployments, we also offer opportunities for students to set the sail, steer the boat, do an otter trawl and learn about the role of the Gundalow in the Piscataqua Region.

Following the sail, a member of our crew comes back into the classroom to help students synthesize their data. Each group examines the data collected while on the Gundalow and makes conclusions on their research project. Classes are encouraged to present their research to their school or community through displays, posters or presentations

Our programs and activities are correlated with state frameworks and closely aligned with principles of both estuarine and ocean literacy. Your students will come away from this experience with a greater ability to problem solve, think critically, and work as a group

Reading our Rivers

High School - Adult

The rivers of the Piscataqua Region are central to the dynamic history of the people and ecosystems of this area. Our advanced history program 'Reading Our Rivers' explores the historical influence of the river on human history and the impact of human history on the land and the river itself. While onboard our traditional replica of a Gundalow, students step back in time to set the sail, steer the boat and become the most recent humans in history to travel down the river by Gundalow.

Our Gundalow serves as powerful platform to engage students in conversations and hands on learning about the history of our region. During our 'Reading the River' program, the crew leads the students through a series of discussions and hands on activities that explore the interactions between humans and nature throughout history by literally reading the landscape through which we sail. During each discussion, we use landmarks and points of interest along the river to peel back the layers of history and see the shoreline from a new perspective. Primary sources and other artifacts are used to deepen student connection to events from the past.

Starting with the last glacial period, we begin by discussing the Native Americans followed by the early arrival of the explorers. From there our story takes us through the early settlement of the region and the subsequent extraction of resources in the forests and rivers. The period of gradual settlement is followed by the rapid expansion of the mill industry. Finally, we end our group discussions by talking about the changing use of energy over time from human power, up through modern computer technology.

In addition to group discussions, students are broken into small groups to discuss the historical importance of the Gundalow and shipbuilding, do a plankton tow and talk about the resources

that were extracted from the rivers, and look closely at several maps and charts to gain a geographic sense of the region.

The program is designed to engage students at their level and challenge them to rethink their own assumptions about history and the Piscataqua Region. As with all our programs we work closely with teachers to modify the program to fit the classroom curriculum and meet State frameworks.

Gundalow Company Waterfront Programs

These programs are offered as an add-on to the sailing programs. Teachers can extend the sailing field trip into a full of programs. Our waterfront programs take place in Prescott Park and Sheafe Warehouse and emphasize hands on learning.

Piscataqua People: Travel back in time and take part in settling the Piscataqua Region. Become a Native American, a Shipbuilder, or a merchant and make decisions about how you live, where you live, and how you adapt to the changing settlement. This role-playing game introduces students to the the region and asks them to settle and barter with other early settlers.

A Walk in the Park: A History of the Waterfront: Take a walk around Prescott Park and discover the history of the region through stories, photos and the historical landmarks of the area. Take a step back in time and imagine what Prescott Park looked like when Puddle Dock ran through the area, or find the oldest grave in the cemetery.

Tide-Pooling Scavenger Hunt: Explore our coastline by looking for different critters in the water's of Piece Island. Spending time along the shore is a wonderful segway into looking at plankton on the Gundalow. Our crew and volunteers will spend time exploring the area with you and answering questions.

Shore-Side Scavenger Hunt: Our waterfront is a bustling place with activity and lots of things to see. Let students discover the waterfront in small groups using our scavenger hunt as they explore all that a working waterfront has to offer.

Simple Machines: Explore how simple machines have been used throughout history to make work easier. Through student exploration, we will try out levers, pulleys, inclined planes, screws and a wedge.

Water Quality: During this hands-on, hour long station, students will design several basic scientific hypotheses about what they will find in water of the Piscataqua River. We will then use a series of scientific equipment to test for temperature, salinity, Dissolved Oxygen, pH, and

turbidity. Students then prove or disprove their hypothesis and discuss challenges of carrying out real world scientific research.

Sketching in the Park: After a brief conversation about making artistic observations, students are given supplies and time to doing their own sketching in the park.

Camp Programs

Volunteers help during camp programs as deckhands on the Gundalow and by volunteering to help with rowing during programs at Creek Farm. During camp we use several small boats including 3 Piscataqua Wherries. These boat wooden rowboats are fun to row, but difficult for young kids and we often reach out to volunteers who want to spend an hour or two rowing boats with youth! If you are interested in volunteering or working with the camp program, please let us know. The following is a description of our **2018** summer camp programs:

River Rats Camps

Horseshoe Crabs—ages 5-6—\$180—July 9-13 and July 16-20—daily 9:00-12:00

Our youngest campers join us for a week of exploring, discovering and adventuring along and on the waters near Creek Farm in Portsmouth, NH. Each week, our Horseshoe Crab Campers gain confidence near the water by playing games, doing projects, singing songs and most importantly taking part in nature-play along our shorelines.

Seals—ages 6-8—\$190—July 23-27 and August 13-17—daily 9:00-12:00 AND \$325—July 16-20—9:00-3:00

Our Seals are ready for fun and adventure on the water and on shore. Each week ,Seals will explore the shoreline of Creek Farm, row in our wherries, play games, engage in projects and spend a day on the Gundalow for a sailing adventure.

Sturgeons—ages 8-10—\$325—July 23-27 and August 6-10—daily 9:00-3:00

Our Sturgeon day camp gets campers out on the water both on the Gundalow as well as our small boats. We'll visit islands, learn to row, become naturalists at the tidepool, create our own maritime art, raise the sail and swab the decks on the Gundalow.

Lobsters—ages 10-12—\$325— July 9-13 —daily 9:00-3:00

Lobsters will take more responsibility on the Gundalow including navigation, learning about points of sail, as well as take a deeper look at the marine world through plankton tows, otter trawls and tidepooling.

Discovery Camps

Crew for a Day—ages 9-13—\$40/day-July 2 and August 21— each day- 10:00-2:00

Come aboard and become a member of the crew. Raise the sail, navigate, tie knots, stand bow watch, and respond to emergency situations just like our own crew. During the 4 hour programs, campers will get to experience modern sail training at its best.

Scientist for a Day—ages 9-13—\$40—July 18—10:00-2:00

During this 4 hour program, campers explore the river ecosystem through plankton tows, in the inter tidal zone, studies of marine invasive species and more. Campers will ask questions and gather information to better understand the health of the river.

All Hands on Deck—ages 9-12—\$325—June 25-29—daily—9:00-3:00

The Gundalow Company is partnering with the Strawberry Banke Museum for an exciting maritime camp. Campers spend time at Strawberry Banke immersed in the maritime heritage of the region and then experience life at sea aboard the Gundalow.

Anchors Aweigh—ages 6-8—\$325—June 25-29—daily—9:00-3:00

It's time to set sail on a maritime journey back in time with Strawberry Banke and Gundalow Company. Join the crew of the Gundalow PISCATAQUA and learn to raise the sails, tie knots and swab the decks. Then head over to Strawberry Banke to test your skills through games, making your own bracelets, and even building your own compass.

Marine Science Adventure—ages 8-12—\$325-July 30-August 3—daily—9:00-3:00

The Piscataqua Region is part of a complicated estuarine ecosystem. During the week we will capitalize on camper's interest and build off their natural curiosity to explore the marine science of the rivers, bay and ocean. We will explore the critters that live here and through a series of STEM activities gather data that will help students better understand the waters.

Sailors and Shipwrights: ages 11-15—\$390- July 30-August 3—daily—9:00-3:00

Discover the fundamentals of boatbuilding and design at The Boatshop at Strawberry Banke Museum and then head out on the water to learn the basics of sailing with the Gundalow Company. During this week, campers will create their own wooden model sailboats from scratch .

Sailing School and Gundalow Adventure— \$700 ages 10-14—August 6-17 (2 weeks) daily—9:00-3:00

This program is a partnership between Kittery Point Yacht Club and Gundalow Company and combines small boat sailing skills with learning to sail and navigate a large sailing vessel. During this 2 week session campers divide their time between the Gundalow and other small boats.

Appendix

CHECK LIST FOR VOLUNTEER DECKHAND SKILLS ON THE PISCATAQUA

This checklist should be completed by volunteer crew each year as a record of basic safety knowledge. Professional crew will initial by each skill after they have been talked through or demonstrated.

Skills and objectives are adapted from Tall Ships America guidelines.

SAFETY

- Locate Personal Floatation Devices and demonstrate their use
- Give a brief safety talk, as if to guests
- Remove fire extinguishers from brackets and describe their use
- Explain primary response in case of MOB and set up MOB platform
- Demonstrate throwing a life ring
- Be familiar with location and general contents of first-aid kits and AED

CREWING

- Know the chain of command
- Understand terms: fore and aft, port and starboard, midships, bow and stern, cuddy cabin, hold, head, forepeak, lazarette
- Heave a dockline, explain terms: take, send, hold, ease, tend, make fast
- Assist in setting and striking the sail, tacking, gybing
- Describe the daily opening and closing procedures
- Understand basics of dropping anchor and use of fenders
- Explain the use of the head, as if to guests
- Locate the electrical panel, volunteer log, youth life vests

EDUCATION

- Explain the Gundalow Company mission
- Be comfortable answering common guests' questions

Gundalow Company Volunteer Eligibility and Performance Policy

Thank you for your interest in volunteering with the Gundalow Company.

Gundalow Company staff has been fortunate to work with hundreds of loyal and dedicated volunteers since 2002. Volunteers are the heart and soul of the organization.

Volunteers are the “face of the organization” since they communicate with the public and our supporters on a daily basis while volunteering or at other times when not volunteering (such as when seen in town wearing a gundalow hat!)

Volunteers are among our best promoters of *external* aspects of the Gundalow Company when working directly with students and teachers, the public, charter hosts and guests, members, sponsors, etc.

Volunteers are often asked by the public about the *internal* aspects of the Gundalow Company such as office staff, board members, or sources of income. Volunteers are expected to use discretion about confidential information and are encouraged to seek factual information from staff before answering any questions that might promote gossip.

The positive goodwill that our volunteers bring onboard PISCATAQUA, in the office, as a Board or Committee members and at events is a morale builder, and creates a team atmosphere that permeates everything we do. Volunteers’ positive goodwill contributes to our reputation as a respected and successful nonprofit organization.

Volunteers are held to the same standards of professional behavior as staff. Volunteers are expected to exhibit professional behavior when volunteering. Failure to do so will result in dismissal. Reasons for dismissal are listed in the Volunteer Handbook.

Volunteers are required to submit information needed for a background check before being placed on a list of eligible volunteers.

All volunteers are asked to sign this form once a year to indicate general willingness to adhere to Gundalow Company policies and procedures.

Volunteer (print)

Volunteer Crew Duties aboard PISCATAQUA

Opening procedures:

Raise Ensign

Raise Pennant

Remove and stow chafe gear

Squeegee house tops and boxes if wet

If time allows for a deck wash, retrieve scrub brushes and hose from forward cabin, then stow

Coil down Yard tackle and Lee Board lines on deck (clockwise, bitter end on the bottom).

Boarding:

One volunteer on the floating dock offering a hand

One volunteer clicking passengers. Give # to the mate and captain.

Welcome everybody aboard the vessel

Offer life vests to children under age 8 on public sails. On school sails, check with crew

Casting Off:

Docklines are numbered one through four, bow to stern as they leave the Gundalow.

Lines one and four are breast lines, holding the vessel close to the dock. Lines two and three are spring lines which hold the vessel in place fore and aft.

All lines are HELD with a round turn on the cleat until a different command comes—especially line two, which is usually used to pivot the stern out.

On command “Take One”: REPEAT and cast the line off its cleat or quarter bitt; the mate will coil it on the dock.

Captain usually takes Four.

On command “Take Three”: REPEAT and cast the line off its cleat so that it can be unhooked from the dock cleat and taken aboard. Coil down on deck.

On command “Take Two”: REPEAT and cast the line off its cleat so that it can be unhooked from the dock cleat and taken aboard. Coil down on deck.

Setting Sail:

On command “Prepare to Set Sail”: prep Brails by setting down coils but keep turns on the cleats

On command “Ease the brails”: Cast brails 1, 2, & 3, ease lively brails 4 & 5 (professional crew handle brail 5)

Unless it's breezy and you are instructed to hold upper brails and ease just the lower brails first

Coil down mainsheet aft ASAP (bitter end on the bottom)

Adjust yard tackles for point of sail

Make fast brails with some slack, then coil (clockwise) and hang.

Tending Yard Tackles:

On command "Prepare to Gybe" or "Ready About" or "Ease or Tend the tackles":
REPEAT and ease the side under a greater strain so the yard can pivot to where it naturally will rest; Take up the slack on the opposite side. Then secure both Port and Starboard Tackles tightly with four turns on the cleat. Coil down the line on deck (clockwise, bitter end on the bottom).

During Sail:

Be available to answer passenger questions and keep an eye on the captain for maneuvers.

On school programs, one volunteer DH should be the timekeeper, and one should bring students to steer

Striking Sail:

On command "Prepare to strike sail":

Check that yard tackles are taut and secure

Ready Brails by taking them completely off the cleats

On command "Brails, haul away", REPEAT and

Haul Brails, make fast to appropriate (1-5) yard cleat

Once crew are clear, center the yard with tackles

Coil and hang brails (clockwise, bitter end outside)

Raise Lee Board if Captain instructs it to be raised

Docking:

In preparation for docking, if tending line 2 or 3:

Pass half of the dockline under the lifelines and up and over; ready the coil to throw

On command "Send Three" REPEAT and throw it on the dock. Once the mate has dropped the eye over a dock cleat, take up slack or ease *as needed*. Do NOT put any turns on your cleat until commanded.

On command "Send Two" REPEAT and do the same as above

On command "Check a line" REPEAT and with a round turn on the cleat, pay out just a little line as it comes under strain to slow the vessel motion

On command "Ease a line" REPEAT and ease lively (or whatever distance is given)

On command "Hold a line" REPEAT and put enough turns on the cleat so it doesn't pay out

On command "Make Fast" or "Belay all" REPEAT and put three turns and a locking hitch on the cleat or bitt, then coil down

At the end of the day:

Place Chafe Gear on docklines where they pass over wood or metal

Stow life vests

Assist with any education gear clean-up

Sign the Volunteer Log

Lower and stow pennant and then ensign

Good job!

Safety Briefing:

- Welcome everybody aboard the vessel
- Show location and use of PFDs, including child sizes
- MOB- please don't fall overboard!
- Don't lean over lifelines and keep your feet on deck
- Don't throw anything overboard
- Mainsheet—no passengers allowed between the traveler horse and forward hatch while setting or striking sail.
- When you hear “ready about” or “prepare to gybe”, stay clear of the mainsheet traveler horse. The crew will handle lines; please do not try to help.
- No passengers allowed forward of the stump mast.
- Location of the head (ask the crew before using it)
- Introduce crew

EMERGENCY INSTRUCTIONS

(1) Rough weather at sea, crossing hazardous bars, or flooding.

- (i) Close all doors and hatches to prevent taking water aboard or further flooding in the vessel.
- (ii) Keep bilges dry to prevent loss of stability due to water in bilges. Use electric bilge pump, hand pump, and buckets to dewater.
- (iii) Check all intake and discharge lines which penetrate the hull for leakage.
- (iv) Passengers must remain seated and evenly distributed.
- (v) Passengers must don life jackets if the going becomes very rough, the vessel is about to cross a hazardous bar, or when otherwise instructed by the master.
- (vi) Never abandon the vessel unless actually forced to do so.
- (vii) If assistance is needed follow the procedures on the emergency broadcast placard posted by the radio.

(2) Man overboard.

- (i) Throw a ring buoy overboard as close to the person as possible.
- (ii) Post a lookout to keep the person overboard in sight.
- (iii) Maneuver the vessel to pick up the person in the water.
- (iv) Have a crew member put on life jacket, attach a safety line to him or her, and have him or her stand by to jump into the water to assist the person overboard if necessary.
- (v) If person is not immediately located, notify Coast Guard and other vessels in vicinity by radio.
- (vi) Continue search until released by Coast Guard.

(3) Fire.

- (i) Cut off air supply to fire--close items such as hatches, ports, and ventilators.
- (ii) Cut off electrical system supplying affected compartment if possible.
- (iii) If safe, immediately use portable fire extinguishers at base of flames for flammable liquid or grease fires or water for fires in ordinary combustible materials. Do not use water on electrical fires.
- (iv) If fire is in machinery spaces, shut off fuel supply and ventilation and activate fixed extinguishing system.
- (v) Maneuver vessel to minimize effect of wind on fire.
- (vi) If unable to control fire, immediately notify the Coast Guard and other craft in the vicinity by radio.
- (vii) Move passengers away from fire, have them put on life jackets, and if necessary, prepare to abandon the vessel.

MORE ABOUT THE REGION

PORTSMOUTH NAVAL SHIPYARD

The Portsmouth Naval Shipyard is located on 281 acres of islands in Maine, at the mouth of the Piscataqua River

Established on July 12, 1800, the Portsmouth Naval Shipyard has never had its mission interrupted.

PNS is the oldest *continuously* operating shipyard in the country. While the Washington Navy Yard was opened 9 months earlier, it was deliberately burned to keep it out of enemy hands and later re-opened.

In serious debt after the Revolutionary War, the US government mothballed and/or sold ships to help control finances.

An onslaught of pirate raids that enslaved many American sailors motivated the US government to authorize 6 new ships in the late 1790s, including the *USS Constitution*

These 6 new ships were spread out among 6 shipyards, including the Langdon Yard on Badger's Island, Maine where the *USS Congress* was constructed.

Following scheduled delays and cost over-runs at the private shipyards, the government decided to take control by establishing naval shipyards.

After deciding the \$28,000 purchase price for Badger Island was too expensive, nearby Dennett Island was obtained for a new shipyard for \$5800.

Over the years PNS evolved and spread onto 5 adjacent islands that were merged by filling land.

The US Marines came to guard the new shipyard, and a fort was constructed. The Shipyard was never invaded, which was a very good thing since the Navy never delivered any cannon to the fort.

The first shore command was established at the Shipyard during the War of 1812 and the first residence on Kings' Row was finished in 1813. It still stands and is the oldest structure at PNS.

The Navy's very first Admiral, David Farragut, died at the PNS Commander's house in the summer of 1870 when he suffered a heart attack during his vacation.

The first ship built at PNS was the *USS Washington*, a 74-gun ship complete in 1815.

The historic district of the Shipyard - - including King's Row and the Mall - - is now registered with the Maine State Historic Office

In 1905 the Navy used 46 tons of dynamite to blow up Henderson's Point so that large ships could maneuver safely into Portsmouth Harbor.

Also in 1905, Teddy Roosevelt picked Portsmouth as the site to negotiate an end to the Russo-Japanese War. As a result, Roosevelt became the first American to receive the Noble Peace Prize.

The Cherry Trees in Washington, DC were given by Japan as a thank-you gift to the US. A tree from the same stock will be planted on the grounds of the Shipyard in May, 2012.

In 1906 the first permanent dry dock was constructed on the base. The expected duration of PNS had been unclear up to that point in time.

L-8, the first submarine completed in a naval shipyard, was built at PNS in 1917. Portsmouth was chosen for its small size and proximity to Groton, CT.

The first diesel sub, the 300-foot *Squalus*, was completed in just 500 days in 1938. After she sank to the bottom in May, 33 crew were rescued using a newly developed diving bell

During World War II over half of the Navy's subs were built at PNS, with 94 others in for repairs. The work force numbered over 20,000, with 20% of them female.

In 1953 the *Albacore* was commissioned at PNS, becoming the first vessel built to operate primarily underwater. She became the prototype for nuclear subs and the standard for today's vessels.

Launched in Groton, CT on September 30, 1954, the *Nautilus* was the first commissioned nuclear submarine in the United States Navy.

In 1963 the *Thresher* - - the pride of PNS - - was lost with all hands. This led to the development of the Sub Safe Program still in place today.

The last sub constructed at PNS was launched in 1971, since then the base has been focused on repairing nuclear subs. Only 25,000 workers in the US are qualified for this work.

While diesel subs spent 85% of their time on the surface, nuclear subs conduct their entire mission completely submerged, operating at maximum speeds greater than 25 knots with no communication.

On any given day in 2011, PNS had 4700 workers employed, 1000 contractors on site, and 500 military personnel on the base. Civilians now out-number military 6:1

With 3 dry docks at the present time, the Shipyard usually has 3-4 submarines in for repair, and they typically remain for 11-20 months,

The Naval Prison, a historic landmark on the shore of the Piscataqua River, was used until 1974 and housed 82,000 prisoners over its 66 years of use. Guards for the prison were US Marines.

Offering prisoners training in specific skills and work in on-site shops, the PNS prison was recognized for pioneering work in rehabilitation.

The reinforced concrete-wall prison is currently available for lease. A historic site, it can't be torn down, needs lots of work, and must be leased by a group with appropriate security clearance.

Additional Shipyard history can be found in "Cradle of American Shipbuilding", published by the Portsmouth Naval Shipyard and available in the Gundalow Office

The Wood Island Lifesaving station

The Wood Island Lifesaving Station was built in 1908 on Wood Island in Kittery ME. It was used by the US Life Saving Service that was founded in 1848, which later became part of the US Coast Guard in 1915.

Wood Island Station is the only station in the US with a surviving marine railway that was used to launch boats into the water to help with rescues.

It remained active until 1948, with its duties as a lifesaving station ending in 1941 when it was used by the US Navy to help protect Portsmouth Harbor. The station was used as an observation post and to help secure a net across the harbor to prevent non US submarines from entering the harbor during WW II.

The Station is currently undergoing a complete interior and exterior restoration and will be used as a maritime museum open to the public after restoration is complete.

<https://woodislandlifesaving.org/restoration/>



Photo – Jim White (sprucecreektv.com)

Lighthouses – Portsmouth Harbor, Whaleback, and White Island



Portsmouth Harbor Light

A lighthouse was first established in 1771 and its light was provided by 3 oil lamps.

The current lighthouse was built in 1878 and is 48 ft tall. It is a cast iron brick lined tower.

The light is visible for 12 nautical miles and is equipped with a 4th order Fresnel lens. The light is green.

The lighthouse is located within Fort Constitution in New Castle NH. Also on the site are an 1872 lighthouse keepers house, and a 1903 oil house.

Whaleback Light

A lighthouse was first established on “Whales Back” in 1820.

The current tower was built in 1872 and is 59 ft tall. The tower also contains the lighthouse keeper’s quarters, a storage area, and a fog horn.

The light is equipped with a 4th order Fresnel lens, is white, emits 2 white flashes every 10 seconds, and is visible for 14 nautical miles.



Isles of Shoals Light, also known as White Island Light

A lighthouse located at White Island on the Isles of Shoals was first established in 1821 and the current tower was rebuilt in 1865. The tower is 58 ft tall and constructed of granite and brick.

It has a 190 mm lens, and flashes white every 15 seconds. The light is visible for 14 nautical miles. It also contains a fog horn.

Thomas Leighton became the lighthouse keeper in 1839.

The Bridges



Memorial Bridge is the closest to the Piscataqua dock and connects Portsmouth NH to Badgers Island ME. It is a vertical lift bridge.

- The original bridge was in operation from 1923 to 2012.
- The bridge ribbon cutting in 1923 was done by Eileen Foley who also returned to dedicate the bridge 90 years later in 2013 after serving as the Mayor of Portsmouth for 8 terms.
- The current bridge was opened in 2013 and is dedicated according to the plaque on the bridge as a "Memorial to the Sailors and Soldiers of New Hampshire who gave their lives in the World War 1917–1919."
- The bridge is 1,201 ft long, 27.9 ft wide, and has a clearance to the water of 150 ft when fully open.
- The bridge opens on the half hour, on demand during the summer season.

Sarah Mildred Long Bridge is the newest bridge and sits between the Memorial Bridge and the Piscataqua River bridge. It connects Portsmouth NH to Kittery ME.

- The original steel truss vertical lift bridge was opened in 1940 and closed in 2016. Demolition commenced that year and construction of the new bridge had begun in 2017.
- The bridge was originally called the Maine-New Hampshire Bridge, it was renamed in 1987 to honor Sarah Mildred Long the Executive Director and 50-year employee of the Maine- New Hampshire Interstate Bridge Authority.
- Construction began in 2015 and is expected to open in early 2018. The new bridge will provide passage of both cars and trains over the river.
- The new bridge will have 56 ft of clearance when in the resting (cars) position and this should allow many fewer opening to be required. When in the fully open lift position there is 135 of clearance to the water.

Piscataqua River Bridge is the furthest from the Piscataqua dock and connects Portsmouth NH to Kittery ME via Interstate Route 95. The bridge was opened in 1972 and carries 6 lanes of traffic. It is a thru arch bridge.

- The bridge is 4,503 ft long, 98 ft wide, and has a clearance to the water of 135 ft.
- The bridge carries over 60,000 cars daily (1990).
- This bridge will undergo scheduled maintenance in 2018

Wentworth Hotel

- Wentworth by the Sea was built in 1874 and was first called Wentworth Hall. It is one of the surviving Gilded Age Hotels.
- When it opened in 1874 it was the largest wooden structure on the New Hampshire coast. Called the "Ship Building" it was modeled after the elegant ocean liners of the day.
- In 1905 it housed the Russian and Japanese delegations that under President Theodore Roosevelt's suggestion negotiated the end of the Russo-Japanese War at the Portsmouth Naval Shipyard.
- Operated until its close in 1982, it was slated to be torn down until a new owner was found and renovations made to reopen in 2003 as a Marriot Resort.
- The Wentworth Marina and adjacent Wentworth by the Sea Country Club are operated independently.
- Visible from the Piscataqua River the large white building with its distinctive red roof is highly visible from both the river and from the ocean.

Fort Foster

- Fort Foster is located on Gerrish Island in Kittery Point ME and was active from 1901 to 1946.
- It was a sub post of Fort Constitution and was part of the Coast Defenses of Portsmouth.
- The site is located at Fort Foster Park, an 88-acre state park.
- There are gun emplacements, an observation tower at the site and gives excellent views of the Wood Island Life Saving station, Whaleback Light, and Fort Constitution.
- Still visible are the supports that held a net that stretched across the harbor to Newcastle during WWII to catch submarines.

Ft. McClary

- Located on 1.87 acres in Kittery ME the location was initially called Ft Pepperrell or Pepperrell's Garrison in 1689 when William Pepperrell obtained the land.
- In 1720 the Colony of Massachusetts built a fort on the site to collect duty from incoming ships and was then called Fort William.
- In 1775 the land and fort were confiscated by local citizens from the loyalist Pepperrell family and manned by New Hampshire militia.
- In 1808 the land was turned over to the US Government and work began on improvements to the grounds, buildings, and armaments. It was renamed Fort McClary.
- In 1844 the hexagonal blockhouse that is present today was built. Its first story is granite, and the upper 2 floors are squared off logs. The fort had 9 guns at that time.
- The last modifications were done in 1874. The fort today looks the way it did in 1890.
- Lincoln's vice president, Hannibal Hamlin served here as a private and cook during the civil war (while he was VP!)
- The site was used as a lookout post during both WW I and WW II
- In 1924 the property was transferred to the State of Maine and is now a state park.

Ft. Constitution

Ft. Constitution (formerly Ft. William and Mary) is located on a peninsula on the northeast corner of New Castle Island.

The first fortifications mentioned here are from 1632, and a timber blockhouse was constructed in 1666. The location was further strengthened in 1692 and at that time named Fort William and Mary.

In 1791 the fort and a lighthouse were given to the United States by the state of New Hampshire and renamed Fort Constitution.

Additional renovations occurred in 1808 and that is what is seen today. Further renovations were planned during and after the Civil War, but improvements in Naval artillery made the fort obsolete

Fort Constitution was returned to the state of New Hampshire in 1961 and placed on the National Register of Historic Places on July 2, 1973.

There is a US Coast Guard station outside the Fort grounds in use today.

Raid on Fort William and Mary

On December 13, 1774, after a warning from Paul Revere that more British troops were heading to Portsmouth, a group of over 400 men and boys gathered to raid the fort and take possession of the gun powder stores. After just a few shots, the party overwhelmed the 6 men guarding the fort and took the gunpowder. The raiders took around 98 barrels of gunpowder which were loaded onto gundalows and carried upriver. The following night an additional 16 cannons were taken and transported by gundalow. The powder was distributed throughout the region and was used in battles during the war.



Naval Prison

Portsmouth Naval Prison located on Seavey Island was formerly a US Navy and Marine Corps prison on the grounds of the Portsmouth Naval Shipyard (PNSY).

Construction began in 1905 and the facility was first occupied in 1908. It housed prisoners from 1908 until 1974. Its (at the time) novel construction of reinforced concrete and architecture resembled a castle, and was sometime referred to as The Fortress or The Castle.

The guards for the prison was US Marines.

The site was first used to hold prisoners in 1898 during the Spanish American war. The stockade held 1612 Spanish prisoners during this time.

It also held surrendered German Prisoners after the end of WW II.
It housed over 82,000 inmates during its lifetime.

Commanded in 1917 by Lieutenant Commander Thomas Osbourne a prison reform advocate who had lived in the Sing Sing prison and the at Portsmouth Naval Prison at different times to view firsthand the living conditions and to see what changes could be implemented.

Offering prisoners training in specific skills and work in on-site shops, the PNSY was recognized for pioneering work in prisoner rehabilitation.

Various plans have been proposed for the facility, but given its location on the shipyard with todays security considerations, no plan currently exists for it reuse.

Famous Inmates:

Humphrey Bogart is sometimes mentioned, but he transported a prisoner to the prison while in the Navy but was not a resident.

Walt Disney is also sometimes mentioned as an inmate, but this does not seem to be true.



Isles of Shoals

The Isles of Shoals are a group of 9 islands located 6 miles off the coast of New Hampshire/Maine. These are: Appledore, Smuttynose, Duck, Malaga, and Cedar (Maine), and Star, Seavey, Lunging, and White (New Hampshire).

Historically used seasonally by native indigenous tribes, and first listed in European history in 1614 when mapped by John Smith and first called by them Smyth's Isles.

First recorded landfall of a European was in 1623 when Captain Christopher Levett and 300 fishermen used the islands as a seasonal Cod processing location. Isles of Shoals Cod was considered superior to others and often brought a higher price.

Initially named Apledore and incorporated in 1661 by the Massachusetts Bay Colony it was later called Isles of Shoals around 1665.

The community was successful until 1778 when most of the population was evacuated during the Revolutionary War.

Appledore Island is the largest island and saw Thomas Leighton and Levi Thaxter open a hotel. Thomas' daughter Celia married Levi and Celia Thaxter was a highly popular poet in the 19th century. The island and hotel saw many prominent visitors such as Oliver Wendell Holmes, John Greenleaf Whittier, Nathaniel Hawthorne, Sarah Orne Jewell, and Childe Hassam. The hotel was opened in 1847 and destroyed by fire in 1914.

Visible on the island is a WW II concrete observation tower built to house a RADAR installation. Today the island is the home of the Shoals Marine Laboratory run cooperatively by the University of New Hampshire and Cornell University.

Star Island the second largest island is home to the Oceanic Hotel and Conference Center and Gosport Chapel. The island contains the largest off-grid solar farm in New England (in 2015) and provides all of its electricity in the off season and 60% during their operating season. Star Island is highly self-sufficient producing its own electricity, water and providing septic treatment. Star Island is owned by the Star Island Corporation (since 1915) and has ties to the Unitarian Universalist Association and the United Church of Christ.

Smuttynose Island is the third largest and is best known as the location for the murder of 2 island women in 1873 detailed in the story by Celia Thaxter titled "A Memorable Murder". It is also alleged to be the location of Blackbeard's honeymoon.

White Island is home to the Isle of Shoals Lighthouse and a coastal weather station.



The Gundalow Song

Lyrics and Music by the Shaw Brothers

About a small boat I'll now sing a song
That played a big part when our country was young.
She was built on these shores and called gundalow
And long may her story be told.

CHORUS:

Gundalow row, gundalow sail.
Carry the lumber, the crops, and the mail.
Carry the freight on river and bay.
Gundalow, gundalow boat.

They were shallow of draft, they were chubby and
square They could sail on the dew, they could go
anywhere. Down the river on one tide and home on
the next, With 10 tons of cargo stacked high on the
decks.

CHORUS

From Exeter, Newmarket, Durham and Dover,
South Berwick and Portsmouth, they traveled all over
To the towns all around the Piscataqua Basin
They carried the goods to build a new nation.

CHORUS

So here's to the gundalow, here's to the men,
And though we may never see their likes again,
Their story and glory and pride will live on
Whenever we join in the gundalow song.

LAST CHORUS



RESOURCES

If you're going to read anything, read *Cross-Grained and Wily Waters, a Guide to the Piscataqua Maritime Region*

Most of these books are available in our office. Come in anytime to read a book or look through our binders with articles etc.

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LOCAL WATER QUALITY DATA ciceet.unh.edu/great_bay

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WATERSHEDS & RUN-OFF www.stormwatercenter.net/

MARINE SCIENCE EDUCATION
www.vims.edu/brige/

ESTUARINE EDUCATION www.estuaries.gov

ESTUARIES - NOAA oceanservice.noaa.gov/education/pd/estuaries/welcome.html

NON POINT SOURCE TOOLBOX www.epa.gov/nps/toolbox/

Great Bay Water Quality Data www.greatbaydata.org

Ocean Literacy <http://oceanliteracy.wp2.coexploration.org/>