

NEW YORK/NEW JERSEY HARBOR ESTUARY

Hidden Treasure in Your Own Backyard



Hidden Treasure in Your Own Backyard
is a project of



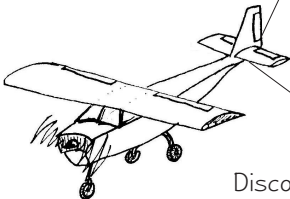
NEW JERSEY
MARINE SCIENCES
CONSORTIUM

Sea Grant
New Jersey

www.njmssc.org

NEW YORK/NEW JERSEY HARBOR ESTUARY

Hidden Treasure in Your Own Backyard



Discover treasure—right in your own backyard! The treasure is the New York/New Jersey Harbor Estuary. On each page of this booklet you will learn about its riches from its busy port to its amazing ecosystem.

An estuary is a partially enclosed body of water where fresh water from rivers meets and mixes with salt water from the ocean. The NY/NJ Harbor Estuary has deep, calm water and is connected to the Atlantic Ocean. That makes it a great spot for a port. A port is a place where ships carrying goods can enter, unload, and reload. The Port of NY/NJ is the largest port on the east coast of our country. It is also the third largest port in the United States. Ships entering our Harbor carry anything you can imagine from automobiles to zebras!

Besides moving goods, the Harbor Estuary moves people. Cruise ships take families on vacations to fun places. Ferries carry thousands of workers from home to work and back each day. This means less traffic on our crowded highways.

The NY/NJ Harbor Estuary is also a great place to play. Boat, fish, sail, kayak or just see the sights from the parks and pathways that line the banks of the Harbor. Tourists come from near and far to visit the Harbor's world famous landmarks including Ellis Island and the Statue of Liberty.

Last but not least, the Harbor Estuary has a rich natural ecosystem. Many people think nothing lives in its waters but over 260 species of fish, birds, and other wildlife call this estuary home or use it part of the year as a nesting or feeding ground.

The NY/NJ Harbor Estuary gives us so much—jobs, food, fun and more, but it needs you to care for it. Only you can make our Harbor Estuary a place where human use can co-exist with nature, keeping it a great place to live, work and play!

Acknowledgments:

New York/New Jersey Harbor Estuary: Hidden Treasure In Your Own Backyard was funded in part by the NY-NJ Harbor Estuary Program and created by the New Jersey Marine Sciences Consortium's Brian Harris, Mindy Voss, Rory Joyce and Claire Antonucci. Acknowledgment is also given to the NJ Department of Transportation, Office of Maritime Resources for their continuing support of NJMSC's efforts in harbor education for K-12 audiences including their sponsorship of the *All Hands On Deck* program.



NEW JERSEY
MARINE SCIENCES
CONSORTIUM

www.njmssc.org



New York - New Jersey
Harbor Estuary Program



Office of
Maritime Resources

Harbor Riddles

Each riddle describes a landmark or place within the NY/NJ Harbor Estuary. Use the map of the Harbor on the next page for clues. As you solve each riddle, draw a line from the riddle to its correct name and picture.

A high bridge that is suspended
And quite lengthy too
Spans across the Harbor
To welcome you.

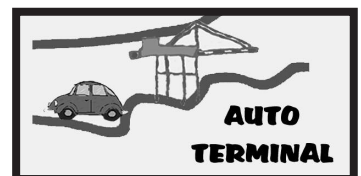
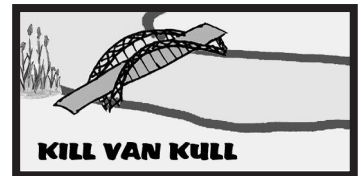
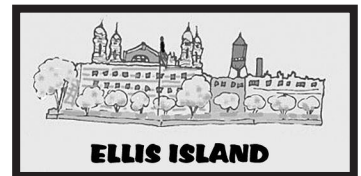
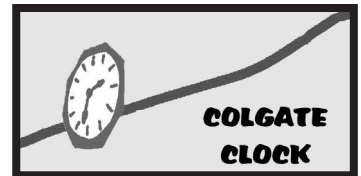
In this country's great history
The island north of Liberty
Was the first stop for all
Who entered this country from places abroad.

Many ships big and wide
Sail to Bayonne
Delivering cars and trucks
To drive and own.

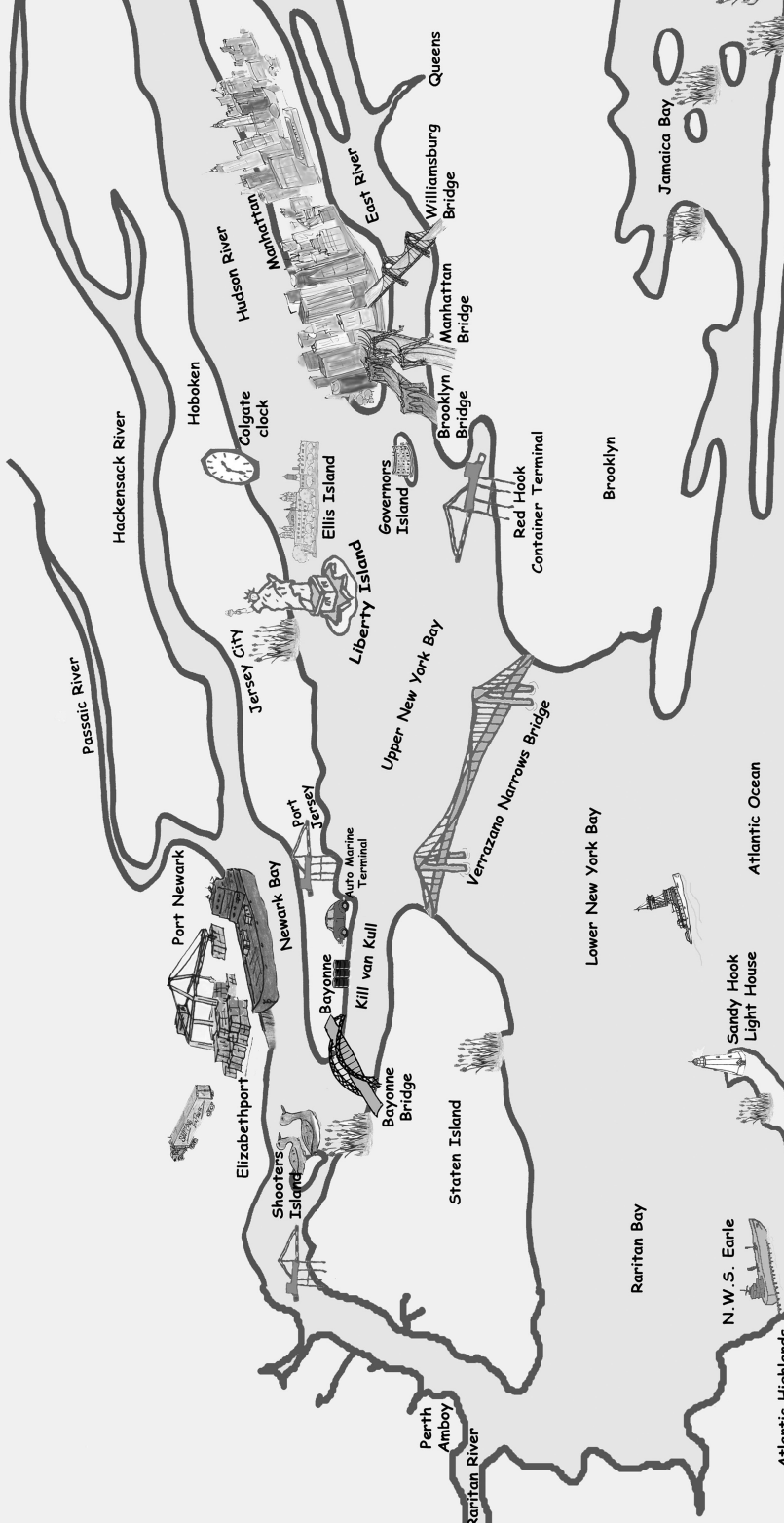
With a name meaning creek,
It's dredged to keep it deep.
This tidal strait is the waterway
For all ships entering Newark Bay.
Hint: The Bayonne Bridge spans this waterway.

In Jersey City on the Hudson River you will see,
A place that tells time
And a bit of toothpaste's history.

Cargo shipped in containers comes to this place,
Ships are loaded and unloaded in this very space.
Look near the airport and interstate highway,
To find this port on Newark Bay.

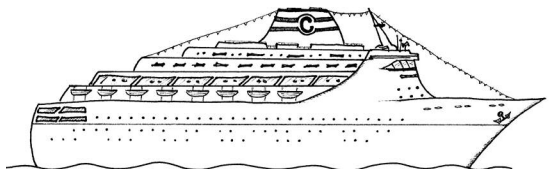
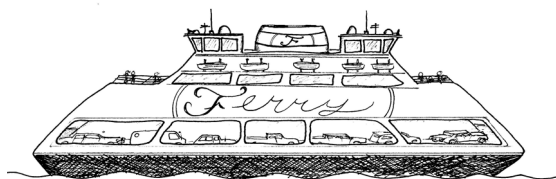
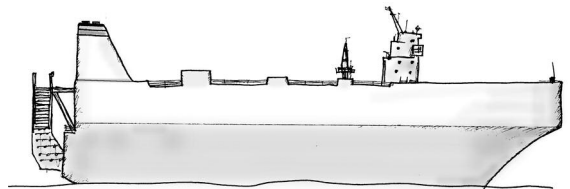
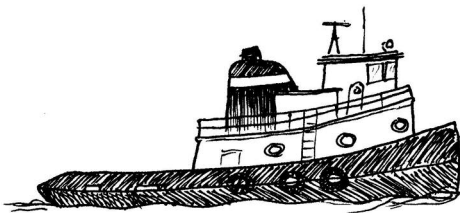
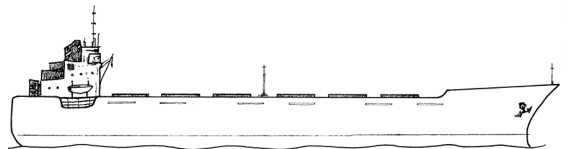
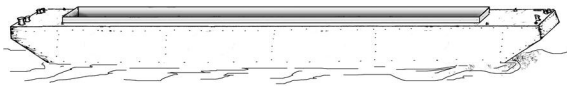
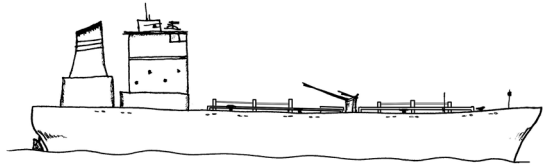


NY / NJ HARBOR ESTUARY MAP



What Ship is That?

Cut out the ship identification cards below and you'll be able to identify many of the ships which enter our Harbor.



What Ship is That?

Cut out the ship identification cards below and you'll be able to identify many of the ships which enter our harbor.

TANKER

Tanker ships are used to pick up and deliver liquid products such as oil, petroleum and chemicals. Their large, flat decks have pipelines and valves running along them. Tankers can be up to 1,000 feet long.

CONTAINER SHIP

These ships are massive, from 600 to 1,000 feet long. Their loads are packed into containers or truck-size metal boxes. Look for containers of all colors stacked high and wide on the decks of these ships. Each container holds valuable goods. A deckhouse is often located near the stern or the back of a container ship.

BULK CARRIER SHIP

These ships move products that cannot fit into containers, such as sheets of metal and large machines. Bulk carriers often have cranes on their decks to load and unload their cargo. You may also notice hatches on their decks. These hatches hold loose cargo such as grain or coal.

BARGE

Barges are long, flat vessels with no motor. They need tug boats to power them along. They are used to move heavy things like sand or gravel. Barges often carry goods to ports further upriver. Their flat shape does not draft much water so it can go into these often shallow waterways.

AUTO CARRIER SHIP

These ships have high sides and look totally enclosed, making the ship seem as if it is sitting high on the water. However, this ship is actually a huge, floating parking garage filled with cars, trucks and other vehicles. They are often called RO/RO's because they have built-in ramps which allow cars and trucks to be efficiently "rolled on" and "rolled off" when the ship arrives in port.

TUG BOAT

Tug boats are small, powerful boats that move massive ships into or around the Port. They can push or pull much larger vessels, getting them through narrow waterways and into or out of tight berths. Tug boats also push barges up and down more shallow waterways, such as a rivers and canals.

CRUISE SHIP

These ships are used for vacations. The ship's many services, including swimming pools on deck, are a big part of the trip! These ships are often headed to places like the Caribbean or Europe. They can carry thousands of passengers. Look for portholes, open decks and even balconies on these ships that give ocean views to everyone onboard.

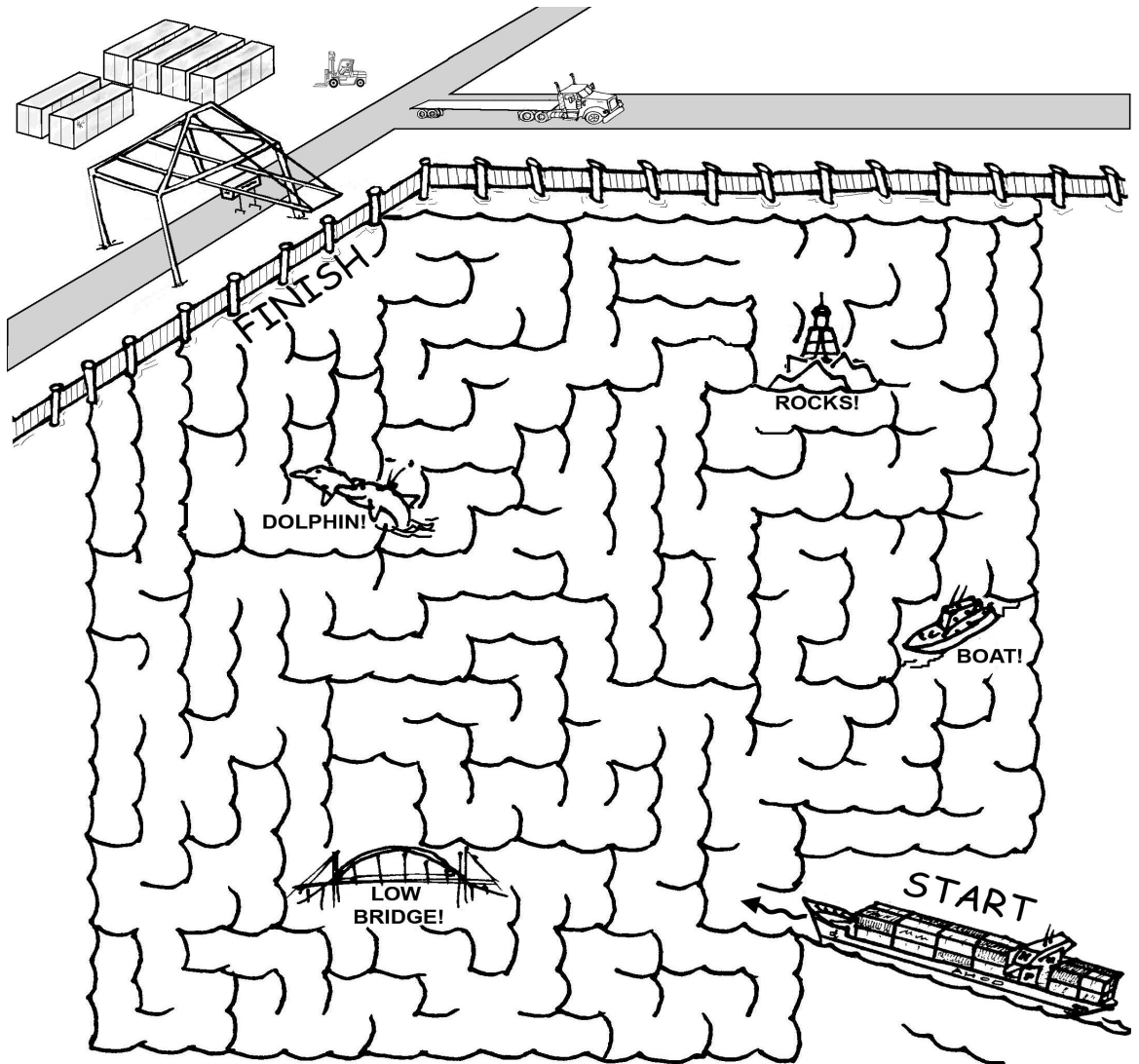
FERRY BOAT

Ferries take people to places all around the Harbor. They can be quite large, like the Staten Island Ferry, but they seem small compared to the ships in the Harbor used for trade. Ferries often take the place of cars and buses to bring people into and out of New York City. This means less traffic on our roads, bridges and tunnels.

Navigate the Harbor

Each year, over 6,000 ships from all over the world sail into NY/NJ Harbor. Some are longer than the Empire State Building is tall! It would be impossible for each ship's captain to know how to safely navigate each harbor. That's why there are Harbor Pilots. Harbor Pilots are experts in navigating harbors including NY/NJ Harbor. It is their job to safely guide each arriving ship to the proper dock. They also keep a look out for other ships, smaller boats and even wildlife.

See if you can navigate the ship below to its dock. Just like a real Harbor Pilot, you've used your own small boat to meet the large ship waiting near the entrance to the harbor. Now its time to climb on board, take the wheel and guide this vessel safely to its dock!

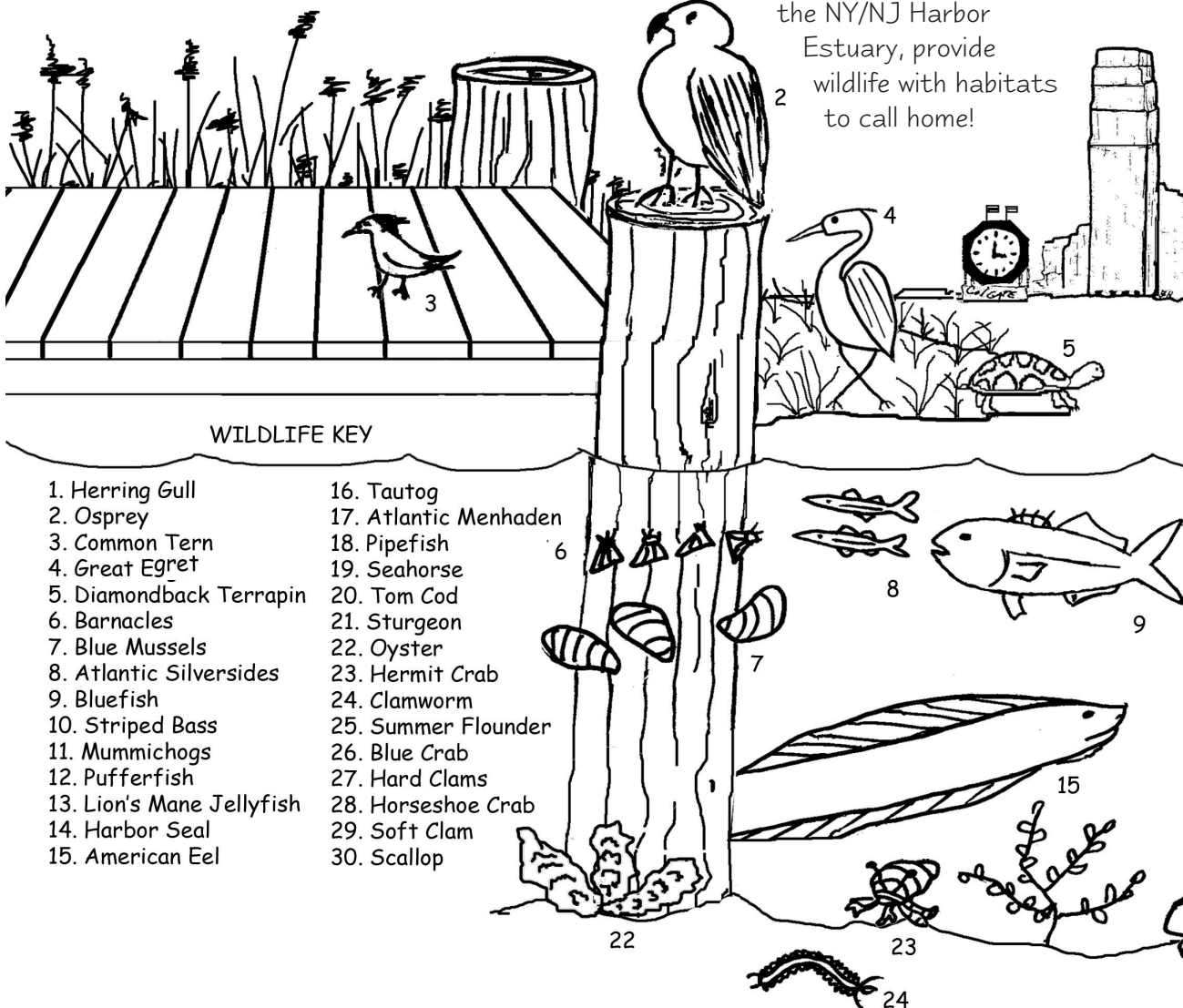


Harbor Estuary Wildlife Guide

NY/NJ Harbor and its connecting waterways are part of a natural ecosystem known as the NY/NJ Harbor Estuary. Go back to the Harbor Estuary map in this booklet and locate the rivers that empty into the Harbor Estuary. This mixture of salt and fresh water is called brackish water. Since there is fresh, salt, and brackish water in an estuary, a broad range of plants and animals can be found there.

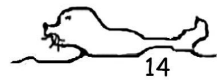
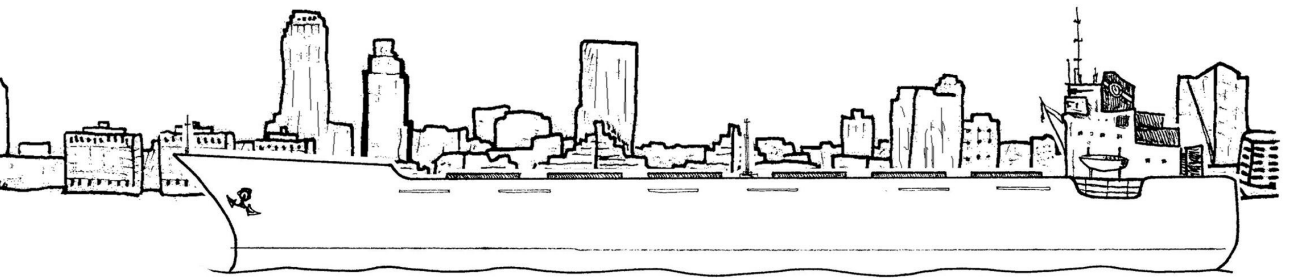
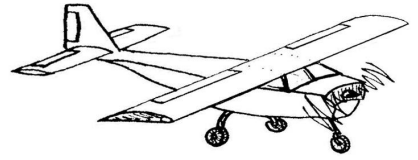
Look on this page and the next page to discover just a sample of the wildlife living in the Harbor Estuary.

Estuaries, including the NY/NJ Harbor Estuary, provide wildlife with habitats to call home!

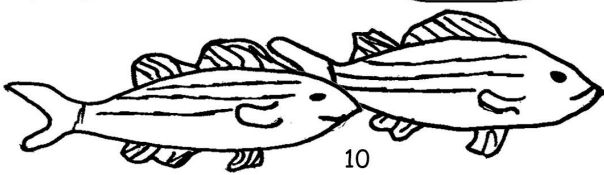


WILDLIFE KEY

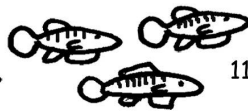
- | | |
|---------------------------|-----------------------|
| 1. Herring Gull | 16. Tautog |
| 2. Osprey | 17. Atlantic Menhaden |
| 3. Common Tern | 18. Pipefish |
| 4. Great Egret | 19. Seahorse |
| 5. Diamondback Terrapin | 20. Tom Cod |
| 6. Barnacles | 21. Sturgeon |
| 7. Blue Mussels | 22. Oyster |
| 8. Atlantic Silversides | 23. Hermit Crab |
| 9. Bluefish | 24. Clamworm |
| 10. Striped Bass | 25. Summer Flounder |
| 11. Mummichogs | 26. Blue Crab |
| 12. Pufferfish | 27. Hard Clams |
| 13. Lion's Mane Jellyfish | 28. Horseshoe Crab |
| 14. Harbor Seal | 29. Soft Clam |
| 15. American Eel | 30. Scallop |



14



10



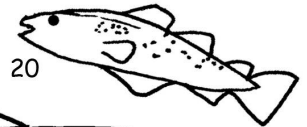
11



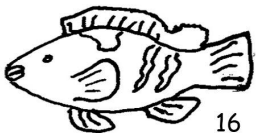
12



13



20



16



17



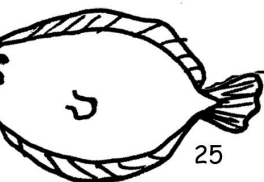
19



18



21



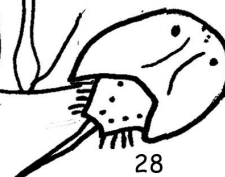
25



26



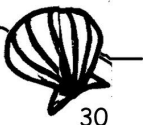
27



28

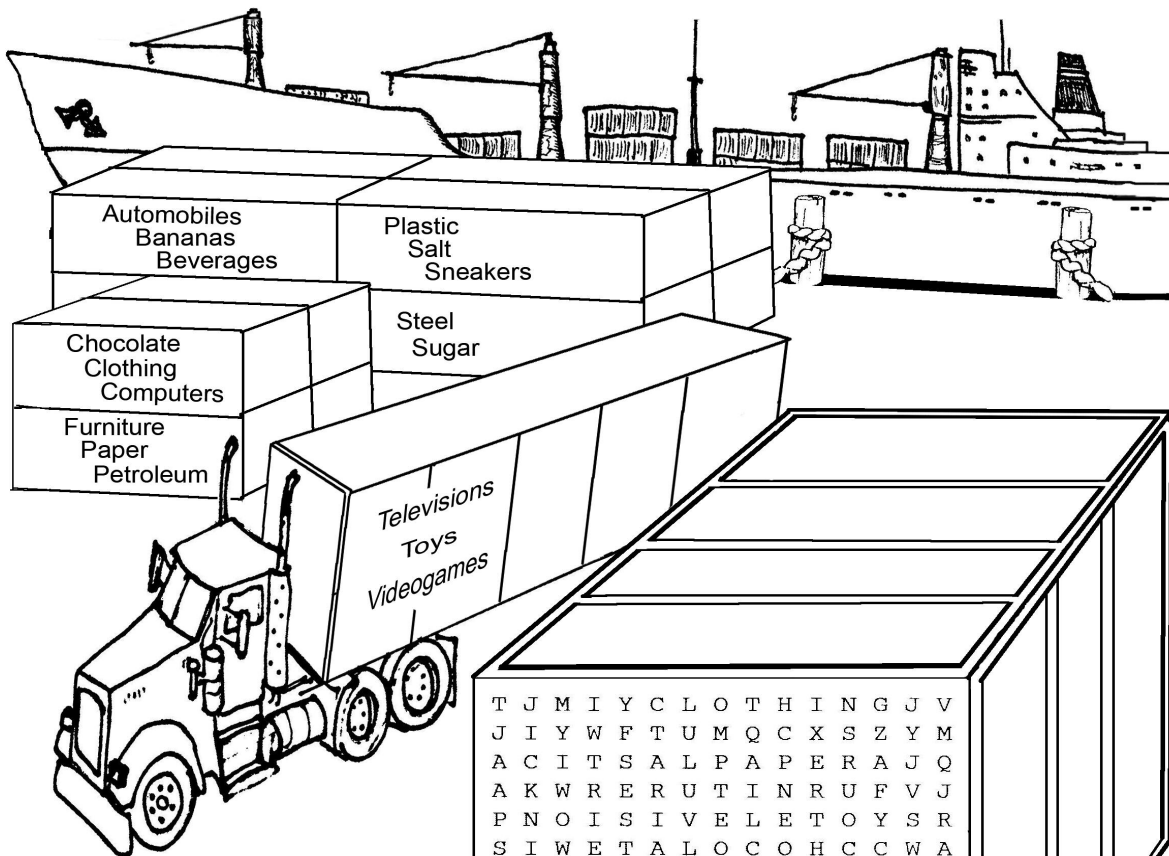


29



30

Harbor Word Search



The Port of NY/NJ is the third largest seaport on the east coast of the United States. Anything you can imagine enters or leaves the Port of NY/NJ from apples to zoo animals!

Countries exchange goods to get what they need or sell what they produce. This is known as trade. China is the United States' biggest trading partner. When a product comes into this country it is called an import. When a product is made here and shipped to another country it is called an export. A port is the place where imports enter and exports leave.

The Port of NY/NJ has huge terminals where ships can dock to load and unload cargo. Gantry cranes do this work. The men and women who work

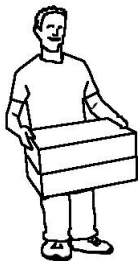
at these terminals loading and unloading cargo are known as longshoremen.

The containers drawn on this page contain the top imports brought into the Port of NY/NJ. See if you can find them all in the word search puzzle.

T	J	M	I	Y	C	L	O	T	H	I	N	G	J	V
J	I	Y	W	F	T	U	M	Q	C	X	S	Z	Y	M
A	C	I	T	S	A	L	P	A	P	E	R	A	J	Q
A	K	W	R	E	R	U	T	I	N	R	U	F	V	J
P	N	O	I	S	I	V	E	L	E	T	O	Y	S	R
S	I	W	E	T	A	L	O	C	O	H	C	C	W	A
O	D	O	G	D	V	H	L	M	E	E	M	L	R	G
K	D	Q	N	Y	H	Y	O	P	K	Y	T	G	N	U
S	A	N	A	N	A	B	E	V	E	R	A	G	E	S
X	R	D	M	V	I	D	E	O	G	A	M	E	S	T
I	Q	W	R	L	M	C	B	X	F	I	X	A	Z	E
S	T	P	E	T	R	O	L	E	U	M	L	Z	V	E
I	S	S	N	E	A	K	E	R	S	T	X	S	S	L
V	O	C	A	W	S	R	E	T	U	P	M	O	C	X
K	L	N	U	O	J	O	Q	A	R	V	T	C	D	W

Take the Container Challenge

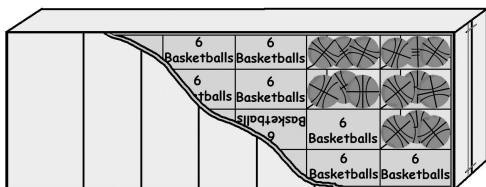
In 1956, Malcom McLean, a resident of New Jersey and former truck driver, revolutionized shipping. He loaded 58 truck trailers with their wheels removed onto the deck of a ship for a six day voyage from Newark, NJ to Houston, Texas. Prior to that, goods were carried on ships in sacks, bundles, or wooden crates. Each package had to be loaded or unloaded onto or off the ship by hand. This was a long, difficult process. Goods often were dropped, damaged and even lost. It could take a week to unload a cargo ship!



Containers are now used to ship almost everything. They are easily taken on and off ships using gantry cranes. Trains and trucks then carry those same containers inland. Today's containers are large, strong, waterproof and come in standard sizes. They have vastly improved overseas shipping. Most container ships can now be loaded and unloaded in less than 24 hours. Containers have changed the world and the Port of NY/NJ too!

The Port of NY/NJ's specialty is container shipping with more than 2.40 million containers entering per year on over 5,000 container ships.

Containers are measured in standard units. One standard container is 20 feet long. This is called a TEU or Twenty Foot Equivalent Unit.



Let's Fill a Container!



1. If a container ship has 8500 standard containers on it, how many TEUs are there? _____
2. Today containers are getting bigger. If a container is 2 TEUs, how long is the container? _____
This is also known as a FEU or Forty Foot Equivalent Unit!
3. If a ship can carry 4000 FEUs, how many TEUs is this? _____

Loading a container is not as easy as it sounds. It requires careful calculations. Shipping companies want a container filled to capacity, so the person packing the container must know how much the container can hold. This figure is, of course, its volume.

4. So how much space is inside a container? One TEU container is 20 ft long by 7.5 ft wide by 8 ft high. It has a total volume area of how many cubic feet? _____
(To get cubic feet (feet³) multiply width times length times height)

5. A shipping crate of basketballs is 3 feet long by 1 foot wide by 2 feet high equaling how many feet³? _____

6. How many boxes of basketballs will fill a TEU container? _____
To find the answer divide the feet³ of the box of basketballs into the feet³ of the TEU.

7. If there are 6 basketballs in each box, how many basketballs can be shipped inside a container? _____

To find the answer multiply the number of boxes in the container by the number of basketballs in a box.

Be a Harbor Steward

There are a lot of simple things you can do to improve water quality, help marine life and preserve the NY/NJ Harbor Estuary. Just a few changes will make a real difference now and in the future.

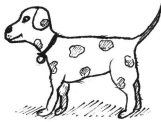
Below are two lists. "Actions" are things you can do to help the Harbor. Alongside that is a list of "Effects." These are the ways the Harbor will be helped though your actions. These two lists do not match up! See if you can draw a line between each "Action" and its corresponding "Effect".

Actions



1. Do not litter. Ever!

2. Clean up pet waste.



3. Drive less. Walk, bicycle or use public transportation.

4. Reduce (or eliminate) use of fertilizers on lawns and gardens.



5. Plant trees and shrubs. Maintain and preserve existing trees and shrubs in your yard and in your neighborhood.



Effects

A. This would improve air quality. It would also prevent oil and grease from entering the Harbor's waterways.

B. This would prevent erosion of soil into the Harbor. This means clearer water and less need for dredging.

C. This keeps our Estuary's animals safe from entanglement and other dangers. It also keeps beaches and riverfront parks clean and safe.

D. This keeps fecal coliform and other bacteria from entering the Estuary. Fecal coliform poses health risks to humans and animals and is often the reason for temporary beach closures.

E. By lessening or eliminating nutrient-laden run-off from entering our Estuary's waters, you will help prevent harmful algal blooms that can kill fish.

A Salty Experiment

Estuaries are places where fresh water from rivers meets salty ocean water. Because salt water is heavier than fresh water, the water in an estuary like the NY/NJ Harbor Estuary settles into two layers: a salt water layer on the bottom with a freshwater layer above. Mixing occurs where the layers meet. More mixing takes place as a result of wind, tides, temperature changes and rainfall.

Try this experiment to show how salt and fresh water in a typical estuary layer and mix.

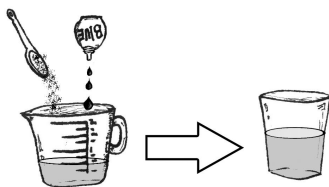
What You Need

Water (tap water is fine)
Measuring cup
3 teaspoons of salt
2 clear cups
Red and blue food coloring

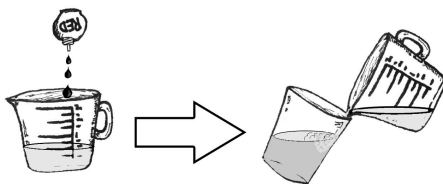


What You Will Do

1. In the measuring cup combine 1/2 cup of water with 3 teaspoons of salt. Stir well to dissolve the salt as much as possible. Add 3 drops of blue food coloring. Pour this into a clear cup. Rinse your measuring cup.



2. In your measuring cup add 3 drops of red food coloring to a 1/2 cup of fresh water. Very slowly pour this mixture down the inside of the clear cup with the salt water. What happened? Why do you think this happened?



3. Now reverse the experiment. First pour the fresh water mixture into a clear cup. Then very slowly pour the salt water mixture down the side. What happened? Why do you think this happened?

Here's What Happened

In the first experiment you should have seen two distinct layers form. The fresh water should have floated on top of the salt water because it is less dense (lighter). You can also try slowly dripping the fresh water into the saltwater to form layers.



In the second experiment you should have observed swirls of salt water sinking to the bottom of the cup. You created an estuarine current!



How Much Salt?

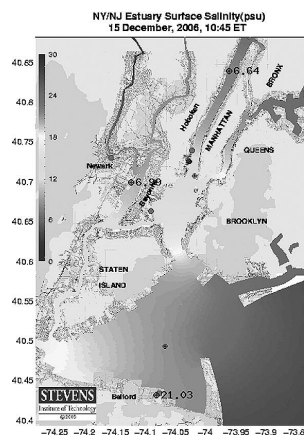
Salinity is the term scientists use to describe how much salt is in water. Salinity is one of the most important features in determining what plants and animals can live in an estuary and where.

How Salty is NY/NJ Harbor Estuary?

Visit Stevens Institute of Technology Urban Ocean Observatory website!

Go to www.stevens.edu/maritimeforecast

Near the top of the webpage click on salinity and a colorful map of the Harbor will appear. The key on the left side of the map



The Animals of the Harbor

Who Am I?



Surrounded
by industry and
millions of
people, the NY/NJ

Harbor Estuary is a
true urban estuary.
Most people think urban
estuaries are terribly
polluted with no healthy
wildlife but in the NY/NJ
Harbor Estuary, wildlife
thrives. With its salt
and freshwa-
ter marsh-
es, sandy
beaches, rocky shores,
reefs, mud-flats and
open waters, the NY/NJ
Harbor Estuary provides
a healthy habitat for
many types of wildlife.



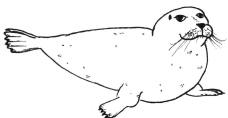
Identify each NY/NJ
Harbor

Estuary
animal
described.

For help,

use the

illustrations on the
center pages and the
Wildlife Word Bank
below.



1. I have two claws to capture food and two paddle legs that let me swim. I also have a shell called an exoskeleton that covers my body like a suit of armor.

Who Am I? _____

2. I have five arms with rough skin on one side and tube feet on the other. My arms can regenerate (grow back) if they break off.

Who Am I? _____

3. I like to hide under piers and rocks. I am not your typical fish! I have a long muscular body and look a lot like a snake.

Who Am I? _____

4. I am called a crab, but I'm more closely related to spiders. My head looks like a helmet and my ancestors have been on earth since before the dinosaurs.

Who Am I? _____

5. I like to live on hard surfaces like the pilings of docks and piers. My shell surrounds my body. I don't look like a crab, but I am related to them. I stand on my head and kick my feet to capture food.

Who Am I? _____

6. I am a bottom-dwelling flat fish. My ability to change my appearance to match my surroundings helps me survive. Both of my eyes are on the same side of my body.

Who Am I? _____

7. I am a marine mammal with warm blood and thick blubber. Lots of us lived here long ago. Now that the water is so much cleaner, we are visiting again, mostly in search of food. I enjoy surfing on the waves behind ships.

Who Am I? _____

WILDLIFE WORD BANK

Harbor Seal, Horseshoe Crab, Seastar, Blue Crab, Barnacle, Flounder, American Eel

Hidden Treasure Crossword

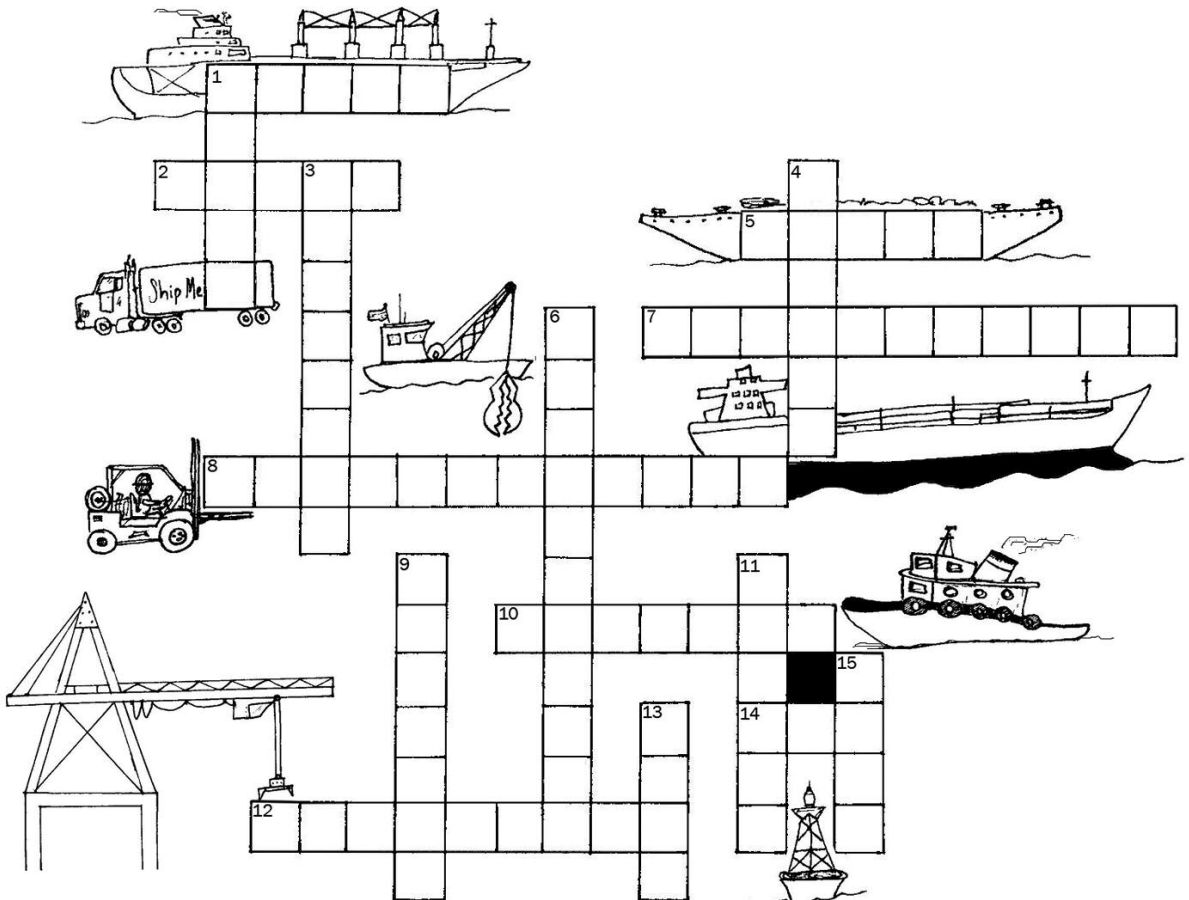
If you've read this booklet, you can solve this puzzle!

ACROSS

1. The United States' biggest trading partner.
2. Exchange of goods.
5. Flat bottomed boat used to move heavy goods over calm water. Most have no engines and need tugboats to move them.
7. Ship that transports sugar, grain or other cargo not put into containers.
8. Workers who operate equipment used to load and unload ships.
10. Boat that brings large ships into a port, mainly by pushing or pulling.
12. Metal box used to ship goods.
14. Abbreviation for a twenty foot long container.

DOWN

1. Goods transported in large quantities by ship, train, truck or airplane.
3. Digging into the Harbor's bottom to deepen the shipping channels.
4. This ship transports liquid cargo.
6. The Hudson River is named after this explorer.
9. Goods shipped into a country.
11. The type of crane used to lift cargo on and off ships.
13. A facility that receives ships and moves their cargo inland.
15. A floating channel marker.



Coming Soon to a Computer Near You!



Follow the adventures of Marit the Monkey as he explores the world of international trade and learns there's a whole lot more to shipping than fruit! Maritime Kids is a project of NJ Marine Sciences Consortium in collaboration with the NJ Department of Transportation's Office of Maritime Resources and the NJ Office of Information Technology. Watch for Marit's debut online.

Want to Tour the Harbor?

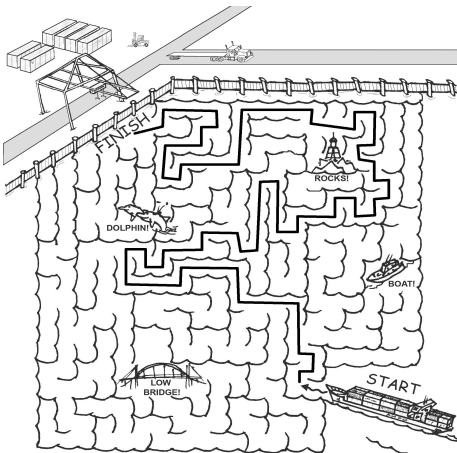
Teachers can now book an interactive tour of NY/NJ Harbor for their students through the *All Hands On Deck (AHOD)* program. *AHOD* is a project of the NJ Marine Sciences Consortium and the NJ Department of Transportation's Office of Maritime Resources. In addition to this exciting field trip, several curriculum projects are underway. For more information or to request an *AHOD* field trip program please call Mindy Voss at 732-872-1300, ext. 30.

Answer Key

Harbor Riddles

Verrazano Narrows
Bridge
Ellis Island
Auto Terminal
Kill van Kull
Colgate Clock
Port Newark

Navigate the Harbor (maze)



Word Search

T J M I Y C L O T H I N G J V
J I Y W F T U M Q C X S Z Y M
A C I T S A L P A P E R A J Q
A K W R E R U T I N R U F V J
P N O I S I V E L E T O Y S R
S I W E T A L O C O H C C W A
O D O G D V H L M E E M L R G
K D Q N Y H Y O P K Y T G N U
S A N A N A B E V E R A G E S
X R D M V I D E O G A M E S T
I Q W R L M C B X F I X A Z E
S T P E T R O L E U M L Z V E
I S S N E A K E R S T X S S L
V O C A W S R E T U P M O C X
K L N U O J O Q A R V T C D W

Take The Container Challenge:

1 = 8500
2 = 40 feet
3 = 8000
4 = 1200
5 = 6 cubic feet
6 = 200
7 = 1200

Be A Harbor Steward

1 - C, 2 - D, 3 - A, 4 - E, 5 - B

Who Am I?

- 1 - Blue Crab
- 2 - Seastar
- 3 - American Eel
- 4 - Horseshoe Crab
- 5 - Barnacle
- 6 - Flounder
- 7 - Harbor Seal

Crossword

