

project PORTS

Promoting Oyster Restoration Through Schools



An Oyster-focused Outreach Initiative of the Haskin Shellfish Research Laboratory, Rutgers University

Curriculum & Activity Guide for Grades 3 through 8

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Seeding the future: Inspiring youth to care for the environment



How to use the guide.

The Curriculum Guide is divided into three main volumes, each presenting lessons on one of three themes: the Delaware Estuary, the history of the Delaware Bay oyster fishery, and oyster biology and ecology. Each volume contains a Primer, which presents in depth background information for the educator, and a series of classroom activities and lessons. Most activities included within are written in a class-ready form; however, some activities may require specialized materials. Please contact the Project PORTS coordinator for assistance with material acquisition and technical support.

The eastern oyster *Crassostrea virginica* is one of, if not the most important species of the Delaware Estuary. Dating back thousands of years the oyster has served as a keystone organism in the estuary, promoting water quality and providing food, habitat, and refuge to countless organisms. The oyster has also served as a principle Delaware Bay fishery holding both social and cultural significance to Bayshore communities.

Project PORTS: Promoting Oyster Restoration Through Schools is a community-based oyster restoration and educational program focusing on the importance of oyster populations in the Delaware Bay ecosystem. The goal of the program is to: increase an awareness and understanding of the oyster as a critical species and an important natural resource of the Bay; to promote an understanding of basic scientific concepts and stewardship values; and to contribute to the revitalization of Delaware Bay oyster populations.

Project PORTS presents the oyster resource of Delaware Bay as an ideal vehicle for problem-based, experiential learning in the K-12 educational setting. The oyster serves as a focal point for the integration of interdisciplinary scientific topics, the local environment, and local history. The strategy of Project PORTS is to promote hands-on activities and to emphasize the local significance of the issue. The Project has three main components. (1) Workshops offer educators an opportunity to learn about the Delaware Bay and its oyster resource directly from scientists and resource managers. (2) "Oyster-focused" classroom curriculum materials enable teachers to extend these lessons to their students. (3) A community-based oyster restoration project gives school communities the opportunity to contribute to the revitalization of Delaware Bay oyster populations. The restoration component is central to Project PORTS as it offers educators, students, and their families an opportunity to experience the Delaware Estuary, oyster ecology, and environmental stewardship first hand, while at the same time enhancing critical oyster habitat in the Delaware Bay. Project PORTS educational resources are designed to supplement current school curricula and to address NJDOE Core Curriculum Content Standards.



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Primer 2. The Oyster as a Natural Resource: A History of the Delaware Bay Oyster Fishery

The oyster populations of Delaware Bay are important to the ecological health of the Bay as they promote water quality through their tremendous filter feeding capacity, serve as a secondary producer providing a critical link in the food web, and provide habitat for scores of other organisms. Aside from their invaluable ecological role, we as humans are also interested in oysters because they represent a significant **natural resource**.

Archaeological studies suggest that oysters were utilized as food by aboriginal peoples living along the Delaware Bay some 6,000 to 8,000 years ago. By colonial times oysters were an important food source of both native-Americans and colonists. Though originally collected from inshore areas it was not long before oysters were harvested in the deeper waters of Delaware Bay as locally constructed sloops and schooners became available in the mid-1700s. Since that time the Delaware Bay **oyster fishery** has been an important industry providing food to peoples worldwide and shaping the economic, cultural, and community identity of the Delaware Bayshore region.



Like so many **renewable natural resources**, the production of oysters in the Delaware Bay has been greatly impacted by technological changes in harvesting and processing methods, management actions, and environmental changes. As a result Delaware Bay oyster harvests have varied from millions of bushels per year at the industry's

prime in the early 1900s to less than 60,000 bushels annually in recent years.

From a historical perspective the fishing of Delaware Bay oysters has gone through a number of phases.

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Figure 1: The oyster fishery docks at Bivalve, New Jersey. Photograph courtesy of the Haskin Shellfish Research Laboratory.

Related Vocabulary

Natural resource—a naturally occurring substance that is of value. A natural resource may be living (biotic) or nonliving (abiotic). Natural resources may be classified as non-renewable or renewable.

Non-renewable resources—finite in abundance and unable to restock themselves (eg. natural gas, oil, and gold).

Renewable resources—living resources that are capable of restocking themselves if not overharvested or diminished at a rate greater than that of replenishment (eg. Fisheries and ground water).

Fishery—an industry devoted to the catching of a particular aquatic animal.

Sloops and Schooners—sailing vessels.

Seed beds—discrete oyster reefs located in the upper Delaware Bay that are formed as oysters settle upon one another. Also called oyster bars.

Tongs—mechanical devices consisting of two long poles that have a scoop to collect oysters. The poles are joined and movement of the handles allows the scoops to come together and collect the oysters from the bay floor.

Oyster dredges—steel mesh bags that are dragged along the bottom by a vessel.

***Haplosporidium nelsoni* (MSX)**—a spore forming protistan oyster parasite, which can cause disease and mortality of oysters.

***Perkinsus marinus* (Dermo)**—a protistan oyster parasite that can cause disease and mortality of oysters.

■ Phase I: Pre-colonial times

The first written documentations of the oysters in Delaware Bay date back to the 1600's. Swedish explorers documenting their findings in the period of 1631-1654 noted the large size of Delaware Bay oysters and charted an extensive distribution of oysters along the entire Delaware shoreline and extending west to Cape May Point in New Jersey. Native Americans gathered oysters and utilized them as a food source.

■ Phase II: Colonial Era

Delaware Bay oysters were an important food source for early colonists. By the 1750's fresh oysters from the Delaware Bay were being shipped to the rapidly growing cities of Philadelphia and New York and pickled oysters were being shipped as far as the West Indies. Oysters were initially harvested from inshore areas using small boats and **tongs**. The harvest of oysters in the deeper waters of the Delaware Bay began in the 1730's as locally constructed **sloops** and **schooners** became available. Oysters were harvested directly from the primary **seed beds**, areas where oysters grow in large concentrations forming reefs or beds, and transported by sailing vessels to ports in Philadelphia.

■ Phase III. 1800s

Early in the 19th century oystermen began to harvest Delaware Bay oysters using iron dredges that were dragged across the bay bottom by sloops and schooners. This harvest method was more efficient and faster than the more traditional tonging method. Harvested oysters were directly marketed or transplanted in northern states for grow out and subsequent marketing in Boston and New York. The opening of the transcontinental railroad and the Chesapeake and Delaware Canal greatly expanded the commerce of Delaware Bay oysters. The ability to ship larger quantities of oysters spurred increased oyster harvests. The first oyster-packing house, which opened in Baltimore in 1834 initiated the marketing of shucked and canned oysters.

■ Phase IV. 1900-1930 The Boom Years

By the 1900s it had become common practice to harvest oysters from the seed beds located in the upper Bay and transplant in down Bay waters where prevailing higher salinity favored faster oyster growth and better meat quality. A natural division arose between the up bay seed beds and the down bay planting grounds. As the demand for local seed often exceeded the supply, oystermen began to supplement the local resource with seed imported from the Chesapeake Bay. Oyster production during this period ranged between 1 and 2 million bushels annually.

■ Phase V. 1930 to 1957 The Initial Decline of the Oyster Resource

Fishing pressure began to take its toll on Delaware Bay oyster populations. Overharvesting of seed beds and the depletion of shell, the foundation of the oysters habitat, had become a chronic problem despite repeated legislation aimed at protecting the resource. A shift in legislation allowing harvesting by motorized vessels, which were much more efficient than sailing vessels further exacerbated the deterioration of the seed beds. Climatic conditions also had a significant impact on the resource as drought conditions allowed predatory oyster drills to move up bay into the seed beds resulting in severe mortality of juvenile oysters.

■ Phase VI. 1957 to the present

Adding insult to injury the past five decades have been marked by the presence of two disease causing protistan oyster parasites. *Haplosporidium nelsoni*, or **MSX** first appeared in 1957 causing severe mortalities of oysters in the higher salinity areas of the bay. The parasite spread and by 1960 killed 90-95% of the oysters on the planted grounds and 50% of the oysters in the seed beds. The oysters in the bay developed some natural resistance to the disease and the resource somewhat rebounded in the 1970s and early 1980s. However, a second oyster parasite, *Perkinsus marinus*, also called **Dermo** emerged in the early 1990s and caused severe oyster mortalities. Like MSX, this parasite also favors high salinity. *Perkinsus marinus* continues to persist in Delaware Bay and has been associated with significant oyster mortalities, particularly in drought years when river flows are reduced and salinities increase bay wide. The practice of planting seed oysters in the lower bay ceased with the emergence of the two oyster diseases and there has been a return to the 150 year- old practice of harvesting market oysters directly from the seed beds. The impact of the diseases combined with decades of over fishing has resulted in a severely depleted Delaware Bay oyster resource. Oyster resource management strategies promote restoration of oyster populations and habitats. Restoration efforts involve planting oyster and clam shell in the bay. The shell provides a settlement surface for oyster larvae.



Figure 2: Oyster schooner. Photograph courtesy of the Haskin Shellfish Research Laboratory.

Figure 3: Commercial vessel with load of shell for large scale oyster restoration project. Photograph by Gustavo Calvo.

Activity 2.1

- Grade Level
5-8
- Subject Areas
Science, History, Social Studies, Mathematics
- Duration
One to two 40-minute class sessions
- Setting
Classroom
- Skills
Graphing, interpreting, inferring, hypothesizing, demonstrating, explaining, correlating
- Vocabulary
Natural resource, renewable resource, nonrenewable resource, fishery, schooner, dredge, tong, harvest, overfishing
- Correlation with NJ Core Curriculum Content Standards
5.3.4B, 5.3.8B, 5.10.4A, 5.10.2B, 5.10.6B, 5.10.8B, 6.1.2A, 6.1.4A

Materials:

- Student Worksheet-Activity 2.1

Too Many Bushels?

Charting the Course

Students will prepare a graph depicting oyster harvest data. They will interpret the graphs and hypothesize about events that might have affected oyster harvests.

Background

The oyster populations of the Delaware Bay represent an important **renewable natural resource**. Native-Americans living along the Delaware Bay Shore gathered oysters from inshore waters and used them as food. Later colonists used **skiffs, sloops, and schooners** to harvest oysters from deeper waters. Hand **tongs** and mechanical **dredges** were utilized to scrape the oysters from the bay bottom. During colonial times and through the 1800s oysters were a popular food. Harvest records indicate that in the late 1800s and early 1900s 1-2 million bushels of oysters were landed annually. Port Norris is recognized as the heart of the New Jersey oyster **fishery** and was one of the wealthiest cities in the State at the industry's prime. The expansion of the railroad and development of local canning plants resulted in an expansion of oyster commerce. In the 1930s and 1940s oyster abundance began to decline. The 1940s also saw a technological change as the sailing vessels that were traditionally used by the fishery were replaced by or transformed into motorized vessels. Oyster abundance continued to decline in the later part of the 20th century partly due to **overfishing** and partly due to changes in environmental conditions and the onset of two devastating oyster diseases, **MSX** and **Dermo**. Today oyster harvests are a fraction of what they once were. The oyster resource is carefully managed and efforts are underway to help preserve and restore Delaware Bay oyster populations.

Objectives / Students will be able to:

1. Recognize the oyster as a locally important natural resource.
2. Construct a graphical representation of oyster harvests.
3. Describe and interpret the graph.
4. Hypothesize cause and effect relating to changes in oyster harvests.

Procedure / Warm Up

Have a class discussion about natural resources. Have the students name some natural resources and identify those occurring within the region. Introduce the Delaware Bay oyster as a natural resource and have them define fishery. Discuss the importance of oysters to the Delaware Bay region and the long history of oystering in the Bay. Have students discuss what things might have impacted oyster production through the years.

The Activity

Present students with the data table of oyster harvests through time and graphing template provided in student worksheet.

1. Have students create a bar graph showing oyster harvests through time. Review graphing techniques as needed. For this exercise the x-axis will be year and the y-axis will be the number of oysters harvested in bushels (there are approximately 300 oysters per bushel). Students should carefully label graph including units.
2. Have students interpret the graph. This may be done within student groups, with teacher led discussion, or through a writing exercise. Key discussion points or questions to be raised include:
3. Did oyster harvests remain constant through time?
4. If not, how did they change?
5. Was this change gradual or sudden?
6. When did the highest and lowest oyster harvests occur?
7. Have students speculate as to the cause of the changes (increases and decreases) in harvests that are indicated by their graphs.

Wrap Up / Student research teams should present their observations and speculations to class for comparisons and discussion. Discuss how the decline in the resource came about and how it may have been prevented.

Assessment / Students may be evaluated on oral presentations, and on their constructions of oyster harvest graph and oyster fishery history timeline.

Extensions / Take the class aboard the Bayshore Discovery Project's schooner the A.J. Meerwald for a first hand experience of sailing on the Delaware Bay.

Activity 2.2

- Grade Level
3-6
- Subject Areas
Science, History, Social Studies, Mathematics
- Duration
One to two 40-minute class sessions
- Setting
Classroom
- Skills
Graphing, interpreting, inferring, hypothesizing, demonstrating, explaining, correlating
- Vocabulary
Natural resource, renewable resource, nonrenewable resource, fishery, schooner, dredge, tong, harvest
- Correlation with NJ Core Curriculum Content Standards
5.3.4B, 5.3.8B, 5.10.4A, 5.10.2B, 5.10.6B, 5.10.8B, 6.1.2A, 6.1.4A

Materials:

- Student Handout-Activity 2.2
- Index cards
- Ribbon (5 foot per group)
- Hole punch

Time Passages, Constructing a Visual Timeline

Charting the Course

Students will examine the development and decline of the Delaware Bay oyster fishery. Harvest data will be correlated with significant events that affected the oyster resource and industry.

Background

The oyster populations of the Delaware Bay represent an important renewable natural resource. Native-Americans living along the Delaware Bay Shore gathered oysters from inshore waters and used them as food. Later colonists used skiffs, sloops, and schooners to harvest oysters from deeper waters. Hand tongs and mechanical dredges were utilized to scrape the oysters from the bay bottom. During colonial times and through the 1800s oysters were a popular food. Harvest records indicate that in the late 1800s and early 1900s 1-2 million bushels of oysters were landed annually. Port Norris is recognized as the heart of the New Jersey oyster industry and was one of the wealthiest cities in the State at the industry's prime. The development of local canning plants facilitated an expansion of oyster commerce. In the 1930s and 1940s oyster abundance began to decline. The 1940s also saw a technological change as the sailing vessels that were traditionally used by the fishery were replaced by or transformed into motorized vessels. Oyster abundance continued to decline in the later part of the 20th century partly due to overfishing and partly due to environmental conditions which the onset of two devastating oyster diseases MSX and Dermo. Today oyster harvests are a fraction of what they once were. The oyster resource is carefully managed and efforts are underway to help preserve and restore Delaware Bay oyster populations.

Objectives / Students will be able to:

1. Recognize the oyster as a locally important natural resource.
2. Describe methods for harvesting oysters.
3. Understand events that affected Delaware Bay oyster production.
4. Create timeline with images of the history of the oyster industry.
5. Describe images relating to oystering and make inferences as to how the image depicted related to the harvesting of Delaware Bay oysters.

Procedure / Warm Up

Have a class discussion about natural resources. Have the students name some natural resources and identify those occurring within the region. Introduce the Delaware Bay oyster as a natural resource and have them define fishery. Discuss the importance of oysters to the Delaware Bay region and the long history of oystering in the Bay. Have students discuss what things might have impacted oyster production through the years. Construct a chronological outline beginning with colonial times and guide students through key elements of oystering in Delaware Bay.

The Activity

1. Hand out timeline supplies to student research teams. Supplies should include copies of pictorial oyster history cards, index cards, pencils, and a 5 foot length of ribbon.
2. Working in research teams, have students order pictorial images chronologically based on what they see in the image.
3. Students should punch hole in center top of cards and weave them on ribbon in chronological order.
4. Have students write on index cards a brief description of what they see in the image and how what they see may have impacted the oyster resource of Delaware Bay.

Wrap Up / Student research teams should present their observations and speculations to class for comparisons and discussion. Discuss how the decline in the resource came about and how it may have been prevented. Relate observations of visual images with graph depicting Delaware Bay oyster harvests through time.

Assessment / Students may be evaluated on oral presentations, and on their constructions of the oyster fishery history timeline.

Extensions / Take the class aboard the Bayshore Discovery Project's schooner the A.J. Meerwald for a first hand experience of sailing on the Delaware Bay.

For lower grades select images and discuss then and now comparisons.

Host local folk singer Jim Albertson for a celebration of seafaring songs
www.members.aol.com/downjerseyjim/



Figure 1-6: far left: Offloading bushels of oysters at the docks of Bivalve, New Jersey, left: oyster schooners under sail. Right top to bottom. Canning oysters, modern vessel loaded with shell for oyster restoration, motorized oyster vessel, oyster dredge. Photographs courtesy of the Haskin Shellfish Research Laboratory.

Activity 2.3

- Grade Level
4-5
- Subject Areas
**History, Social Studies,
Mathematics**
- Duration
One 40-minute class session
- Setting
Classroom
- Skills
**Interpreting, inferring, demon-
strating, explaining.**
- Vocabulary
Shuck, market, commerce.
- Correlation with NJ Core
Curriculum Content Standards
**5.8.4B, 5.8.6B, 5.8.6C, 6.6.4C,
6.6.8B**

Materials:

- Student Worksheet-Activity 2.3
- Paper
- Pencils
- Calculators

A Look at the Numbers by Rail

Charting the Course

At the boom of the Delaware Bay oyster fishery 1-2 million bushels of oysters were harvested each year. In the following exercise students will examine the harvest numbers through mathematical word problems and view the harvest numbers in terms of number of railcars needed for shipping that many oysters. They will then compare the number of railcars needed to ship the same number of canned oysters.

Background

In the 1870s and 1880s several railroad lines extended rail transport to the New Jersey Delaware Bayshore. The rail lines had a significant impact on the oyster industry of New Jersey making land transportation of oysters cost effective and rapid. The town of Bivalve became the shipping center of the New Jersey oyster industry. Adjacent towns became residential and commercial centers for the industry as merchants and tradesmen relocated from Philadelphia, New England, and other areas. The area became very prosperous. Some 56 million oysters were shipped out of Bivalve in 1925 with a value of more than 5 million dollars. Early on, most of the oysters were shipped first to Baltimore where they were removed from their shells and packed in cans. In 1922 the first shucking plant in Bivalve was opened. The ability to shuck directly where the oysters were landed greatly reduced freight and handling costs. Within a decade packing houses lined the Maurice River waterfront. In the packing houses men and women lined long wooden stalls, quickly shucking as many oysters as possible. Many immigrants came from Maryland and Virginia to work in New Jersey's oyster shucking houses. The packing houses played an important role in shaping the cultural and economic life of the Bayshore region.

Objectives / Students will be able to:

1. Gain an appreciation of the number of oysters harvested from Delaware Bay during the oyster industry's boom days.
2. Calculate the number of railcars needed to ship the oysters harvested from the Delaware Bay in 1925.
3. Calculate the number of railcars needed to ship the same number of oysters if they were all shucked and canned.
4. Compare the relative costs of shipping whole oysters (in shells) versus canned shucked oysters (meats only).

Procedure / Warm Up

Revisit the New Jersey oyster landings graph. Focusing on the boom years discuss how the ability to ship oysters by rail and later the ability to can shucked oysters impacted the commerce or marketing oysters. At the industry's peak 1-2 million bushels (about 300 oysters per bushel) of oysters were harvested per year. Ask: "How many railcars of oysters would be needed to transport that many oysters?"

The Activity

1. Hand out the worksheet and scrap paper. Have students take out their pencils and calculators.
2. Have students complete the math word problems on the Student Worksheet-Activity 2.3, or using the numbers in the A Look at the Numbers Box create and have them solve your own word problems.
3. Discuss the results.

Wrap Up / Have an open discussion about how technological changes, such as the establishment of railroads and canning in the case of oysters, can affect the demand for and on a natural resource. Have students suggest other changes that could impact the resource. Discuss the economic benefit to the oyster industry of locally packing (canning) oysters.

Assessment / Student's mathematical computations. Participation in class discussions.

Extensions / Invite the folklorist from the Bayshore Discovery Project to visit your class for a presentation on the history of oystering in Delaware Bay.

Select curriculum materials from *Down Jersey Celebrating Our Sense of Place*.

A look at the numbers:

The year: 1925

7,000 railcars from Bivalve

100 bags oysters in shell per railcar

800 oysters per bag

560 million oysters

\$8.00 per bag

\$5.6 million wholesale worth

What if the oysters were shucked before shipping?

746 railcars

1.8 million oyster cans

300 shucked oysters per gallon can

560 million oysters

895,680 cubic feet of shells on shell pile at shucking house

How many football fields would this be?

Figure 1: Railcars at the Bivalve wharf. Photograph courtesy of the Haskin Shellfish Research Laboratory.



Activity 2.4

- Grade Level
3-5
- Subject Areas
**Art, History, Social Studies,
Language Arts**
- Duration
**One to two 40-minute class
sessions**
- Setting
Classroom
- Skills
**Interpreting, inferring, demon-
strating, explaining, creating.**
- Vocabulary
Shuck, market, commerce.
- Correlation with NJ Core
Curriculum Content Standards
**5.18A, 5.3.4C, 5.6.2D, 5.8.4D,
5.8.6D**

Materials:

- Tin cans
- Drawing paper cut to tin cans
- Crayons, Markers, or Paints
- Glue or Tape

What's in the Can?

Charting the Course

Students will examine photographs of oyster cans from the 1900s and describe the key marketing features shown on the label. Students will then design and construct oyster can labels for their own hypothetical oyster company.

Background

Oysters were originally sold in the shell, but in the late 1920s packing houses developed and oysters were shucked (removed from their shells) and sold in cans. The ability to shuck oysters directly at the site where they were landed greatly reduced freight and handling costs. Within a decade packing houses lined the Maurice River waterfront. Towns like Port Norris, Bivalve, and Shellpile grew as a result of the oyster industry. At the peak of the fishery, Port Norris, had more millionaires per square mile than any other city in the state. This prosperity extended through out the region. In the packing-houses men and women lined long wooden stalls, quickly shucking as many oysters as possible. Many immigrants, primarily African Americans, came from Maryland and Virginia to work in New Jersey's oyster shucking houses. The packing-houses played an important role in shaping the cultural and economic life of New Jersey's Delaware Bay shore region.

The shucked oyster meats were placed in steel buckets and transferred to large steel tubs where they were washed in water. The oysters were then drained, sealed in tin cans, and placed in cold rooms where they awaited shipping. Each packing-house had its own can label. The labels were often fanciful and colorful, rich with descriptions relating to the superiority of the product. Today these tins are prized and sought after by many collectors.

Objectives / Students will be able to:

1. Recognize the significance of towns like Port Norris and Bivalve, NJ as centers for the commercial oyster fishery.
2. Examine and describe oyster can labels from the early 1900s.
3. Discuss how the labels helped oyster marketing.
4. Design and construct oyster can labels for their own hypothetical oyster company.

Procedure / Warm Up

Discuss the significance of oysters to the Delaware Bay Shore region. Explain that oysters were originally sold in the shell, but in the late 1920s packing houses developed and oysters were shucked (removed from their shells) and sold in cans. Show them pictures of oyster cans noting the information that they provided.

The Activity

1. Show students pictures (or the real thing if you have them) of oyster cans.
Note: Google image search will offer a wide variety of samples of oyster can images.
2. Ask the students to describe the cans. Ask: What information is given? What features make the product appealing to them? If they were in the market for oysters which would they buy?
3. Hand out art supplies and instruct students to design and illustrate their own oyster can label (Paper should be appropriately sized and cut to be glued onto a gallon tin can or modify for size of available cans).
4. Affix labels to cans using tape or glue.
5. Have students orally present their oyster can labels to the class.

Wrap Up / Have an open discussion about how technological changes, such as the establishment of railroads and canning in the case of oysters, can affect the demand for and on a natural resource. Have students suggest other changes that could impact the resource. Talk about ways that products are marketed including products that students use today.

Assessment / Participation in class discussion. Oyster can label.

Extensions / Invite the folklorist from the Bayshore Discovery Project to visit your class for a presentation on the history of oystering in Delaware Bay.

Select curriculum materials from *Down Jersey Celebrating Our Sense of Place*.



Figure 1: Oyster Can, courtesy of *Cape May Magazine*. James Kirks, photographer.

Student Worksheet Activity 2.1 Too Many Bushels

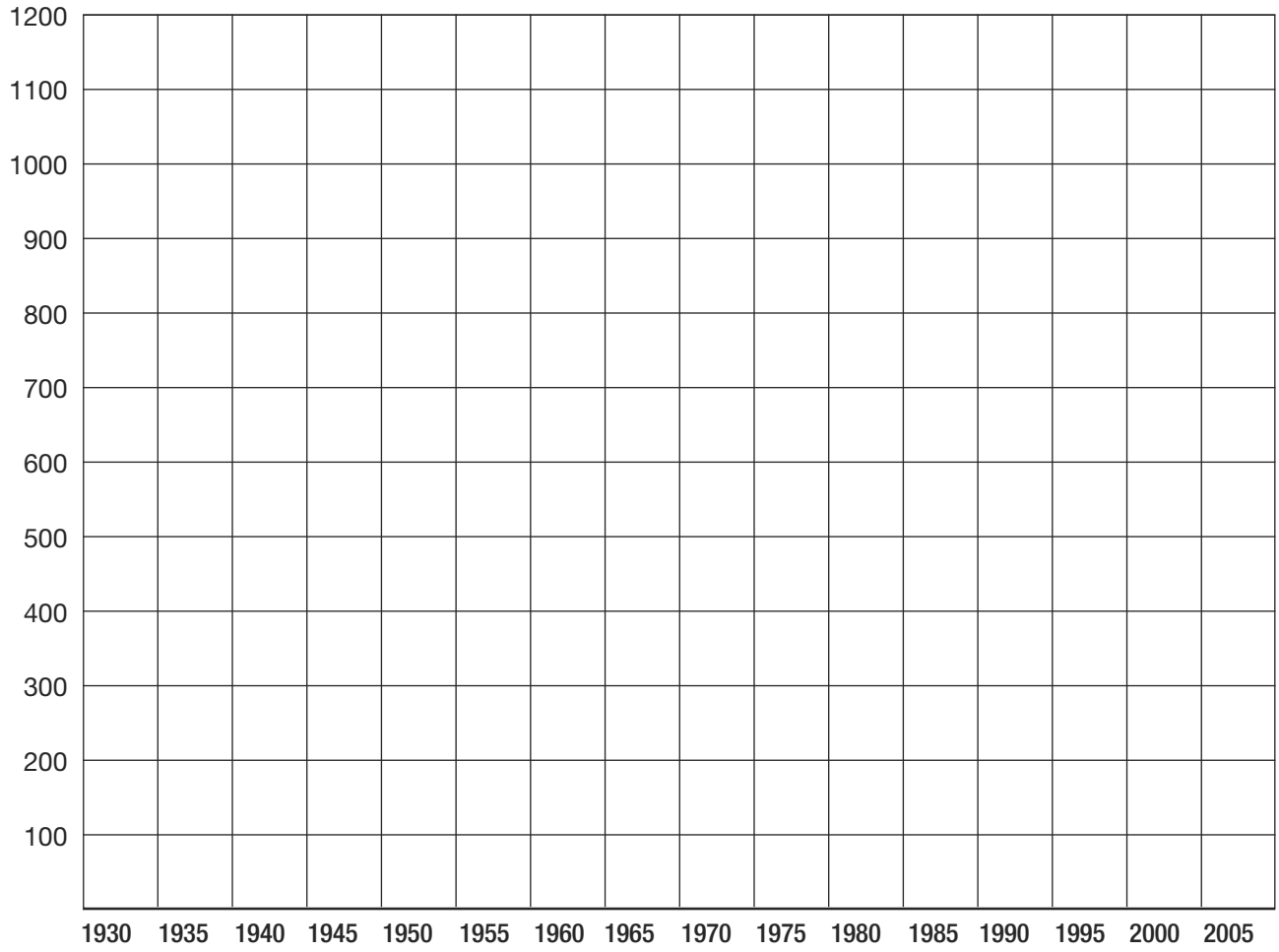
Name _____ Date _____

1. Plot oyster landing data with the y-axis representing thousands of bushels. Be sure to include axis labels on your graph.
2. Interpret your graph by answering the following questions.
 - a. Did oyster harvests remain constant through time?
 - b. If not, how did they change? Can you observe a trend in the data?
 - c. Was this change gradual or sudden?
 - d. When did the highest and lowest oyster harvests occur?
 - e. What do you think oyster harvests changed through time?

Student Worksheet Activity 2.1 Too Many Bushels

Name _____ Date _____

Delaware Bay New Jersey Oyster Harvests



Year	Bushels (thousands)	Year	Bushels (thousands)
1930	1160	1970	192
1935	605	1975	186
1940	665	1980	93
1945	835	1985	34
1950	610	1990	30
1955	175	1995	80
1960	85	2000	58
1965	125	2005	44

TABLE 1

Student Handout Activity 2.2 Time Passages Constructing a Visual Timeline



Student Worksheet Activity 2.3 A Look at The Numbers

Name _____ Date _____

Complete the following word problems. You may use a calculator, but show your calculations on this worksheet. You may need the answer from a previous problem to determine the answer for a later problem, so solve the problems in the order that they are presented.

1. In 1925, 1.8 million bushels of oysters were harvested from Delaware Bay. Assuming there were 300 oysters per bushel, how many oysters were harvested?
2. The oysters were transported to market in bags. Each bag held 800 oysters. Assuming that all of the oysters harvested were shipped in bags, how many bags of oysters were shipped in 1925?
3. The bagged oysters were shipped by railroad. Each rail car could hold 100 bags of oysters and a lot of ice. How many railcars were needed to transport the oysters from the docks at Bivlave, NJ in 1925?
4. Each bag was sold for \$8.00. What was the price of a single oyster? Remember there were 800 oysters per bag.
5. What was the wholesale value of all the oysters harvested in 1925?

Student Worksheet Activity 2.3 A Look at The Numbers

Name _____ Date _____

Super Number Challenge

1. If in 1925 all the harvested oysters were shucked and shipped to market in cans. How many cans would be shipped if each gallon contained 300 oysters?

2. A railcar could hold 2000 cans. How many railcars were needed to ship the canned oysters? Were more cars needed to ship the oysters in bags or cans?

3. What was the benefit to the oyster company of selling shucked oysters (canned oysters)?

The Ultimate Number Challenge

Shucking all those oysters resulted in a huge pile of oyster shells beside the packing house. The total volume of shells was 895,680 cubic feet. If the shell was spread out in a pile 1 foot high, how many football fields would it cover? (Hint: a football field is 300 feet by 160 feet)