



Gateway to New Haven: The New Haven Harbor

Curriculum Unit 84.06.10
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There are many theories as to the origin of our vast universe. As we know, the earth has been around for billions of years. Looking around us we can't help but question how this creation of our planet came to be as it is today. Through experience and past knowledge it has been brought out that there are three major forces which are responsible for our land formations: 1) glaciers, 2) volcanoes, and 3) water.

The purpose of this unit is to show how the geographical location of the New Haven Harbor has affected the lives of the people living in New Haven by focusing our attention on the phenomena of nature which has been prevailing for millions of years.

When this unit is completed the students will:

1. Know how the early settlers made use of the New Haven Harbor.
2. Know the three main geographical divisions of the state of Connecticut and how they came to be.
3. Be able to discuss the Triassic fault and what effect it has on the New Haven Harbor.
4. Know how the channel of the New Haven Harbor has changed in the last two centuries and how these changes are affecting our social and economic growth today.
5. Know what proposals the city of New Haven has made to protect the New Haven Harbor for future use.
6. Be able to conclude whether it is an advantage or disadvantage to expand industry along the New Haven Harbor.

This unit is designed primarily for a Science and/or Social Studies class of grades 5-8. Its adaptation for other areas can easily be implemented. This unit can be completed in 2-4 weeks.

Location and Description of the New Haven Harbor

The New Haven Harbor is located on the northern shore of the Long Island Sound about 75 miles from New York and about the same distance from Block Island. ¹ The outer harbor is four miles wide and is protected by three outlying breakwaters. The inner harbor, which is about four miles inland, is where the Mill and Quinnipiac Rivers meet. It is at this point that the harbor is quite shallow and less than a quarter mile wide. The amount of maritime commerce handled by this body of water and the three tributary rivers—West River, Mill River, and Quinnipiac River—that flow into it, is greater than that at any other New England port with the exception of the harbors at Boston, Massachusetts and Providence, Rhode Island. ²

Shallowness and silt were problems from the very beginning of the New Haven Colony. The settlers set out to improve conditions of the harbor immediately. The labor was great for the settlers had to contend with building on soft mud. Wharves were built in the deeper water. Tidal flats and creeks were filled and the waterway was eventually dredged. The results of this hard work and dedication was Long Wharf which extended more than a half mile into deep water and supported dozens of shops, taverns, warehouses, and offices.

At the head of this estuary lies the city of New Haven, the home of Yale University, and formerly the capital city of Connecticut. ³ Due to its favorable geographical location near the mid-point of the southern shore of New England and the many railroads and highways radiating from it, the city is often called “The Southern Gateway to New England.” ⁴

At the entrance of the harbor three breakwaters provide a harbor of refuge for vessels using Long Island Sound. (See Map Below). The inner half of the bay is well sheltered naturally. The mean range of tide at the head of the harbor is about 6 feet. The maximum range is over 10 feet, which is due to the wind and other causes.

Quinnipiac River

The Quinnipiac River flows into the New Haven Harbor at its northernmost border. The original depth up to Ferry Street was nearly 11 feet before improvements were made by the United States. It meanders through marshland and flows through Fair Haven and Fair Haven East before it turns west and enters the harbor. The section of the bed located between Grand Avenue and Ferry Street was used to cultivate oysters. During the early part of the year 1900 it became apparent that access by water was needed to the industrial plants located along the river, especially near Ferry Street. Congress authorized the dredging of a channel 12 feet deep and 200 feet wide under the Act of 1899. ⁵ There was much opposition from the oystermen owning the grounds. They claimed that the dredging would injure the oyster bed. As a result of the arguments, two short channels were dredged measuring 50 feet wide and 8 feet deep. These channels were located at each end of a natural channel along the wharves on the east side of the river.

Mill River

The Mill River is a small stream flowing between Fair Haven and New Haven. Prior to 1900 the natural depths of the Mill River were 4 1/2-5 feet up to the fork between Chapel Street and Grand Avenue. In 1913 under the Act of 1899, Congress allotted the necessary funds and a channel in the east was widened to 100 feet and on the west a width of 125 feet. ⁶

West River

The West River is a shallow meandering stream which enters the harbor between New Haven and West Haven. In 1902, there were six wharves and one small shipyard in West Haven below Kimberly Avenue. To facilitate commerce in the river, the Act of March 3, 1905, provided for a 9-foot channel, 100 feet wide from the southwest corner of the 16-foot anchorage basin in the main harbor to the wharf frontage at West Haven via Oyster Point. ⁷ The 9-foot channel was beneficial at first but soon became inadequate for the amount of traffic. On July 25, 1912, funds were allocated to deepen the channel to 12 feet and to widen it at the bends to 125 to 150 feet.

Breakwaters

During the latter part of the 19th century and early 20th century, the traffic in the New Haven Harbor was heavy. As unreal as it may seem, it has been stated that in 1895, about 31,000 vessels entered the New Haven Harbor of which nearly 9,000 were sails and over 8,000 were barges. The River and Harbor Act of March 3, 1879, authorized the construction of two riprap breakwaters (the present east and middle breakers) at the entrance to the harbor to provide a refuge. ⁸ Those two breakwaters were not adequate and two additional breakwaters were authorized to be built. Only the present westerly breakwater was completed.

The Use of the New Haven Harbor During Earlier Days

The First inhabitants of the northeast were the nomadic hunters who had crossed the continent from the western world following herds of caribou about 12,000 years ago. It is believed that these groups of people were a hearty race and adapted themselves to make long perilous journeys through the dense forests. About 10,000 years ago the continental forest underwent a major change. These changes proved to be advantageous for the inhabitants. Instead of drifting from place to place they began to settle down and make permanent homes. By the 1600's when the first settlers from Europe began to explore the New World, they found that these hunters now called Indians, were living relatively comfortable on the land digging for shellfish and hunting the wild fowl and deer.

The settlers of New Haven arrived in 1638 under the leadership of John Davenport and Theophilus Eaton. They wanted to start a new colony because of their religious beliefs. These settlers were the wealthiest group of merchants to come to any New England Colony before 1660. They had no intentions to spend their lives farming but to make the most of Quinnipiac's spacious harbor and favorable location.

The new settlers had their work cut out for them. They had to clear land, build homes, construct roads and build bridges, and lay out a town. The identity of the man who designed the town that would one day become New Haven is a mystery, but it is believed to be Lion Gardiner whose plans for Saybrook bore striking similarities. ⁹ Robert Seiley who had the technical qualifications as well as sufficient status with the colony could have performed the task. Whoever the designer was, organized the town around 11 squares. The land was allotted according to wealth and family size.

From the very beginning the founders of New Haven believed it essential to create a network of subsidiary towns whose function would be to deliver agriculture and forest products with other neighboring ports. On October 27, 1643, the New Haven Jurisdiction was formed which composed of six towns, New Haven, Branford, Milford, Stamford, Guilford, and Southold. Southold is the only town which was not located in Connecticut.

The original settlers of New Haven referred to their colony as a refuge. From 1638 until the mid 19th century,

the harbor was its chief means of trade and transportation. The leaders of the new colony were men of high commercial ambition. They dreamed of making New Haven a center of transatlantic trade while at the same time making themselves rich. With all the enthusiasm of prospering, the colonists invested too much money in the "Phantom Ship." This ship was lost at sea in 1646 with all crew members while on a voyage to England. This was the first of many misfortunes that the colony encountered during the early days. The loss of the Phantom Ship caused New Haven's merchants and seafarers to concentrate on serving the needs of the colony's agricultural production. During this period New Haven exported wheat, corn, rye, pears, pork, beef, cattle, horses, and lumber. Some of these goods were carried to other ports found along the shores of Connecticut, some to Boston, and some to New York. However, the bulk of these goods was sent to the sugar islands of West Indies in return for refined sugar, the most valuable commodity of international trade during the 17th and 18th centuries. In addition to sugar, they also received molasses, rum, and bills of exchange in order to purchase goods imported to Boston and New York from Europe.

During the year of 1662, the Connecticut Colony received a charter from the King of England. This charter gave the Connecticut Colony a strip of land which the New Haven Colony occupied. New Haven objected to being a part of the Connecticut Colony, however, the two united in 1665. New Haven brought both its rich heritage and a galaxy of able leaders to the Connecticut Colony. New Haven served as one of Connecticut's two capital cities until 1875, when Hartford became sole capital. ¹⁰

The American Revolutionary War temporarily destroyed New Haven's trade, however, peace brought prosperity. Although many of their ships were captured by British privateers, trade and profit continued on the rise. As time marched on New Haven appeared to have left the confines of local and West Indies trade and advanced into the circle of world trade.

The year of 1787 marked the beginning of an 18-year period of prosperity on American shipping. The Constitution was established, ending arbitrary state laws and creating uniform duties and tonnage fee. The new central government supplied a more reliable and abundant currency. The colony was able to build a stronger commercial base and gain confidence in foreign trade. The year of 1789 also renewed West Indies trade to American merchants. A steady flow of goods was sent to Ireland for Irish linen. Other ships traded directly with France, Spain, and the Canary Islands. The war between England and France broke out in 1793 which caused much interruptions. During that period in history war meant huge risks and profits.

With the little profit of wartime trade, New Haven reinvested in another venture. A fleet of large vessels was used to kill fur seals and trade them to China and other countries around the world for tea, silk, and chinaware. This burst of prosperity was never to be repeated in the city's history.

The War of 1812 marked a turning point in the economic history of New Haven. In 1812, the British started a rigorous blockade which stretched from New York to New Orleans. New Haven joined Sweden, Portugal, and Spain to conduct a large indirect trade with the enemy. On November 13, 1813, British war ships blocked the end of Long Island Sound which destroyed all foreign trade, coastal trade, and blockade running.

The New Haven Harbor had few advantages and many short comings. The most severe was the market problem. New Haven itself was too small to consume all foreign trade. Another serious drawback was entirely geographical. Its harbor was too shallow and frequently filled with silt. The limited harbor line meant limited dock and wharf facilities and no large rivers connected extensively with the interior. In addition, all trade had to come into port either from the east against the prevailing wind or through New York from the southwest. ¹¹ The seaport of New London further hurt New Haven trade. New London controlled most of the eastern

Connecticut commerce. This limited New Haven's coastal and foreign trade and boxed the colony in between two powerful competitors.

There was a growing demand for coal after 1840. Thousands and thousands of schooners full of this commodity was brought in by way of the Delaware River and Norfolk, Virginia. The New Haven Harbor was quite busy because the age of coal caused the shipment of this fuel to double and redouble. New Haven was in its high heavens and was looking forward to another dream, the Farmington Canal. This project was looked upon to do for New Haven what the Erie Canal had done for New York. The idea was to provide connection all the way to the St. Lawrence River which would tie New Haven to all of New England and eastern Canada.

The Farmington Canal

After the War of 1812, New Haven had a great desire to match the competitors that were found in the upper Connecticut Valley. The people of New Haven developed a plan which would link the Long Island Sound with the Farmington Valley and produce a connection in Massachusetts with the Connecticut River in Northampton. When this project was completed the rich lands of the upper Connecticut Valley would be united in a traffic line by a cut off into the Farmington Valley and on to the New Haven Harbor. The Farmington Canal Company which was chartered in 1822 and the Hampshire and Hampden Canal Company which was chartered in 1823 were in charge of the construction and operation of this system. The Farmington Company was the overseer of the activities which ran to the Massachusetts border. The Hampshire and Hampden Company controlled the activities from the Massachusetts border to the Connecticut River junction.

Although the Farmington Canal Company received its charter in 1822, the work on the canal didn't begin until almost 3 years later. The canal was to be 4 feet deep 20 feet wide at the bottom, and 36 feet wide at the top. The labor on the project was great for most of the work had to be done by hand with the help of domesticated animals. The builders placed 28 locks over the 220 foot rise in elevation from the Long Island Sound to the Massachusetts border. Also aqueducts and culverts were built because the path of the canal crossed several rivers and streams. The canal was finally completed and the first boat traveled from New Haven to the Connecticut River junction in 1835. ¹²

After the canal was opened the New Haven and Northampton Company operated the system for a period of 10 years from the harbor to the Connecticut River junction. The merchants and banks suffered a financial loss from the canal which was due largely from freezing weather and the drought of 1845. All was not lost, however, because New Haven had well-developed inland trade. In 1847, a portion of the canal was closed. This limited its use in the years to follow. About mid-century the railroad was making a strong appearance. The railroad bug was being caught by many capitalists. Thanks to the efforts of James Brewster, the first train entered Hartford from New Haven on December 14, 1839. ¹³

During the latter part of the 19th century railroads brought about concurrent and competing activities. Much of the Farmington Canal route was used for the Northampton railway, one of the competitors of the New Haven and Hartford Railroad Company. In 1848 New Haven and Hartford Railroad merged with the New York Railroad in an attempt to eliminate some of the competition in southern New England. This merger was successful which led the way for greater expansion of the railway system to what it is today in all of New England. Thus the end of the canal era in Connecticut was fast approaching. Parts of the Farmington Canal can still be seen in many areas along its route from New Haven to Massachusetts.

The Geology of the New Haven Harbor

Connecticut, without its vast western land claims, ranked among the mainland colonies as larger only than Delaware and Rhode Island. It contained about 5,000 square miles, not a large area even in an age of primitive transportation. When the boundaries were finally settled, the northern line, with Massachusetts, ran about 87 miles; the eastern, with Rhode Island, about 50 miles; that on the Long Island Sound, nearly 100 miles; and the western, with New York, about 75 miles. ¹⁴

The Mesozoic Era began about 225 million years ago and ended about 65 million years ago. There were three periods during this era which were named as follow: 1) Triassic, the oldest; 2) Jurassic, the second; and 3) Cretaceous, the youngest. The area that we are concerned with in this unit contains rocks that were formed during the Triassic period of the earth's history.

The state of Connecticut has many different land and water forms. Its natural setting is very much today as it was when the settlers arrived in the 1600's. Most sections of the state are noted for rolling hills, forests, rocks, ravines, lakes, and rivers. Many millions of years ago there were mountains of Connecticut which rose high into the air. Over the years rain caused quite a bit of erosion and weathering of these mountains. This resulted in these mountains slowly being worn to surface level. About 200 million years ago there was a great fault. This tremendous break in the earth known as the Triassic Fault ran through what is now Connecticut and parts of Massachusetts. This crack caused a portion of the earth to drop forming our present appearance of the state today. The geographical names of the sections of Connecticut are the Western Highlands, the Eastern Highlands, the Central Valley Lowlands, and the Coastal Lowlands. (See Diagram Below). There was much sand being washed down from the east and west filling the cracks which had been formed. In most parts of the New Haven area, the bedrock is hidden by a varying thickness of soil and sand. This sand formed into the sandstone that the Connecticut Valley is noted for. In hills about the city or along the rocky basement, this bedrock is exposed to direct view. These natural outcrops are supplemented by numerous artificial cuts along highways and railways. From time to time there was volcanic activity. It is apparent what happened as you travel through the state and see layers of sand and layers of lava. There were also fine particles of clay and gravel which were washed down over the cooled lava. The volcanic rock which we find in the Connecticut region is basically traprock. There is also sandstone and shale which is made from sand and mud deposits. The continued eroding of the soft sandstone left impressive traprock mountains standing up as a series of long hills. Some of these include Mount Higby, the Hanging Hills of Meriden, East Rock, and West Rock.

After the big break in the surface of the earth there was another force at work. The east and west uplands were squeezing toward each other. The rock of the Central Valley was very hard and under this type of pressure broke causing the rocks to shift on top of one another. The minor earthquakes which have occurred in the area in the last 5 to 10 years are an indication that there has been an increase in the activity of these rocks.

Although the early settlers had other purposes for coming to Connecticut, they too were attracted by its beautiful landscape. There was easy access to the interior by the major river valley. The Thames in the east, the Connecticut in the central, and the Housatonic in the west. Of these three rivers, the Connecticut River is the largest, it has the longest navigable distance, and it leads to the widest and most fertile valley. Although the Connecticut River did not flow directly into New Haven, the deep rich soil deposits found their way to parts of the city. The first settlers frequently commented about the fertile and prosperous appearance of the Connecticut Valley. That rich portion of the valley found in the Hartford area is only 10 to 20 miles wide.

There are a series of hills which marked the original limits of New Haven. From the early days these hills were known as West Rock, Pine Rock, Mill Rock, and East Rock. These hills at one time were used as a topographical

barrier from east to west, between the valleys of the West River and the Quinnipiac River. From these hills we can get the best viewpoint in the vicinity of New Haven. From the steep cliffs and slopes we get much of our information about the Triassic rocks of the Connecticut Valley Lowlands.

(figure available in print form)

This diagram shows the divisions of the state of Connecticut after the Triassic Fault

It is obvious that these four rocks have related features. Each rock is made up of trap which is associated reddish and gray sandstone and conglomerate. The hills owe their existence to the resistant nature of the dark igneous rock; and the excellent exposures of sedimentary layers of these localities are due chiefly to the protective effect of the trap bodies. ¹⁵

In all of the rocks the trap is intrusive, which means it represents liquid, molten material that was forced into the Triassic sediments below the surface of the earth. The four rocks are separated into two classifications. West Rock and East Rock are classified as intrusive sheets of sills. That means that there is a thin layer of igneous rock intruded between level or gently incline of beds of other rocks. Pine Rock and Mill Rock are classified as dikes, which means there is a mass of igneous rock filling a fissure in other rocks into which it has been intruded. West Rock and East Rock are sheetlike masses lying between layers of sandstone and tilted eastward with these layers; the other two, Mill Rock and Pine Rock are long and narrow, rise steeply out of the depths, and cut directly across the Triassic layers. ¹⁶

Glaciation of the New Haven Area

At this point we can think of Connecticut as having a drowned coastline so that an irregular coastline with good harbors exists. This irregularity in the surface represents the results of hundreds of millions of years of geological changes. Connecticut is in the part of the continent that was covered by glaciers until about 10,000 years ago. The climate grew bitterly cold as great sheets of ice formed in Canada and pushed southward over the land. The weight of the ice carried along soil, stones, and bedrock as it moved across the land. Much of Connecticut's topsoil was probably deposited in the Long Island Sound, but quantities of soil and boulders from Massachusetts, Vermont, and New Hampshire were left here. Thousands of years later the climate began to warm up, which caused the massive ice sheets to slowly melt. As the glaciers began to melt, loose material known as glacial till or drift, was deposited in small hills or drumlins, very common in northern Connecticut towns such as Woodstock, Pomfret, Putnam, Ashford, and Mansfield. ¹⁷ The melting glaciers created serpentine (zig-zag) ridges, clay beds, and sand plains. In some cases the course of the rivers was changed because of large dams of glacial debris. The Farmington River which at one time probably flowed into the Long Island Sound at New Haven was forced to cut a new route northward through an old gap at Tariffville, and then eastward to the Connecticut River at Windsor. ¹⁸ The glacial movement may have scarred Connecticut superficially and carried away much fine topsoil, but it left behind an enriched land scenery with hundreds of lovely lakes, ponds, waterfalls, undulating ridges, elongated drumlins, picturesque boulders, sandplains, and fine harbors. ¹⁹

Now that we have some knowledge of the geological background of the state of Connecticut, we can better understand some of the problems the early settlers encountered. We will always be amazed of the diversified landscape about us.

The New Haven Harbor Today

More than three centuries have gone by and the New Haven Harbor is still considered one of the city's greatest resources. There are many potentials for its use which remain to be uncovered. The harbor provides magnificent views and a great opportunity to improve the social and economic conditions of the residents of New Haven and its neighboring towns. A large portion of the harbor has been filled in order to provide needed space along the shore to facilitate the growing industries and expanding thruways. The Connecticut Coastal Management Act of 1979 has established a set of goals and policies to guide Federal, State, and local actions of the coastal area. These goals are: 1) Protect and improve the natural resources of the harbor, 2) Guarantee and increase public access to the harbor, 3) Develop the recreational potential of the harbor, 4) Maintain and improve existing waterfront residential neighborhoods, 5) Encourage development and maintenance of the port as a valuable regional economic asset, and 6) Give priority to water-related uses whenever possible.

Due to the fact that the conditions of the harbor vary so widely, each section along the shore of the harbor will be described separately. The map below will give the location of each community.

Morris Cove

Morris Cove was named for one of the early settlers, Thomas Morris. This strip of land is used mostly for parks and residents. The quality of the water at Morris Cove is very poor, however, there is a great deal of boating activity. Tweed New Haven Airport which is partly in New Haven and partly in East Haven is one of the dominant land users of Morris Cove.

While touring Morris Cove you will be able to visit the Pardee-Morris House which has been restored and opened to the public; The Lighthouse at Lighthouse Point Park; Raynham, home of the Townshend family; Black Rock Fort, the remains of a Revolutionary Fort, and Fort Wooster Park.

Port District

On the east shore south of the Tomlinson Bridge is the major deepwater port for both New Haven and the surrounding region. There are several active piers, wharves, and docks which handle primarily petroleum products. The New Haven Terminal owns and operates the general cargo handled at the port. Business at the New Haven Terminal has been on the rise in recent years. The results of this booming business has made this port the third busiest found in New England.

Lower Mill and Quinnipiac Rivers

This section of the harbor is bound by three bridges: The Tomlinson, Chapel Street, and Ferry Street. More than half of the area is used for industry. There are two active barge terminals used for petroleum and sulfuric acid. There is also a U. S. Steel barge dock which has been abandoned. The water of this area is quite shallow and filled with silt. Plans are being made to dredge the channel to accommodate the ships entering and departing from this point of the harbor.

Upper Mill River

The chief use of this area is for industries. The area is bound on the south by the Chapel Street Bridge and on the north by the East Rock Park. There are substantial freshwater wetlands along the Mill River. These wetlands are important to maintaining the flow of freshwater into the Mill River.

East and West Shores of the Quinnipiac River

Fair Haven and Fair Haven Heights are found along the Quinnipiac River. Both of these communities grew up

around the thriving 18th and 19th century oyster industry and the Long Island Oyster Farms still maintains docks and other facilities on the east shore of the river. More than two-thirds of the land in the area is residential. There are extensive tidal wetlands along the eastern shore. It is in this section of the harbor where you will find excellent spawning grounds for oysters. Due to the polluted waters of the harbor, the oysters have to be taken to the Long Island waters for short periods of time for purification before they can be consumed.

West Shore

The West Shore extends from the Tomlinson Bridge to City Point. Much of the land in the area was created in the 1950's for the construction of Interstate-95. There is a strip of undeveloped land running along the waterfront side of Long Wharf Drive. Remains of the Long Wharf Pier which was the center of attraction during the 19th century can be seen here.

Upper Quinnipiac River

This section of the harbor contains vast areas of undeveloped marshlands, sanitary landfill, extensive railyards, and numerous junk yards. The bulk of the land is used for residential, industry, and open space. Much of the tidal wetlands in this section are invisible to the public eye. The marshlands found here are some of the most productive in the state.

City Point

City Point grew up around the oyster industry but has since become a quiet residential neighborhood. There is an 8 foot West River channel which provides the City Point shoreline easy access to the deep water of the harbor. In this area extensive and productive intertidal flats can be found. At the mouth of the West River are state-designated tidal wetlands.

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The shallow water of the harbor was a problem 300 years ago and is still a problem today. In addition, there is a major concern of the pollution caused by the disposal of waste material by the industries found along the harbor. The quality of the water throughout the harbor has been rated by the Connecticut Department of Environmental Protection as being unsuitable for any use. The city and state are trying to come up with solutions to make the water conditions better.

There is a wealth of historical and cultural resources found throughout the harbor. Much has been done to preserve these resources but the task is a long and costly one. The future of the harbor depends greatly on the value and pride we seek of our immediate environment.

MAP: COASTAL MANAGEMENT AREA (as defined by the Conn.Coastal Management Act) Planning Districts, City of New Haven 1982

(figure available in print form)

Suggested Field Trips

New Haven Historical Society

A visit to the New Haven Historical Society will enable the students to see the original model of the Eli Whitney's cotton gin. There are also valuable prints and early American portraits. Arrangements can be made for lectures on specific subjects you deem appropriate for this unit. Call 562-4183 for further details.

Peabody Museum

A visit to the Peabody Museum of Natural History of Yale University will enable the students to examine the minerals, plant fossils, and animal fossils found in the state. There is an excellent exhibit on the Connecticut Geology in this building. Special lectures are also provided by this institute. For further information call 436-1710.

East Rock *

East Rock is one of the most attractive spots in the city of New Haven. East Rock Park is situated on an area which is over 400 acres. It is at East Rock that the students will be able to examine the traprock found in the area. The students will also be able to see the Mill River, one of the tributaries of the harbor.

West Rock *

As you approach the area of the West Rock there is exposure of traprock which has changed from a bluish gray to a rusty coloring due to weathering. The students will be able to note the sharp breaks in the angle of the slope which marks the base of the traprock.

Mill Rock *

This ridge is formed of Triassic sandstone veneered with only a few feet of soil, which is for the most part boulder clay or till deposited by the melting glacier. Nearly all of the rocks found here are of trap or sandstone, which is a characteristic of the Connecticut Valley Lowland.

Ride Through the Harbor

Guided tours to ride on the sloop around the harbor will enable the students to view East Rock, The Lighthouse, parts of the city of New Haven, and other interested points as a navigator. For further information call 865-1737.

* For further information on walks of East Rock, West Rock, and Mill Rock contact New Haven Parks and Recreation—787-8027.

Sample Lesson

The Connecticut Valley

Objectives The students will be able to:

1. Discuss faulting and note what effect this type of movement has on the surface of the earth.
2. Identify the divisions of the state of Connecticut and locate the city of New Haven.

Vocabulary *fault, uplift, outcrop, pressure, sediment, valley, and erosion*

Materials Needed:.

U. S. map, outline map of the state of Connecticut, pencil, and crayolas.

Procedures Introduce the state of Connecticut and have the students locate the area on the U. S. map. Discuss the periods of the earth's history and point out the Mesozoic Era focusing attention on the three periods, especially the Triassic Period.

Explain the Triassic Fault and what happened to the state as a result of this break. (Have the students draw the divisions of the state on their map outline and label them.)

Questions for Discussion

1. In what part of the United States is Connecticut found?
2. What chain of mountain is located on the east coast?
3. How can these mountains affect us?
4. What is a valley and how are they formed?

Related Activities

1. The students can make a model of the state showing their distinctive divisions.
2. The students can write creative stories describing what the area would have been like if the fault had not occurred.

Field Trips Contact the local Parks and Recreation Department and arrange for a speaker to come in to talk with the students. Also arrange a walk of East Rock Park or West Rock Park.

Sample Lesson

The Story of Rocks

Objectives The students will be able to:

1. Identify the three groups of rocks found on the earth.
2. Identify some of the kinds of rocks found in each group.
3. Identify some of the common rocks found in New Haven and its neighboring towns.

Vocabulary sediments, metamorphic, igneous, sedimentary, and pressure

Material Needed Paper, pencil, outline map of New Haven or the state of Connecticut, and crayolas.

Procedures Introduce the terms geology and geologist. Discuss rocks and the two most common minerals, feldspar and quartz, that are found in most rocks. Discuss sedimentary, igneous, and metamorphic rocks. Point out that sedimentary and igneous rocks are the most common kind found in the New Haven area. (The students can use their outline maps to show where the kinds of rocks are found.)

Questions for Discussion

1. How are sedimentary, igneous, and metamorphic rocks formed?
2. What are the characteristics of identifying rocks?
3. How are rocks useful to man?

Related Activities

1. Have the students use references to find out how rocks change from one kind to another. Ex. Limestone under pressure changes to marble.
2. Make a chart of some common rocks and give their qualities: color, weight, composition, hardness, texture, and use.
3. Make a display of the rocks found in their area.

Field Trips Arrange a field trip to the Peabody Museum for a lecture on rocks found in the area of New Haven and to see the exhibit they have there.

Sample Lesson

Water Pollution

Objectives The students will be able to:

1. Discuss how our waters are polluted.
2. Explain and suggest ways to prevent water pollution.

Vocabulary Natural resource, spills, recycle, dumps, waste, ecology, and conservation

Materials Needed Map of New Haven or Map of Connecticut, paper, and pencil

Procedures Ask the students what do they do to save time and energy?

Introduce the words conservation and natural resources.

Discuss what the city and state are doing to reduce the amount of pollution in the area. Find Long Wharf on the map. Have the students tell what experiences they have had which are associated with this landmark. (This should open the discussion of the odor found in the area and what causes it.)

Questions for Discussion

1. Why is it necessary to keep things clean?
2. Why does waste material have to be disposed of properly?
3. Why does Long Wharf area smell?
4. How does the Bottle Bill help to stop pollution?

Related Activities

1. The students can find out how the community disposes of waste materials.
2. Make a display of newspaper articles which relate to conservation and ecology.
3. Make a bulletin board display of the natural resources and their uses found in the area.

Field Trip Arrange for a tour of the New Haven Harbor on the Carter to note the effects of pollution there as well as to view the city of New Haven and other interested sites along the shore.

Sample Lesson

Our Changing Harbor

Objectives The students will be able to:

1. Tell how the harbor has been filled to provide more land space.
2. Identify the channels of the harbor.
3. Tell how wide and deep the channels have been dredged in recent years.

Vocabulary dredge, surficial, channel, geology, and navigation

Materials Needed Surficial geology map of New Haven, outline map and a navigational chart of the harbor, pencil, and crayolas.

Procedures Ask the students what happens if their drainpipes become clogged or if the gutters around their house are not cleaned out periodically? Have the students locate and label the channels of the harbor. Compare how the harbor has changed through the years. Discuss how the land area near the harbor has increased. Discuss the purposes of the changes in size. (Ex. To construct I-95, industries along the shore, etc.). Use the navigational chart to show where dredging has taken place. Have the students identify the points where some of the buildings have been constructed due to added land space.

Questions for Discussion

1. How wide was the harbor in 1900? 1950? 1983?
2. Why is it necessary to dredge the channels of the harbor?
3. Should industries be constructed near water? Why or Why not?

Related Activities

1. Collect and display articles related to improved plannings for the city and the harbor.
2. Have a mock meeting of the Planning Committee to discuss their readings.

Field Trip A trip to Lighthouse Park will enable the students to get a good view of the outer and inner harbor.

Glossary

bedrock—the solid rock underlying the looser material of the earth’s surface.

blockade—a blocking of a place by military means to control who or what goes into or out of it.

breakwater—a wall or barrier built to break the force of waves.

competitor—a person or group who competes to gain control of something.

conservation—the preservation of natural resources for economical use, specifically the preservation of forests, fisheries, harbors, etc.

decompose—to decay or rot; putrefy

dredge—an appliance for bringing up mud, silt, etc.; to clear or widen.

dumps—a dumping ground; especially, a place where city refuse is dumped.

ecology—that which deals with the relation of living things to their environment and to each other.

elevation—the act of raising or lifting.

erode—to wear down by the actions of the wind, water, and other agencies.

estuary—the wide mouth of a river where it is met and invaded by the sea especially in coastal depressions.

exposure—the portion of a rock mass exposed to view.

fault—a displacement or break in the continuity of rock masses, caused by disturbances of the earth’s crust and resulting in many surface features.

fissure—a long narrow opening; split; crack.

geography—the science that describes the surface of the earth and its associated characteristics.

geology—the science that deals with the earth s crust, the layers of which it is composed, and their history.

glacier—a field of ice, formed in regions of perennial frost from compacted snow.
incline—to slop; slant.
intrude—to cause to enter.
intrusive—formed by solidification before reaching the surface of the earth.
outcrop—the exposure at or above the surface of the ground.
pressure—any force which acts against an opposing force.
prosperous—successful, flourishing.
ravines—deep gorge or gully especially one worn by a stream or flow of water.
recycle—to process or treat something in order that it may be used again.
sediments—fragmentary material deposited by water or air.
spills—to allow or cause to fall or run out or over as a liquid or a powder.
uplift—an upheaval; to lift up; to raise aloft; elevate.
valley—a depression of the earth’s surface; land between mountains, hills, or highlands.
waste—cast aside as worthless as of no practical value; used; worn out; discarded.
weathering—to discolor or crumble resulting from exposure to the weather.

Notes

1. Floyd Shumway and Richard Hegel. *New Haven An Illustrated History* . Windsor Publications. United States. 1981. p. 63.
2. *New Haven Harbor Connecticut* . U. S. Engineer Office. Providence, Rhode Island. January 1939. p. 1.
3. Ibid. p. 1.
4. Ibid. p. 10.
5. Ibid. p. 11.
6. *An Economic and Engineering Survey of all Navigable Waters in the State for Connecticut* . Port Survey Commission. Parsons, Brinckerhoff, Hogan, and MacDonald, Engineers. September 1946. p. 61.
7. Ibid. p. 62.
8. Ibid. p. 62.
9. Shumway. p. 12.
10. Albert E. Van Dusen. *Connecticut* . Random House. New York. 1961. p. 74.
11. Charles F. Adams and R. G. Osterweis. *The Rise and Fall of New Haven Port 1784-1814* . January 1972. p. 51.
12. Rollin G. Osterweis. *Three Centuries of New Haven 1638-1938* . Yale University Press. New Haven. 1953. p. 246.
13. Van Dusen. p. 323.
14. Ibid. p. 25.
15. Chester R. Longwell. *Walks and Rides in Central Connecticut and Massachusetts* . Tuttle, Morehouse, and Taylor Company. New Haven. 1932. p. 76.
16. Ibid. p. 77.
17. Van Duesen. p. 30.
18. Ibid. p. 31.
19. Ibid. p. 31.

Suggested Readings for Students

Carpenter, Allen. *The New Enchantment of America, Connecticut* . Children's Press. Chicago. 1979.

This book discusses the history, natural resources, and famous citizens of the Constitution State and describes a number of places to visit.

Fradin, Dennis B. *Connecticut in Words and Pictures* . Children's Press. Chicago. 1980.

This book gives a brief introduction to the history, geography, and places of interest.

Fenton, Carroll Lane and Mildred Adams Fenton. *Riches From the Earth* . John Day Company. New York. 1953.

This book tells of the rare and everyday riches that come from rocks in the earth. It tells what they look like and where they are found.

Goldreich, Gloria and Esther. *What Can She Be? A Geologist* . Lothrop, Lee, and Shepard Co. New York. 1976.

This book introduces aspects of a career in geology using descriptions of the activities of a female field geologist and professor.

Humphreville, Frances T. and Albert E. Van Dusen. *This is Connecticut* . The L. W. Singer Co. Chicago. 1963.

This book gives a historical survey of the land and its people from 1614-1960.

Johnston, Johanna. *The Connecticut Colony* . Crowell-Collier Press. London. 1969.

This book describes the early explorations of Connecticut by the English and the Dutch. It also tells of the gradual building of towns, the wars, and the life of the early settlers.

Reed, W. Maxwell. *The Earth for Sam* . Harcourt, Brace and World, Inc. New York. 1960.

This is the story of the earth from the beginning of life to the beginning of history.

Bibliography

Adams, Charles F. and R. G. Osterweis. *The Rise and Fall of New Haven Port 1784-1814* . Jan. 1972.

This is a report which gives an account of the activities which contributed to the triumphs of the harbor and the misfortunes it encountered causing a decline in the profits of this great port.

Bixby, William. *Connecticut A New Guide* . Charles Scribner's and Sons. New York. 1974.

This is an up-to-date guide of Connecticut. The book tells what you can see and do in every part of the state. It also describes places of interest and explains the history behind each one.

Longwell, Chester R. *Walks and Rides in Central Connecticut and Massachusetts* . Tuttle, Morehouse and

Taylor Co. New Haven. 1932.

This book describes the sites which can be toured in New Haven and its neighboring towns. It also gives a very good description of the land formations and traces its composition to the period of origin.

Osterweis, Rollins G. *Three Centuries of New Haven 1638-1938* . Yale University Press. New Haven. 1953.

This book recalls the activities which surrounds the New Haven Colony, its union with the Connecticut Colony, and its involvement during the revolutionary period. It also explains the growth of New Haven from 1784-1938.

Parsons, Brinckerhoff, Hogan, and MacDonald, Engineers. *An Economic and Engineering Survey of All Navigable Waters In The State of Connecticut* . Port Survey Commission. September 1946.

This report is a survey of all navigable waters within the territorial limits of the state of Connecticut. This report gives a description of the physical features of all the ports, harbors, and coves in the state.

Shyway, Floyd and Richard Hegel ed. *New Haven An Illustrated History* . Windsor Publication. U.S.A. 1981.

This book is the compiled works of eight of New Haven's most distinguished historians. It gives an authoritative illustration of the city of New Haven.

Van Dusen, Albert E. *Connecticut* . Random House. New York. 1961.

This is one of the few books about Connecticut which gives an informative account of the state's history from the seventeenth century to 1960.

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