   

Photos Courtesy of the Sable Points Lighthouse Keepers Association

Lake Michigan Lighthouses

Lesson plan prepared and provided by the Education Committee of the
Sable Points Lighthouse Keepers Association (SPLKA)

Notes:

- While written for fourth-grade implementation, this lesson plan could be modified – or used in full – at other grade levels.
- The lesson can be implemented as described here, with little or no modification, or customized to focus on lighthouses found in a specific portion of the state or to further emphasize one or more components of the lesson.
- This lesson would require multiple class sessions to complete.

Content Areas:
Science
Social Studies
Language Arts

Lesson Title:
Lake Michigan Lighthouses: Styles, Settings, and Unique Features

Objectives:
After completing this lesson, the students will be able to:

- Explain the geological processes that formed the Great Lakes and the various shoreline configurations of Lake Michigan.
- Explain the importance of the Great Lakes to transportation, migration, and trade.
- Explain the dangers faced by shipping vessels on the Great Lakes, especially those that sailed the lakes in the mid-to-late Nineteenth Century and early Twentieth Century, and the role of lighthouses in preventing maritime disasters.
- Explain the factors that affect the effectiveness of lighthouse beams in penetrating out into the Great Lakes.
- Research and identify the location, design, and interesting features of specific Lake Michigan lighthouses.
- Drawing from research found on the Internet, write a well-organized, informative essay on a lighthouse of choice.

MI Content Standards:
Science: 4-ESS2-1, 4-ESS2-2, 4-ESS3-2 (Earth's Systems: Processes that Shape the Earth); 3-5-ETS1-1, 3-5-ETS1-2 (Engineering Design)
Social Studies: 4 – H3.0.1, 4 – H3.0.4 (History); 4 – G1.0.1, 4 – G1.0.3, 4 – G2.0.2, 4 – G4.0.1, 4 – G4.0.3 (Geography)
Reading Standards for Informational Text for Grade 4 Students (see 1, 3, 7, 9 and 10)
Writing Standards for Grade 4 Students (see 1, 2, 4, 5, 6, 7 and 10)
Standard 10: Range, Quality, Complexity of Student Reading K-5
Range of Text Types for K-5: Literary Nonfiction and Historical, Scientific, and Technical Texts

Materials:
Classroom computer with projection capability, student access to the Internet and writing technology

Activities:
- Provide an overview of the geological events that created the Great Lakes, emphasizing variations in lakeshores
- Discuss the importance of the Great Lakes for transportation, immigration, shipping and trade
- Discuss the various vessels that sailed the Great Lakes during the time when most lighthouses were built and the dangers the lakes presented to these vessels
- Explain the factors that affect penetration of lighthouse beams out into the lakes
- Discuss the various styles of lighthouses found on the Great Lakes and the relationship between lighthouse style and shoreline setting
- Assign Lake Michigan Lighthouses Internet Scavenger Hunts #1 and #2 to individuals or small groups, score and discuss (see enclosed summary table for teacher reference)
- Assign research and written essay on a Lake Michigan lighthouse (location, need, style and connection to setting, brief history, interesting features)

Assessment:
- Participation in individual/small-group research
- Participation in discussion
- Research and essay writing

Writing Assignment: Conduct Internet research on a Lake Michigan lighthouse of choice. Based upon information from at least two websites, write a well-organized, informative essay that addresses the following:
- The location, setting, and corresponding style of the lighthouse
- The history of the lighthouse
- Features of the lighthouse and its history that you find especially interesting

Optional additional element for the assignment: Print off a map of Lake Michigan lighthouses (for example, see: https://www.miplace.org/4a7298/globalassets/documents/shpo/programs-and-services/michigan-lighthouse-assistance-program/2020-lighthouse-map-web.pdf) and ask each member of the class to "claim" a different lighthouse for the required essay and, if you choose, a brief presentation to the class. After writing their essays, each member of the class presents a brief (e.g., five minutes) overview of her/his chosen lighthouse to the class, drawing from at least two visual aids (e.g., photos, video clips, maps, drawings) projected on the classroom screen.

Lesson Content

The Great Lakes have been home to 379 lighthouses, 102 of which are found on Lake Michigan. The state of Michigan borders on the three largest Great Lakes. Michigan is home to over 140 lighthouses,

more than any other state; 42 of these historic structures are located on the Lake Michigan shoreline. Michigan's lighthouses vary in structure and design, depending largely on their location and the nature of the shoreline on which they reside.

Formation of the Great Lakes

A billion years ago, volcanic activity formed a fracture that developed in two forks from the current Lake Superior to the location of the current states of Alabama and Oklahoma. Over the next 20 million years, lava intermittently flowed from the fracture, creating mountains that covered areas now known as northern Wisconsin and Minnesota and eastern Canada that eroded over time. As volcanic activity continued over time, molten magma formed an enormous rock basin that eventually would hold Lake Superior.

The volcanic activity that formed the region was replaced by glaciers, thousands of feet thick in some places, about 14,000 years ago. The ice sheets that flowed over the land leveled mountains and created enormous valleys. In the north, where hard bedrock predominated, only the overlaying layers were removed; the softer shales and sandstone in the south were more significantly affected. The glaciers melted and began receding about 10,000 years ago; they left behind high ridges, between which huge lakes were left behind.

In the northern Great Lakes, the rock was resistant enough to leave rocky shorelines ringed by cliffs. The Bruce Peninsula, across Lake Huron from Alpena, MI, features rugged rocky cliffs and cobble beaches; however, sand beaches and dunes line the indented and protected shoreline on the opposite side of Lake Huron. On the other side of Michigan, the eastern shore of Lake Michigan has some of the finest sandy beaches in the world. The Great Lakes also contain an estimated 35,000 islands.

Importance of the Great Lakes

The Great Lakes contain 20% of the world's surface fresh water. All the lakes' basins are linked, forming a continuous drainage basin, and a series of lakes, rivers, and waterways connect them to the Atlantic Ocean. As a result, the Great Lakes have been a center for migration, transportation, fishing, and trade for thousands of years.

The Iroquois Nation were among the first settlers of the Great Lakes, followed by European explorers. The earliest trade was for fur; eventually, a bustling shipping industry, which reached its height by the late 1800's and early 1900's, moved grain, livestock, iron, coal, lumber, cement, stone, fish, salt, and even Christmas trees throughout the lakes.

Vessels, Dangers, and Lighthouses

For a very long time, the enormous size of the Great Lakes has presented the captains of trading vessels with both opportunities and dangers. With nearly 9,500 miles of coastline, the lakes have enabled shipping to play a significant role in the economics of the Great Lakes region. For example, some of the nation's largest grain-shipping ports are located on the Great Lakes. Also, the iron ranges near Lake Superior have been the primary source of ore for North America's iron and steel production for more than a century.

Some Lake Michigan ports are located in protected bays, while others are situated near rocky shoals, at the mouths of rivers, or in narrow channels. To reach these ports, vessels often must sail along shorelines whose depth can change dramatically, and vessels often seek shelter in the ports during the violent storms that can suddenly develop on the Lakes. Storms that cross the Great Lakes arise when two air masses collide. As the wind blows across the surface of the lakes, energy is transferred from the wind to the surface of the water, causing currents and waves. Storms can arise unexpectedly, and the

resulting waves can be enormous. Ice can also create dangerous conditions, especially if a ship captain miscalculates the depth or firmness of the ice.

Dangers like these have caused over 6,000 shipwrecks in the Great Lakes, with a loss of over 30,000 lives. As a result, some 379 lighthouses have been built at strategic locations to guide Great Lakes mariners, and over 200 of these beacons are still active. Most of the lighthouses were built in the mid-to-late 1800's, when wooden schooners and early steamships were especially susceptible to the dangerous conditions on the lakes (for example, see: https://www.maritimehistoryofthegreatlakes.ca/documents/hgl/default.asp?ID=c023).

For a lighthouse to be effective in alerting sailors to dangers, its beam must be visible for a considerable distance out onto the lake; this distance is limited by the curvature of the earth and by the elevation of the lighthouse. So, to be effective, a lighthouse on a high cliff or bluff would not need to be as tall as a lighthouse on the shoreline. Also, a lighthouse is visible farther out on the lake from the deck of a ship than from the surface of the water. For example, a 60-foot-tall structure is visible from a distance of 11 miles, or 16 miles on the deck of a ship; a 90-foot-tall structure is visible from a distance of 12 ½ miles, or 17 ½ miles on the deck of a ship; and a 110-foot-tall structure is visible from a distance of 14 miles, or 19 miles on the deck of a ship.

Great Lakes lighthouses are located along sandy shorelines (e.g., Little Sable Point Lighthouse: https://www.lighthousefriends.com/light.asp?ID=193), on rocky cliffs (e.g., Split Rock Lighthouse: https://northshorevisitor.com/attractions/state-parks/split-rock-lighthouse/), at the ends of long piers (e.g., Grand Haven Lighthouse: https://www.lighthousefriends.com/light.asp?ID=189), on rock reefs or rocky shoals (e.g., Port Austin Light: https://portaustinarea.com/port-austin-reef-light), at river mouths (e.g., Cheboygan River Front Range Lighthouse: https://www.lighthousefriends.com/light.asp?ID=216), on islands (e.g., Grand Island North Lighthouse: https://marinas.com/view/lighthouse/lraewp_Grand_Island_North_Channel_Light_Lighthouse_Munising_MI_United_States, and on points of land (e.g., Whitefish Point Light Station: https://www.michigan.org/property/great-lakes-shipwreck-museum-whitefish-point-light-station).

A person standing anywhere in Michigan is within 85 miles of one of the Great Lakes. Michigan has over 3,200 miles of shoreline, more than any other state except Alaska, and the most freshwater shoreline in the world; over 140 lighthouses, more than any other state, have been built along its shores.

Michigan lighthouse dwellings and towers were designed in a variety of styles. While some lighthouses were designed with their own individual styles, others fell within one of several style categories:
Schoolhouse: Sand Point Lighthouse - https://www.us-lighthouses.com/sand-point-lighthouse
Norman Gothic: White River Light Station - https://www.splka.org/whiteriver.html
Conical: Tawas Point Lighthouse - https://www.lighthousefriends.com/light.asp?ID=175
Skeletal: Whitefish Point Light Station - https://stignace.com/attractions/great-lakes-shipwreck-museum-whitefish-point-light-station/
Pyramidal: Manistique East Breakwater Lighthouse - https://www.us-lighthouses.com/manistique-east-breakwater-lighthouse
Square: Forty Mile Point Lighthouse - https://40milepointlighthouse.org/
Round: Point Betsie Lighthouse - https://www.us-lighthouses.com/point-betsie-lighthouse
Even *"sparkplug"* style: Harbor Beach Lighthouse - https://www.us-lighthouses.com/harbor-beach-lighthouse

For context, project the map of Michigan Lighthouses: https://www.miplace.org/4a1b40/globalassets/documents/shpo/programs-and-services/michigan-lighthouse-assistance-program/2020-lighthouse-map-web.pdf

Scroll through the list of Lake Michigan lighthouses. Ask students if they have visited any of them; do an Internet search of lighthouses noted and project photos. Ask students if they are interested in any of the other Lake Michigan lighthouses; search and project photos of these.

Additional resource: Although portions are quite technical in nature, you might consider showing and discussing all or parts of the National Geographic Channel's documentary *Drain the Great Lakes*: https://www.youtube.com/watch?v=VAo4qvP6o2E

References

Environmental Education for Kids: https://www.eekwi.org/great-lakes/great-lakes-formation-and-physical-features/how-were-great-lakes-formed
U.S. Army Corps of Engineers: https://www.lre.usace.army.mil/Missions/Great-Lakes-Information/Coastal-Program/Coastal-Processes/
Wisconsin Sea Grant: https://www.seagrant.wisc.edu/resources/the-formation-of-the-great-lakes/how-they-were-made/
Awesome Mitten: https://www.awesomemitten.com/how-the-great-lakes-were-formed/
EOS – Science News by Advancing Earth and Space Science: https://eos.org/articles/long-live-the-laurentian-great-lakes
Maritime History of the Great Lakes: https://www.maritimehistoryofthegreatlakes.ca/documents/hgl/default.asp?ID=c023
Bruce Peninsula Biosphere Association: http://www.bpba.ca/bpcsp/uploads/CH3Shore140518.pdf
Minnesota Historical Society: https://www.mnhs.org/places/nationalregister/shipwrecks/mpdf/craft.php
A Century of Light – Captain Edward Hermann: http://www.lighthousediscovery.com/Sailing%20the%20gl.html
Great Lakes Shipwreck Museum: https://www.shipwreckmuseum.com/underwater-research/shipwrecks/
Michigan Economic Development Corporation: https://www.miplace.org/4a7298/globalassets/documents/shpo/programs-and-services/michigan-lighthouse-assistance-program/2020-lighthouse-map-web.pdf
Seeing the Light (Terry Pepper): http://www.terrypepper.com/lights/lists/visibility.htm

Selected Lake Michigan Lighthouses

Name, Date	Location	Setting	Style	Notes
McGulpin Point 1869	3 mi. west of Mackinaw City	Wooded shoreline	Norman Gothic-style dwelling, octagonal brick tower	Was determined to be ineffective, replaced by lights on Mackinac Bridge
White Shoal 1910	20 mi. west of Mackinac Bridge	On offshore reef	Conical steel and concrete tower	Marks dangerous shallow shoal; only "candy cane" striped lighthouse on the Great Lakes, 121 ft. tall; original Second-Order Fresnel lens on display at Whitefish Point

				Shipwreck Museum
Beaver Island 1858	South end of Beaver Island, largest island in Lake Michigan	Located on a bluff on the southern end of the island	Dwelling, conical brick tower	Environmental education center for Charlevoix Public Schools
St. Helena Island 1873	St. Helena Island, 6 mi. west of Mackinac Bridge	Flat, grassy island shoreline	Dwelling, conical brick tower	Much restoration done annually by Boy Scout Troop 4 from Ann Arbor
Grand Traverse 1853	Cat's Head Point at Leelanau State Park, entrance to Grand Traverse Bay	Grassy wooded shoreline	Schoolhouse-style brick dwelling, integral square roof-mounted lantern	Museum contains original fourth-order Fresnel lens
South Manitou Island 1871	East shore of Manitou Island, to the south of the harbor	Rocky island shoreline	Dwelling, brick conical tower	Marks the narrow Manitou Passage, one of the most dangerous in the Great Lakes
Point Betsie 1858	5 mi. north of Frankfort, marks key turning point for ships entering or exiting Manitou Passage	Sandy shoreline	Dwelling, round brick tower	Museum, several Coast Guard buildings, elaborate breakwaters to contain erosion
Big Sable Point 1867	1.5 mi. north of Ludington State Park campground	Beach, sand dunes	Dwelling, steel-plated conical tower	Navigational aid to guide ships sailing along coast; plates cover original deteriorating bricks
Ludington North Breakwater 1924	Ludington harbor	Pierhead, at the end of 1,700-foot breakwater; arrowhead breakwaters protect the harbor	Pyramidal steel and concrete tower	Marks entrance to Ludington harbor; unique shape of base deflects strong waves; Fresnel lens made in Pittsburgh, PA; tilts at 4-degree angle
Little Sable Point 1874	In Silver Lake State Park	Beach, sand dunes	Conical brick tower	One of oldest brick lighthouses on the Great Lakes; marks southernmost of three "bumps" of land on eastern shore of Lake Michigan; Third-

				Order Fresnel lens still in place
White River Light Station 1875	Mouth of White Lake, just west of Whitehall	On peninsula separating Lake Michigan from White Lake	Limestone Norman Gothic-style dwelling and octagonal brick tower	Guided ships into White River; museum; several original buildings on site
Grand Haven 1895	In Grand Haven State Park	On pier at entrance to the Grand River	Two red structures several hundred feet apart, connected by catwalk– iron conical tower (inner) and streel-plated square/integral wooden building (outer)	Marks one of Michigan's best deep-water harbors; one of Michigan's most striking pier lighthouses
Holland 1936	In Holland State Park	At the end of the south inner pier	Schoolhouse-style, square/integral tower	Marks channel into Black Lake; nicknamed "Big Red"; one of most photographed lighthouses in Michigan
St. Joseph 1907	Mouth of the St. Joseph River	On north pier	Two white cast iron lights several hundred feet apart, connected by a catwalk; conical tower (outer) and octagonal/integral building (inner)	Marks entrance to St. Joseph River channel; original light (1832) was one of earliest lighthouses on Lake Michigan; considered one of most beautiful structures on the Great Lakes
Menominee North Pier 1877	Marks entrance to the Menominee River, across which lies Wisconsin	On end of north pier	Bright red octagonal cast iron tower	Previous fog signal building and catwalk have been removed
Sand Point 1868	At Escanaba in Ludington Park	On harbor waterfront	Schoolhouse-style dwelling/integral brick tower	Somehow built backwards, with the tower facing the town instead of the water; original building still stands despite disastrous fire in 1886; fully

				restored in 1990's; museum
Manistique East Breakwater 1915	Marks the port of Manistique at the entrance to the Manistique River	On end of breakwater	Bright red cast iron pyramidal tower	Not far from shore and a park at the shore end of the breakwater
Seul Choix Point 1895	About 16 mi. east of Manistique	Wooded shoreline	Dwelling, conical white brick tower	Only active site of a once-thriving fishing community; all original outbuildings still standing; marks a dangerous limestone shoal extending 100 yds. from shore; museum

Lake Michigan Lighthouses Internet Scavenger Hunt #1

Directions: Using information found in Internet searches, match each Lake Michigan lighthouse with its corresponding description.

_____ 1. The only "candy cane" striped lighthouse on the Great Lakes

_____ 2. Now serves as an environmental education center for the Charlevoix Public Schools

_____ 3. Withstood disastrous fine in 1886

_____ 4. Steel plates protect original deteriorating bricks.

_____ 5. Replaced by lights on the Mackinac Bridge

_____ 6. Two red structures on a catwalk several hundred feet apart

_____ 7. "Big Red"

_____ 8. Original light (1832) was one of the earliest lighthouses on Lake Michigan

_____ 9. Unique shape is designed to deflect strong waves

A. Big Sable Point

B. Grand Haven

C. Holland

D. McGulpin Point

E. Beaver Island

F. St. Joseph

G. White Shoal

H. Ludington North Breakwater

I. Sand Point

Answer Key:
1. G
2. E
3. I
4. A
5. D
6. B

7. C
8. F
9. H

Lake Michigan Lighthouses Internet Scavenger Hunt #2

Directions: Using information found in Internet searches, match each Lake Michigan lighthouse with its corresponding description.

_____ 1. Bright red cast iron pyramidal tower

_____ 2. Marks a hazardous limestone shoal

_____ 3. Much of its restoration done by a Boy Schout troop

_____ 4. Marks one of the most dangerous passages in the Great Lakes

_____ 5. Its museum contains original Fourth-Order Fresnel lens

_____ 6. Site includes several original Coast Guard buildings and an elaborate breakwater for erosion control

_____ 7. Marks the southernmost of three "bumps" of land, tower still contains its original Third-Order Fresnel lens

_____ 8. At the end of a long pier, fog signal building and catwalk removed

A. Grand Traverse

B. Menominee

C. Seul Choix Point

D. Manistique

E. St. Helena Island

F. Little Sable Point

G. Point Betsie

H. South Manitou Island

Answer Key:
1. D
2. C
3. E
4. H
5. A
6. G
7. F
8. B

Note to teachers: SPLKA welcomes your feedback on this lesson plan. Please send any comments and suggestions for improvement to Cherie Hockenberger at the following address: SPLKAofficemanager@gmail.com. Thanks!