

LESSON 2 Patterns in the Hawaiian Islands

Lesson at a Glance

The lesson begins with information about the age, size and location of each of the islands found in the Hawaiian archipelago. Using data provided, the students construct a bar graph showing the relationship of each island's size and age relative to its location in the chain. This information will assist the class in preparing a wall map of the Hawaiian Island chain. The students will work individually, or with a partner, to design, cutout, and label the island assigned to them. As a class, using latitude and longitude, each of the islands will be placed in its correct geographic location on the wall map.

Lesson Duration

Two 45 minute periods

Essential Question(s)

What patterns do we see when we look at the age of each island in the Hawaiian Island chain?

How can bar graph data help me see the pattern in age and size of the islands in the Hawaiian archipelago?

Key Concepts

- Island formation patterns, in terms of location and size, are related to the island's age and movement of the Pacific plate from southeast to northwest.

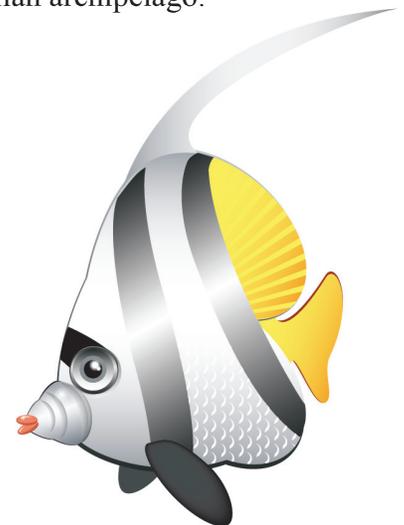
Instructional Objectives

- I *can* see patterns and relationships of age, location, and size of the different islands of the Hawaiian archipelago.
- I *can* label my axes on a bar graph and give it a suitable title.
- I *can* use knowledge I already have about longitude and latitude, graphs, and making hypotheses (good, educated guesses) to help me complete the wall map of the Hawaiian archipelago.

Related HCPSIII Benchmark(s):

Mathematics MA.4.11.2
Label the parts of a graph (e.g., axes, scale, legend, title).

Social Studies SS.4.7.2
World in Spatial Terms.
Collect, organize, and analyze data to interpret and construct geographic representations.



Assessment Tools

Benchmark Rubric:

Topic		Data Collection and Representation	
Benchmark MA.4.11.2		Label the parts of a graph (e.g., axes, scale, legend, title)	
Rubric			
Advanced	Proficient	Partially Proficient	Novice
Effectively label the parts of a graph	Sufficiently label the parts of a graph	Label the parts of a graph, with a few omissions or errors	Label the parts of a graph, with significant omissions or errors
Topic		World In Spatial Terms	
Benchmark SS.4.7.2		Collect, organize, and analyze data to interpret and construct geographic representations	
Rubric			
Advanced	Proficient	Partially Proficient	Novice
Collect, organize, and analyze data to interpret and construct geographic representations, with accuracy	Collect, organize, and analyze data to interpret and construct geographic representations, with no significant errors	Collect, organize, and analyze data to interpret and construct geographic representations, with a few significant errors	Collect, organize, and analyze data to interpret and construct geographic representations, with many significant errors

Assessment/Evidence Pieces

<p>Lesson</p> <ul style="list-style-type: none"> <i>Islands Bar Graph</i> student worksheet <p>Unit</p> <ul style="list-style-type: none"> The Island Formations portfolio maybe used to monitor student progress throughout the unit.
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Materials Needed

Teacher	Class	Group	Student
<ul style="list-style-type: none"> Overhead transparency copy of the Student Reading <i>Island Age, Size, and Location</i> Overhead transparency copy of the Student Worksheet <i>Islands Bar Graph</i> Overhead projector 	<ul style="list-style-type: none"> None 	<ul style="list-style-type: none"> None 	<ul style="list-style-type: none"> Construction paper Crayons or colored markers Scissors

Instructional Resources

Student Reading: *Island Age, Size, and Location*

Student Worksheet: *Islands Bar Graph*

Teacher Answer Key: *Islands Bar Graph*

Student Worksheet: *Island Cutouts*

Hawaiian Island Chain Wall Map (due to file size it is a separate PDF)

Student Vocabulary Words

absolute location: the exact location on the planet where something resides, or the latitude and longitude of a place.

archipelago: a group of islands in an expanse of water, with many scattered islands.

atoll: a ring-shaped coral reef or string of closely spaced small coral islands that enclose or nearly enclose a shallow lagoon.

fringing reefs: a reef that runs parallel to and is in close proximity or is directly adjacent to the shoreline.

guyot: a submerged seamount that at one time was above or in close proximity to the sea surface.

hotspot: generally localized plumes of magma that originate in the Earth's mantle and move outward through the crust; magma movement may result in volcanic eruptions.

high islands: islands that are composed of volcanic rock whose landmass is above the sea surface.

low islands: islands that are composed of coral and/or sand whose landmass is above the sea surface.

lines of latitude: numerical system of imaginary circles on Earth's surface that lie parallel to the Equator and are used to describe position north and south of the Equator; measured in increasing degrees north and south away from the Equator.

lines of longitude: numerical system of imaginary half circles on Earth's surface that lie perpendicular to the Equator and end at the poles, used to describe position east and west, measured in degrees with 0° at the Prime Meridian.

plate tectonics: geologic theory that combines the concepts of seafloor spreading and continental drift to explain the large-scale movement of the Earth's crustal plates.

relative location: the location of a place in relation to another place (*Kauai* is WNW of Oahu).

Lesson Plan

Teacher Preparation

- Review the Science Background provided in the Unit Overview.
- Review and make copies of Student Reading *Island Age, Size, and Location* and the Student Worksheet *Islands Bar Graph*, one per student.
- Make a copy of the Island Cutouts Student Worksheet, so that one cutout of each island can be added to the wall map of the archipelago. There are 18 islands to be distributed amongst students. In addition, there are 17 pages that make up the rest of the graphics needed to complete the bulletin board. There is a direction page provided with this lesson plan that explains where these materials can be found and how to assemble them.
- Make sure the blank wall map is prepared as described in Lesson 1.

I. *Patterns in the Islands*

- Have students get out their *Island Formations* science portfolio and refer to the map entitled *Map of the Main Hawaiian Islands*. Ask students: *What do you notice about their sizes as you move from east to west? What patterns do you see?* If, based on their observations and prior knowledge, students fail to respond, explain that the islands become smaller as you move northwest from the Big Island.
- Pass out the Student Reading *Island Ages, Sizes, and Locations*. Have students look at the map of the main Hawaiian Islands as you discuss the features of the Student Reading. Discuss with students the sizes in square miles of each island. Talk about which island is the oldest in the chain based on the data presented.
- Distribute the Student Worksheet *Islands Bar Graph*. Explain to the class that they must create a title for their bar graph so that when people look at it they know what information they will gather from it. Have the class give a few suggestions of appropriate titles. Have the students explain where the axes are on their bar graph and what they are labeled. Read the directions at the top of the worksheet with the class and remind them they must use the information from the Student Reading to complete the graph.

- D. Display a copy of the Student Worksheet *Islands Bar Graph* on the overhead projector as you model one example of how students will make a bar graph using the information on island age and size. Once students have finished their bar graphs ask for a volunteer to come up and complete the bar graph on the overhead projector for the remaining islands.
- E. Discuss the bar graph data. Ask students if they see any islands that were formed around the same time. (Answer: *Maui, Lānaʻi, Molokaʻi and Kahoʻolawe*) Have students compare the sizes of these four islands looking at the bar graph. What do they notice or what can they hypothesize about age and size of these islands?
- F. After the lesson is complete the bar graphs are to be placed in their learning portfolio or science notebook.

II. *Creating the Hawaiian Archipelago on Our Classroom Wall*

- A. There are 18 islands to assign. Depending on class size, some students may have to partner up. Distribute one of the *Island Cutouts* to each student, or group of students.
- B. Direct students to cut out and color their assigned island. The next step is to have students label their island with its name, the type of island (high island, pinnacle, atoll or island with fringing reef), and list the island coordinates (latitude and longitude). The coordinates for each island are located on the previous Student Reading *Island Age, Size and Location*. (NOTE: For the smaller islands, students can write the island name and coordinates directly onto the wall map or a small sheet of paper that can be affixed with their island cutout.)
- C. Have students place their island on the wall map one island at a time. Students must place their island on the wall map grid using longitude and latitude coordinates. Assist students as they come up to place their islands to ensure that they are as close as possible to the actual island locations. After they have it in the correct location have the student tell the rest of the class the name of their island and its type.
- D. By the end of this lesson, you should have an excellent wall map of the Hawaiian archipelago that can be used as a reference tool in future lessons.

III. *Student Reflection*

- A. Write the following assessment questions on the board:
 - 1) What hypothesis can you make about the island chain from studying your graph and the wall map?
 - 2) Why do you think some of the islands become smaller when you move northwest?
- B. Have students write their responses on a separate sheet of paper, and ask them to file their responses in their *Island Formations* portfolio.
- C. Students should have their labeled maps from Lesson 1, their bar graphs from this lesson, the reference maps, and their reflections in their learning portfolio or science notebooks as evidence of meeting the benchmarks at this point.

Extended Activities

Challenge students to come up with a different graphical representation of the data.



LESSON 2 Island Age, Size, and Location

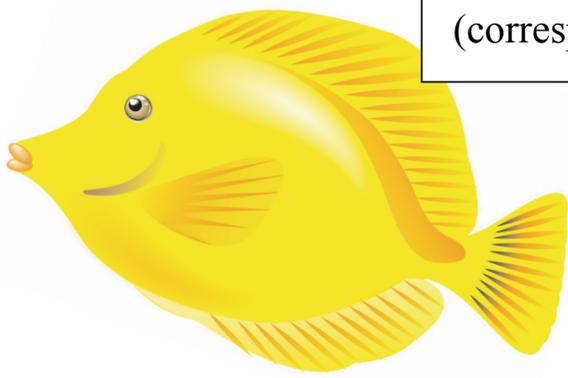
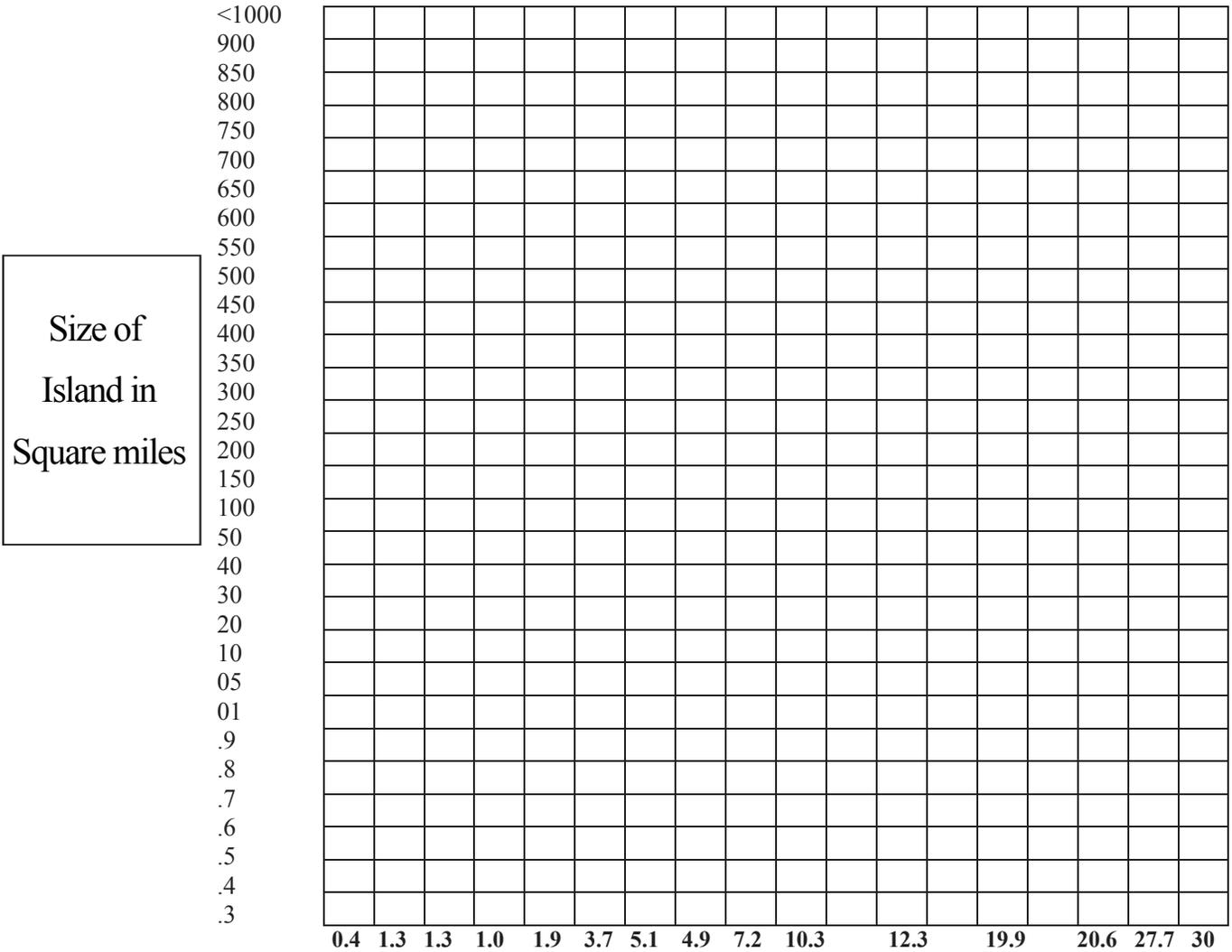
Islands in the Hawaiian Archipelago

NAME OF ISLAND	LOCATION (Longitude and Latitude)	AGE (Millions of Years)	SIZE (Square Miles of total landmass)	Distance from Kure Atoll (km)
Island of Hawai'i	19°3' N 155°3' W	0.4	4038	2544
Maui	21°N 156°7' W	1.3	727	2349
Lāna'i	20°5' N 156° 6' W	1.3	141	2394
Kaho'olaw'e	20°6' N 156°6' W	1.0	45	2393
Moloka'i	21°1' N 157° W	1.9	100	2265
O'ahu	21°3' N 157°6' W	3.7	597	2254
Kaua'i	22° N 159°3'W	5.1	553	2027
Ni'ihau	21°5' N 160°1' W	4.9	70	1979
Nihoa	23° N 161°6' W	7.2	27	1790
Necker	23°3' N 164°4' W	10.3	.00007	1508
French Frigate Shoals	23°9' N 166°3' W	13	.1	1321
Gardner Pinnacles	25°N 167°6' W	12.3	.00772	1141
Maro Reef	25°25' N 170°4' W		.00154	1102
Laysan	25°8' N 171°7' W	19.9	1.6	762
Lisianski	26°1' N 174° W	23	.61776	461
Pearl and Hermes Atoll	27°5' N 175°5' W	22	.13899	312
Midway Atoll	28°1' N 177°2' W	27.7	2.4	100
Kure Atoll	28°4' N 178°3' W	30	.30116	0

LESSON 2 Islands Bar Graph

Directions

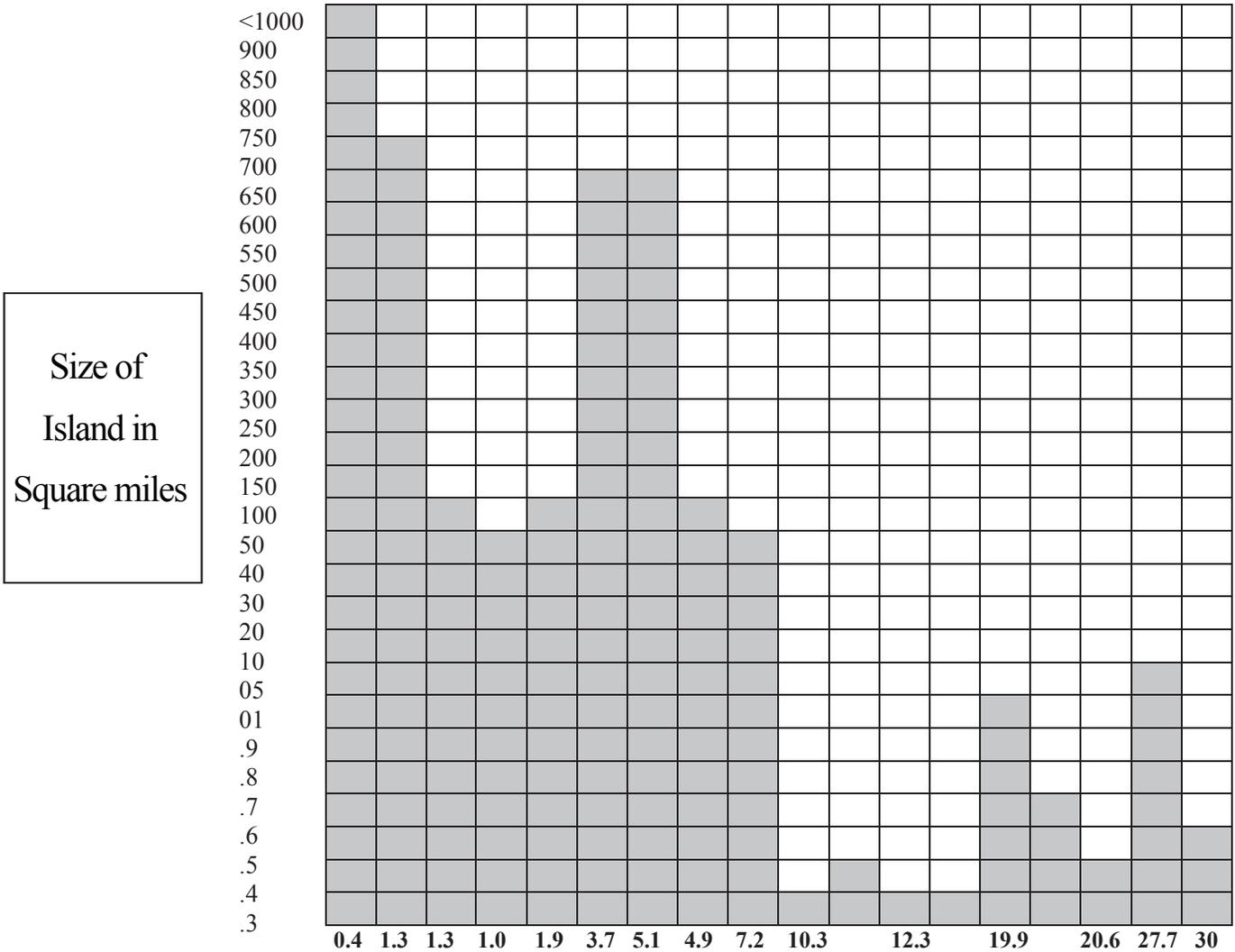
Create a title for your bar graph then using the information from the *Island Age, Size, and Location* Student Reading plot the age and the size of each island. You may round your size numbers to the nearest tenth.



Age of Island in Millions of Years
(corresponds to Island listand distance from Kure Atoll)

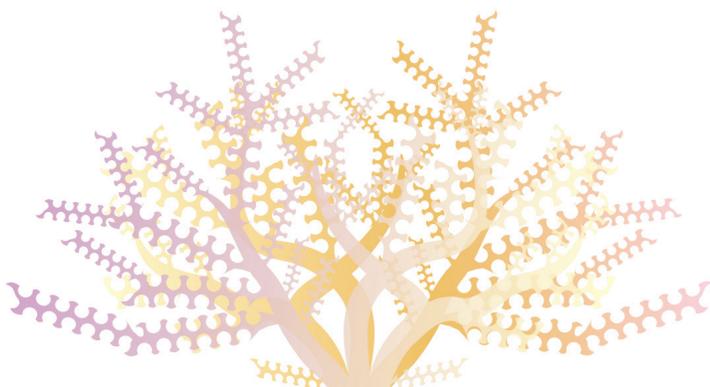
LESSON 2 Islands Bar Graph

Teacher Answer Key



Size of
Island in
Square miles

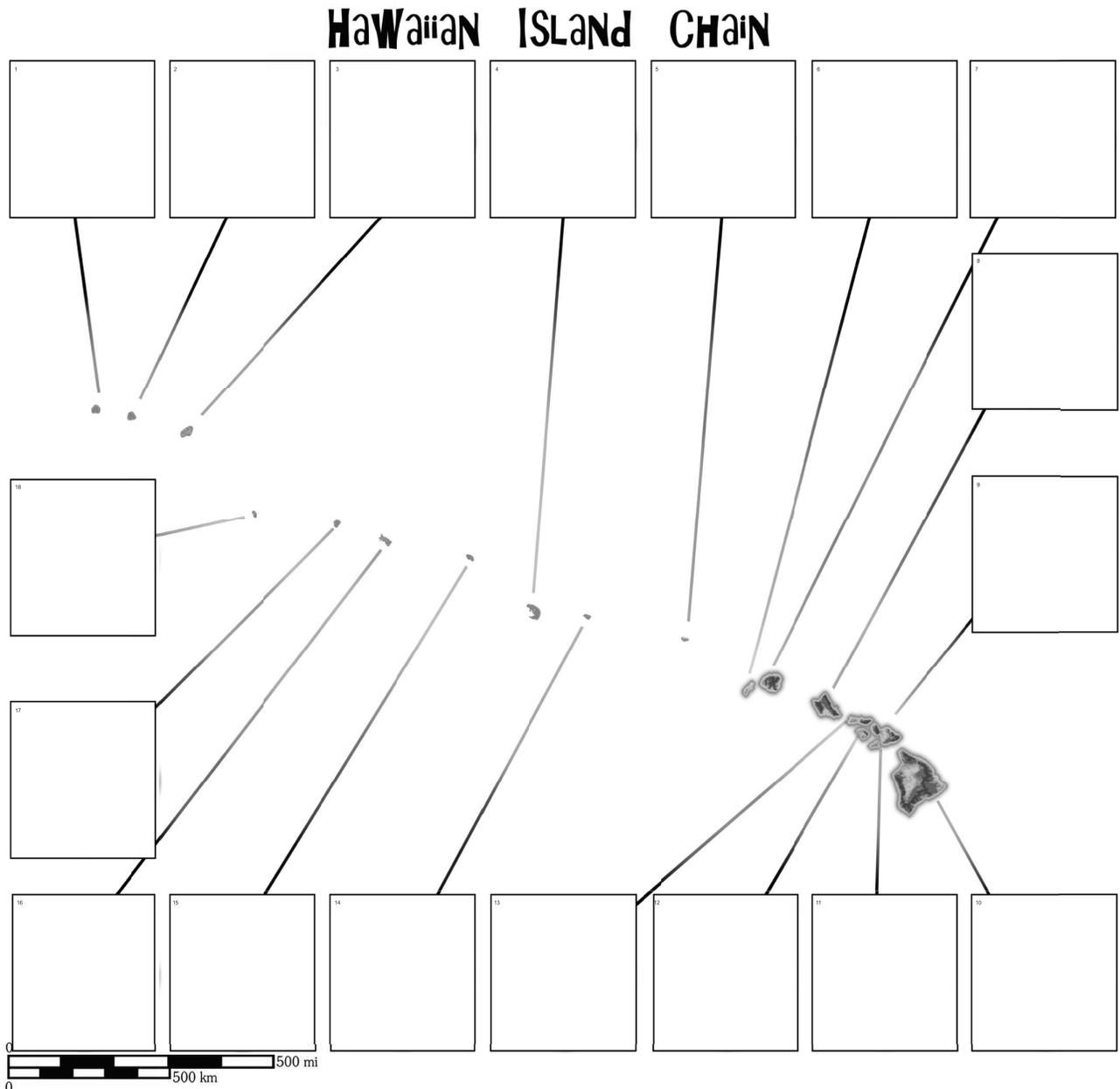
Age of Island in Millions of Years
(corresponds to Island listand distance from Kure Atoll)



LESSON 2 Island Cutouts

Directions

For this wall mount or bulletin board you will need the “Island Cutouts” and the “Hawaiian Island Chain Map.” Due to the file size of the map it has been saved along with the other materials for this unit as a PDF entitled “G4 U1 Lesson 2 Hawaiian Island Chain Wall Map.pdf.” When assembled, it should look like this:



NOTE:

The file for the map shown above is 60”x 55”, and once printed out, requires assembling. Select ‘Tile’ under print settings to print the file on multiple pages. (17 pages total)

See the PDF bookmark entitled “Island Cutouts” for the 18 island pieces, that match the squares on the map. Each separate island needs to be cut to the box border.