

Mystic Seaport for Educators
Science on the 38th Voyage of the *Charles W. Morgan*
Lesson 1 of 6: Water Transparency and Whales
Teacher Worksheet

Name: _____

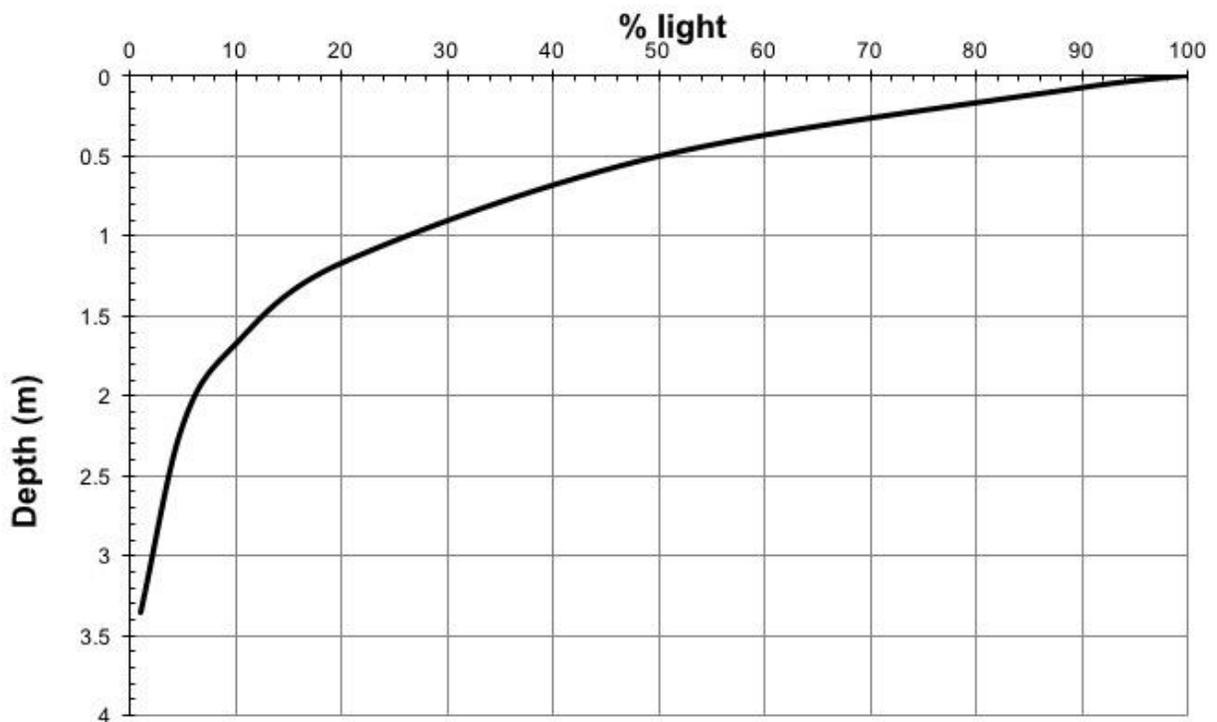
Questions:

1. After watching the video, record the observed Secchi depths and light levels in the Mystic Estuary. Write your answers in the box below:

Depth	How well can you see the Secchi disk?
0.25 meters	The disk should be very visible
0.50 meters	The disk should still be very visible
0.75 meters	The disk is slightly less visible, but still clearly seen.
1.0 meters	The disk is even less visible, but the white color still shows through the wtaer
1.25 meters	The disk should be barely visible, if at all

1.50 meters	The disk should not be visible.
-------------	---------------------------------

2. The graph below shows light level (percentage) as a function of depth (m) in the Mystic Estuary.



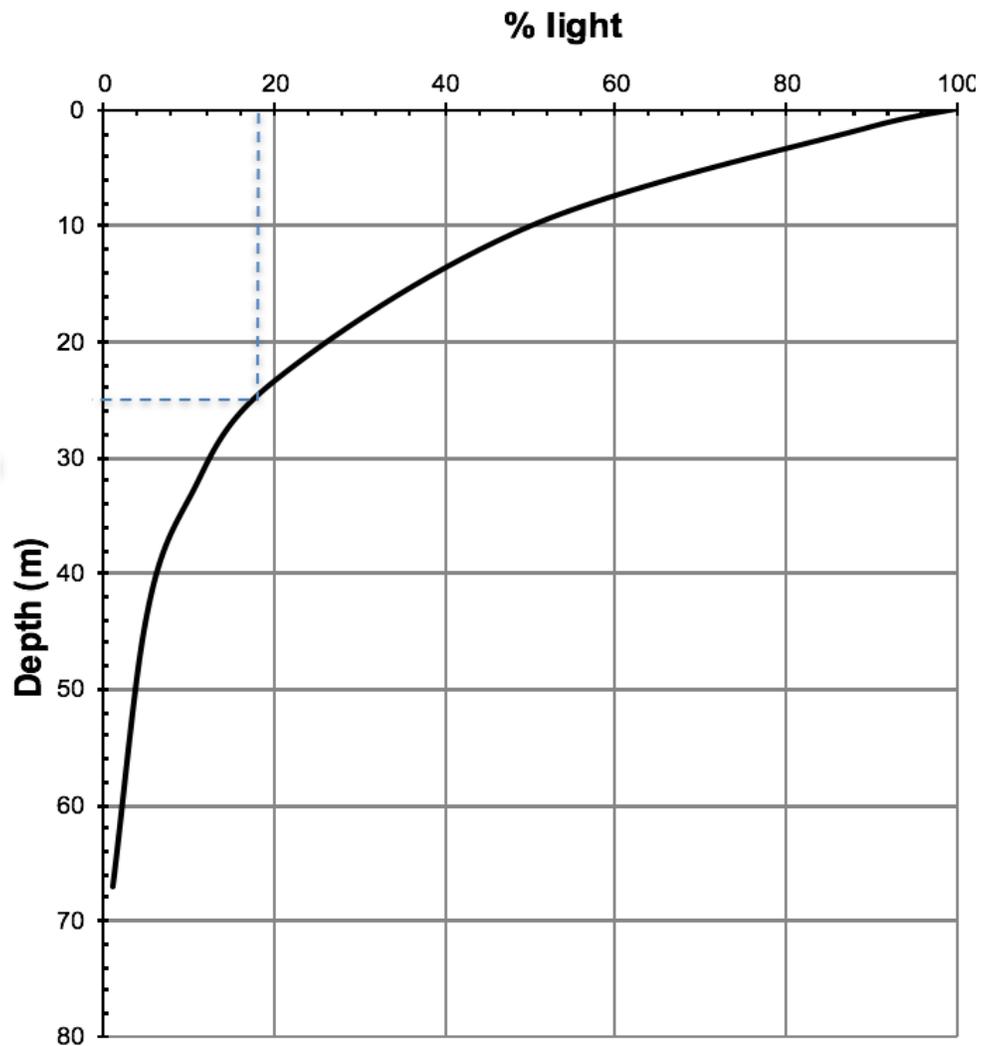
- a. Before you consider the graph above, remember your observations from the video. Based on these observations, what is the Secchi depth in the Mystic Estuary?

Students should estimate Secchi depth at around 1.25 meters (there may be a range of answers, depending on how specific the students are in their estimation; however, a correct answer will be near 1.25 meters).

- b. Does your answer above match the Secchi depth reading from the graph? Hint: The Secchi depth corresponds to the 18% light level.

Students should locate the 18% light level on the graph and find the corresponding location on the curve. It should match their observations from the video (1.25 meters).

3. The graph below shows the relationship between Secchi depth and percentage of light in a deep sea environment.



Using the graph above, find:

- Depth of 50% light level: 10 meters
- Depth of 18% light level: 25 meters
- Depth of 1% light level: 67 meters

4. Compare the above graphs of the Mystic Estuary and deep ocean.
- a. What is the Secchi depth in the deep ocean?

Students should recognize that the Secchi depth corresponds to the 18% light level, or 25 meters.

- b. Which location (Mystic Estuary or deep ocean) has a deeper Secchi depth?

Based on the graphs, the deep ocean should have a deeper Secchi depth.

- c. What are some factors that may have caused the difference in Secchi depth between the Mystic Estuary and the deep ocean?

The Mystic Estuary likely has a lower Secchi depth because of the higher turbidity, or water movement, in the shallow waters. Students may also infer that this is an area of high productivity that hosts a variety of plankton and juvenile organisms, which may contribute to lower light attenuation.

5. **Challenge Question:** The Secchi disk can also be used to determine areas where plankton, a primary food source for many whale species, are most likely to be found.
- a. Where would you be more likely to find a whale feeding? (Circle one)
- i. In open waters with a Secchi depth of 1 meter
- ii. In open waters with a Secchi depth of 10 meters

Students should circle the first option.

- b. Support your choice in part a, using your knowledge of the relationship between plankton abundance and water clarity.

This question asks students to link phytoplankton abundance to light transmission, with the understanding that higher phytoplankton abundance limits the amount of light that can pass through the water. Students should first note that low Secchi disk reading indicates low light transmission. They should then consider the potential factors that influence Secchi disk reading. Because the Secchi depth is measured in open water, sources of turbidity such as pollution or erosion are unlikely. Therefore, light transmission is probably affected by phytoplankton abundance in this area. Since the Secchi reading is low, this suggests that there is high phytoplankton abundance, and the likelihood of finding a plankton-feeding whale is relatively high in these productive waters.