

Using Drone Imagery to Measure Erosion

Erosion is a natural geologic process wherein earthen materials such as soil, sand, and rock are worn away and transported by natural forces such as wind and water. Presque Isle State Park has experienced erosive forces since it's formation 23,000 years ago.

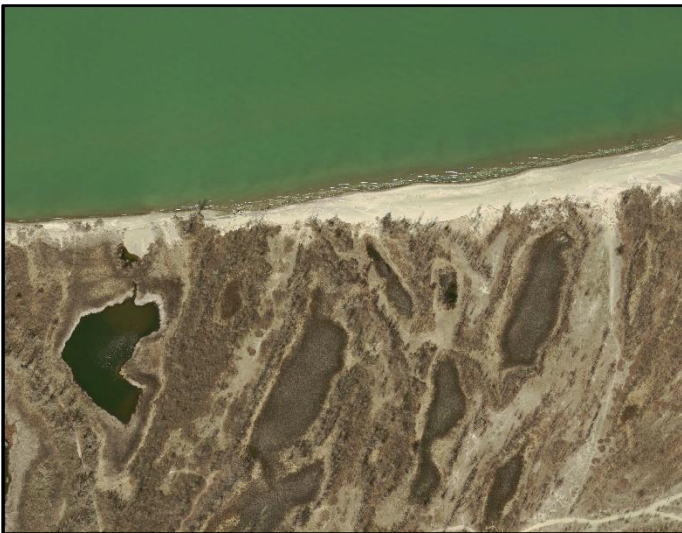
Using modern drone technology, the Regional Science Consortium is able to visualize and track shoreline changes. In this activity, you will be comparing past and present images of various portions of the PISP shoreline and calculating the amount of shoreline lost to erosion.

Directions:

1. Begin by drawing a grid across each image. Start at any corner and create squares of 1 cm^2 .
 - a. $1 \text{ cm}^2 = 61,504 \text{ ft}^2$
2. Once the grid is in place, count the number of squares that contain more than 50% sediment. Do not count squares made mostly of water.
 - a. Assume that all squares inland of the beach shoreline are composed entirely of sediment.
 - b. Breakwaters should be considered water, not sediment.
3. Compare the amount of sediment in the past image to the amount of sediment in the present image. For each set of images, answer the questions below.

Image set 1 – Gull Point

Past



41cm²

Present



32 cm²

1. Did erosion occur along this shoreline? If so, how much sediment area (ft²) was lost?

Yes, 861,056 ft² of sediment was lost.

$$61,504 \text{ ft}^2 / 1 \text{ cm}^2 = X \text{ ft}^2 / 41 \text{ cm}^2$$

$$X = 41 \times 61,504 = 2,521,664 \text{ ft}^2$$

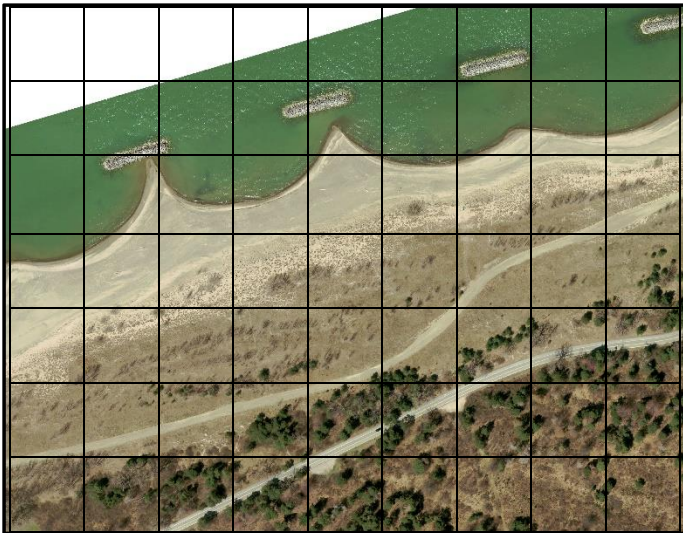
$$32 \times 61,504 = 1,660,608 \text{ ft}^2$$

$$2,521,664 \text{ ft}^2 - 1,660,608 \text{ ft}^2 = 861,056 \text{ ft}^2$$

Image set 2 – Ice Dune Cover

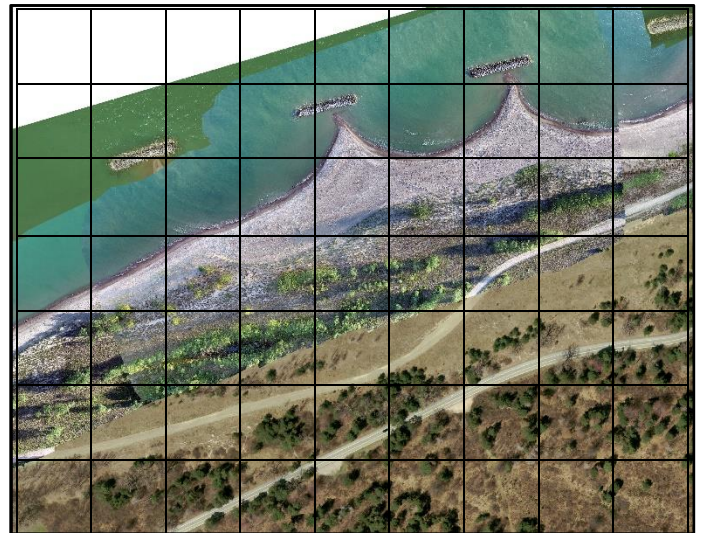
The image on the left was taken before winter, and the image on the right was taken the following spring. Ice dunes formed along this shoreline over the winter.

Past



41 cm²

Present



41 cm²

2. Did erosion occur along this shoreline? If so, how much sediment area (ft²) was lost?

No, erosion did not occur as the sediment area is the same in both images.

3. How do ice dunes affect erosion rates? Explain.

Ice dunes prevent erosion by protecting the shoreline during the winter, especially from winter storms which would wash away sediment.

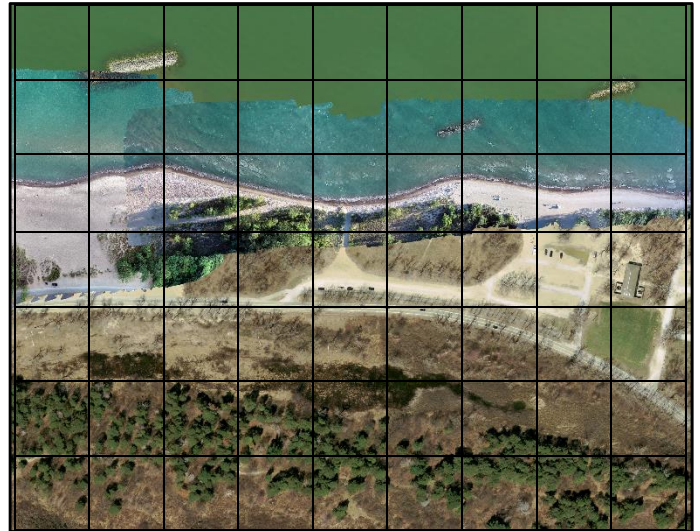
Image set 3 – These images were taken before and after a large storm event.

2012 – Storm Event



46 cm²

2020 – Storm Event



44 cm²

4. Did erosion occur along this shoreline? If so, how much sediment area (ft²) was lost?

Yes, erosion occurred along this shoreline. 123,008 ft² of sediment was lost.

$$46 \times 61,504 = 2,829,184 \text{ ft}^2$$

$$44 \times 61,504 = 2,706,176 \text{ ft}^2$$

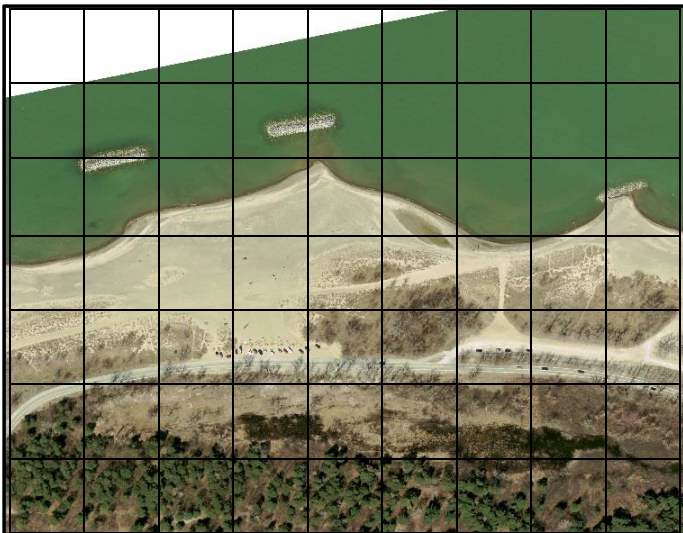
$$2,829,184 \text{ ft}^2 - 2,706,176 \text{ ft}^2 = 123,008 \text{ ft}^2$$

5. How do storm events affect erosion rates? Explain.

Storm events typically increase rates of erosion as demonstrated above. This is due to increased water velocity and other factors. However, storm events can also relocate sediment from one area to another making one area appear severely eroded while making another look as if it has gained sediment.

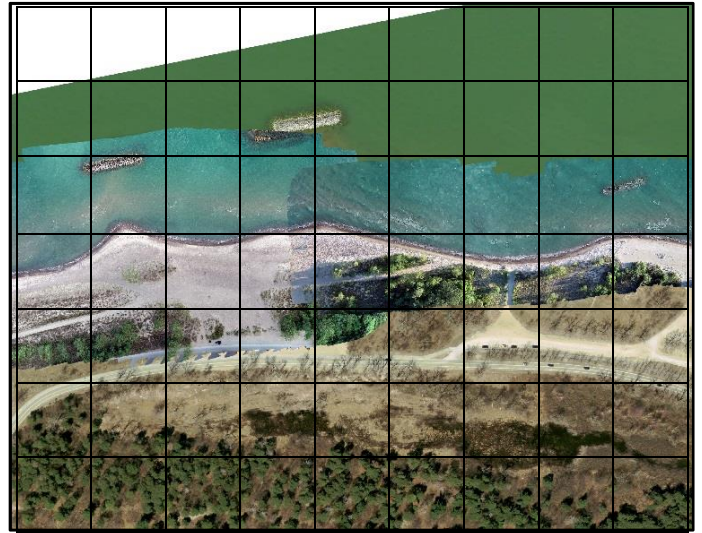
Image set 4 – These images were taken before and after the lake water levels rose.

2012 Rising Lake Levels



38 cm²

2020 Rising Lake Levels



36 cm²

6. Did erosion occur along this shoreline? If so, how much sediment area (ft²) was lost?

Yes, 123,008 ft² of sediment was lost.

$$38 \times 61,504 = 2,337,152 \text{ ft}^2$$

$$36 \times 61,504 = 2,214,144 \text{ ft}^2$$

$$2,337,152 \text{ ft}^2 - 2,214,144 \text{ ft}^2 = 123,008 \text{ ft}^2$$

7. How do rising lake levels affect sediment area? Explain.

Rising lake levels reduce sediment area.

8. Is this change in sediment area a form of erosion? Explain.

No, this sediment area is lost because it is now underwater, not because it was eroded away.