Name____________________

DATA *Nugget*

Can a salt marsh recover after restoration?

Featured scientists: Liz Duff from Mass Audubon, Eric Hutchins from NOAA, & Rockport Middle School science club. Written by: Bob Allia, Cindy Richmond, & Dave Young.

<u>*Research Background*</u>:

In the 1990s, it was clear that the Saratoga Creek salt marsh was in trouble. The invasive plant, *Phragmites australis,* covered large areas of the marsh. Thick patches of *Phragmites* crowded out native plants. There were very few animals, especially migrating birds, because the plants grew too densely for them to move around.

Students collecting salinity data at a point along the transect. The tall, tan grass is invasive *Phragmites*.

Salt marshes are wetland habitats near oceans where water-tolerant salt-loving plants grow. Usually native grasses dominate the marsh, but where humans cause disturbance *Phragmites* can start to take over. Human disturbance was having a huge effect on the health of Saratoga Creek by changing the water coming into the marsh. Storm drains, built to keep rain water off the roads, were adding more water to the marsh. This **runoff**, or freshwater and sediments from the surrounding land, made the marsh less salty. The extra sediment made the problem even worse because it raised soil levels along the road. Raised soil means less salty ocean comes into the marsh during high tide.

In 1998, scientists, including members of the Rockport Conservation Commission and students from the Rockport Middle School science club, began to look at the problem. *Phragmites* grows best when salt levels are low. When salt levels are high, native grasses do better. The scientists thought that the extra fresh water and sediments added by the storm drains into the marsh was the reason *Phragmites* was taking over.

The scientists wanted to see if a restoration could reverse the *Phragmites* invasion. In 1999, a ditch was dug along the side the road to catch runoff before it entered the marsh. A layer of sediment was also removed from the marsh, allowing ocean water to reach the marsh during high tide once again. Students set up sampling areas, chosen to observe and record data, called **transects**. Transects were 25 meters long and

Name____________________

students collected data every meter. The transects made it possible to return to the same points in the marsh year after year. Along the transects, students counted the number of *Phragmites* plants and calculated abundance as the percent of points along the transect where they found *Phragmites*. They also measured the height of *Phragmites* as a way to figure out how well it was growing.

Students in *Phragmites* portion of marsh.

The students compared *Phragmites* data from before 1999 and after 1999 to see if the restoration made a difference. They predicted that the abundance and height of *Phragmites* would go down after runoff was reduced by the restoration.

Scientific Question: Is there evidence that the Saratoga Creek restoration in 1999 was successful at reducing the *Phragmites* invasion?

What is the hypothesis? Find the hypothesis in the Research Background and underline it. A hypothesis is a proposed explanation for an observation, which can then be tested with experimentation or other types of studies.

View of the Saratoga Creek salt marsh several years after restoration,
showing location of one of the transects. Native grasses are growing in the foreground.

Name____________________

Scientific Data:

Use the data below to answer the scientific question:

Year	Average Phragmites Height (cm)	Frequency of Phragmites (%)*	
1998	(no data)	36%	
1999	280.3	36%	
2000	196	32%	*(After Ditch)*
2001	183	(no data)	
2002	177.5	32%	
2003	200.5	40%	
2004	173.2	44%	
2005	165.8	44%	
2006	193	40%	
2007	155.7	44%	
2008	183	60%	
2009	186.1	48%	
2010	127.8	32%	
2011	128.6	44%	
2012	115.7	32%	
2013	97.5	8%	
2014	116.5	8%	
2015	0	0%	

**Frequency of* Phragmites *is calculated as the percent of locations where* Phragmites *plants were present along the 25 meter transect. 0% indicates* Phragmites *was not found at any points along the transect, where 100% indicates* Phragmites *was found at all points along the transect.*

What data will you graph to answer the question?

Predictor variable: ______________________________

Response variables: ______________________________

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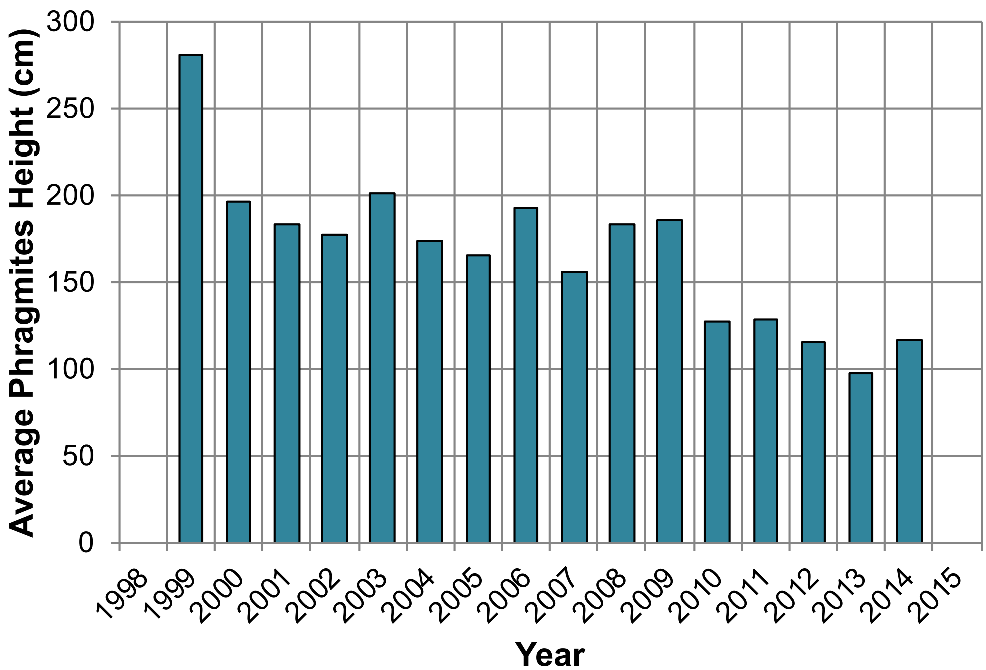
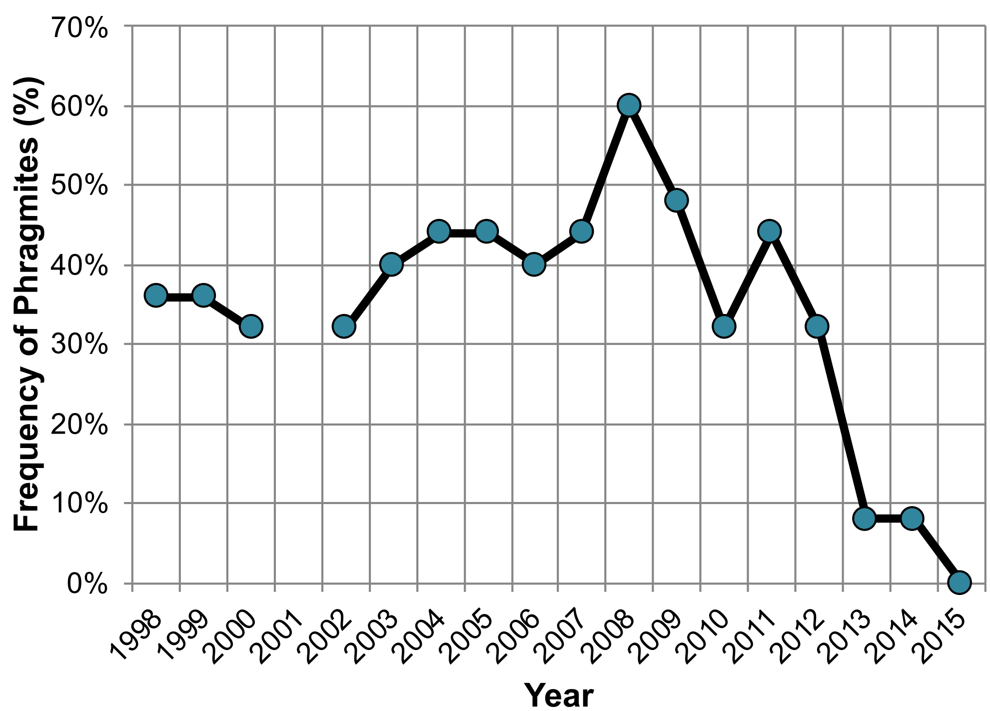
Name____________________

Below are graphs of the data: Identify any changes, trends, or differences you see in your graph. Draw arrows pointing out what you see, and write one sentence describing what you see next to each arrow.





Name____________________

Interpret the data:

Make a claim that answers the scientific question.

What evidence was used to write your claim? Reference specific parts of the table or graphs.

Explain your reasoning and why the evidence supports your claim. Connect the data back to what you learned about the effect of the storm drains and how this disturbance affected the marsh.

Name____________________

Did the data support the scientists' hypothesis? Use evidence to explain why or why not. If you feel the data were inconclusive, explain why.

Your next steps as a scientist: Science is an ongoing process. What new question(s) should be investigated to build on the scientists' research? How do your questions build on the research that has already been done?