

Name \_\_\_\_\_

Date \_\_\_\_\_

## Should the common reed be removed from Iona Marsh?

The common reed (*Phragmites australis* var. *australis*) is an aggressive, invasive wetland plant in the Hudson Valley and across most of the northeastern United States. It expands rapidly and tends to force out other types of wetland vegetation, such as cattail (*Typha angustifolia*) and *Phragmites australis* var. *americanus*, our native (rare) reed variety. Land managers often prefer cattail to grow in their marshes, because it typically supports higher biological diversity. Yet as of 2013, the non-native *Phragmites* has been found in most Hudson River tidal marshes, comprising up to 90% of the vegetation in some of these marshes. Biodiversity may or may not be the most important factor affecting land managers' decisions. When is it worth the cost to remove *Phragmites*? When should we leave it? Through this activity and the subsequent reading, you will learn about both the benefits and drawbacks of *Phragmites* dominating wetlands and be able to give an opinion in response to these questions.

**Part 1:** In the first part of this activity, you will look at vegetation maps of Iona Island, which is located in the Town of Stony Point in Rockland County, six miles south of West Point. Using the transparent overlay of boxes, count the number of boxes that are completely covered by *Phragmites* (pink) and *Typha angustifolia* (green) from 1991, 1997, and 2005. Write your results here:

	# boxes of <i>Phragmites</i>	# boxes of <i>Typha</i>	% of vegetation that is <i>Phragmites</i>
1991			
1997			
2005			

Based on your observations, what can you say about the changes at Iona Island since 1991?

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**Part 2:** On the attached sheet you will find two charts showing information about the bird communities at Iona Island and three other Hudson River marsh areas: Constitution Marsh, Tivoli Bays, and Stockport Flats. None of these other marshes has seen an increase in *Phragmites* like that of Iona Island. Based on the data and your observations from Part 1, answer the following questions:

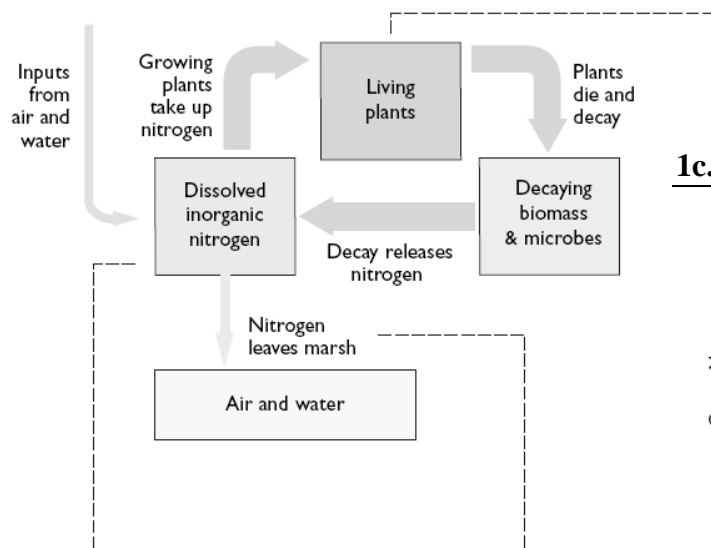
1. Which bird species is the most common at Iona Island?
2. How does this differ from the bird species found at the other marshes?
3. At which marsh do you find the greatest variety of birds?
4. Researchers also looked for nesting sites. What do the results of the nesting survey tell you about the diversity of bird species at Iona Island?
5. Why do you think there is such a different bird community at Iona Island? How could the *Phragmites* invasion possibly impact the bird community? (Be specific.) What other things might influence the bird community besides the presence of *Phragmites*? What else would you like to know about the marshes in order to decide if the invasive species has caused the change in species diversity?

**Part 3:** Scientists are concerned about the health of marshes and other wetland areas—not just because of the birds that live there, but also because wetlands perform important ecosystem services. They act as a water filter, removing excess nitrogen from the water supply and allowing it to be used biologically by plants. When wetlands are destroyed or altered, this capacity changes. Currently, most wetlands are a ‘sink’ for nitrogen, which means they absorb more nitrogen than they release.

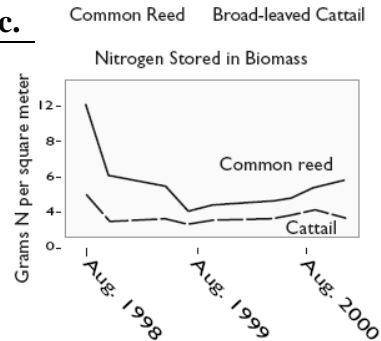
Scientists wanted to know what consequences removing some of the *Phragmites* from a marsh might have on important wetland functions, like nitrogen uptake by plants. They sampled before and after the removal, returning to the study site for several years to measure the long-term impact of reed removal.

Figure 1 shows a schematic of nitrogen cycling in a tidal marsh. Figure 1a shows the difference in the amount of ammonium nitrogen that is in the soil water (porewater) of the marsh in areas that have been cut, areas that haven’t been cut, and an area that only has cattails. Figure 1b shows the amount of nitrogen lost from cut and uncut reed, with cutting occurring in the summer of 1995. Figure 1c shows the difference over time between nitrogen that is stored in two different types of plants: common reed and cattail.

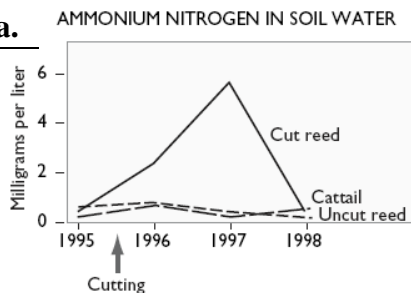
**Figure 1.** NITROGEN CYCLING IN A TIDAL MARSH



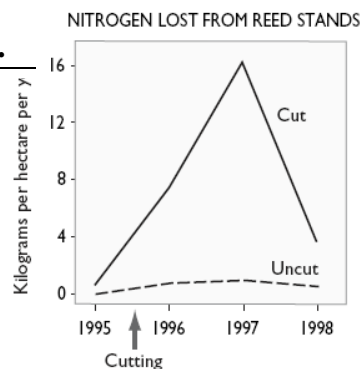
**1c.**



**1a.**



**1b.**



Use the Figure 1 and the reading to answer the following questions:

1. In your own words, explain how nitrogen moves through a tidal marsh.
2. Look at Figure 1a. In which plant, and at what time, did the ammonium levels increase the most? Why do you think this occurred? How long did it take for the ammonium levels to return to normal? Was this change permanent or temporary (a *bend* or a *break*)?
3. Look at Figure 1b. How did nitrogen loss change when *Phragmites* was removed? Was this change permanent or temporary? Why do you think these changes occurred?
4. Finally, look at Figure 1c. How do these two plants differ in their ability to store nitrogen? Which plant stores more nitrogen? What implications does this have for removing a plant from the marsh?
5. Based on these two charts, what can you conclude about the way nitrogen behaves in a marsh where *Phragmites* has been removed? How do you think this behavior would differ (if at all) if cattail were removed? Why?

#### Part 4: Reading

For homework tonight, read the article by Erik Kiviat, Executive Director of Hudsonia, a not-for-profit organization that works to educate people about the biodiversity in the Hudson Valley. Once you have completed the reading, write a one page, thoughtful response to this question:

Do you think we should spend money to remove common reed from Iona Marsh? Why or why not?

Begin by thinking about what else you would like to know to make a confident decision about what to do with common reed at Iona Marsh. Think about what would replace the reed plants and whether this would cause the bird populations to rebound or not.

How hard is to remove reed? What types of management options are there for removing or controlling the plant? What are the implications of eliminating the reed, if it means using a chemical in the marsh? How does the size of the common reed invasion in the Hudson River or locally affect your decision, if at all? Be sure to reference the research you completed in class as well as the reading. Conclude by discussing what circumstances might change your mind (higher/lower cost of removal, presence/absence of rare species, different management goals, etc.).

#### References:

- Findlay, S., P. Groffman, and S. Dye. 2003. Effects of *Phragmites australis* removal on marsh nutrient cycling. *Wetlands Ecology and Management* vol 11: 157-165.
- Kiviat, Erik. 2007. What reed (*Phragmites*) ecology tells us about reed management. *News from Hudsonia*, Vol 21, No 1.
- Wells, AW, Nieder WC, Swift BL, O'Connor KA, Weiss CA. 2008. Temporal changes in the breeding bird community at four Hudson River tidal marshes. *J. of Coastal Research*. SI 55 (221-235).

See also: Kiviat, Erik. 2013. Special Issue: *Phragmites australis* in North American and Europe: Ecosystem services of *Phragmites* in North America with emphasis on habitat functions. *AoB PLANTS*. 5: plt008 doi:10.1093/aobpla/plt008