

## Common Reed and Marsh Birds

**Time:** 2 class period

**National Benchmarks:** Benchmarks 5A: Diversity of Life; 5D Interdependence of Life; 5E: Flow of Matter and Energy; 9B:Symbolic Relationships; 9D:Uncertainty; 12B:Computation and Estimation; 12D:Communication Skills; 12E:Critical-Response Skills.

**National Science Content Standards:** *Science as Inquiry: A; Life Science: C:* Biological Evolution; The Interdependence of Organisms; Matter, Energy, and Organization in Living Systems; *Science and Technology: E:* Abilities of Technological Design; Understandings about Science and Technology; *Science in Personal and Social Perspectives: F:* Population Growth; Natural Resources: Environmental Quality; Natural and Human-induced Hazards; Science and Technology in Local, National, and Global Challenges

**New York State Standards:** 1, 2, 4, 5, 6, 7

**Objective:** Students will know that invasive plant removal can have a variety of impacts and be able to explain this by using graphs.

**Lesson Outline:**

1. View maps of vegetation change on Iona Island.
2. Discuss implications of changes on marsh birds using data and photos
3. Analyze graphs of the effects of invasive plant removal

**Materials:** Iona Island maps, transparencies with chart, student worksheets, bird data handout, Common Reed powerpoint (photos of site, birds, vegetation)

**Engagement:** Before asking students to determine how vegetation has changed over time on Iona Island, make sure that students know what kinds of plants the lesson refers to. Use the accompanying powerpoint slides to show photos of the Island, as well as the two major types of plants: common reed and cattails.

Divide students into groups and hand out copies of the maps (there are three maps: 1991, 1997, and 2005-you can either give each group all three maps, or divide the maps between groups, depending on class size). Using the chart overlay provided at the end of this lesson (make copies on transparency sheets), ask students to classify the percentage of different vegetation. Students should focus on only: *Phragmites australis* (common reed, pink) and *Typha angustifolia* (cattail, green). There are other vegetation types but it is difficult to tell the difference between the shades of green, and the main changes take place with the above mentioned plants. Make a chart on the board and have them write their results for the class to view.

**Explore:** Students will be given the marsh bird data along with the information on the effects of *Phragmites* removal on marsh nutrient cycling. Based on this information, students should be able to make some conclusions about the benefits and drawbacks of removing the plant.

**Explain:** Common reed (*Phragmites australis*) is a native plant across most of the northeastern United States, but once it becomes established in an area, it acts as an aggressive invasive. It expands rapidly and as a result plant and bird biodiversity decrease markedly in areas dominated by *Phragmites*. The data tables show that at Iona, most of the birds are red winged blackbirds. At the other marsh locations, a more diverse plant community has allowed a more diverse bird

community to flourish. Use the photos of the birds to engage students and help them visualize the community changes that have taken place at Iona.

However, removal of the reed leads to some negative and possible unanticipated outcomes, at least in the short term with regards to denitrification potential and the amount of ammonium. Denitrification, which is the process by which nitrate is converted to nitrogen gas, occurs in low oxygenated soils (often in wetlands). This is viewed as a positive function of wetlands—you have probably heard that wetlands act as a natural filter and can remove N pollution. In the areas where *Phragmites* was removed, the denitrification potential was reduced by almost 50% during the first two years following the removal. In addition to this change, ammonium concentrations increased significantly in the two years following reed removal. If too much ammonium builds up in the sediment, then the area could act as a ‘source’ rather than a ‘sink’ of N for the surrounding area. Two years after removal, however, the restored area had higher plant diversity and ammonium and denitrification potential had returned to pre-removal levels.

While some students may be able to reason through the implications of the nitrogen changes, without having experience with the nitrogen cycle, many will find this part of the lesson challenging. However, even if students haven’t had a lot of experience with nutrient pollution, it is a good discussion point when talking about the range of possible impacts of removing an established invasive plant.

**Extend:** Ask advanced students to read the complete article by Findlay et al (cited below). Students can create discussion questions or debate the merits of this type of invasive plant removal.

**Evaluate:** For homework, students should read the article by Erik Kiviat. Once they have completed the reading as well as the classwork, they should be able to decide whether or not common reed should be removed from Iona Marsh in a one-page (or more) essay.

### Comments:

**Reference:** 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.

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*. (in press).

