

## **GREEN EGGS & SAND: A CASE STUDY FOR DEVELOPING CURRICULUM ABOUT NATURAL RESOURCES MANAGEMENT**

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### **INTRODUCTION**

Horseshoe crabs have roamed the bottom of Earth's oceans for millions of years, their presence largely unnoticed by humans. In recent years, the horseshoe crab has become the focal point of a multiple-use resource controversy that involves key ecological, economic, and biomedical benefits. With multiple stakeholders, each with different opinions about how its uses should be prioritized and managed, developing a horseshoe crab management plan has become a story filled with controversy and on-going challenges.

### **BACKGROUND**

Green Eggs & Sand was initiated in early 2000, in response to interest in developing educational modules around the Mid-Atlantic horseshoe crab/shorebird phenomenon, and the complex and challenging management issues it presents. A steering committee was subsequently formed, comprising a unique coalition of environmental educators, natural resource agencies and non-profit organizations from Delaware, Maryland, and New Jersey. The Delaware National Estuarine Research Reserve along with the Aquatic Resources Education Programs from the three states led the group along with a videographer who had long been documenting the horseshoe crab controversy on film. Over the next several months, this group planned and ultimately presented a special workshop for the spring 2000 spawning season, inviting selected, master teachers from the three states to participate. This first Green Eggs & Sand workshop featured a three-fold focus: 1) the immerse educators in experiencing this phenomenon first hand; 2) to expose them to the issues and experts; and 3) to explore the feasibility of, and chart directions for, developing educational modules around the phenomenon and issues.

The fourteen teachers, who convened at the Mallard Lodge in Delaware for that weekend, became, along with the steering committee, the "think-tank" for Green Eggs & Sand, responding to surveys and exchanging countless emails. They met on several subsequent weekends to hash out priorities, plan strategies, and ultimately form the module writing teams that produced the draft/pilot curriculum. These same teachers then assisted in planning and presenting the second Green Eggs & Sand workshop in May of 2001, as a vehicle for exposing a new group of educators to the phenomenon and issues. This workshop also served as a vehicle for distributing draft curriculum modules to the

collective group for subsequent piloting during the school year ahead, with an eye to using their feedback to develop a more finished product for 2002.

During 2002, grant monies received through the Federal Aid in Sport Fish Restoration Program of the U.S. Fish and Wildlife Service provided the funding needed to take the project to the next level. This included: the addition of several lessons to the various modules; the revision of lessons based on feedback from pilot educators; the filming /editing of several additional video pieces in support of specific lessons and to update new developments in the ongoing management story; and the reformatting of the entire curriculum (lessons, videos, etc.) to a user-friendly CD product. Two workshops were also offered during the spring spawning season in both 2002 and 2003, with more than 150 new educators from 12 states participating. New workshops were then planned for the spring of 2004 and beyond to continue the delivery of the Green Eggs & Sand materials and experience.

#### TRAINING

From its genesis in 2000, workshops have been an integral part of the Green Eggs & Sand experience-providing the venue for which the phenomenon is explored, issues are investigated, and all curriculum materials are profiled and distributed. Intensive weekend workshops are held during the peak full and new moon May/June spawning seasons on Delaware Bay. During these workshops educators are engaged in field studies, presentations by noted experts on all aspects of the topic, and exposure to a wealth of resources for bringing the topic home to their students. In 2004, due to increasing demand for Green Eggs & Sand beyond the mid-Atlantic area, one-day “mini” workshops were introduced. In contrast to the weekend workshops still offered on Delaware Bay each spring, these sessions are held at various times of the year and at various locations, as a venue for educating teachers about the phenomenon and issues, while making the curriculum available to a wider audience. From its inception, the steering committee and teachers involved felt it necessary that for teachers to obtain and then use the curriculum, attendance at a workshop was necessary. In this manner, the Green Eggs & Sand team is able to ensure that all involved realize the complexity of natural resources management and the horseshoe crab/shorebird controversy in particular.

#### CURRICULUM COMPONENTS

The product of the Green Eggs & Sand project consists of four sequential learning modules, each featuring an opening video ‘teaser,’ followed by a series of interactive exercises that deepen student understanding of the concepts and issues. Activities are multi-disciplinary, designed for flexible use in a variety of formal and non-formal education settings, targeting middle school level and up. All lessons are keyed to national education standards for science, math, social studies, and language arts.

Module One, “Horseshoe Crab Biology and Ecology,” is the foundation of Green Eggs & Sand, the subject of which all subsequent modules build. As such, it contains lesson plans that educate on the biology and natural history of this creature, including activities on anatomy, spawning requirements, ecology, life cycle, and how to hatch and grow juvenile horseshoe crabs in the classroom.

Module Two, “The Shorebird Connection,” offers a critical curricular link between horseshoe crabs and humans, just as Delaware Bay provides a vital link in shorebird migration between South America and the Arctic. The activities engage students in exploring and broadening their understanding of shorebirds, including lessons on shorebird identification, feeding behavior, adaptations, and energetics. These lessons reveal the interdependence of species, adding a layer of complexity to the topic as students move on to study human use and management in Modules Three and Four.

“Human Connections,” Module Three, builds on the topic of horseshoe crab values, introduced with shorebirds, through activities that focus on historical aspects of horseshoe crab use, economics of the resource, and a complex of lessons dealing with the unique and varied biomedical applications. A mix of outdoor-interactive, lab-experimenting, and internet-exploring activities is featured in this module.

The final piece of the Green Eggs & Sand curriculum is Module Four, “Managing the Resource.” This module is what sets it apart from most other environmental education initiatives. Throughout the module, video clips weave in and out, telling the story of the development of the coast-wide Horseshoe Crab Fishery Management Plan. The videos set the stage for accompanying learning activities that build awareness of how the management process works, and the challenges it entails.

These activities help students to understand the complexities of managing a multiple-use resource, appreciate the varying points of views and biases of stakeholders, recognize the importance of having sound scientific data in basing decisions, and develop skills in discriminating how science, media, and politics can be used and misused in the process.

#### USING GREEN EGGS AND SAND AS A MODEL

Along with the need to manage resources sustainably is a clear need to better educate the general public and school children about the process by which that happens and to relay the ways in which these natural resource issues affect them, whether directly or indirectly. Throughout the United States, natural resource managers are faced with balancing stakeholder groups when determining the fate of various types of resources: logging and the spotted owl in the Pacific Northwest, wolf management in the West, wind farms off of Cape Cod’s shores, etc. The process by which Green Eggs & Sand has succeeded, both in terms of fostering collaboration between educators and biologists and in addressing the multiple-use aspects of natural resource management, serves as a model/case study for adaptation to other resource challenges in other areas.

The model that Green Eggs & Sand proposes would consist of the following:

- Involving educators along side of researchers and resource managers to develop and present the curriculum.
- Incorporating scientific data in lesson plans.

- Correlating lesson plans to national education standards in math, science, language arts, and social science.
- Using video to enhance lesson plans.
- Breaking the topic into “modules” devoted to various aspects of the controversy.
- Devoting a module to management to include (1) the different points of view of multiple stakeholders, (2) the challenges faced by natural resource managers seeking to balance the needs of these user groups, (3) the importance of gathering rigorous scientific data upon which to base management decisions, and (4) the importance of becoming involved in understanding and managing a natural resource.
- Requiring training of educators wishing to teach the curriculum, which includes presentations by appropriate subject matter experts.

Using this model, educators in other regions can develop curriculum about natural resource management controversies.

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