Succession in a large restored tidal marsh: first-year vegetation patterns and the role of wrack in colonization

by

Laura J. Jones
Boston University 1999

a thesis

submitted to the University of Southern Maine
in partial fulfillment of the requirements
for the degree of

Master of Science
in Biology

2007

FINAL APPROVAL FORM

THE UNIVERSITY OF SOUTHERN MAINE

M.S. IN BIOLOGY

(to be inserted)

Acknowledgements

I would like to thank my advisor, Karen Wilson, for being incredibly supportive in all aspects of this research. Many thanks also to thank my committee members Theresa Theodose, for input in my earlier stages of thesis development and feedback throughout the process, and Thomas Knight for helpful critique of my research. I could not have accomplished this work without dragging out numerous fellow graduate students, undergrads, friends and volunteers out onto the marsh: Shannon Prescott, Jess Wheeler, Justine Roths, Nancy Olmstead, Kyle Moulton and Mike Rautenberg. I thank Eric Hazelton for GIS assistance and edits. I also thank biology department faculty who took an active interest in my progress and helped whenever possible. I owe a special thanks to Timothy Martel for his help, patience and support. I thank my family for support of my education.

I thank Eric Hutchins (NOAA) for his work to initiate the Sherman Marsh restoration project. I thank the Maine Department of Transportation, especially Charlie Hebson, for their collaborative efforts in the restoration project. Jerry Therrien, Lauren Stockwell and Joanne Sharpe assisted with plant identification. The Damariscotta River Association allowed use of canoes, equipment and facilities. Grondin, Inc., loaned GPS equipment.

Funding for this work was provided by a NOAA/TNC grant, the University of Southern Maine Biology Department, and the Gulf of Maine Research Council.

Abstract

Salt marsh restorations have shown species recruitment limitation due to dispersal constraints and harsh substrate conditions. In restored marshes, wrack may play a key role in recolonization because it is a vehicle for seeds and can reduce salinity by shading bare substrate. I described first-year succession in Sherman Marsh (Newcastle, Maine), a 90 ha tidally restored site that was reconnected to the sea in 2005 after 70 years of freshwater submersion. To investigate the recruitment potential of large, tidally restored salt marshes, I examined vegetation patterns for evidence of dispersal limitation of salt marsh plants. Additionally, I experimentally simulated wrack deposition to test its role in succession as both a seed dispersal mechanism and in ameliorating harsh sediment conditions.

Sherman Marsh revegetated rapidly with freshwater, brackish and salt marsh species. These communities were very different from those of the adjacent reference marsh. Surface and pore water salinities were indicative of fresh to brackish waters. Nine of 11 salt marsh species recorded were confined to the first ¼ of the marsh, closest to the marsh inlet. Among salt marsh plants, *Juncus gerardii* and *Schoenoplectus maritimus* dominated the revegetation. It appears that *J. gerardii* regenerated from a seed bank. *Schoenoplectus maritimus* may have been dispersed by birds. Because substrate stress did not appear to limit seedling emerence and survival and because salt marsh species were absent in most of the marsh, this study demonstrated dispersal limitation.Wrack deposition did not increase seedling emergence or have any effect on substrate conditions. However, cover by wrack decreased *J. gerardii* cover.

Table of contents

List of tables

Chapter 1

Chapter 2

List of figures

Chapter 2