



University  
of Victoria

Graduate Studies

Notice of the Final Oral Examination  
for the Degree of Doctor of Philosophy

of

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MSc (University of Guelph, 2007)  
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**“Sediment budget and morphodynamic changes in a coastal beach-dune system following ecosystem restoration and implications for improved spatio-temporal geomorphic analysis: Pacific Rim National Park Reserve, British Columbia, Canada”**

Department of Geography

Monday, December 17, 2018  
2:00 P.M.  
Clearihue Building  
Room B007

Supervisory Committee:

Dr. Ian Walker, Department of Geography, University of Victoria (Supervisor)  
Dr. Patrick Hesp, Department of Geography, UVic (Member)  
Dr. Brian Starzomski, School of Environmental Studies, UVic (Outside Member)

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## **Abstract**

This dissertation presents the results of a multi-year interdisciplinary study of a dune ecosystem restoration effort in Pacific Rim National Park Reserve. The research is the result of a collaboration between the University of Victoria's Coastal Erosion and Dune Dynamics (CEDD) lab and Parks Canada Agency (PCA). PCA under the Species at Risk Act (SARA) mandate to take direct action in restoring habitat for SARA listed species, committed to and implemented an ongoing coastal dune restoration program which involved widespread removal of invasive vegetation, transplanting of native vegetation, and ongoing volunteer programs to prevent invasive re-growth. Monitoring programs undertaken jointly between PCA and the CEDD lab have been ongoing since the project began in Summer 2008. The material covered in this dissertation is the product of independent research by the author carried out under the supervision of the advisory committee and does not reproduce written materials prepared for or by PCA. The dissertation consists of three separate manuscripts which stand alone as independent investigations but are structured to provide a natural progression of research findings and allow for an overall synthesis of ideas and broader conclusions as is expected for a doctoral dissertation. The restoration program and actions afforded an opportunity to review restoration trends and methods and implement a strategy and monitoring protocols based on leading edge science. Accordingly, the first manuscript, Chapter 2, summarises recent trends in coastal dune restoration, discusses relevant research surrounding beach-dune morphodynamics and coastal dune activity and reviews preliminary data from the project. The study identifies usable control data for the project and builds the criteria for assessing the project as a whole. Chapter 3 presents the core data obtained for the dissertation providing the results from 5 years of geomorphic monitoring with 3 years of detailed sediment budget analysis. The manuscript presented in Chapter 3 reviews the data and identifies several trends in the dune systems response to the restoration that, with reference to the indicators developed in Chapter 2, suggest improved levels of dynamism in the landscape. Finally, Chapter 4 extends the findings of the restoration study and utilises the rich data set obtained from the restoration to develop mapping techniques which better convey spatio-temporal morphodynamic information. The study comments broadly on the potential to apply these data and techniques to the study of disturbance in beach-dune systems as summarised more thoroughly in the concluding chapter of the dissertation.