Greenroof systems have been shown to be an environmentally friendly alternative based on various factors; such as, reduced lifecycle cost, improved air quality, ambient temperature reduction, stormwater management credit, sustainability and preservation of the environment. Recent research studies attempt to determine the construction methods of an ideal greenroof for environmental purposes, yet there is an absence of standards for the best design required to achieve acceptable structural performance and sustainability under wind loads. As a result, there is a need to document the effectiveness of greenroofs under high wind events by addressing the following questions: Do winds have an effect on greenroof material loss? Do greenroof materials modify pressure conditions that would need a modification to current design codes? Does the level of vegetation establishment affect the material loss and pressure distribution?

This thesis first focuses on vegetated green roof construction techniques and issues along with some of the most recent studies conducted by UCF researchers. Then, the literature focuses on wind uplift of vegetated roofs constructed using different wind erosion control methods with respect to vegetation cover, geosynthetic liners, and wind breaks. As part of this research, two monitoring systems with a grid of very low differential pressure transducers and a high speed anemometer were designed and implemented on the East and West coasts of Florida to collect data for the pressure distribution across the greenroofs in relation to wind direction and speed. In addition to this, the design of this monitoring system with specific information about the sensing and data acquisition systems is presented. Subsequently, the analysis of the monitoring data compares the peak wind gusts for each time interval to their corresponding pressure measurement to obtain pressure coefficients identified at each pressure node on the roof. Based on this analysis, pressure changes for hurricane speed winds are predicted to have an overall average uplift pressure envelope within ASCE Code 7-05 design standards with vegetation cover enhancing sustainability under wind events. For future studies, a controlled field investigation in order to reduce in situ limitations due to natural climatic conditions as well as long term monitoring are discussed as recommended studies for evaluation of wind effects.