

Hurricane Impacts on Ecological Services and Economic Values of Coastal Urban Forest: A Case Study of Pensacola, Florida

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Abstract

As urbanized areas continue to grow and green spaces dwindle, the importance of urban forests increases for both ecologically derived health benefits and for their potential to mitigate climate change. This study examined pre- and post- hurricane conditions of Pensacola's urban forest and the associated potential economic and ecological impacts that the 2004 and 2005 hurricane seasons had on the human benefits derived from the region's urban forest canopy. Using CITYgreen© for ArcGIS, 33 random sites in southern Escambia County, FL were analyzed using aerial photographs taken pre- and post-hurricane impacts to calculate quantities for total impervious surfaces, total open spaces, total canopy, and associated economic values for air pollution removal, total carbon stored, annual carbon sequestered, and water retention capacity. We found an overall 34.8% decrease in canopy cover with an estimated combined loss of about \$28 million associated with increased pollution related health care costs, loss of banked carbon storage, and large changes in the stormwater retention capacity in the 25,301 ha study area. All sites had significant decreases in air pollution removal potential, carbon storage, and carbon sequestration ability as a result of significant canopy loss. Stormwater retention capacity was reduced after the 2004 and 2005 hurricane seasons. Case studies such as this one illustrate the large benefits that humans receive from the more natural components of their surroundings. Assessments of the large changes in ecosystem functions associated with large natural disturbances may help galvanize efforts to assess changes in ecosystem services and associated benefits for manageable factors such as those associated with tree planting and preservation ordinances, stormwater management through green infrastructure, and community level development planning.

Keywords: hurricane disturbance, urban forest, carbon sequestration, canopy loss, GIS, CITYgreen©