

Post-Storm Recovering Permits and Ecological Resiliency

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The key inspiration of this research paper is that post-storm community recovery can accelerate the alteration of wetlands via new developments or reconstruction, which can erode the flood resilience of coastal communities over the long term. As wetlands perform many environmental functions, including, helping to reduce the impacts from storm damage and flooding, and are vital for economic, social and cultural reasons. Coastal resiliency is heavily depended upon flood mitigation capabilities; mitigation involves both helping protect human infrastructure and lives, and providing a degree of flood protection to vulnerable regions. Conversely, recovery after disaster events often involves both reconstruction of damaged structures and new development in affected communities. A byproduct of recovery involves the alteration and loss of naturally occurring wetlands. Current research concerning wetland decline coastal margins suggests that urban and suburban development is the central cause of wetland losses. As a result, the U.S. is losing wetlands in flood-prone areas while at the same time coastal communities are becoming less resilient to rainfall-based and storm-surge flood events. By losing naturally occurring wetlands and their flood-protection value during recovery, coastal communities become more prone to flood impacts during future hurricane events. In other words, the very act of restoring human communities may increase their vulnerability to future flood impacts. Therefore, this research pursues to answer the question: *Does post-storm new development and reconstruction exacerbate the loss of naturally occurring wetlands?*

The research project is unique in its process to look at the issues of understanding coastal resiliency to hurricanes. It firmly establishes the concept that during post-hurricane recovery impacted sites are expanded and wetland disturbance extended. Specifically, it defines how we should study and protect wetlands during the post-storm recovery period of human restoration via new developments and reconstruction activities. This research should be considered a starting point for investigating the proposed theory that community recovery after a hurricane can accelerate the alteration of wetlands via permitting, which can erode the flood resilience of coastal communities over the long term. This study employed an innovative research design with a pre-event and post-event comparison to measure the CWA (Clean Water Act) Section 404 wetland alteration permits (by quantifying the intensity and location of changes in wetland alteration) in Hurricane Ike effected area. Thus, this paper stresses that wetland protection is essential for coastal regions to transition into resource-efficient in the promotion of sustainable development.

By analyzing federal 404 wetland alteration permitting data, our study gained a better understanding of how redevelopment or construction activities during recovery are impacting wetlands at a local level. The results highlight that recovery after a major hurricane consequence in an accelerated loss of naturally occurring wetlands and their associated ecological and biodiversity values in buffering the adverse impacts of future flood events. Such losses of wetlands indicate that post-storm recovery activity is compromising ecological resiliency in coastal communities. Therefore, it is important that decision makers recognize coastal areas are subject to multiple types of storms and that displaced, outwardly-expanding development during times of recovery can weaken the ecological system as a whole to protect residents from the next great flood event (note Hurricane Harvey 2017 caused record rainfall and associated property loss). These findings have also important implications for public decision makers charged with regulating development and permitting processes that want to avoid possibly compromising

the ability of their communities to be resilient in the face of future flood events. As wetlands not only play direct or indirect roles in the promotion of sustainable development but also support ecological, human, and economic health and vitality

As the value of wetlands to our society and economy became better appreciated, a net gain of wetland resources has become the broader and more proactive long-range goal for Houston-Galveston region in order to protect the wetlands for further degradation. Thus, this project leads to set future actions to provide public based educational outreach program on the findings so that they can participate directly in order to reduce the further development impacts on wetlands in greater Houston metropolitan area. As recovery is more of a regionally based phenomenon, the cumulative impacts on wetlands should not be neglected. Additionally, previous literature on impacts of wetland permitting program highlights that the cumulative impact of this activity is poorly understood and under accounted. Therefore, a comprehensive understanding of wetland development during recovery after hurricane events and its impacts on coastal resiliency should be a priority to increase public awareness for sustainable coastal development after hurricane events. Future researches on watershed management, water-quality improvement, and wetland degradation can develop quantitative methods to assess coastal resiliency in the same philosophical manner.

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