

Executive Summary

The land value impacts of wetland restoration

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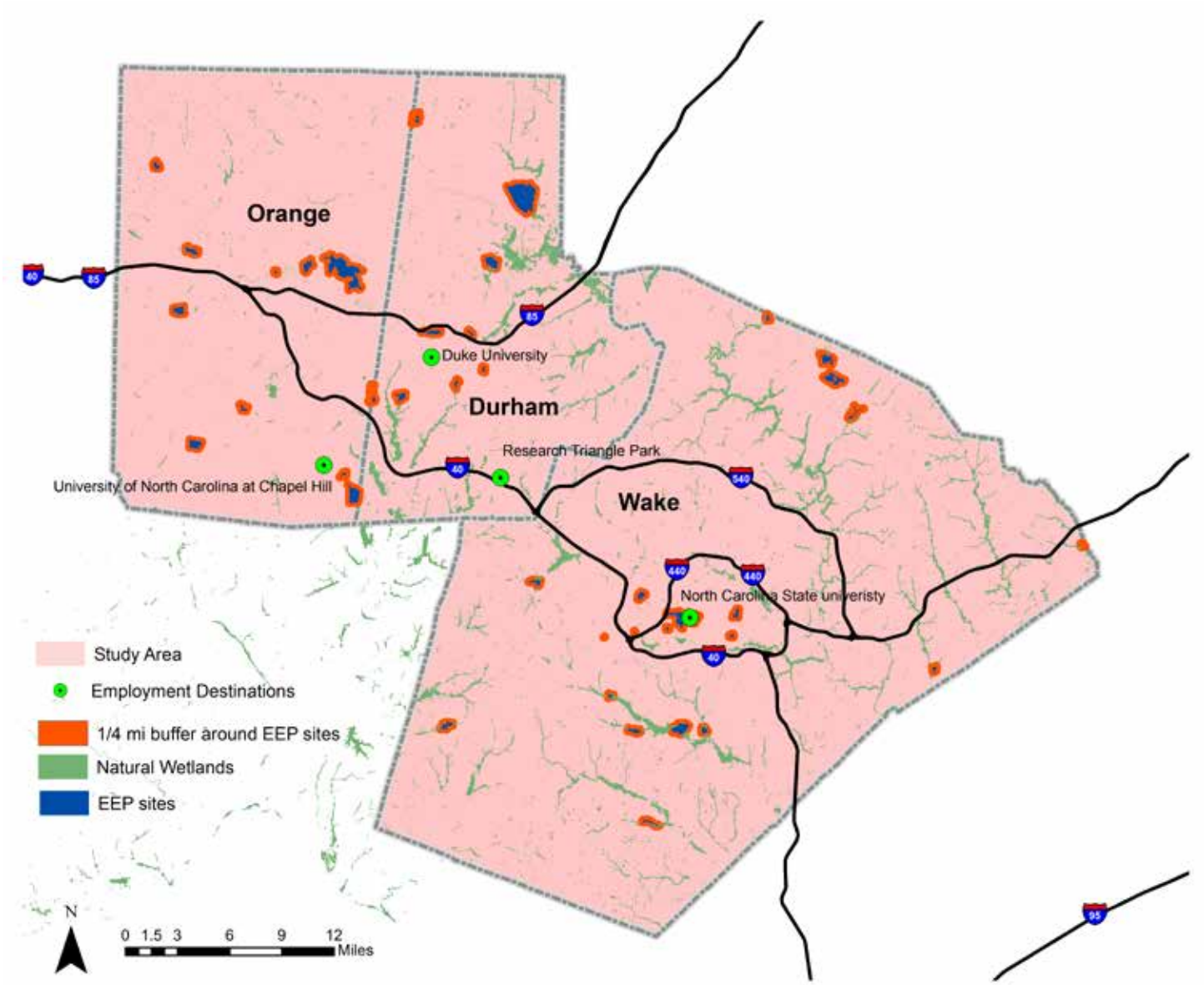
Since 1988, United States aquatic ecosystem protection regulations have centered on achieving a goal of "no net loss" of wetland acreage and function throughout the nation (National Wetlands Policy Forum, 1988). A substantial part of this goal is achieved through Section 404 regulations of the U.S. Clean Water Act (13 USC 1344), which protects aquatic resources by requiring permits for destruction ("impacts") to resources. These permits typically require impact avoidance, minimization, and compensation (offsets) for unavoidable impacts through ecosystem restoration (NRC, 2001). As these restoration efforts proliferate, it is important to know what impact, if any, large-scale wetland and stream restoration have on surrounding land values. Restoration effects on real estate values have substantial implications for protecting resources, increasing tax base, and improving environmental policies.

Unfortunately, although wetland valuation is a topic of intense debate in the urban and environmental economics literature, few studies have focused on the effects of wetland restoration (or any type of ecological restoration) on surrounding real estate values.

This analysis focused on the three-county region encompassing the cities of Raleigh, Durham, and Chapel Hill, North Carolina. The region is ideal for studying this topic, as aquatic mitigation and urban growth are both abundant and data are readily available. Rapid urban development in the Triangle region has created a large sample of recently sold businesses and homes (collected from county governments), allowing us to isolate the effects of restoration sites on nearby real estate values. Data used for this study

This analysis focused on Durham, Orange, and Wake counties in the heart of the Research Triangle region of North Carolina. This region has experienced rapid development and extensive aquatic ecological restoration through the state's Ecosystem Enhancement Program (EEP). Since restoration sites are not randomly distributed across space, we used a genetic algorithm to match parcels near restoration sites with comparable control parcels. Similar to propensity score analysis, this technique facilitates statistical comparison and isolates the effects of restoration sites on surrounding real estate values.

Compared to parcels not proximate to any aquatic resources, we found that, 1) natural aquatic systems steadily and significantly increase parcel values up to 0.75 miles away, and 2) parcels less than 0.5 miles from EEP restoration sites have significantly lower sale prices, while 3) parcels more than 0.5 miles from EEP sites gain substantial amenity value. Our work highlights the need for higher public visibility of aquatic ecosystem restoration programs and increased public information about their value.



consisted of three primary datasets: geo-spatial data on compensatory mitigation projects, longitudinal real estate data, and neighborhood- and county-scale data used to control for covariates that affect residential land values throughout the region. These covariates included school quality, distance to major regional employment centers, and crime rates.

In order to isolate the effects of ecosystem restoration on nearby real estate values, we statistically examined spatial and temporal data on wetland and stream mitigation sites collected between 2000 and 2007. We examined all ecosystem restoration sites in this region, which are comprehensively managed and planned by the North Carolina Ecosystem Enhancement Program (EEP), a state agency that plans for, purchases, and re-sells aquatic ecosystem mitigation to both state and private permitees. We use matching estimators to determine the differences in prices between houses near wetlands and houses not near wetlands, and between houses near EEP sites and houses near wetlands.

We constructed four proximity-based sets of the same three causal models to understand the relationships between matched parcels proximate to EEP restoration sites and other parcels in the landscape. In the first model, we considered treatment parcels to be homes that are proximate to National Wetland Inventory wetlands, while control parcels included all other properties. In the second model, we refocussed the model so that 'treatment' parcels were taken to be homes that were proximate to EEP sites and were sold after

the EEP site was constructed. All parcels that were not proximate to any type of aquatic ecosystem (wetlands, streams, and lakes/ponds) were considered the control parcels. Finally, in the third model, parcels proximate to EEP sites (and sold after EEP site construction) were again considered treatment parcels, while other residential parcels were considered controls. However, unlike the first model, this time we additionally matched parcels based on whether they were proximate to different kinds of aquatic ecosystems, such as streams, lakes/ponds, and wetlands.

We considered four different proximity distances, including 0.125, 0.25, 0.5, and 0.75 miles radius; a parcel was considered proximate to a stream if the stream abuts or crosses a property.

The presence of a wetland in the landscape had a statistically significant, modestly positive effect on surrounding home sale prices ($3,100) compared to parcels with no proximate wetland present. EEP sites, on the other hand, have a negative impact on the houses at short distances (<0.5 miles) and a substantial positive impact on houses at larger distances (between 0.5 miles and 0.75 miles).

In essence, these models statistically isolated, in a quasi-experimental manner, 1) the impacts of restoration sites on surrounding land values as controlled against parcels that are not proximate to wetlands, 2) the impacts of wetlands (generally) on surrounding land values, as controlled against parcels that are not proximate to wetlands, and finally, 3) the impacts of EEP sites on surrounding land values, as controlled against parcels that are themselves near aquatic features. Our finding that non-EEP wetlands significantly increased property values by approximately $3,100 is directly in line with much of the existing literature on wetlands, such as Mahan et al. (2000). The small premium that was generated for parcels proximate to non-EEP wetlands in the region may be the result of proximity to lake fronts (many wetlands in the region surround larger lake areas). While water bodies have long been known to provide high amenity values (David, 1968), remaining wetlands in the region may also be of fairly high value (not necessarily quality), and act as informal park areas with accompanying aesthetic and recreational opportunities (birding, trails, etc.).

Our finding that EEP sites generate a relatively strong disamenity value at close distances (<0.5 miles) forces us to consider three possible explanations: 1) wetland and stream modification can induce enormous temporary aesthetic damage to restoration sites, damaging aesthetic values and creating perceptions of restoration sites as "damaged goods," 2) the public has limited knowledge of EEP restoration projects, and 3) not enough time has lapsed for the amenity value of EEP restoration efforts to internalize into surrounding property values.

We hypothesize that the inflection between increases and decreases in EEP land value effects may be the result of restoration site construction processes that create strong disamenities for closely surrounding residents, but create improved landscape ecological functions for residents at a larger land scale (beyond the 0.5 miles radius). While the distance band around EEP sites where land values decrease appears to be very narrow (<0.5 miles), one explanation can be found in observing the history of EEP restoration construction. Throughout the agency's history, the public perception of low ecological quality of EEP stream and wetland projects has been problematic.

These problems may have begun to change already. In 2010, the NC Department of Natural Resources (Hill et al., 2010) released an analysis of 98 wetland and 129



A restored wetland in North Carolina.
Photo courtesy of Restoration Systems

stream sites, reporting statewide mitigation success rates had risen dramatically to 74.5 and 75.0 percent, respectively.

Our findings are encouraging, as it appears to suggest that restoration has heterogeneious impacts on property values and it is likely that the quality of the restoration is a significant explanatory factor. Given the inflection point that we have observed, the question that remains is: How does ecological success in restoration, which appears to have risen dramatically since the 1990s, actually translate into amenity value perceived by local residents (and internalized into surrounding land values)? Although data to answer this question are improving, the U.S. housing and financial collapse makes studying 2008 and subsequent years difficult, as macro-economic price signals are likely to dominate throughout the region.



A restored wetland in North Carolina.
Photo courtesy of Restoration Systems

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