

Briefing for the City of Kinston, NC: Land Suitability Analysis for Post-Disaster Housing Relocation

Hurricane Matthew Disaster Recovery and Resilience Initiative
September 2018

Note: This Appendix complements the Technical Memo for Land Suitability Analysis and contains the relevant details and results specific to the city of Kinston.

Overview

Hurricane Matthew's heavy rainfall in October of 2016 led to near record flood levels on the Neuse River, impacting over 180 homes as well as several businesses. The flooding reminded the long-time Kinston residents and officials of hurricanes Fran and Floyd from the late 1990s. While many homes, particularly in the Lincoln City neighborhood have since been removed from the flood hazard area and were thus not affected during Matthew, flooding still caused major damage to both private and public infrastructure. Even before Hurricane Matthew, the city was dealing with challenges associated with a declining population and tax base, high levels of poverty, poor health and education indicators, a lack of affordable housing, and a struggling regional economy. The resilience of the city is being tested, yet again.

Kinston and its flooding issues have been the subject of several studies and planning processes aimed to understand the successes of the past and potential vision for the future. HMDRRI has been involved in a number of conversations post-Matthew and have conducted additional analyses and produced reports (e.g., LSA & HomePlace) that speak to the recent challenges facing Kinston and are designed to facilitate innovative thinking and recovery strategy development in the wake of Hurricane Matthew. Through a series of meetings and public discussions, Kinston has explored and begun to address some of their major recovery issues using funds from a number of grants (e.g., Community Development Block Grant – Disaster Recovery [CDBG-DR]¹, the Golden LEAF Foundation, etc.) for reconstruction, repair and relocation of facilities, and is exploring opportunities for integrating several downtown

¹ CDBG-DR funds may supplement, but cannot duplicate, funding available from FEMA or other federal agencies. CDBG funds must be approved by Congress. These flexible grants, administered by the U.S. Department of Housing and Urban Development (HUD), can be used to assist disaster recovery and resilience efforts by local governments, states, or tribes. CDBG may be used to fund a broad range of activities so long as they meet at least one of three national objectives: 1) benefit low- and moderate- income persons, 2) help prevent or eliminate slums or blight, or 3) address urgent risks that pose a serious and immediate threat to the health and wealth of the community where other financial resources are unavailable (U.S. HUD, 2016).

businesses and regional eco-tourism strategies while working to address the immediate needs of the residents most heavily impacted by the storm.

With dozens of residents expected to receive a home buyout through FEMA’s Hazard Mitigation Grant Program, city leaders are concerned about the potential loss of its tax base should individuals relocate outside of municipal boundaries. To minimize this loss, Kinston can use the information derived from the Land Suitability Analysis (LSA) and HMDRR HomePlace document (see Technical Memo on Land Suitability Analysis and Appendix A for details). However, getting from the LSA to the reality of flood survivors living inside safe and affordable homes will take a significant amount of time, energy, investment, and planning on the part of the city officials and staff, their recovery partners, and of course, the survivors themselves. HMDRR has worked to supplement and fill in gaps during the first steps of a long recovery process, including the following LSA which can inform future resilient housing development strategies for the city.

Linking Home Buyouts, Relocation and Greenspace Concepts

A major output of HomePlace for Kinston, which is a component of the broader Relocation Strategy, is a Greenspace Concept (Figure 2) that illustrates a set of potential recovery strategies. The concept includes actions such as: constructing a pedestrian bridge from downtown across the river to the west bank where the Neuseway Planetarium and Health and Science Museum is located, creating a paved shared-use path from King Street to Queen Street, and transforming former residential areas over time to support a network of interconnected trails through the Neuse River floodplain (HomePlace, 2017).

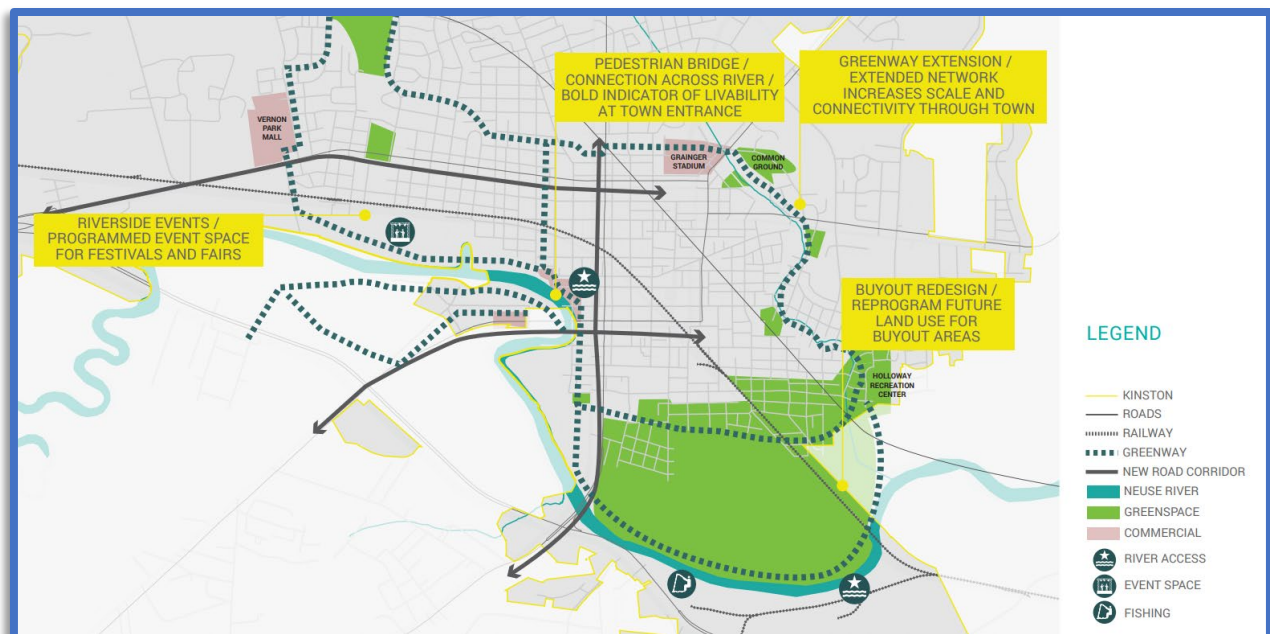


Figure 1. Kinston Greenspace Concept.

The LSA highlights on a parcel by parcel basis the most suitable locations based on a larger set of variables and thresholds. The results are related to the outcomes of other past planning initiatives conducted in Kinston, which includes, but is not limited to the Retrofitting Green plan, the LSAs found in the city's land use plan, the Kinston Waterfront - Now! study and the Mitchelltown Area Revitalization Plan.

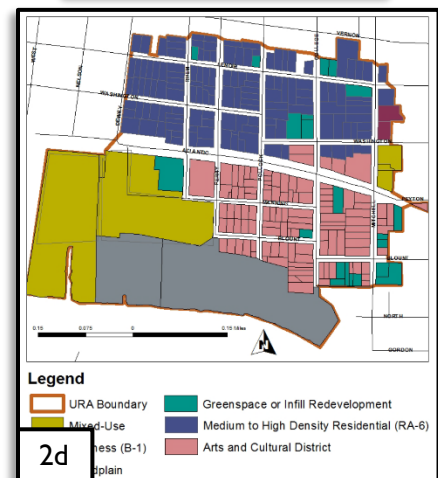
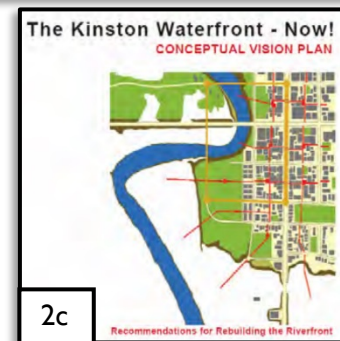
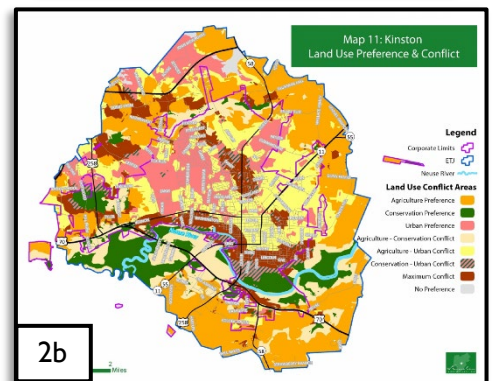
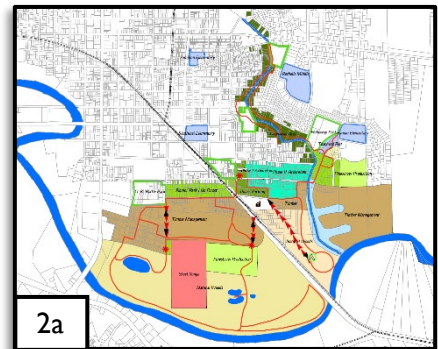
Previous Land Use & Revitalization Initiatives

Retrofitting Green Open Space Plan (2005): Created by a city-designated Open Space Committee, this long-term open space management plan proposes various uses for previously acquired floodplain land following hurricanes Fran and Floyd, creating community assets that compliment other land use programs and projects. While only a small portion of the plan has been implemented, its concepts involve a range of stakeholder groups and aim to promote resource conservation, environmental education and sustainability.

'Plan Kinston' LSAs (2015): The recent comprehensive land use plan for the city, Plan Kinston, includes three separate land suitability analyses done for agriculture, conservation and urban uses. The locations where two or more of the land uses are considered highly suitable, a potential conflict may arise. Figure 2 shows the land use preferences and conflicts identified through this process. These results, and in particular the 'Urban Preference' areas, could serve as a foundation from which to apply the more detailed housing redevelopment LSA presented by HMDRRI.

Kinston Waterfront – Now! Conceptual Vision Plan (2006): Developed by graduate students at the North Carolina State University Landscape Architecture program, the concepts offer a vision for the Neuse River waterfront in downtown Kinston focused on pedestrian and special interest projects. It calls for pedestrian bridges, greenway expansion, and reuse of vacant or underutilized lands for recreational or cultural purposes.

Mitchelltown Area Revitalization Plan (2014): Supported by major grassroots involvement, the City of Kinston developed a number of goals and strategies through an Urban Redevelopment Area proposal to improve the quality of and opportunities for the Mitchelltown neighborhood. This approach and level of detail is crucial to positive neighborhood change and represents what a next step could look like after identifying a relocation area or areas based on the various LSAs, including the one conducted by HMDRRI.



Figures 2a-2d. Snapshots of various land use and revitalization initiatives.

While the city is working to address major issues such as decaying infrastructure and economic development, another challenge is to encourage flood survivors who were displaced from their homes to permanently relocate to areas within the community that are desirable to live in and are located in places that are less susceptible to future flooding. This concept was envisioned after Fran and Floyd through the multi-stakeholder Housing Employment Leading People to Success (HELPS) and Call Kinston Home initiatives which sought to support, educate and empower residents involved in the buyout program. The LSA and Relocation Strategy have been informed by this past work and they strive to help address not only some of Kinston's long-term recovery needs but support the city's goals of increasing long-term resilience.

LSA Variable Description and Weighting

The selection of variables to include in the LSA began with a broad review and consideration of 36 variables of diverse types such as proximity to community services, transportation, environment and topography, planning, and flood risk (Appendix D, Table A1). Since many variables were not applicable in Kinston (i.e., proximity to hazardous waste sites, sea level rise vulnerability) or may not be major determinants of a site's development potential (i.e., bus stop proximity, park proximity, etc.), members of the HMDRRI team prioritized the top 8-10 variables based on past LSA experience and available knowledge about flood risk. Comparison of each member's interpretation led to consensus on the most important factors on which to focus during the development of a preliminary LSA. Described in further detail below and in Table I, some of the key variables included the designated 100-year flood zone, Hurricane Matthew flood extent, land/building vacancy, parcel size, and zoning.

A few variables such as the municipal boundary or 100-flood zone have thresholds of Boolean nature (binary in/out or yes/no) and therefore, had simple criteria for point attribution. Other factors such as parcel size and zoning contained a range of quantitative and qualitative values, and needed criteria and thresholds to be established. These were determined after further exploration of the variability of each factor and discussion with HMDRRI team members about what planning and development concepts were most applicable. Descriptions and justifications of each variable, its associated thresholds, and data sources are explained below and summarized in Table I.

Table 1. Kinston LSA Variables and Criteria Thresholds.

Category	Variable	Criteria Thresholds	Points	Max
Jurisdictional Boundaries	Municipal Limits	Out	0	1
		In	1	
	Extraterritorial Jurisdiction (ETJ)	Out	0	1
		In	1	
Parcel Size*	Infill Potential	< 3,000 ft ²	0	2
		3,000 ft ² - 20,000 ft ²	1	
		20,000 ft ² - 100,000 ft ²	2	
	Multi-Structure Potential	100,000 ft ² - 500,000 ft ²	0	2
		500,000 ft ² - 1,000,000 ft ²	1	
		> 1,000,000 ft ²	2	
Building/Land Vacancy	Vacant/Abandoned Building	Occupied - FP	0	4
		Vacant - NO FP	4	
Flood Risk	100-yr Floodplain (Zone AE)	In	0	4
		Out	4	
	Hurricane Matthew Flood Extent	In	0	2
		Out	2	
Areas of Future Development	Zoning	Institutional, Industrial	0	2
		Commercial	1	
		Residential	2	
*Each parcel, based on its size will fall into one of two categories: infill potential or multi-structure potential, both with possible totals of 2.			Total:	18

Vulnerability to Flooding/Flood Risk

Source: NCEM, 2017

(100-Year Flood Zone; and Hurricane Matthew Flood Extent)

Perhaps the most crucial set of factors for the Recovery Strategy and LSA are related to flood risk and vulnerability. The 100-year floodplain (Zone AE) or base flood elevation delineates the area that is expected to be inundated by a 1% annual chance flood. Hurricane Matthew's flood extent is also relevant as the most recent flood event for the city and generally followed boundaries between the 100- and 500-year floodplains. The event's flood extent represents areas where officials and residents have actually seen flooding versus what is depicted on Flood Insurance Rate Maps which are calculated using hydrology and statistics and included a certain amount of uncertainty or inaccuracy.

Together, these flood risk variables account for both estimated flood risk that is tied to various regulations and programs as well as the observed flood experience which is easier to understand from the public's perspective. These factors provide a range of possible flood elevations, a more comprehensive view of a property's vulnerability to future flooding and meets a main goal of the RS to develop in safer areas.

Jurisdictional Boundaries

Source: Lenoir County, 2017

(Municipal Limits; Extraterritorial Jurisdiction (ETJ))

Municipal governments in North Carolina have control and influence both within their corporate boundaries and in areas designated as its Extraterritorial Jurisdiction, or ETJ (see Owens, 2013). For a number of reasons, it is important for the Land Suitability Analysis to include the ETJ. To promote orderly development and the efficient investments in infrastructure and the provision of services, the most common practice is to annex land prior to development. Where that does not happen, the ETJ helps to avoid problems by applying municipal development standards, zoning, and proper layout of subdivisions for residential, commercial and industrial development. Following a disaster in which buyouts occur on flood-prone land, for example, there may be insufficient land within the community to build replacement housing, requiring an assessment of lands outside the community but within the ETJ. The Land Suitability Analysis concept, in combination with the Relocation Strategy, is well suited to address this issue. For the reasons cited above, annexation prior to development is the best practice but planning prior to annexation is fully appropriate, and this fits well with the planning support offered by the LSA. For post-Matthew recovery, the emphasis is on residential relocations, however in the future it may be useful for commercial and industrial business developments to apply these concepts as well.

Parcel Size

Source: NC OneMap, 2017

(Infill Potential; < 3,000 sq. ft.; between 3,000 and 20,000 sq. ft.; and between 20,000 and 100,000 sq. ft.)

Some lot sizes are suitable only for development of single family homes or lower densities. The thresholds were selected based on size of existing single-family home building footprints and lots sizes in Kinston. The smallest existing lots in the city that have single family homes on them are at least 3,000 sq. ft. and the median parcel size found within the city limits is about 21,000 sq. ft. Therefore, any parcel less than 3,000 would not be considered suitable while the other two categories already do or could support a small- to medium-size single family home and larger homes for which existing lots did not exceed 100,000 sq. ft. Square footage was used instead of acres because some lot sizes were so small that multiple decimal places would have been required to display variability.

(Multi-Structure Potential: between 100,000 and 500,000 sq. ft.; between 500,000 and 1,000,000 sq. ft.; and >1,000,000 sq. ft.)

Larger lots may be suitable for development of multifamily structures or moderate density replacement housing such as apartment buildings. This form of development could be more attractive to developers or investment partners that seek to build a larger number of units. Thresholds were selected based on size of larger parcels within town that had multifamily housing structures on them.

Land Vacancy

Source: NCEM, 2017

(Building Footprint Present: FP or NO FP)

A proxy was created to determine which lots were vacant and had no building footprint because they would be the easiest on which to develop relocation housing, whereas if there is a building footprint (FP) on a lot, it may or may not need to be demolished. The latest building footprint data was obtained through North Carolina Emergency Management and used to identify properties that do not have a building footprint on them. The following categories listed from lowest to highest relative suitability include: Occupied - FP and Vacant - NO FP.

Areas of Future Development

Source: Lenoir County, 2017

(Zoning: Commercial, Industrial, Residential, Institutional)

Zoning reflects the community's intended use of that property, based on a number of factors. It may be more difficult to develop replacement housing on properties that have been zoned for something other than residential, such as manufacturing, whereas a property already

zoned for residential development, will not require a rezoning, variance, or other procedural action. HMDRRI consolidated 10 different zoning designations into 4 categories for simplicity (Table 2). The zone of greatest interest and value for the Recovery Strategy and LSA is one which would require little to no extra administrative burden during the development process. Developing housing in zones such as commercial may conflict with prior planning goals and require rezoning. However, major flood events such as Matthew can lead to redefined planning goals and therefore justified changes in the zoning designations of the community.

Table 2. Kinston Zoning Codes.

Zoning Code	Description
B1-B2	Commercial
I-1, I-2, I-B	Industrial
RA-5, RA-6, RA-12, RA-20	Residential
O&I	Institutional

The eight variables represent the factors that determine a parcel’s composite suitability for housing development or redevelopment. The factors and thresholds guide the results of the LSA which can inform decisions that meet the goals of the HMDRRI Relocation Strategy, which is to reduce flood risk, retain flood survivors within the community, and minimize construction costs.

While this analysis was done to inform the siting of replacement housing, the results are also useful for addressing the lack of affordable housing in general. Additionally, a similar method could be used by the city as was done in *Plan Kinston* for other planning objectives such as siting future park/greenspace or other public facilities. Further description of these possibilities could be explored in more localized revitalization plans and using ideas provided in the LSA Technical Memo.

LSA Results and Interpretation

The results of the LSA reveal significant spatial variation in the total suitability score within the city’s ETJ. For instance, there are areas in close proximity to one another, but with major differences in suitability, most likely a result of the irregular shape of the floodplain boundary and its relative weight and influence on the scoring. Of the analyzed parcels that fall within city limits, there are dozens of parcels that received a “highest” suitability score, generally located north of West Vernon Street/U.S. 258-Business and west of North Queen

Street/Highway 58 N or areas northwest of downtown (Figure 3). Additionally, a few parcels east of Highway 58 N were found to be fairly suitable. While most of the larger parcels are existing parks or working farmland, some of the smaller parcels (<50,000 square feet) that are also vacant or contain abandoned or dilapidated homes could support infill development. Other land use policies and incentive programs could facilitate this sort of process. Low and moderate scoring parcels were made transparent to highlight areas of highest and lowest suitability for easier interpretation on a city-wide scale.

Suitable areas are distinctly separate spatially from the lower scoring, low-lying areas adjacent to and just north of the Neuse River which is where the land that made up the Lincoln City neighborhood is located. Properties near other known-to-flood areas along Adkin Branch stream scored in the 'low' or 'lowest' suitability category, considering the high risk of flooding. This is made clear by overlaying the flooding extent of Hurricane Matthew. Properties that were previously acquired through FEMA's Hazard Mitigation Grant Program lie within the 100-year floodplain and are not suitable for redevelopment because of the federal requirement that this land must be maintained as open space in perpetuity (and it is located in a flood-prone area).

Kinston can use these findings to delve deeper into potential suitable properties for infill or larger housing development and consider additional factors not included in this analysis such as property ownership, land value/acquisition cost, proximity to downtown or other key community assets. City staff, officials and community leaders could also work to adapt the process to fit any newly defined or redefined development and recovery goals.

As a tool for developing new community improvements, the LSA could be used to help design an initiative for housing infill as part of a larger revitalization project dealing with both physical neighborhood upgrades and socioeconomic strategies for disadvantaged segments of the population. Parts of Kinston are hampered by conditions of blight and abandonment, including a number of vacant lots. Some areas are dominated by high rates of poverty, unemployment and low education attainment. To be successful at revitalization, a multi-faceted approach is needed. Infill housing can be an important part of the overall solution that uses resources in disaster recovery, taking advantage of special hazard mitigation funding to meet housing needs in areas outside the floodplain.

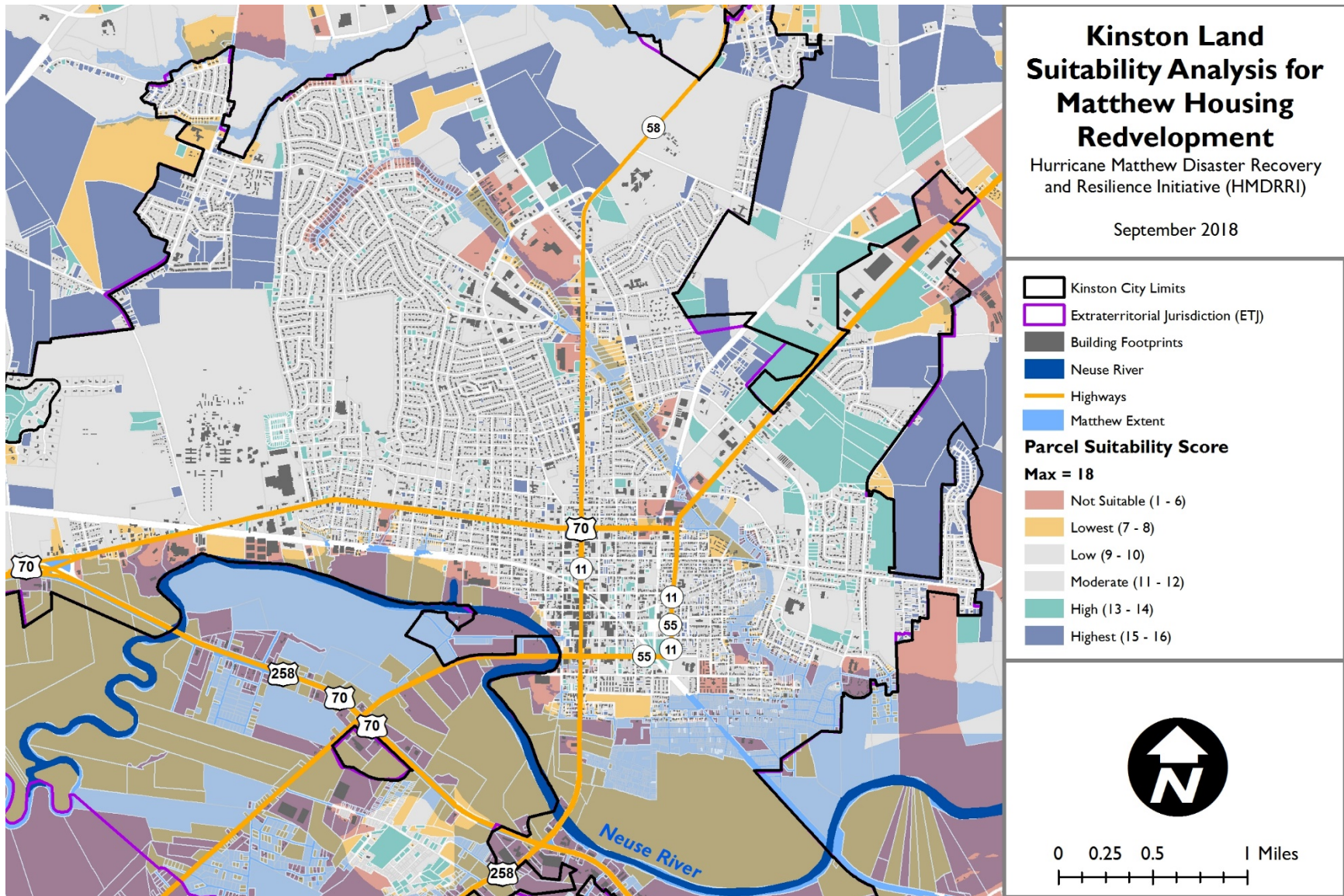


Figure 3. Kinston city-wide Land Suitability Analysis.

Conclusions and Next Steps

As a first step in utilizing the LSA results, community leaders in Kinston can further investigate and explore characteristics of the most suitable parcels. There are a few individual parcels within Kinston's city limits that are considered to have 'high' composite suitability, may be vacant and/or acquirable and could support multiple types of housing. Located primarily north of downtown at significantly higher elevation, a number of small-medium size vacant lots exist in areas of reduced flood risk that could support infill development of single-family homes. Some larger parcels also meet the criteria and could support a cluster of single-family homes.

Moving forward, the city of Kinston may consider revising and expanding the LSA to address a variety of purposes in coordination with Lenoir County and others. Suggested considerations for more general improvements to the process are listed in the concluding remarks of the Technical Memo on Land Suitability Analysis (See Appendix C). Other potential steps for getting the most out of the LSA and its relevance to the ongoing recovery include:

- Exclude other non-suitable areas such as cemeteries, past and expected future buyout properties, existing parks or golf courses, land with poor soil conditions, or others to narrow the scope of suitable properties.
- Share LSA method and results with housing stakeholder groups (local/state housing finance agencies, financial institutions, housing developers, engineers, architects, landscape architects, planners, real estate companies, religious groups, non-profits, and private foundations) to aid in discussing programs and funding mechanisms that support other housing recovery goals.
- Consider pairing the existing or revised results of the LSA with design-oriented public engagement activities during all relevant community plan development or update processes (i.e., Comprehensive Land Use Plan, Bicycle and Pedestrian Plan, Hazard Mitigation Plan, Urban Redevelopment Area plan, etc.)

Implications for Future Planning and Use of LSAs

Along with the devastation seen after Hurricane Matthew, the record-breaking 2017 hurricane season in the U.S. is a stark reminder of the great challenges we face in preparing for, responding to, and recovering from major natural hazard events. Along with recovery from these events, current and future generations are simultaneously trying to understand how to plan and invest more effectively knowing that in an era of climate change, these risks are only expected to increase. Major events like hurricanes Matthew, Harvey, Irma, Maria, and now Florence have produced a set of extremely difficult circumstances for the thousands of people affected. They have also brought people together in amazing ways. The human spirit often shines during response and recovery as everyday heroes emerge and local officials call for the need to ‘build back better’. However, the physical and emotional trauma that transpires in the aftermath of an event often reveals the disproportionate impact felt by communities of modest wealth and communities of color who were struggling prior to the event. Opportunities to invest in alleviating these disproportionate impacts are limited and at the federal government level, lean towards a reactive instead of proactive approach. Pre-event planning offers another opportunity to create positive change with and for those with the greatest levels of vulnerability.

Every year, more accurate data is collected, analyzed, and visualized through new tools that increase awareness and understanding of our country’s natural hazard risks. Some tools are also getting better at linking community goals and addressing multiple issues at once. HMDRRI’s approach to the LSA is an example of how a tool can be flexible, yet powerful in its ability to inform a relocation strategy. Supported by the indigenous knowledge of a community, planning approaches like this can be used to guide a more resilient and equitable recovery in the future.

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Appendices A, B, and C

Appendix A: HomePlace Report on Kinston

The HomePlace document's primary focus is on community-specific designs to include open space management and residential construction. The greenspace concept emphasizes an expanded trails network that takes advantage of the community's location on the Neuse River, and additional greenspace east of the downtown resulting from voluntary relocation and residential buyouts. In addition, several housing designs were developed to offer possible options for those choosing to build replacement housing. The Kinston HomePlace document can be accessed at: <http://coastalresiliencecenter.unc.edu/wp-content/uploads/2017/10/HomePlace-Kinston.pdf>.

Appendix B: Technical Memo: Land Suitability Analysis

This appendix provides a detailed description of the steps involved, reports generated and maps produced as part of a Land Suitability Analysis. Because this is a community-oriented decision support method, engagement with the community is needed when calibrating the weights or rankings of many factors. Participation may include municipal staff, advisory groups and elected officials. The appendix includes a flowchart of the process and sample tables and maps. The HomePlace report and the LSA are part of the larger Relocation Strategy described in this Technical Memo. The Technical Memo can be accessed at:

Appendix C: Master List of LSA Variables

Table A1. Master list of LSA variables considered.

Category	Criteria	Source	Used in LSA
Accessibility of service and facilities	Existing jurisdiction proximity	Census	
	Proximity to commercial area	Local/Plans	
	School proximity (primary, secondary, post-secondary)	Census	
	Hospitals proximity	Census	
	Utility infrastructure connectivity (water, wastewater, electricity, communications)	County/State	
	Park/playground proximity	Local	
Transportation	Bus stop proximity	Local	
	Major highway proximity	Census	
Socioeconomic Factors	Population density	Census	
	Community preference	Survey	
	Renter / owner	Census	
	Neighborhood Type	Local	
	Ratio of less mobile people / disability / aged	Local	
	Land value	Census	
Environment and Safety	Protective infrastructure integrity	Local	
	Drainage	Survey/Local	
	Reliance on protective infrastructure	Local	
	Proximity to water bodies	State	
	Proximity to known / potential environmentally hazardous waste sites	NC DEQ	
Topography	Slope	USGS	
	DEM	USGS	
	Water table depth	USGS	
	Tidal factors	USGS	
	Soil composition	SSURGO	
	Vegetation composition	State	
	Vegetation density	State	
Planning	Areas of future development (zoning or Future Land Use)	Local	
	Parcel Size	Local	
	Land/Building Vacancy	Local/State	
	Large infrastructure project	Plans	
	Economic development areas	Plans	
Flood Risk	Historical value / significance	Survey	
	FEMA Flood Zones (100- and 500-Year)	NCEM	
	Sea level rise (LiDAR)	NOAA	
	Hurricane Floyd flood extent	NCEM	
	Hurricane Matthew flood extent	NCEM	