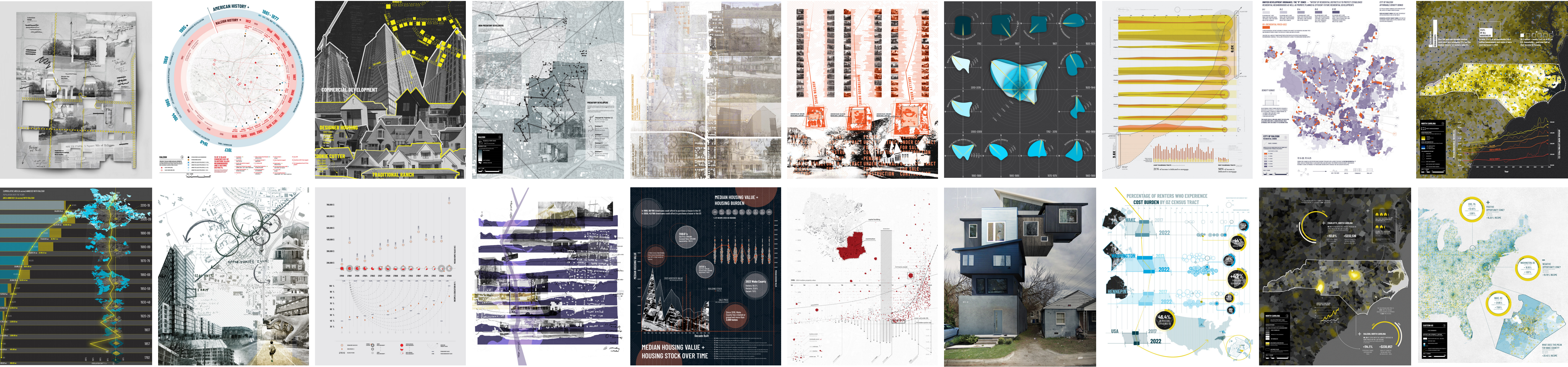


# Squeezed Out

## Mapping Diverse Dimensions of Raleigh NC's Housing Crisis



Across the US we are witnessing a housing crisis catalyzed by a pandemic-related housing shortage and exaggerated by income inequality resulting in a disproportionate burden on the poor and non-homeowners. According to a 2022 article for The Atlantic, journalist Derek Thompson argues that “In 15 years, we’ve had a historic housing crash, a historic housing crunch, a historic pandemic-fueled buying spree, and a historic mortgage-rate spiral.” While many can agree to the primary solution – to build more housing – the priorities for the best way to do this are debated. In small and large cities around the country, the tensions between the desires of the developer, the needs of the citizen and community, and the goals of politicians and policy makers are often at odds. This is especially true in cities like Raleigh, NC , which has shown unprecedented growth over the past 10 years. According to CNBC, Raleigh is the fourth fastest growing city in the US economically, behind San Francisco, Seattle and Austin. A recent study by the Harvard Joint Center for Housing Studies indicated that over 42% of Raleigh Metro renters were rent burdened and 21% were severely rent burdened. At the Wake County and state level, varying sources put that number at over 50% (Ingersoll). According to a 2022 article published by the John Locke Foundation, “of the nation’s 50 most populous cities, Raleigh had the seventh highest year-over-year rent growth increase. The median price for an apartment in September [2022] was \$2,030, up \$287 from a year ago” (Raymer) which is outpacing inflation rates. The past 2 election cycles in Wake County have been dominated by affordable housing debates and policy initiatives by candidates, arguing for the need for density, affordability and accessibility. While Raleigh is particularly vulnerable at this moment, similar issues are continuing unabated in cities around the country.

The following visual essays employ practices of critical cartography to better understand the many complex factors that have contributed to the current state of housing in Raleigh, the Triangle, North Carolina and US. A primary aim for this research is to ultimately create more equitable, effective and innovative design and planning approaches to the future of housing and urban development writ large. Towards supporting synthetic understanding of the factors hindering equity, this research examines historic and contemporary data specific to Raleigh NC, with the aim of offering key insights for other cities across the country.

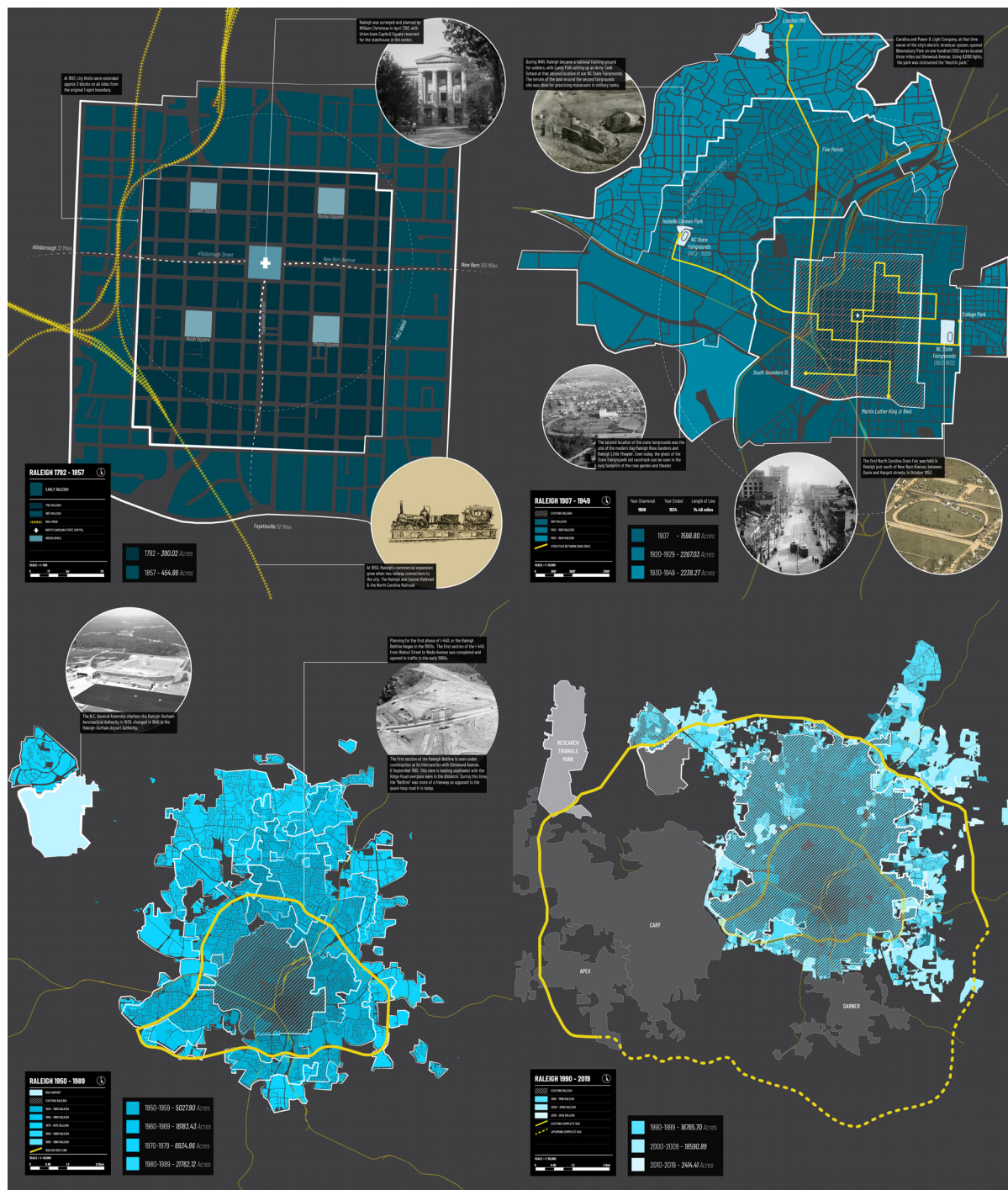
**Research Team**  
Raja Bandari, PhD in Design  
Kole Retterath, Master of Architecture  
Dillon Patel, Bachelor of Architecture  
Lira Gomes, Master of Advanced Architectural Studies  
Gabrielle Schiltz, Bachelor of Architecture  
Ariana Farquharson, Master of Art + Design  
Lucas Stott, Bachelor of Architecture  
Neil Bowen, Master of Architecture

Noelle Robinson, Bachelor Environmental Design in Architecture  
Maggie Kroening, Bachelor of Architecture

**Faculty Advisors, College of Design, NC State**  
Sara Queen, Associate Professor of Architecture  
Tania Allen, Associate Professor of Art + Design

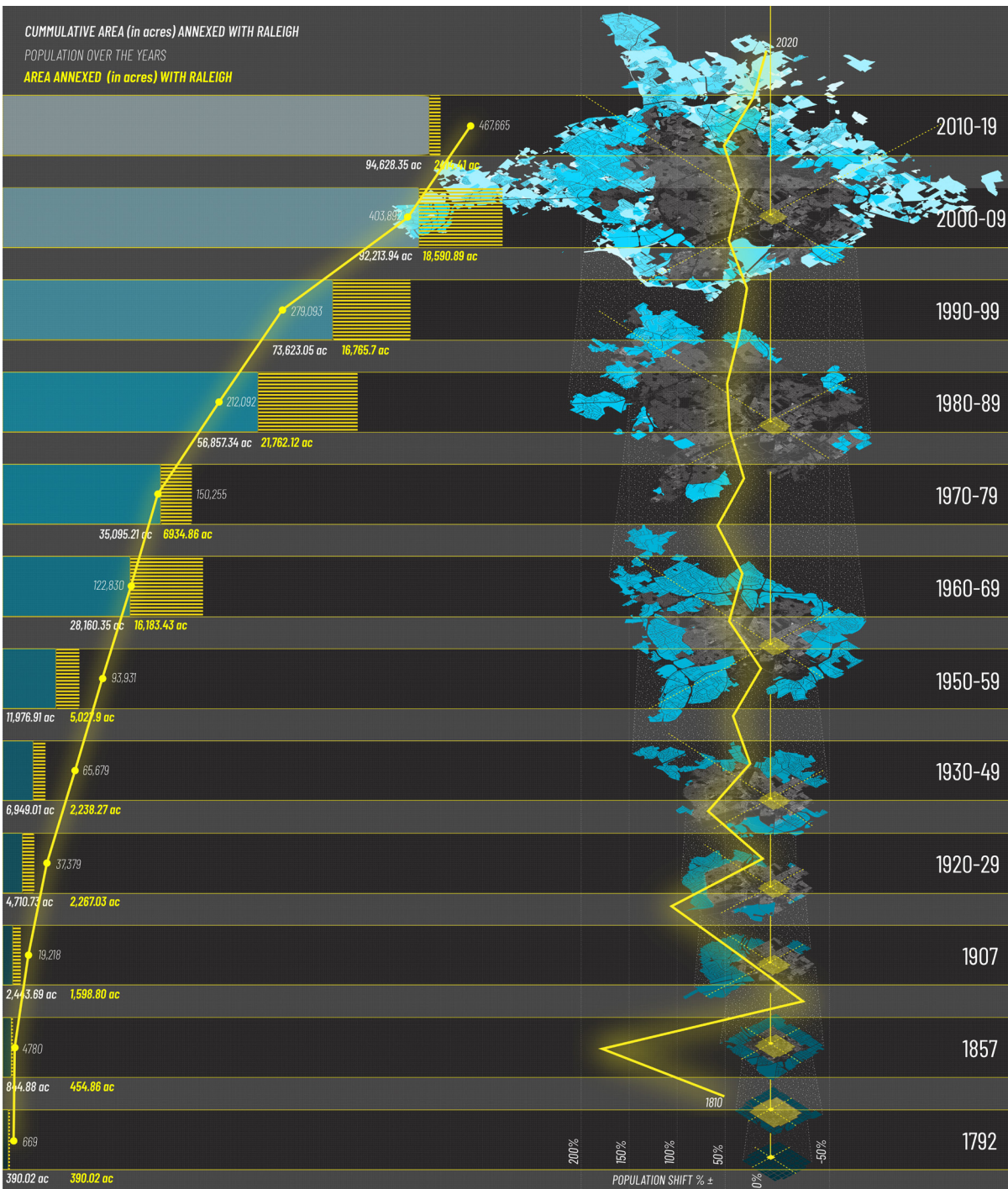
[Squeezed Out Data Sources & Citations Link](#)





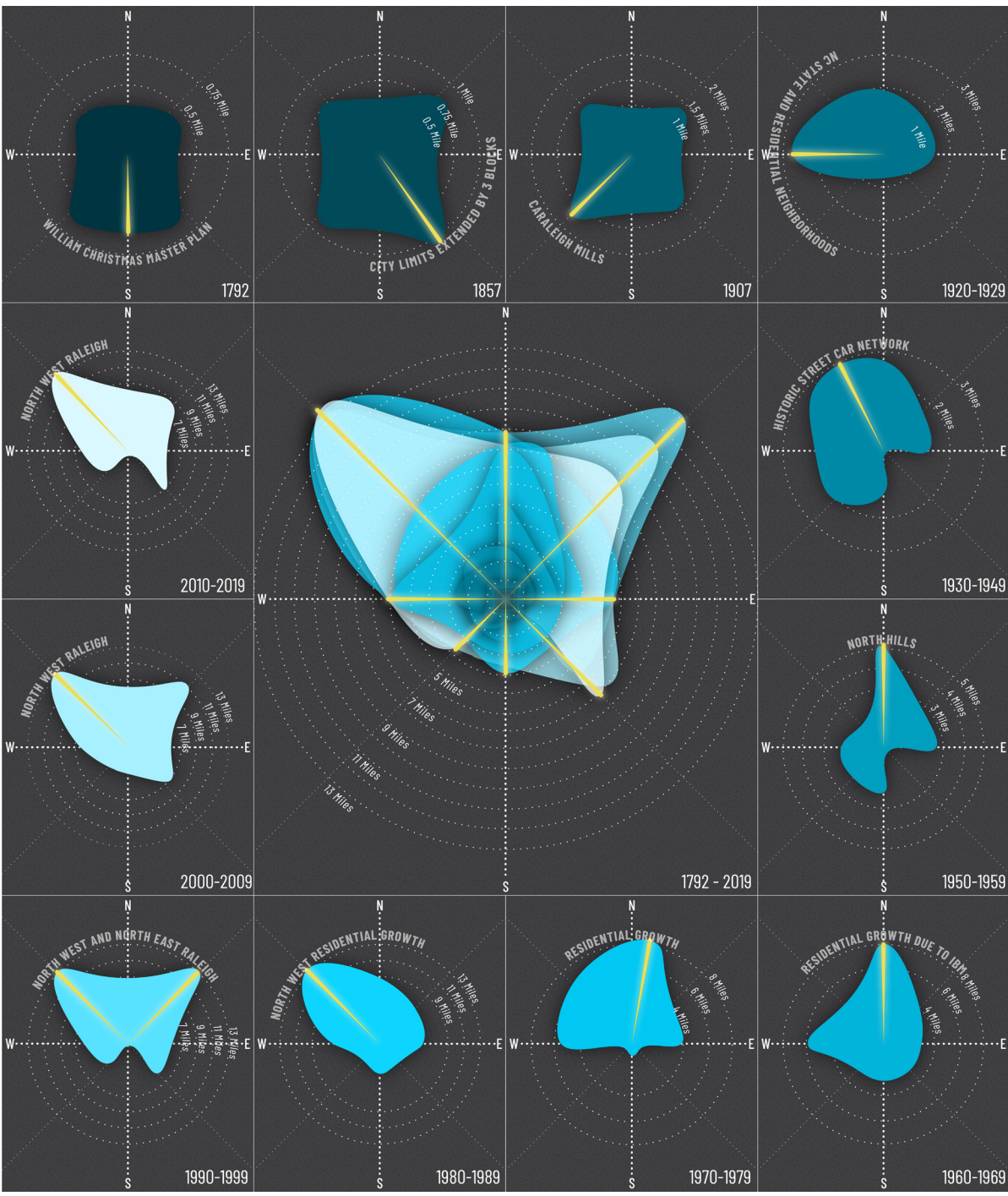
## Spatial Morphology of Raleigh

This map series charts Raleigh's historical expansion, tracing how the city's footprint has expanded over time. Historical context illuminates pivotal moments of growth and development, showcasing the transformation of rural landscapes into urban areas and residential neighborhoods.



## Temporal Morphology of Raleigh

This map illustrates the city's expansion over time, showcasing the interplay between population influx and territorial expansion. Since its master planning by William Christmas in 1792, Raleigh has undergone significant transformation driven by diverse factors such as commerce, education, trade and natural opportunities. This timeline serves as a chronological thread, connecting historical milestones with the city's expanding boundaries and changing demographics.



# Proximity Growth Analysis of Raleigh

This map reveals a detailed analysis of Raleigh's morphological growth pattern from 1792 to 2019 through proximity radar charts centered on the State Capitol Building which track annexed lands in relation to the city's geographical center. Each radar chart depicts the distance in miles between the State Capitol and annexed parcels of land during a specific time period. The central graph illustrates the cumulative annexations over time.



## Morphology of Boylan Heights

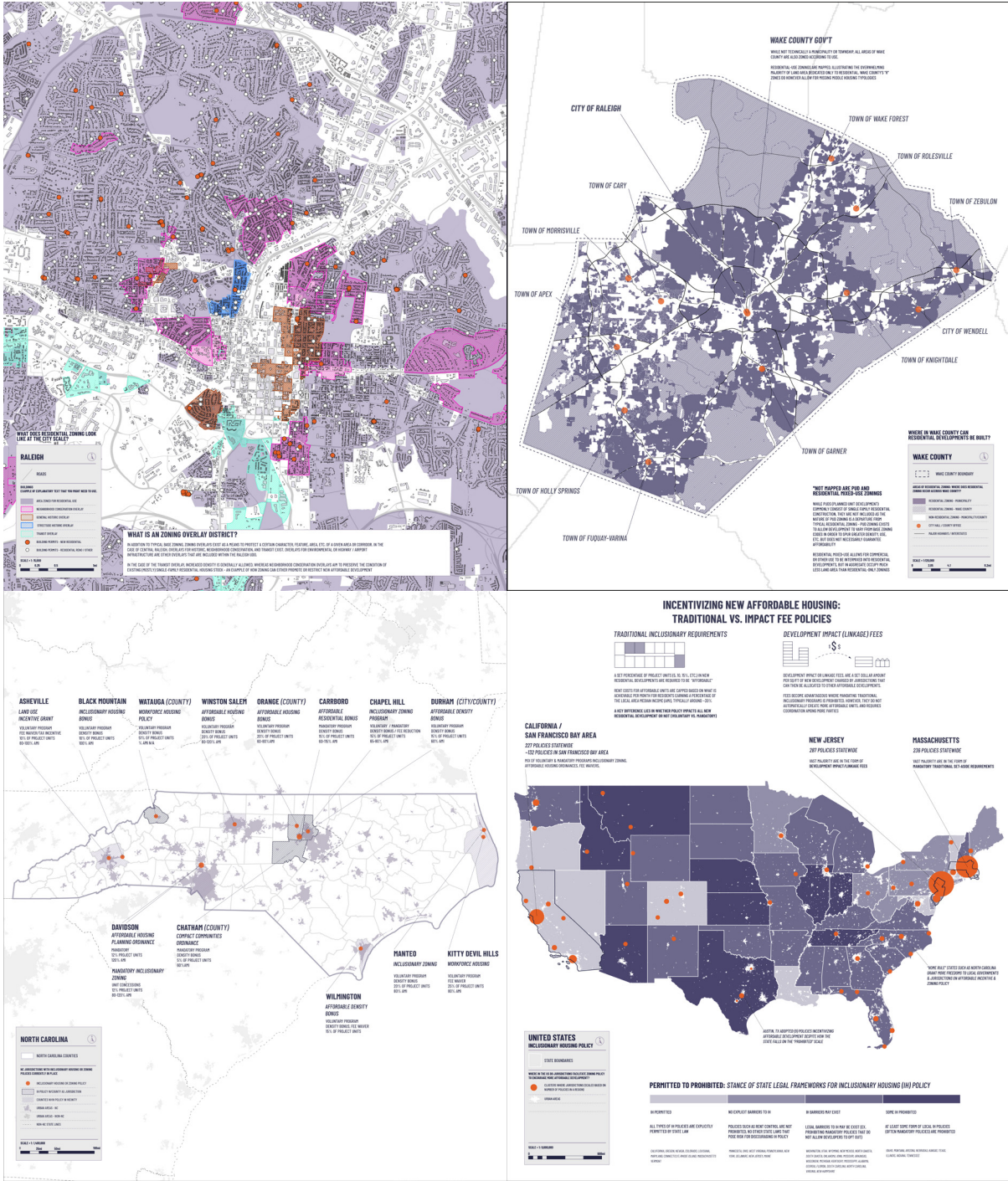
This map offers an intimate exploration of the morphological characteristics and unique layout of Boylan Heights, a neighborhood distinguished by its sloping topography and curvilinear street design. Situated on elevated terrain, Boylan Heights descends gradually from its highest point at Montfort Hall towards the east, south and west directions. Unlike the traditional right-angle grid common in earlier Raleigh developments, Boylan Heights features the city's first curvilinear street grid, designed to harmonize with the natural slope of the land.

# Morphological Growth of Raleigh

# Raja Manikam Bandari

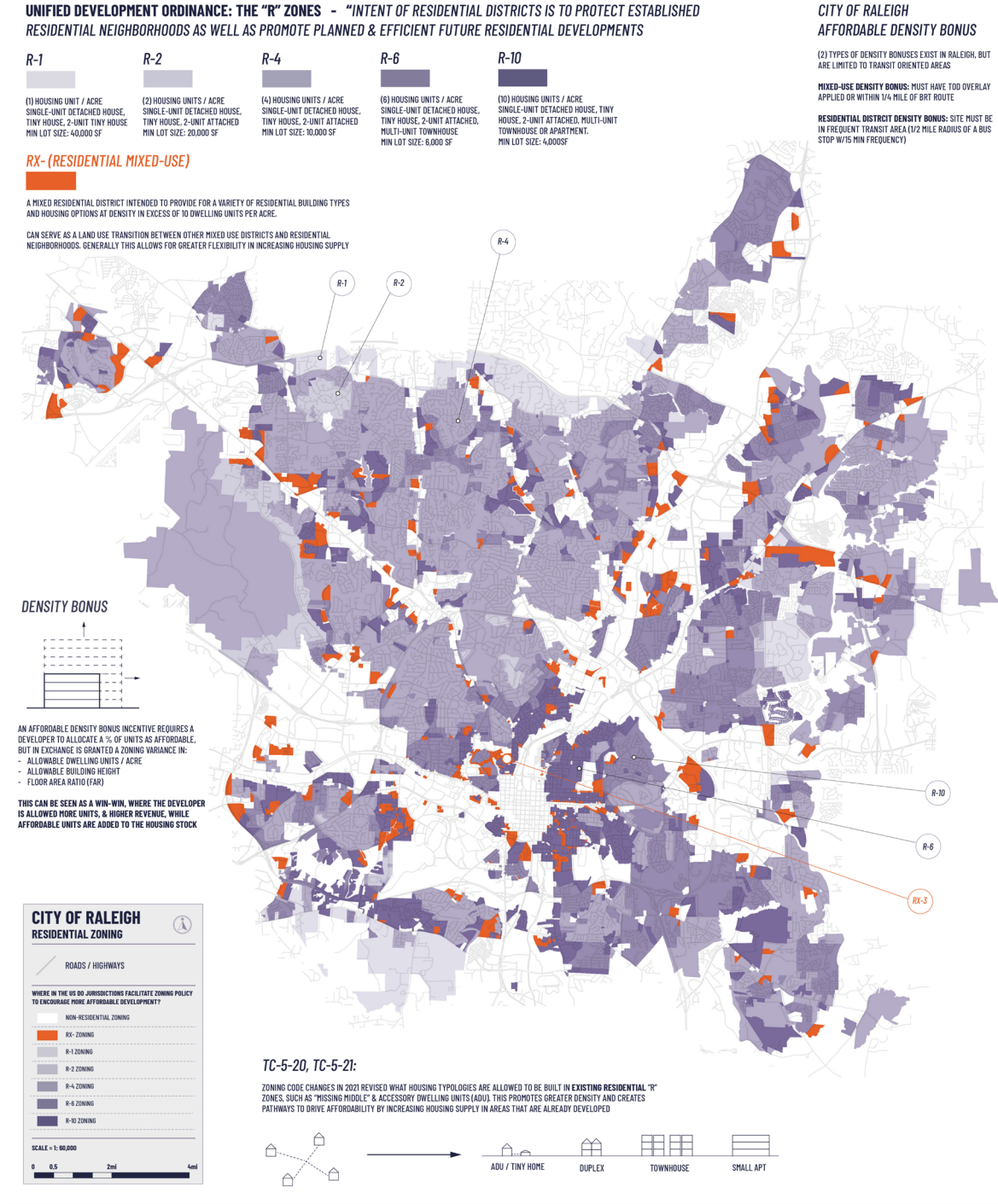
# Mapping the Evolution of Raleigh NC's Urban Form





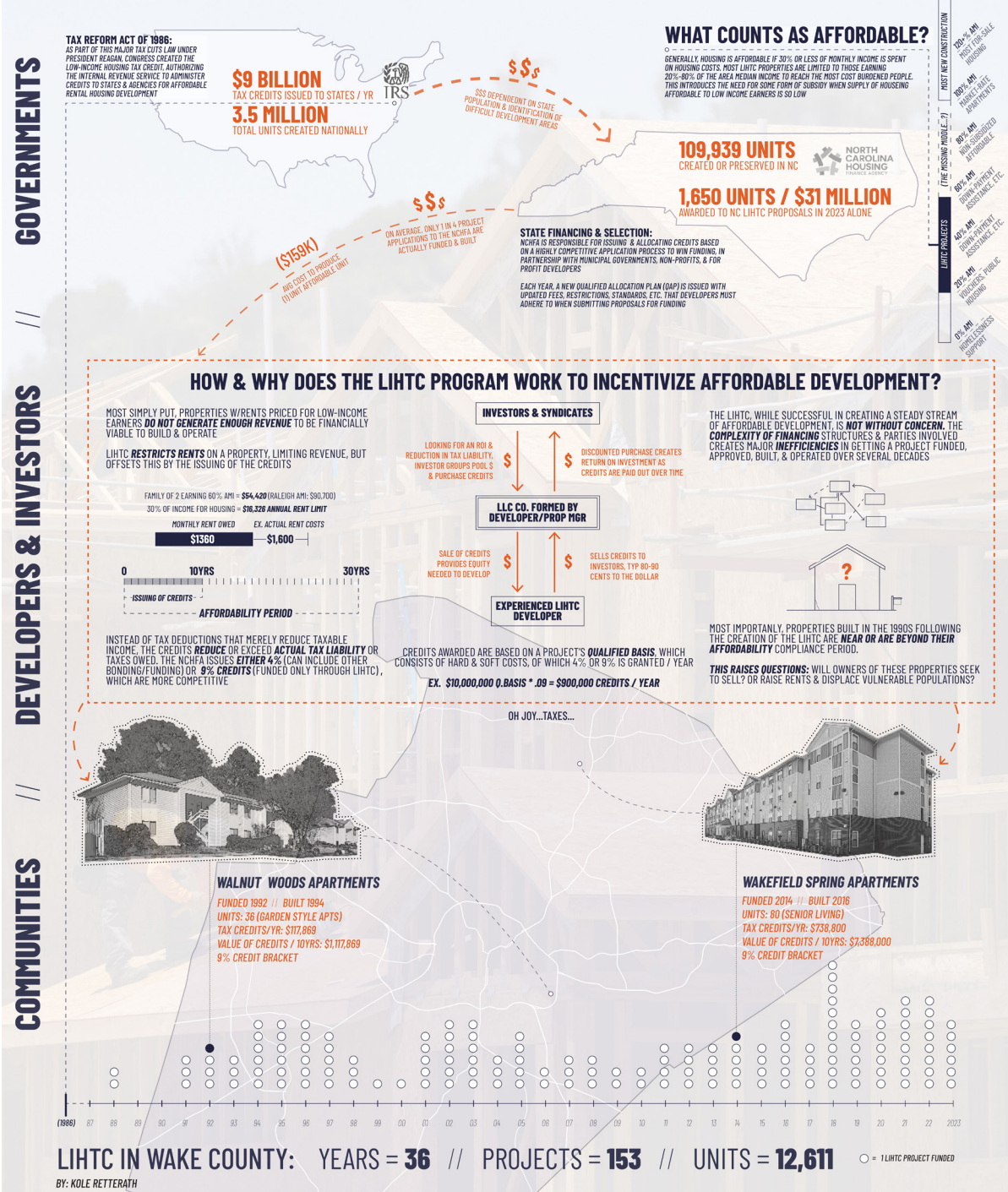
## Zoning and Affordability Incentives

This map series explores the influential forces of zoning and affordable development policies on the current housing crisis. Zoning has major implications for cost, availability and affordability by indirectly impacting supply and demand of housing stock. By highlighting how restrictive zoning policies historically privileged single family typologies and reduced the opportunity for diverse affordable housing units, these maps illustrate how we have arrived at our current “Missing Middle” condition.



## Residential Zoning in Raleigh

This map isolates residential zoning categories and illustrates the dominance of residential single-family zoning (R-1 to R-10) in a purple gradient in contrast to the emerging pockets of residential mixed-use zoning (RX) in orange. The white negative space of the map indicates large institutional footprints and transportation corridors with industrial and commercial land uses.



## Understanding the Low Income Housing Tax Credit

This map visualizes all LIHTC projects in Raleigh and their respective values. Created in 1986, LIHTC is a method of financing rental unit development which caps rent amounts in exchange for equity-building tax credits. LIHTC remains one of the most important tools to finance affordable rental units, but drawbacks include that rent amounts are not permanently capped and very low income renters often still require assistance to pay rent.



## Perceptions of Zoning Policy: Oakwood Ave

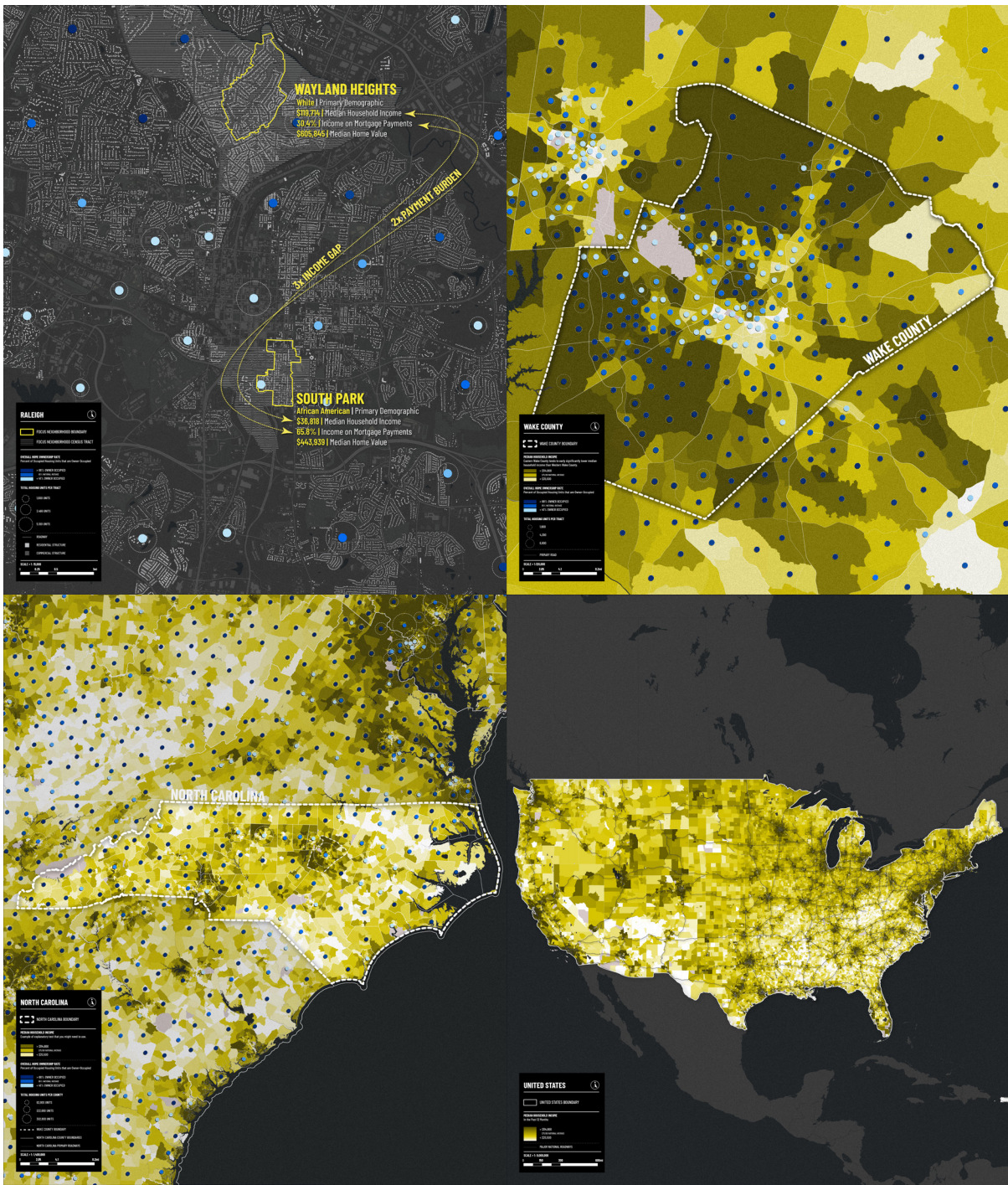
This perceptual collage depicts the diverse conditions along Oakwood Avenue which runs east west from College Park and Washington Terrace neighborhoods to the Historic Oakwood neighborhood and exemplifies the impact of zoning overlay districts and preservation incentives in appearance and investment.

# Zoning Policy & Housing

Kole Retterath

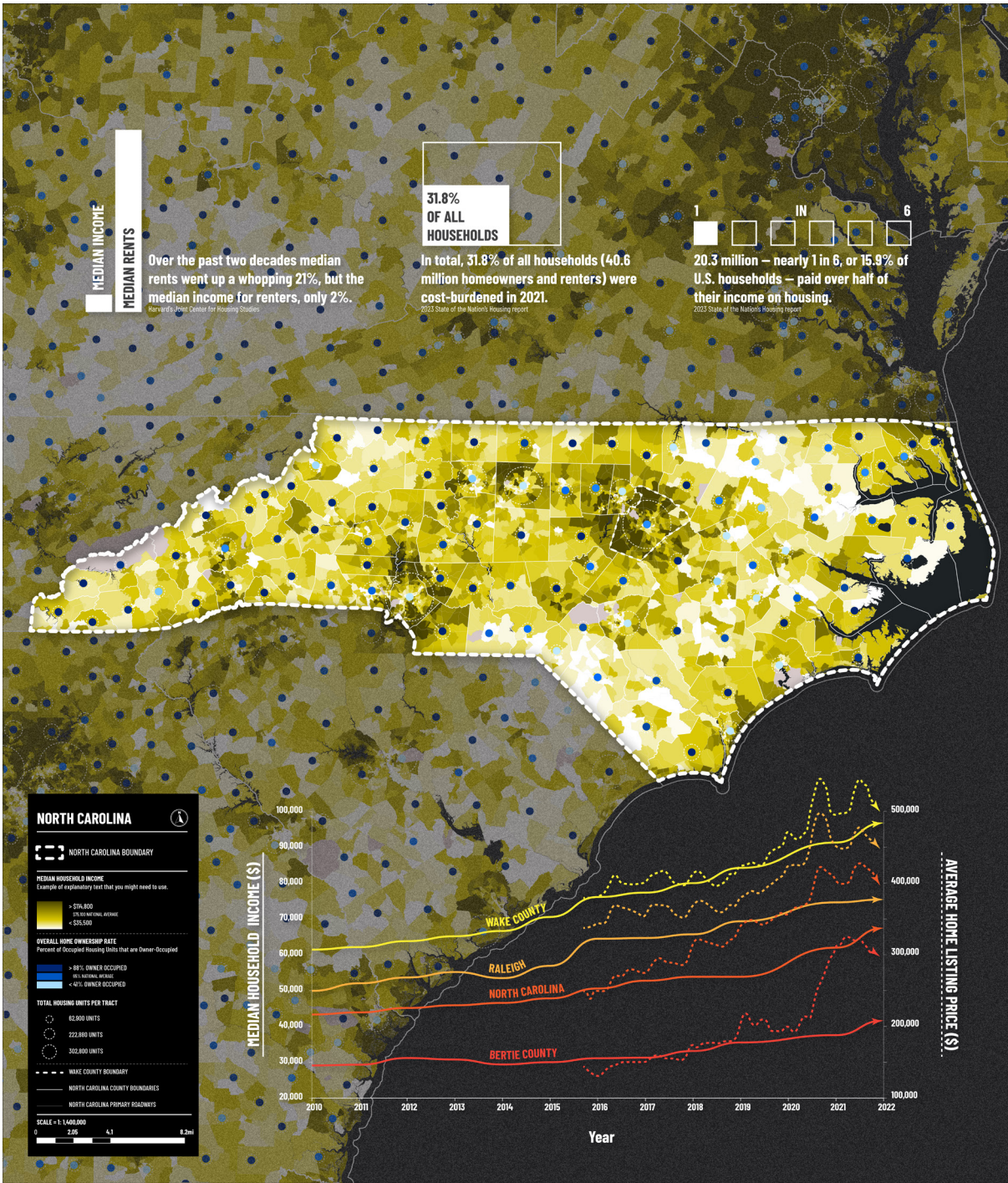
Exploring How Land Use Policies Influence Housing Types and Affordability





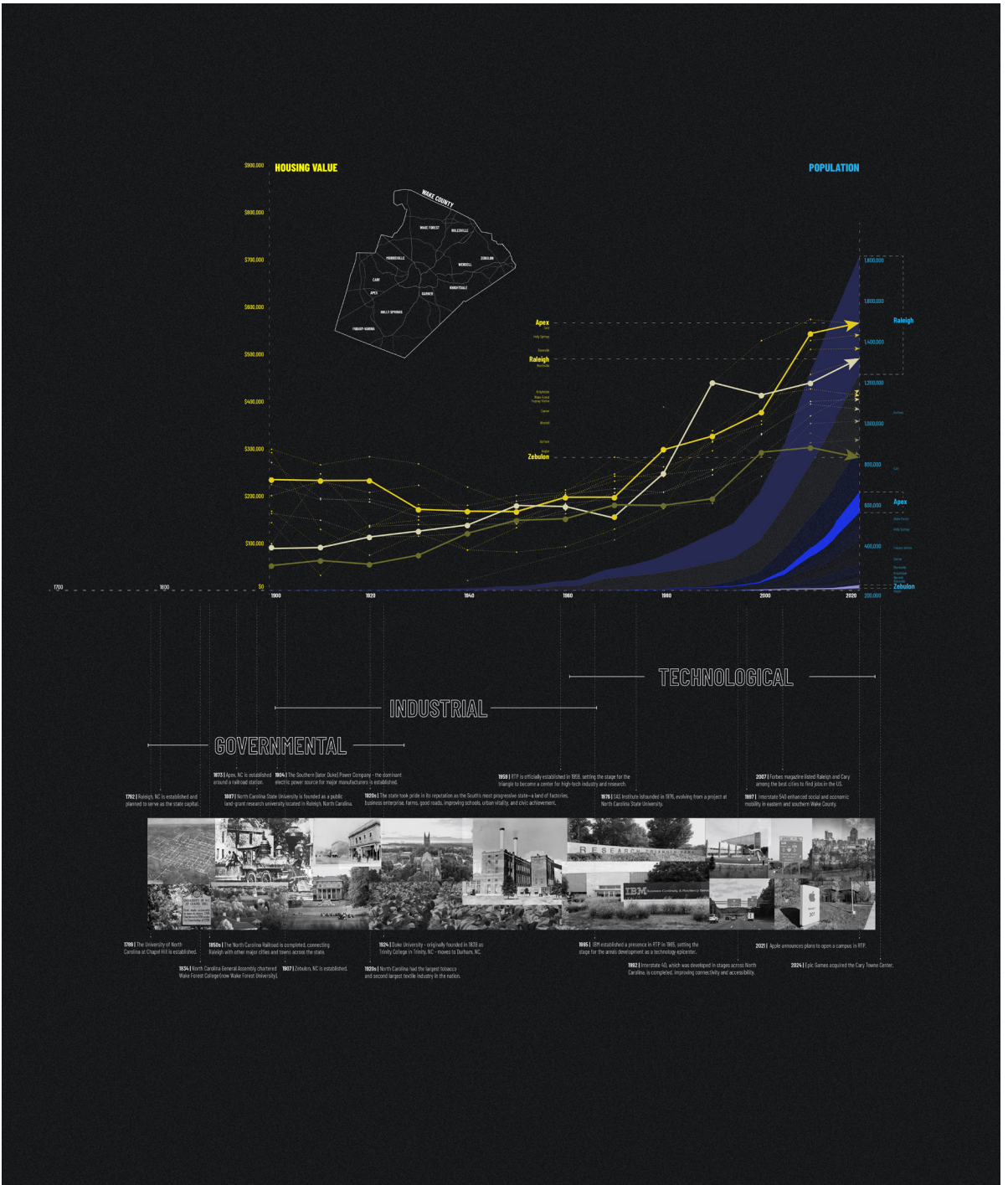
### Homeownership, Median Income and Urbanity

This map series highlights the intricate relationship between home ownership rates and median income levels at four different scales. Nationally, urban areas are concentrated alongside major infrastructure, enhancing economic prospects. In North Carolina, rural regions exhibit significantly higher home ownership rates, despite lower median incomes, compared to urban counterparts that attract higher incomes but fewer homeowners.



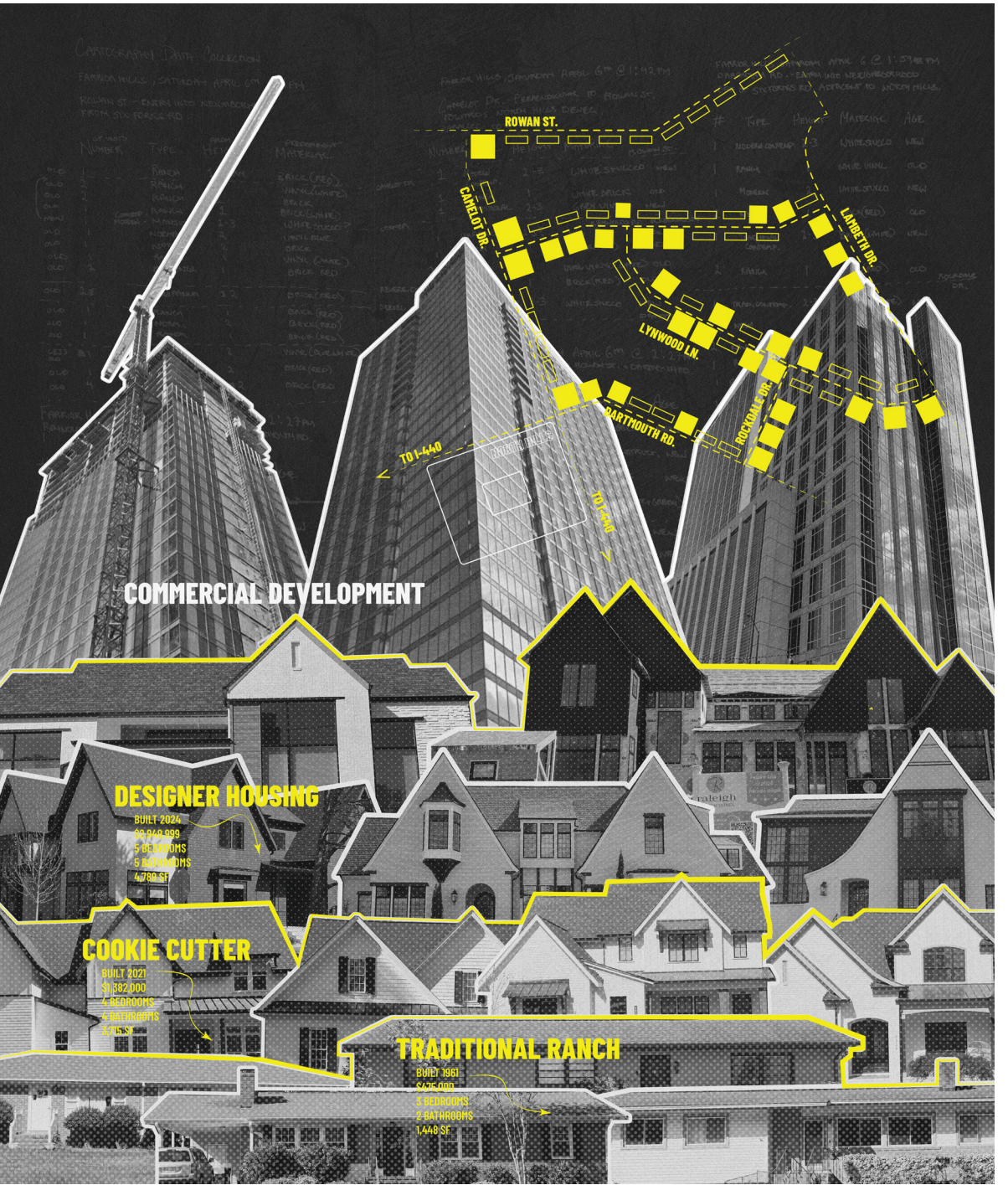
### Median Income and Housing Affordability

This map sheds light on contrasting economic landscapes within North Carolina while highlighting the intricate interplay between income, housing costs, and the pursuit of homeownership. The graph traces the evolution of median incomes and average house listing prices to underscore the stark economic disparities within the state. It reveals Wake County as an apex of economic and housing market vitality as compared to Raleigh, the broader state, and Bertie County.



### A History of Economic Disparities In Wake County

This timeline charts how Wake County's economic vibrancy stems from the distinct developmental patterns of its towns and the surrounding counties. Western Wake towns and cities have remained ahead of eastern towns due to the western focused development toward the Research Triangle Park, Durham, and Chapel Hill. Average housing values are higher in western towns and cities of Wake county, and these are correlated with higher population counts and higher median income levels.



### Old Roots, New Rises: Transitions of Architecture

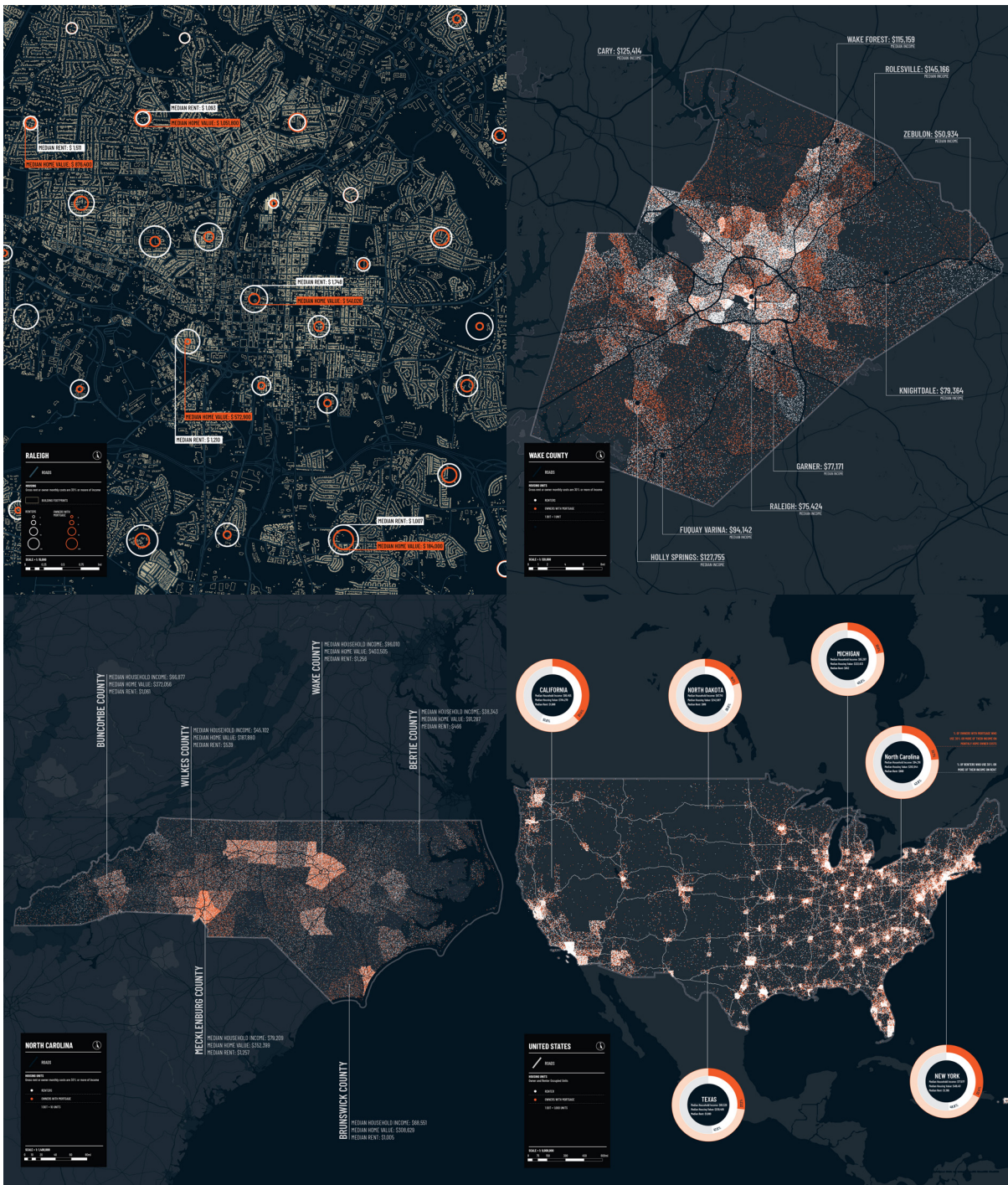
This investigative, on-the-ground mapping project delves into the architectural transformations in Raleigh's Farrier Hills and Lakemont neighborhoods by documenting the evolution from traditional ranch-style homes to modern, multi-story residences, reflecting a complex interplay of tradition and modernization.

# Homeownership & Economic Prosperity

Dillon Patel

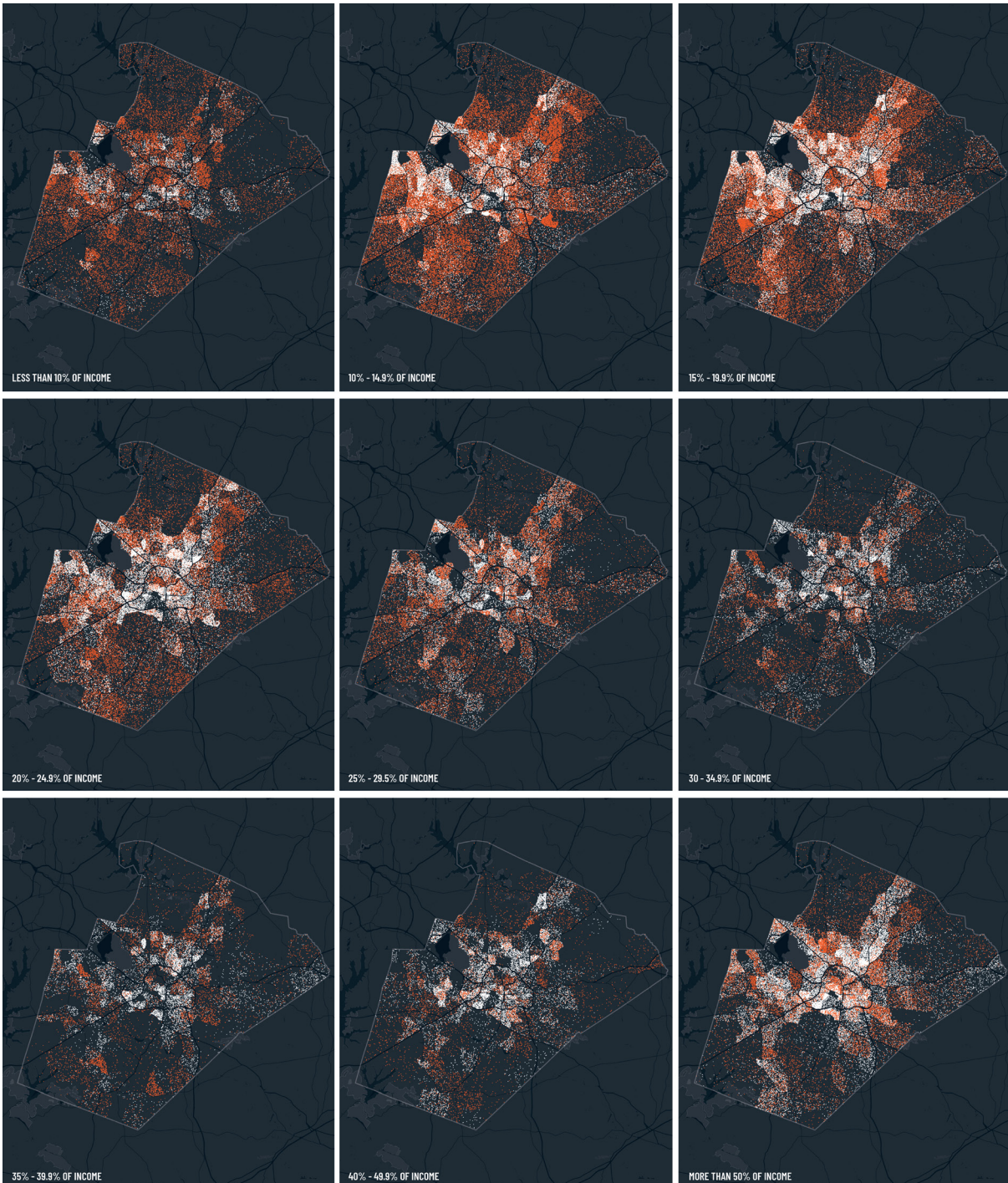
*Mapping Patterns of Growth and Wealth Across NC's Urban-Rural Divide*





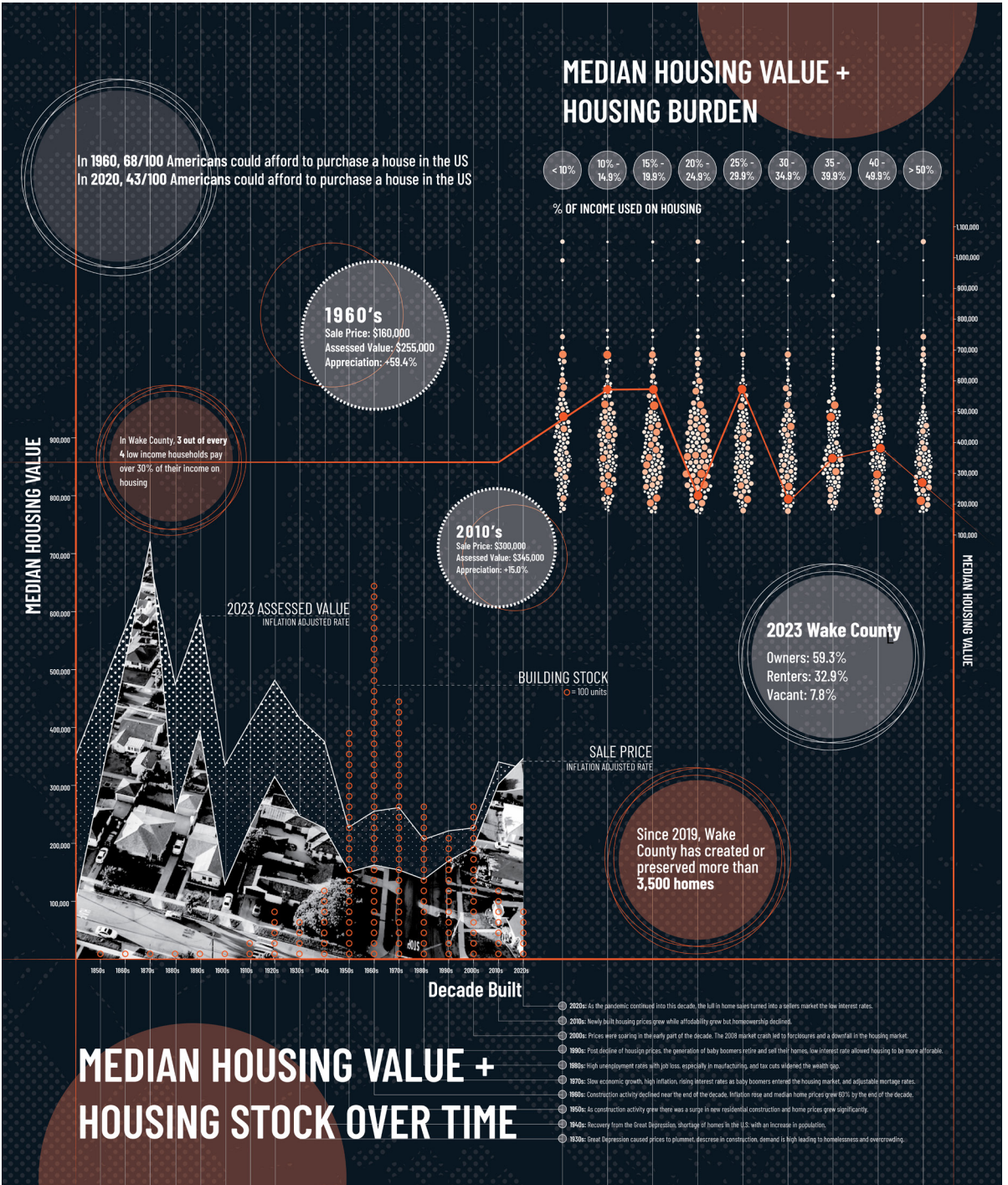
### Housing Affordability for Homeowners vs. Renters

This map series visualizes the distribution of homeowners vs. renters in relation to household income, the value of housing and monthly housing costs at different scales to highlight correlations and reveal factors impacting housing affordability and access.



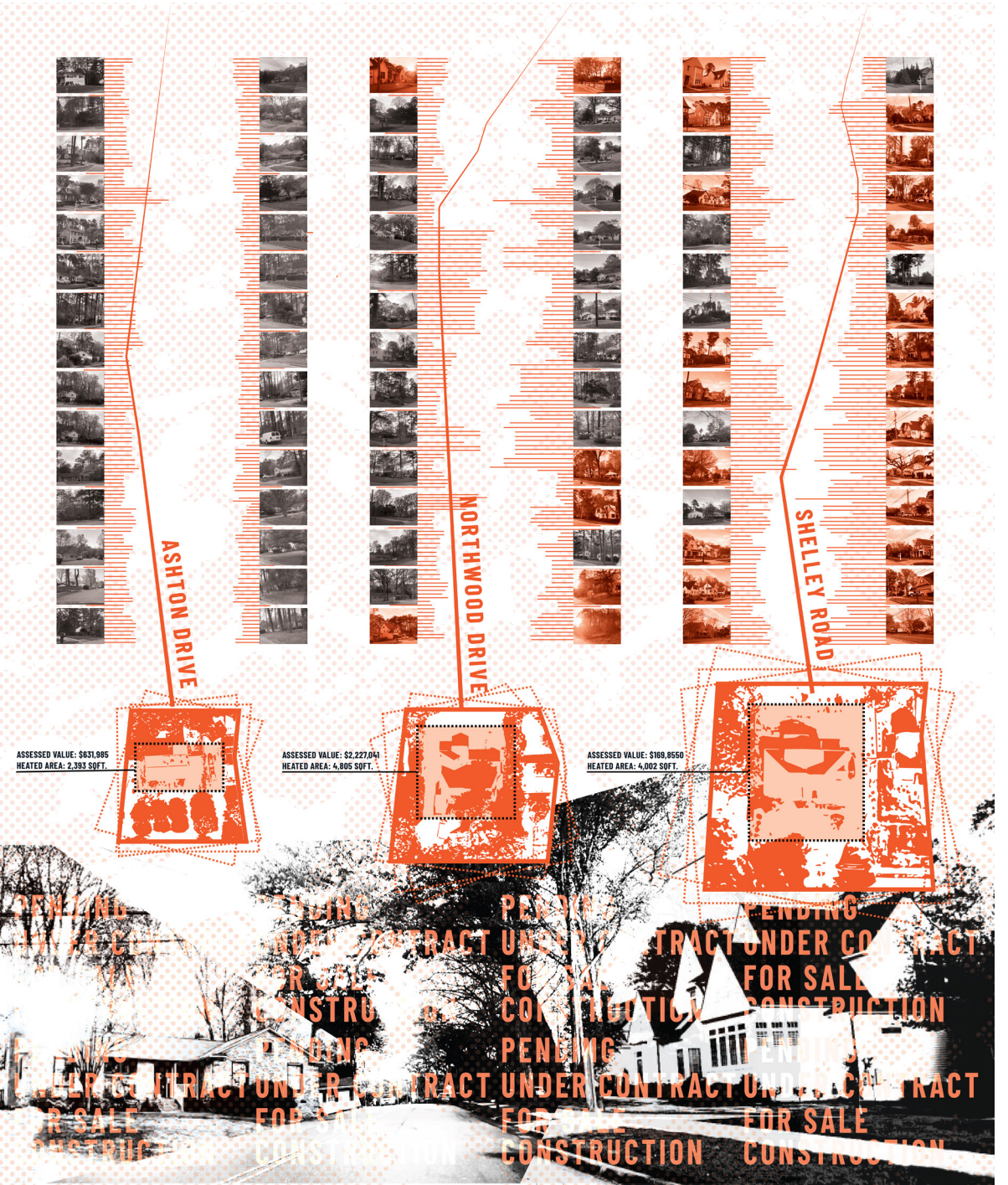
### Housing Burden in Wake County

This series investigates the geo-spatial distribution of homeowners with mortgages (orange) vs. renters (white) across 9 maps which visualize households within specific housing burden ranges (% of income spent on housing cost). Clear patterns include renters predominantly inhabiting the urban center and the majority have housing burdens of 10% - 24.9% and 50%+ of income. The majority of homeowners are located within a dense ring outside of the urban core and have housing burdens of less than 10% up to 19.9% of income.



### Wake County Housing Market Over Time

The housing market has fluctuated in accordance to economic conditions, disease outbreaks and generational decisions. Dating back to the 1850s, this timeline highlights influential events and trends and their effect on median home price, assessed value and building stock over time.



### Evolution of Neighborhood Streets North Hills

This map catalogs the current evolution of neighborhood streets within North Hills, Raleigh into three categories: a street with no construction occurring, a street with some newly built or renovations and a street with mostly newly built or renovations. This progression of new construction illustrates what most older neighborhoods will advance towards over the next decade. The recorded intensity of sound is indicative of activity levels and includes vehicular traffic, lawn mowing, dog walking, children playing and construction.

# Housing Burden

Lira Gomes

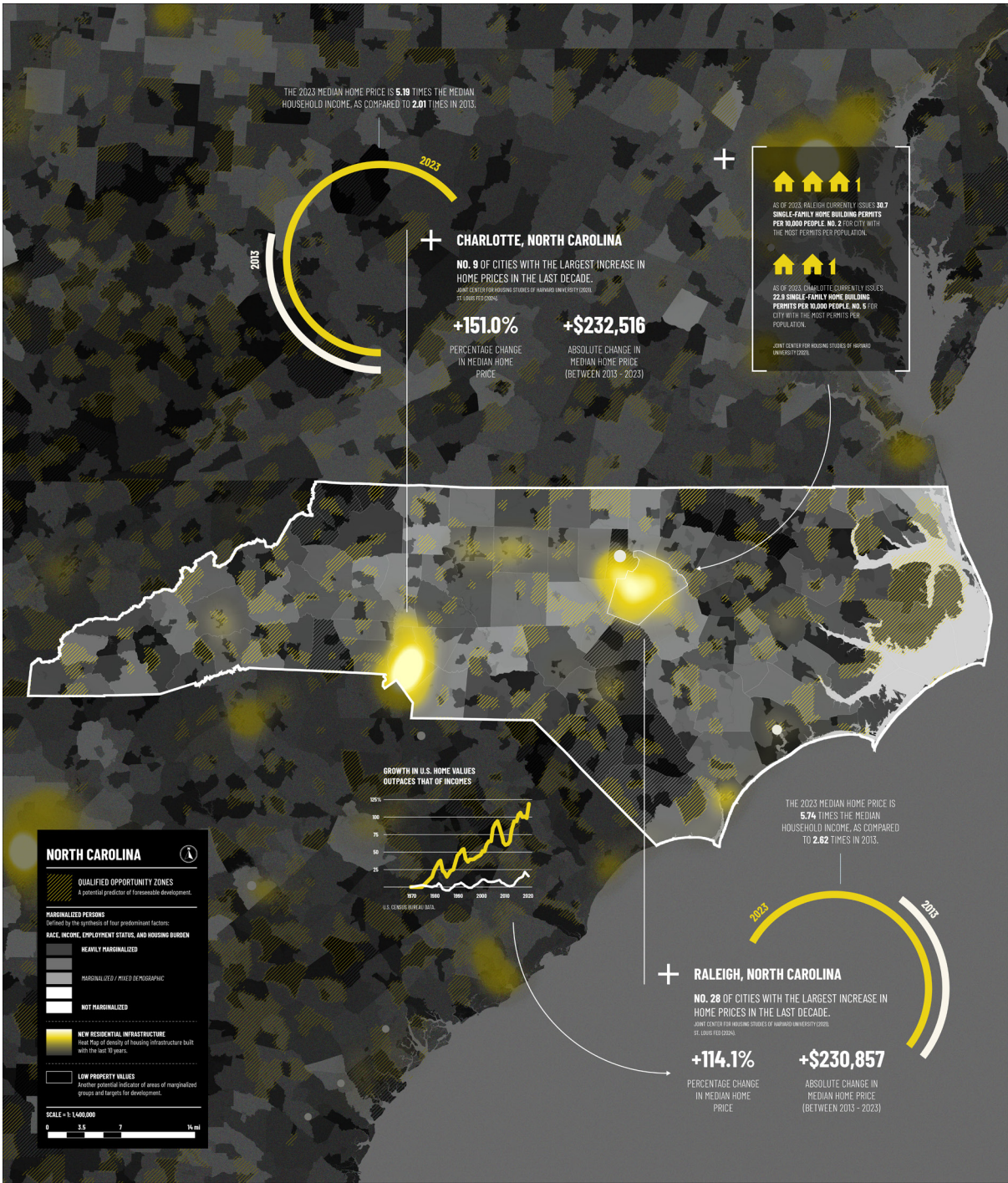
Exploring the Complexity of Housing Affordability for Renters and Owners





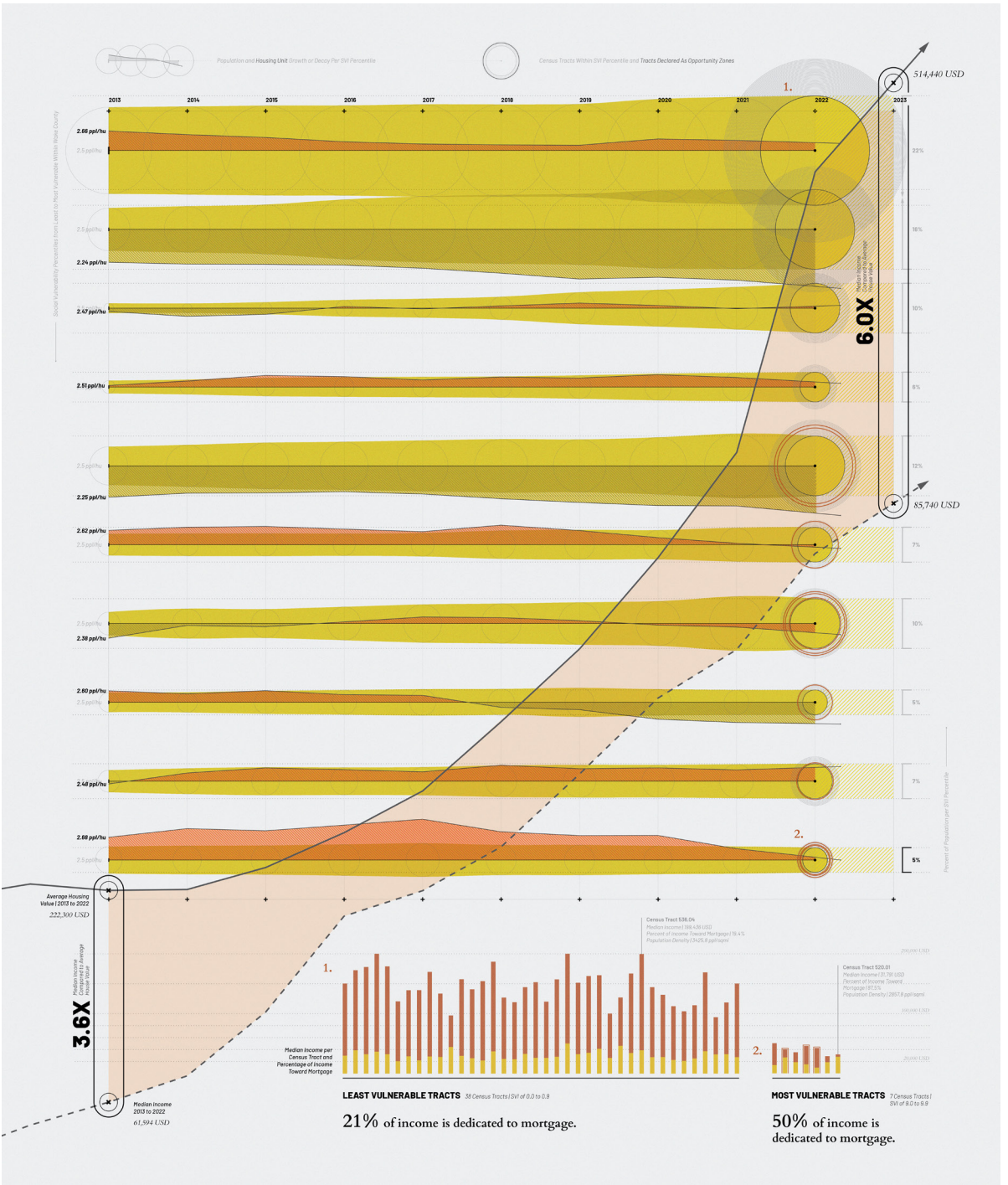
### Examining Development and Marginalized Groups

This map series explores the complex relationship between redevelopment and marginalized communities. The concentration of recent building permits and opportunity zones illustrates foreseeable development with loose correlative patterns between growth and marginalized populations.



### The Disproportionate Rise of Housing Prices

This map explores the potential correlation between residential development and marginalized demographics, questioning if historical patterns persist or are becoming increasingly obsolete. There are many factors that determine if a population is considered marginalized, prime factors articulated through this series include race, income, employment status, and housing burden.



### A Study of Housing Flux Within Wake County

This visualization explores the relationship between population density, housing unit density and population growth within socially vulnerable communities using the CDC's Socioeconomic Vulnerability Index (SVI). The map categorizes Census Tracts per SVI percentile with least vulnerable census tracts at the top and most vulnerable tracks at the bottom. Each string articulates the population and housing unit growth or decline from left to right.



### Erasure of Neighborhood Identity: South Park

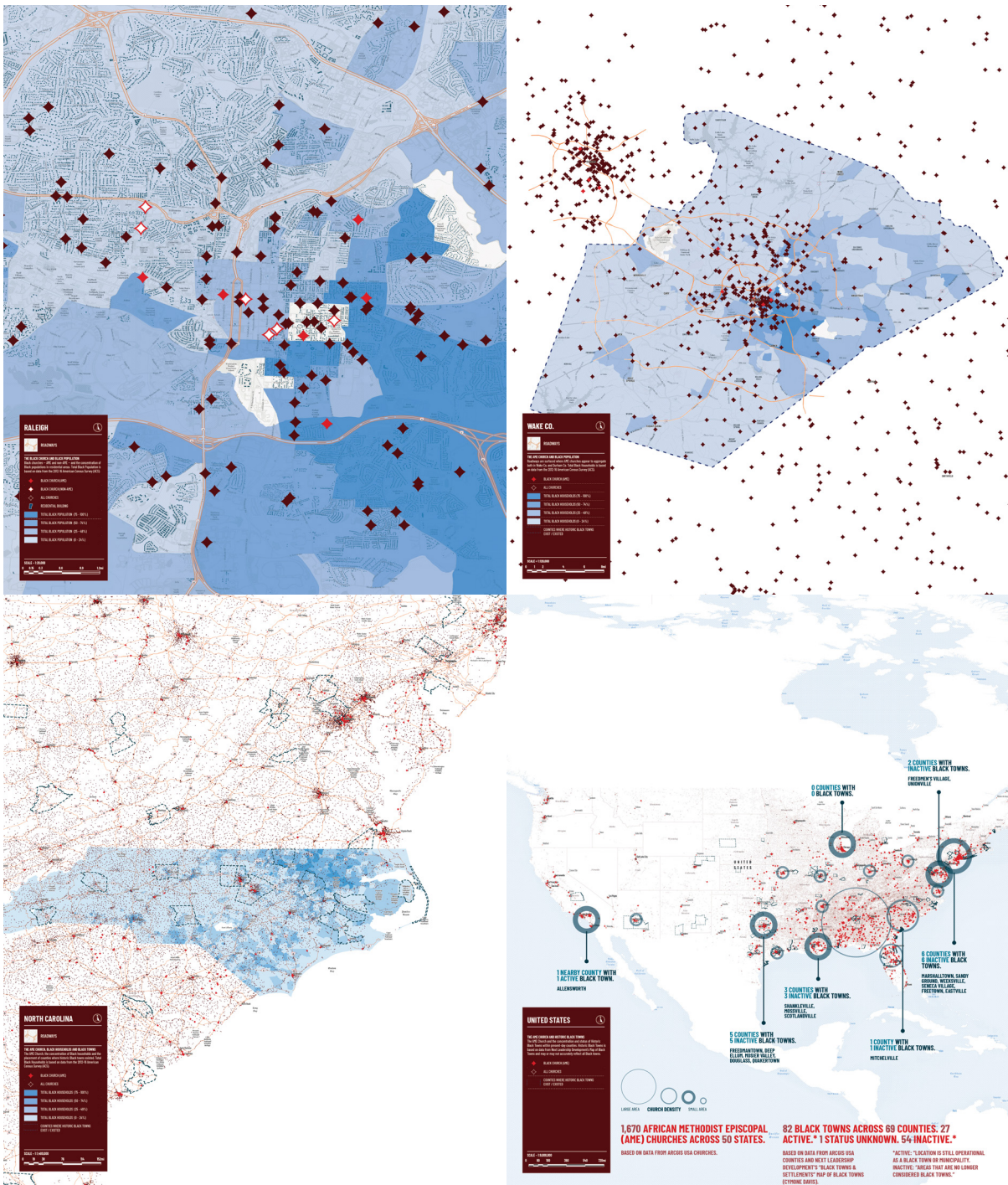
This map offers a human-centric counter narrative to the statistical analysis of redevelopment featured in earlier maps and considers: Who is represented within neighborhood data and how do their lives weave into the greater tapestry of the community? The map illustrates the in-progress erasure of South Park's historically rooted identities due to contemporary redevelopment patterns.

# Growth & Vulnerability

Gabrielle Schiltz

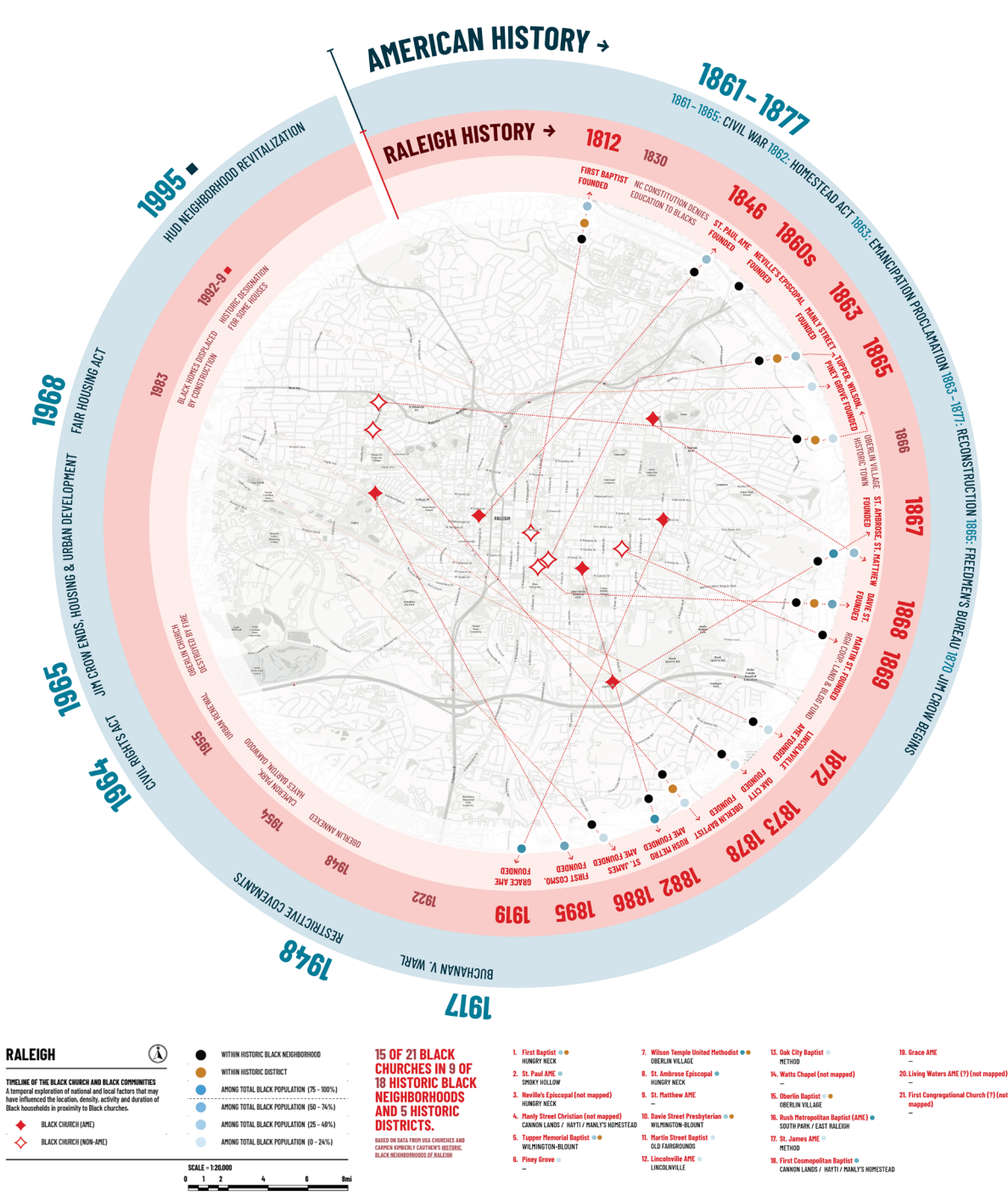
*Measures of Social Vulnerability within Patterns of Redevelopment*





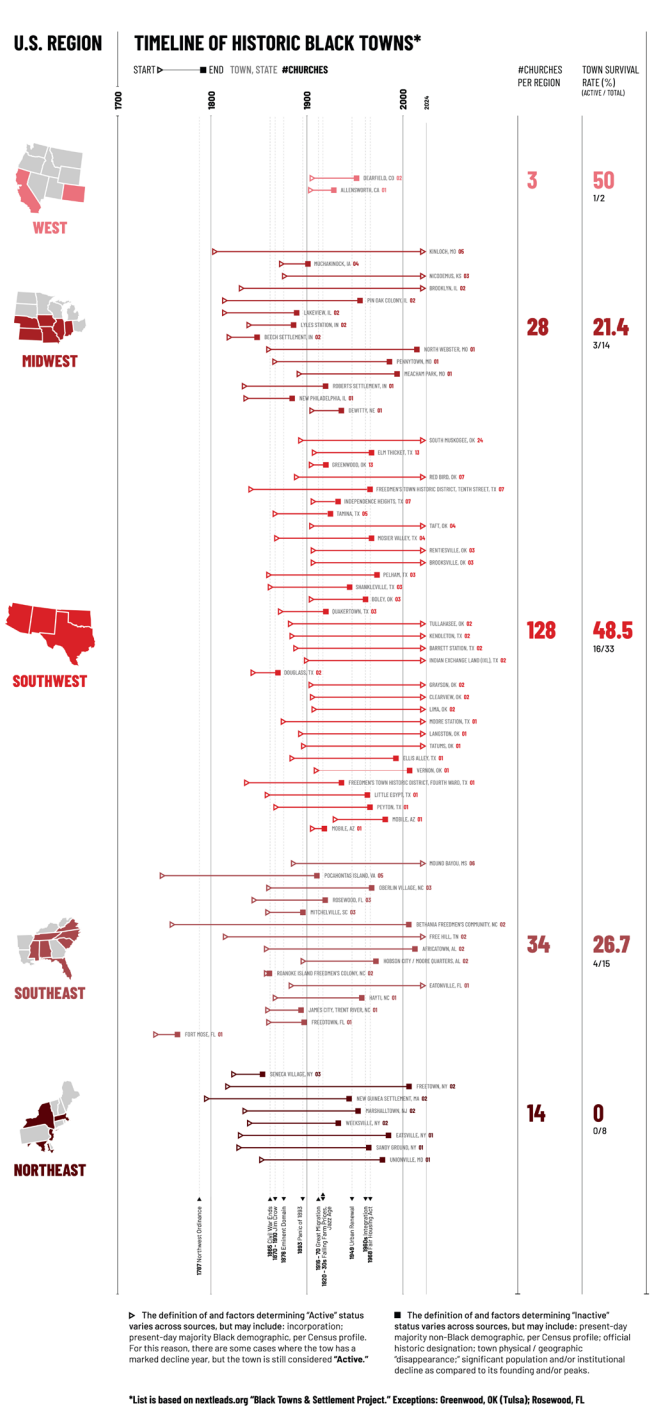
## AME Churches among Black Communities

This map series notes the presence of all christian churches across scales, highlighting Black AME congregations, within the context of % of population that is Black. The African Methodist Episcopal Church was founded in 1816 by Richard Allen and stood as a beacon and anchor for Black communities, often serving as Black schools and community gathering spaces.



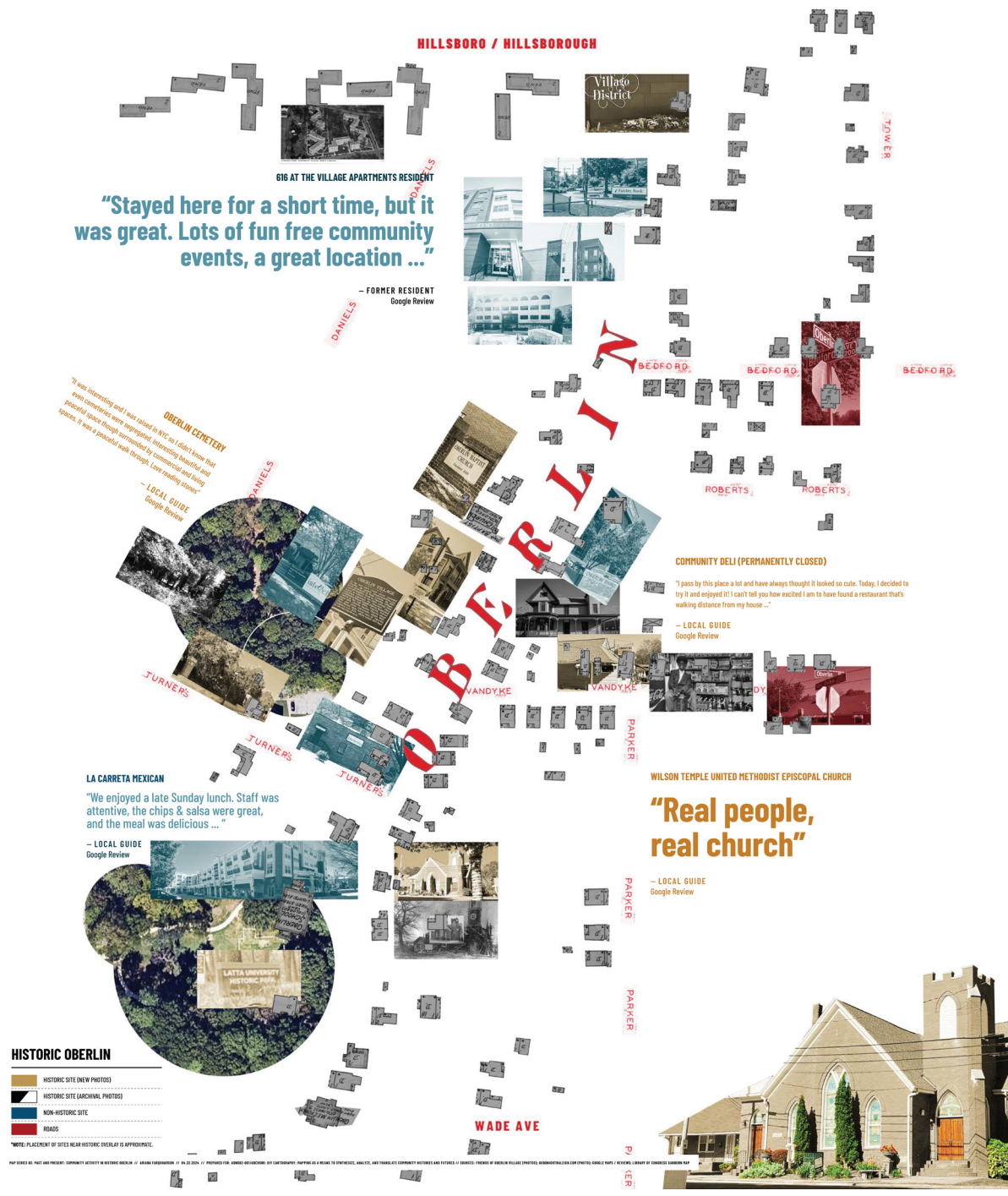
## Raleigh's Black Churches, 1830 - Present

This map geo-spatially and temporally locates historic Black churches within past and present Black communities across Raleigh and contextualizes their development within a timeline of national and local events.



## Historic Black Towns and Churches, 1700 - Present

This timeline explores if, how and when church were instrumental in establishing the longevity of historically Black towns. Using a custom dataset of historic black towns and historic black churches, this timeline compares the duration of towns and the number of churches per region since 1700. While churches served community anchors they often suffered the same fate as other black institutions when communities dissolved.



## Past and Present: Historic Oberlin

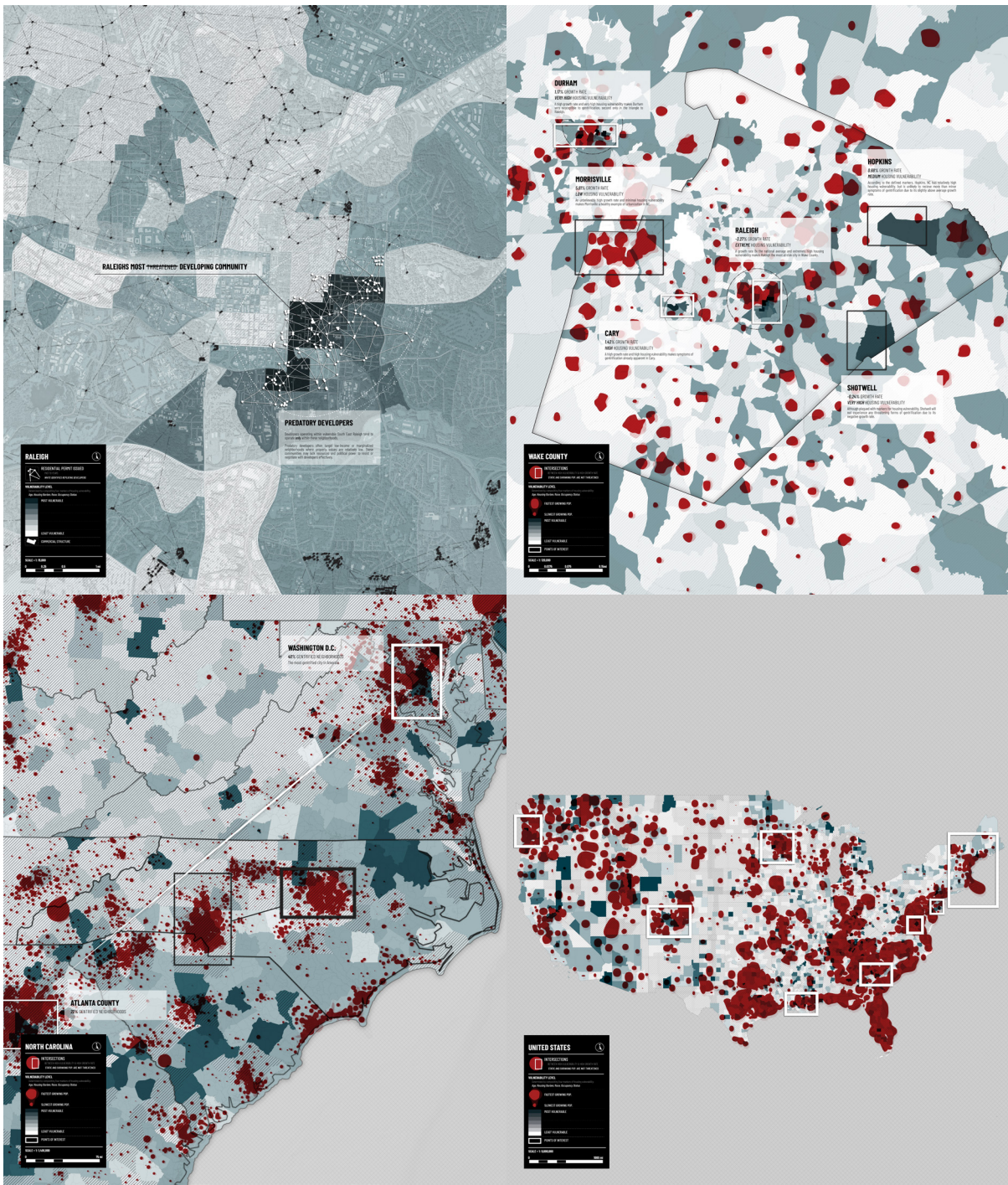
This map depicts the enduring community anchors of Historic Oberlin including Wilson Temple United Methodist Church, Oberlin Baptist Church, the Community Deli, and the Oberlin Cemetery within a blended tapestry of historic fabric (rendered in sepia, black and white) and modern development (rendered in blue).

# Black Churches as Community Anchors

Ariana Farquharson

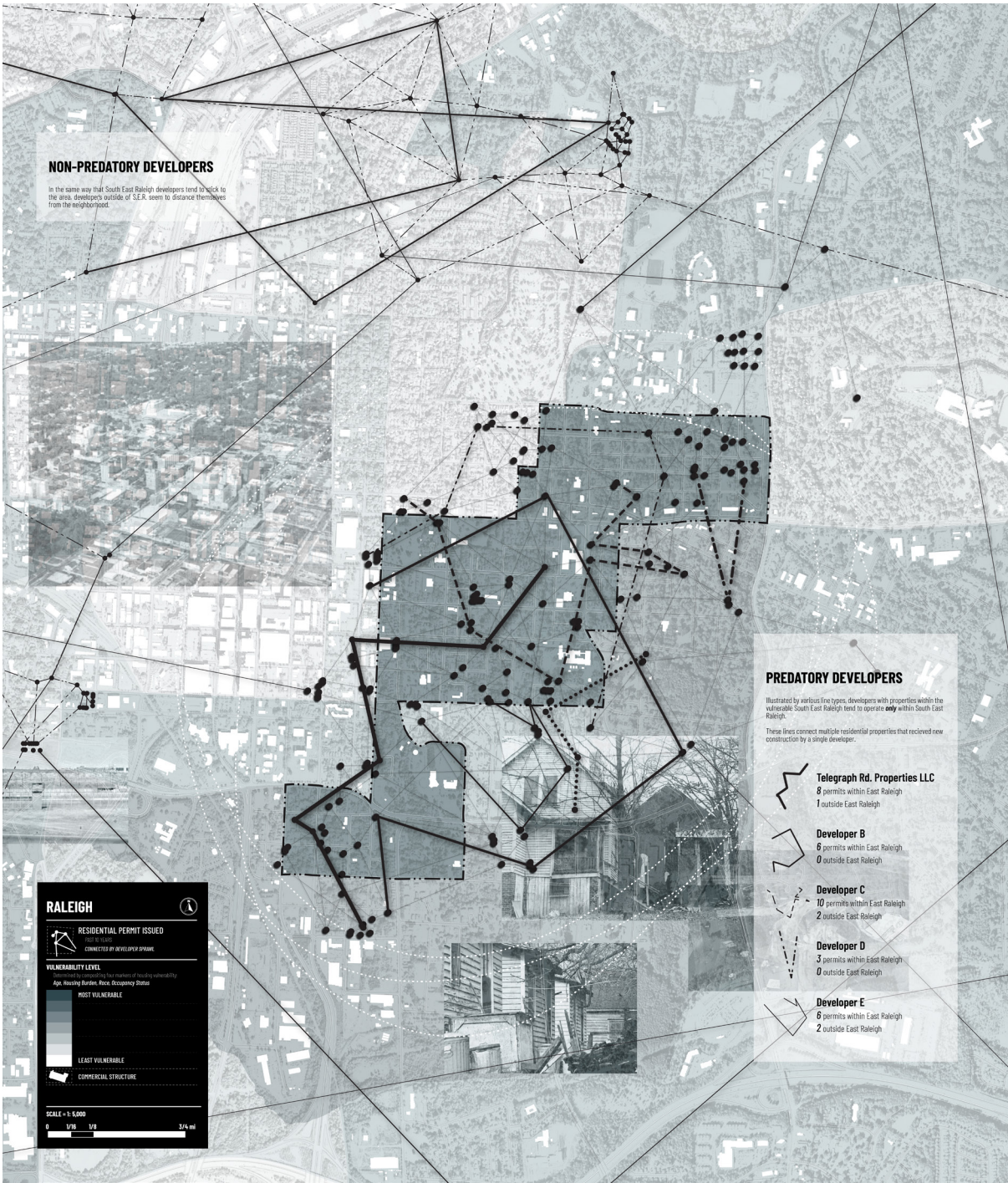
Exploring Churches as Essential Social Infrastructures in African American Communities





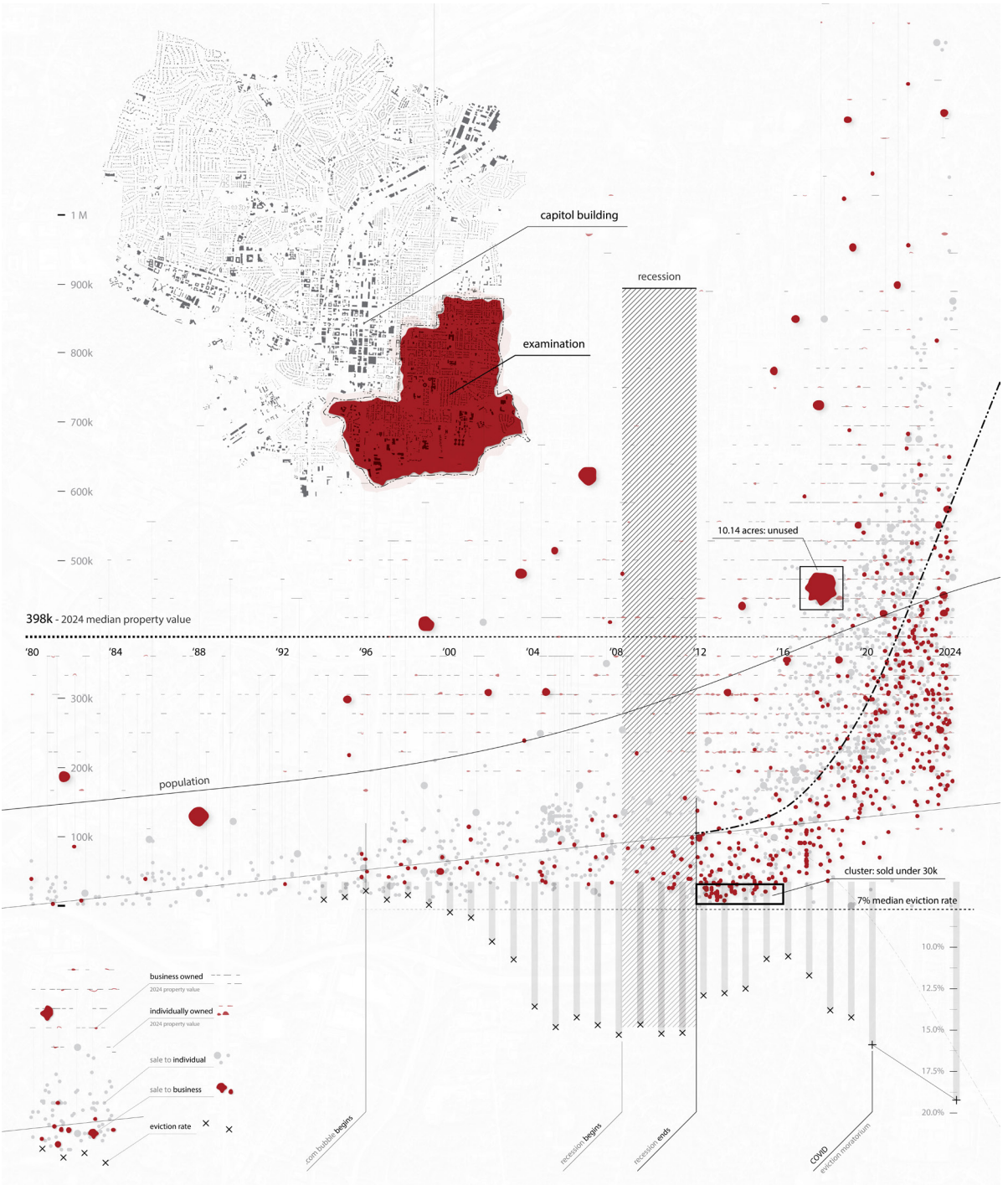
### What Makes a Neighborhood Vulnerable?

This map series illustrates markers for housing vulnerability (race, housing burden, age, and occupancy status) to identify tracts as more/less vulnerable. These measures of vulnerability are overlaid with measures of population growth and the areas of overlap suggest the neighborhoods most vulnerable to the threats of gentrification.



### Predatory Development

This map visualized patterns of redevelopment in Southeast Raleigh which has historically had low income residents and under-valued properties. By plotting building permit data, we see a distinct pattern of developers active solely within Southeast Raleigh versus developers that avoid it completely.



### Speculative Real Estate and Community Vitality

This graphic aims to raise questions about the ethics of modern-day, speculative property sales. Southeast Raleigh, a region with high housing vulnerability, has seen drastic changes in the ownership and popularity of its land. Over time it transformed from an affordable, black neighborhood into a threatened historic district torn apart by redevelopment, rising housing costs, and speculative real estate.



### Urban Squeeze: The Weight of Gentrification

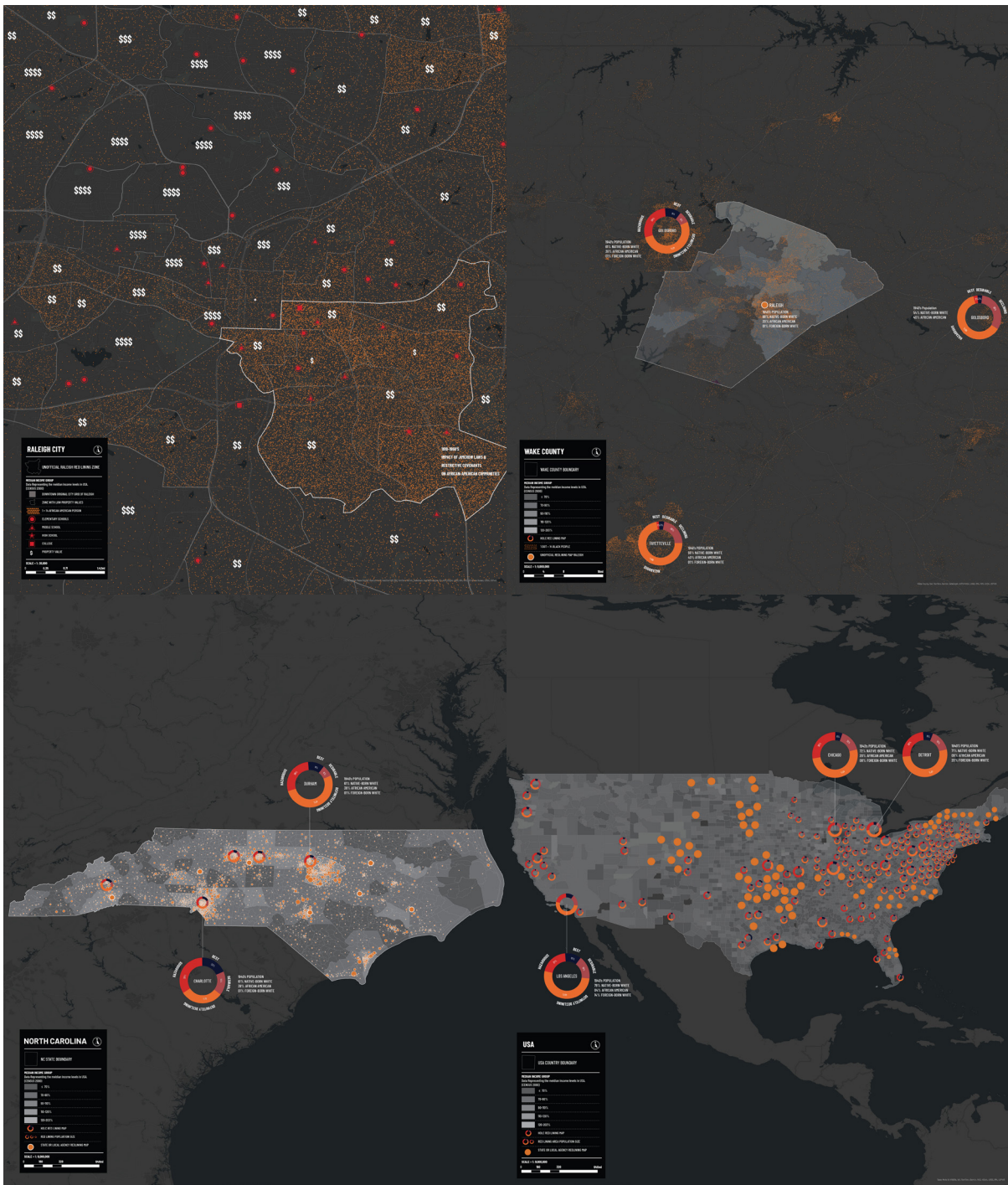
Walking through the South Park neighborhoods reveals a shift from shotgun houses and net-less basketball hoops to two story contemporary houses flanked by Teslas and neon playgrounds. At this map's core is a weather-worn, dilapidated house—a relic of South Park's past and a poignant symbol of the challenges faced by its residents. Street photographs of recently constructed housing developments, all within 500 feet, are meticulously collaged to convey the experience of ongoing social suffocation and displacement.

# Predatory Development

Lucas Stott

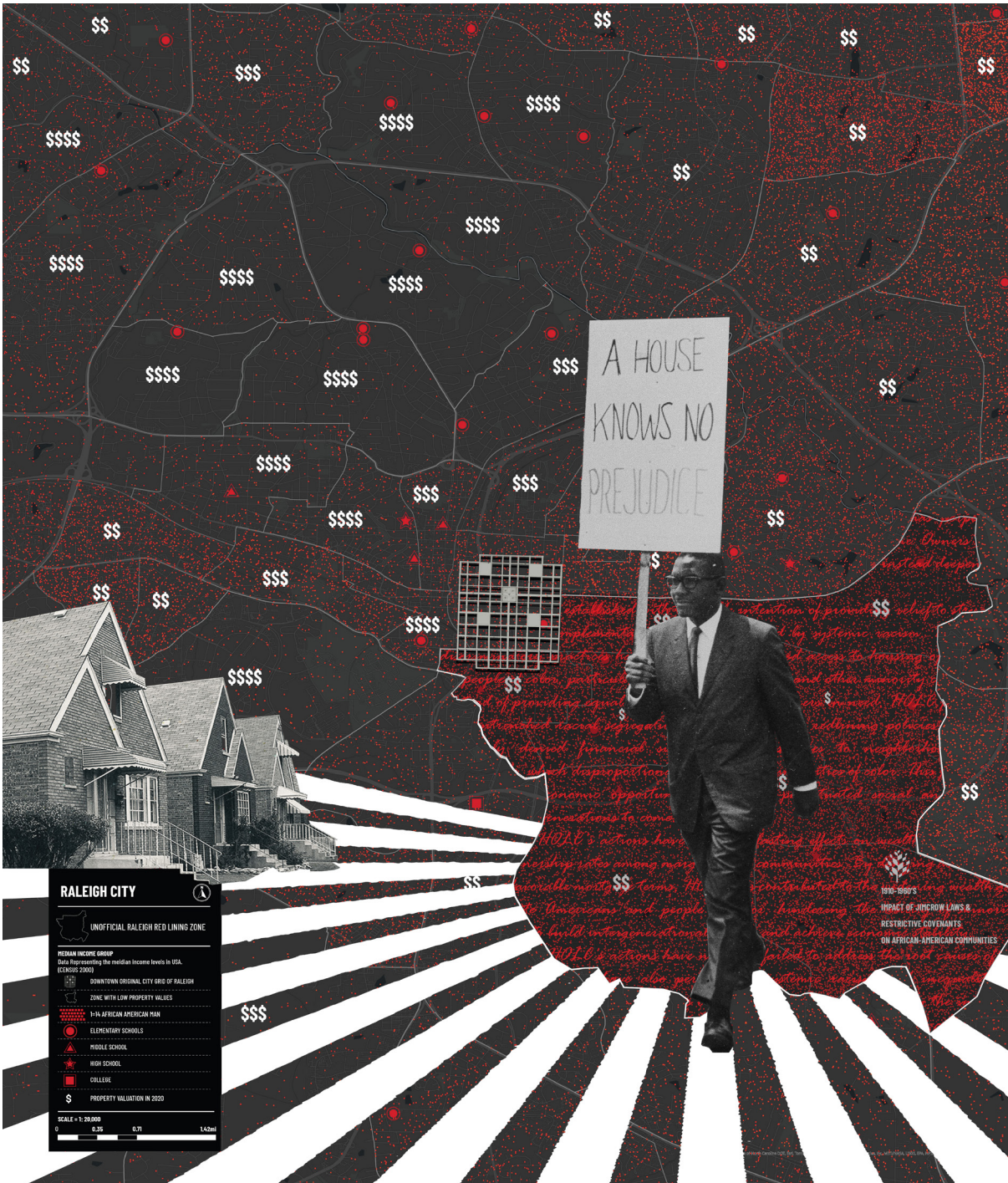
*Mapping Redevelopment Patterns within Vulnerable Communities*





### Barriers to Community Building

This map explores the enduring consequences of redlining and other racial segregation tactics. Beginning in the 1930s, redlining denied financial services to residents of black communities across the US impacting their ability to secure economic stability and generational wealth through homeownership.



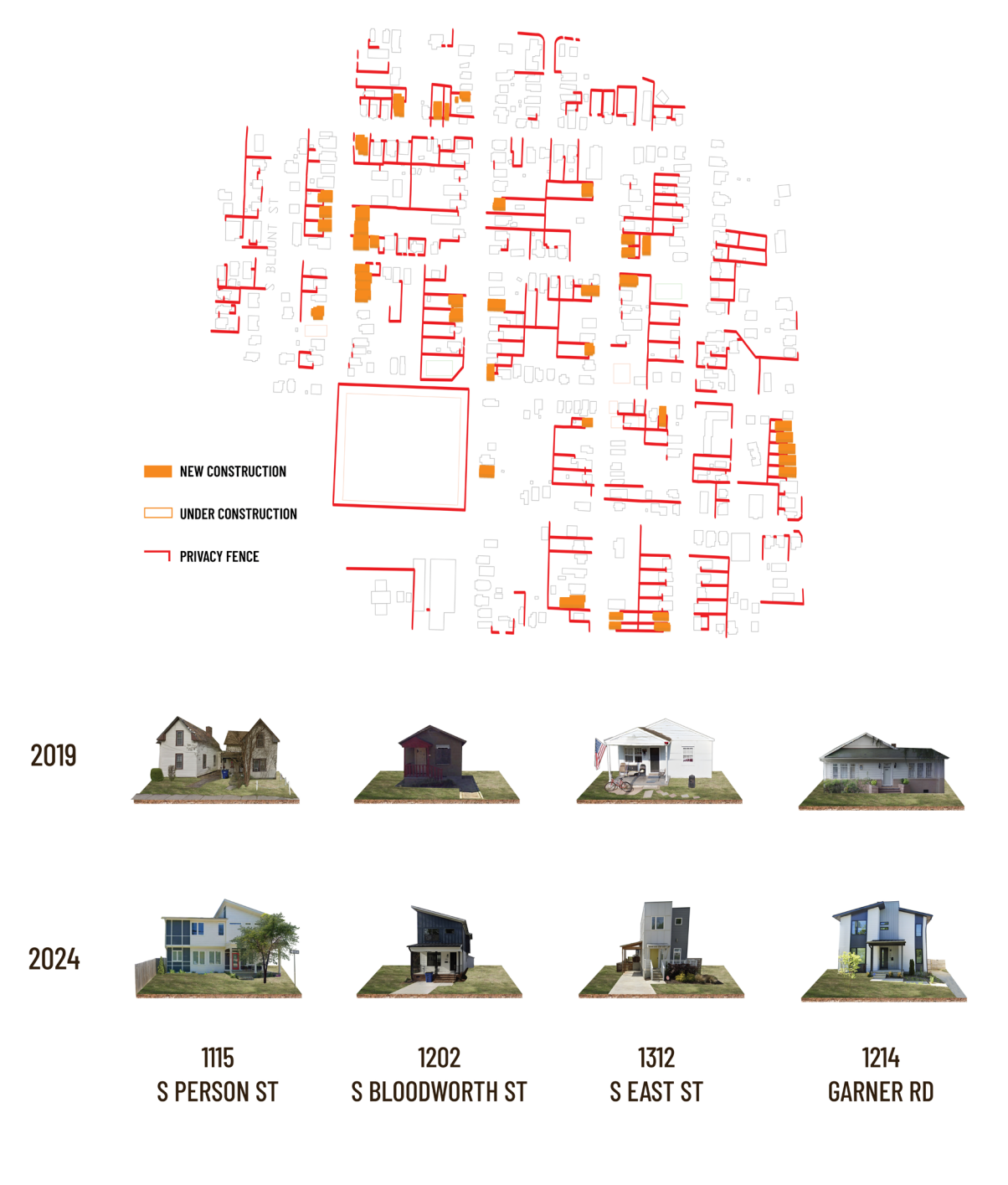
### Lasting Scars of Spatial Discrimination

This case study delves into the concept of racial claustrophobia, exploring how discriminatory policies confined Black communities to under-resourced and neglected areas. While Wake County lacked official redlining maps, discriminatory deed covenants and Jim Crow policies similarly denied Black communities access to opportunities and resources. The consequences of these policies are evident in the history of Southeast Raleigh where land values have not appreciated at similar rates to other downtown-adjacent areas and urban renewal projects have demolished and bisected large parts of the community.



### Patterns of Race and Property Values

This map analyzes US Census Bureau data to find lasting measures of Raleigh’s oppressive measures, such as racially restrictive covenants and discriminatory zoning. The visual structure highlights measures of race, economics, and social bias to reveal correlative patterns between racial demographics and house value. This highlights the intersectionality of race and socioeconomic status in shaping housing outcomes and points to how racial demographics influence housing market dynamics.



### Traces of Gentrification

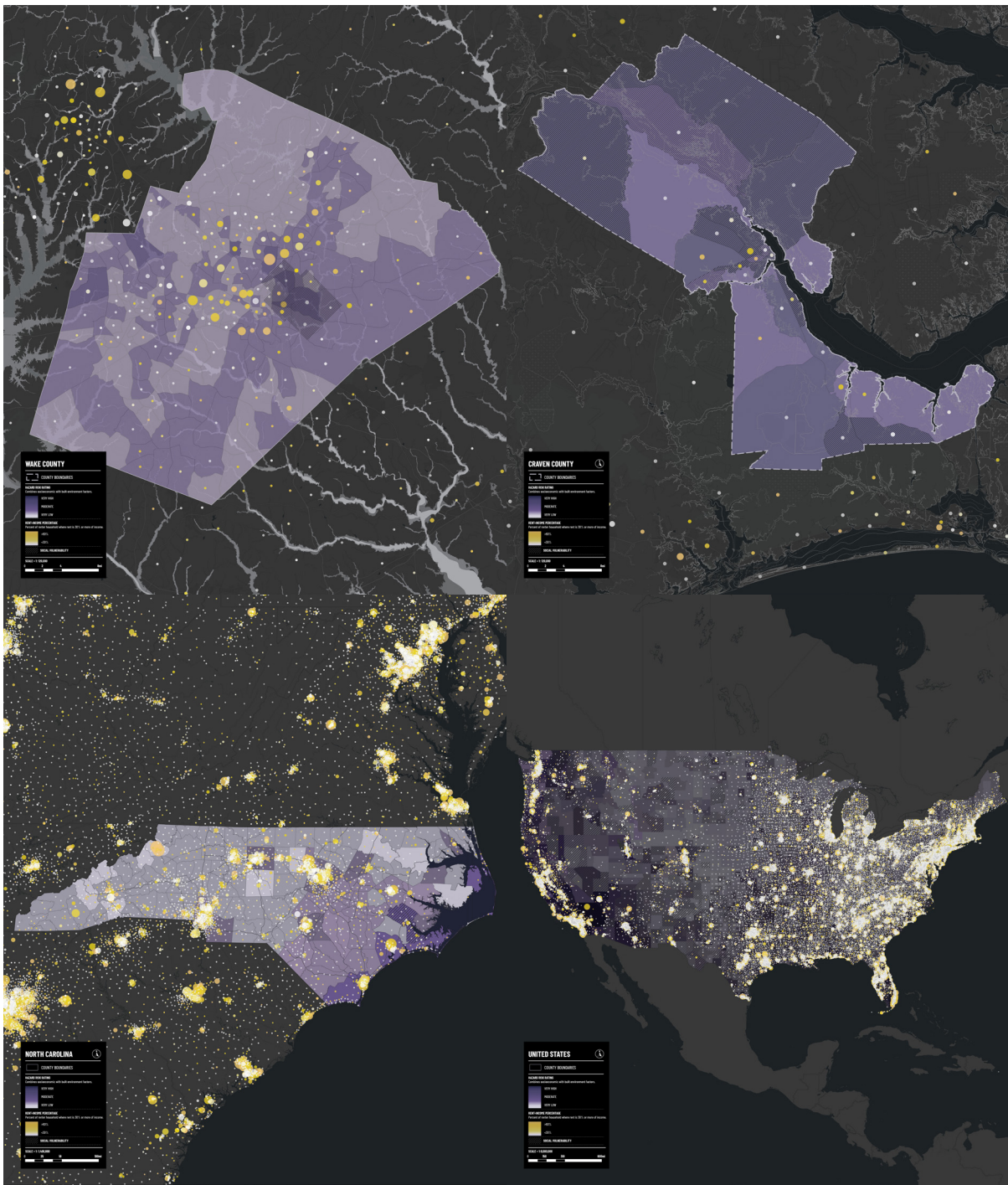
Brightly colored doors and tall opaque privacy fences which adorn the newly built and renovated homes in Southeast Raleigh signal the influx of new residents. Longtime residents fear these changes will lead to rapid gentrification, rising housing costs, displacement and an erasure of the community’s cultural history.

# Redlining & Gentrification

Neil Bowen

*Measuring the Lasting Effects of Segregation Policies*





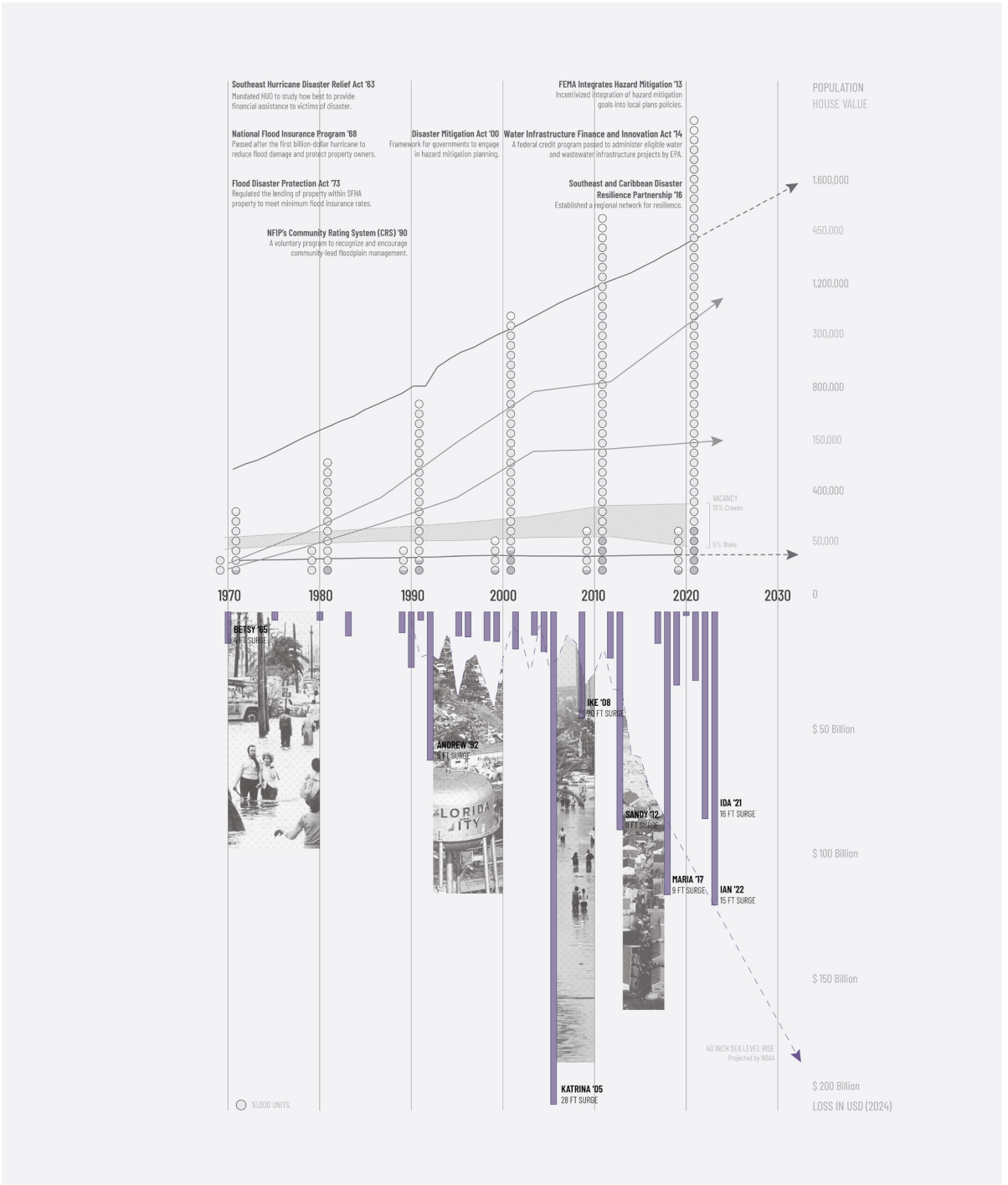
## Hazard Risk and Housing Burden

This map series overlays measures of social vulnerability, hazard risk management, and housing burden cost to illustrate how the housing crisis relates to the hazards of climate change and disproportionately impacts socially vulnerable populations. These maps aim to elucidate a rising urgency for resilient and affordable housing solutions that stretch inland considering regional impacts.



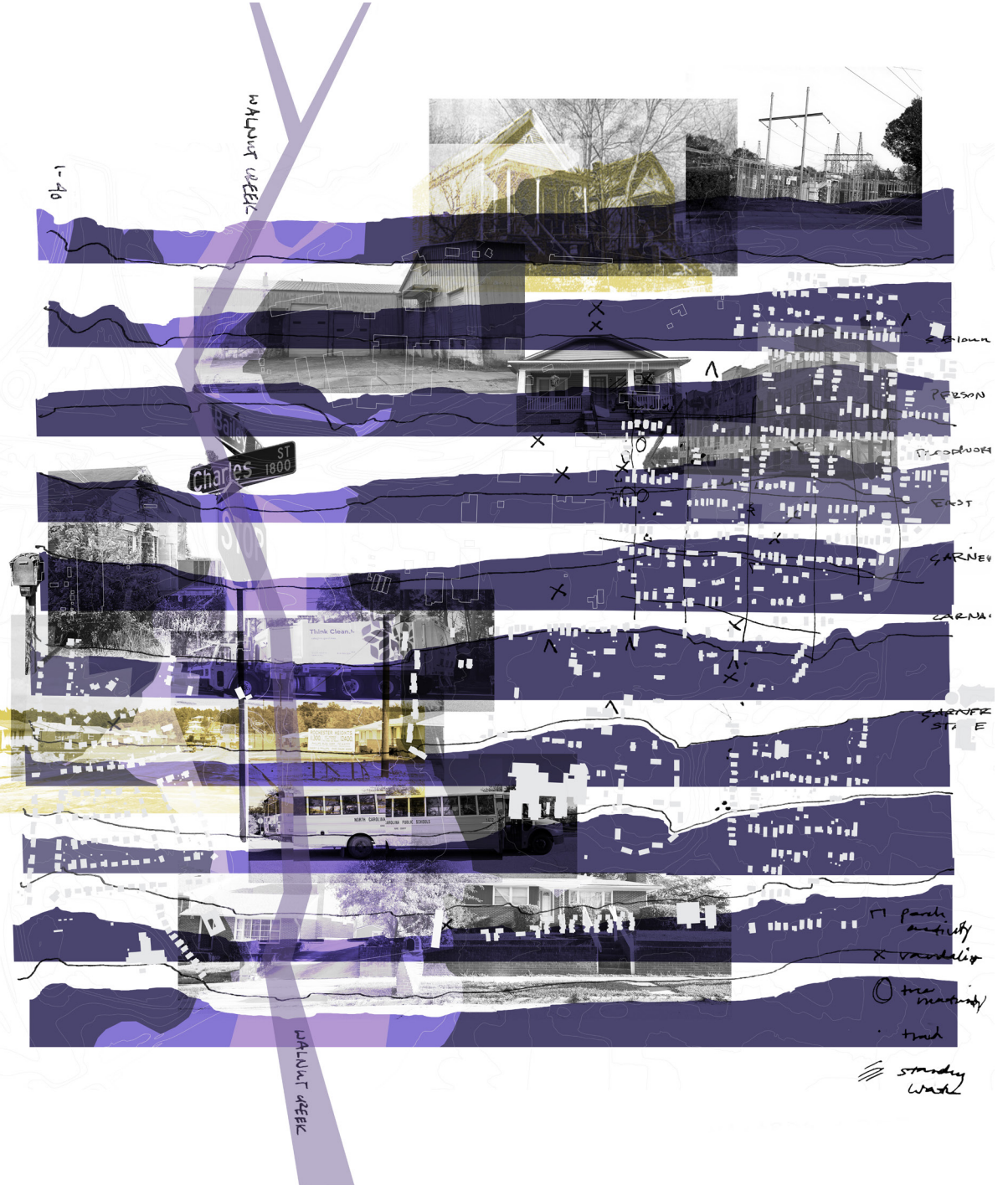
## Climate Displacement: New Bern

Historic communities are slowly being displaced with few affordable options for relocation. The acute threat of rising sea levels and frequent storm events for lower income and generational coastal families is compounded by the ongoing high-end development across coastal NC. This case study highlights a 1940s generational home in New Bern which is threatened by repeated flooding. With few options available for housing that matches in acreage, square-footage, and price, this single family household might be forced to migrate inland and away from their community.



## Intensifying Narratives: Housing and Climate Change

This timeline overlays influential factors contributing to the housing crisis in Wake and Craven Counties since 1970 (population growth with the evolving effects of climate change and storm events). These patterns are juxtaposed with evolving disaster resiliency policy, beginning with the National Flood Insurance Program (1968) to protect property owners.



## Historically Black and Low-Lying

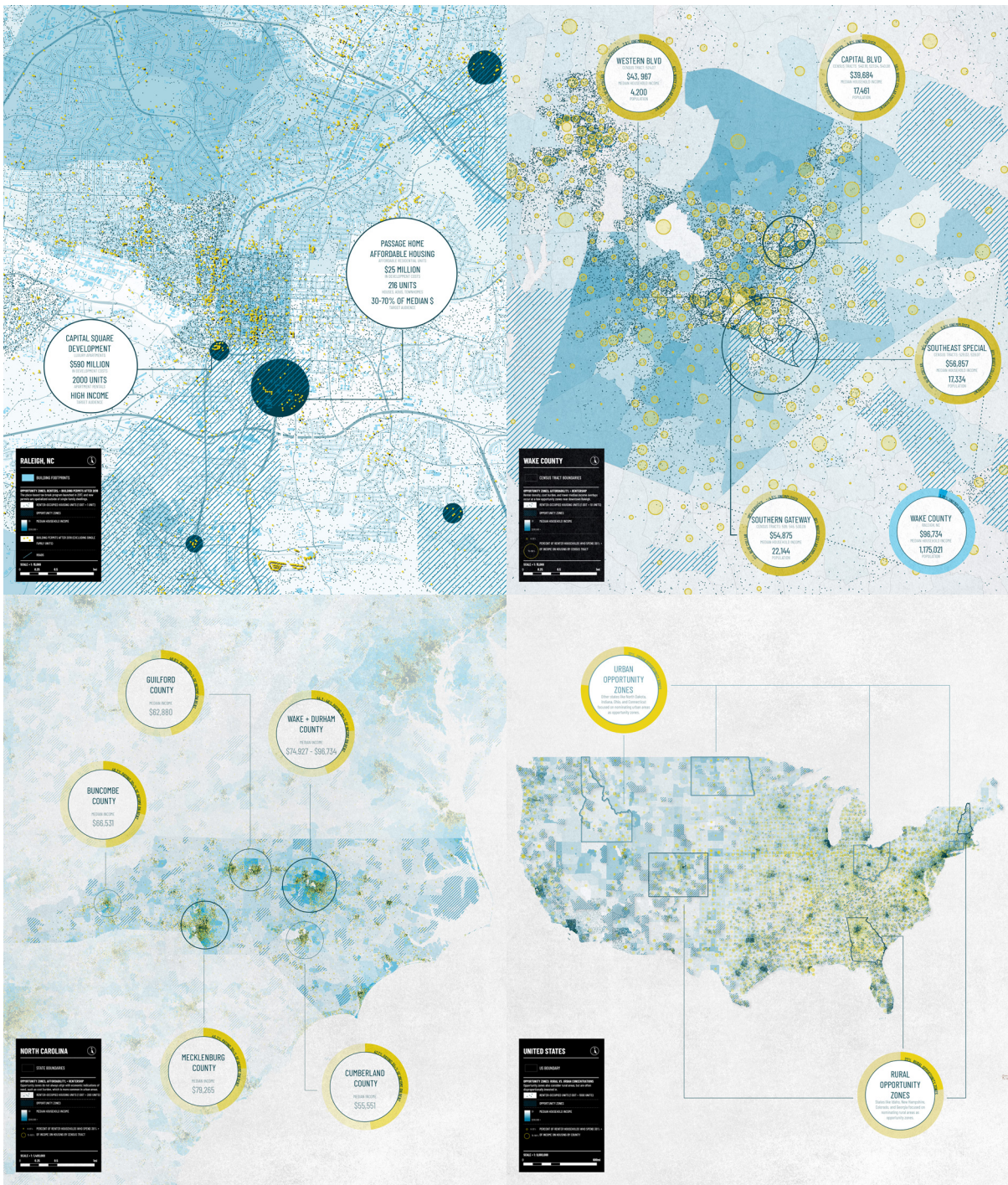
This map captures personal observations of Raleigh's historically Black and low-lying neighborhoods and their disproportionate vulnerability to riverine flooding. Observed details included raised utility equipment, sand bags, overgrown vegetation, collection of pollen in street drainage, and other hazards which are demarcated on a series of cross sections.

# Climate Displacement

Noelle Robinson

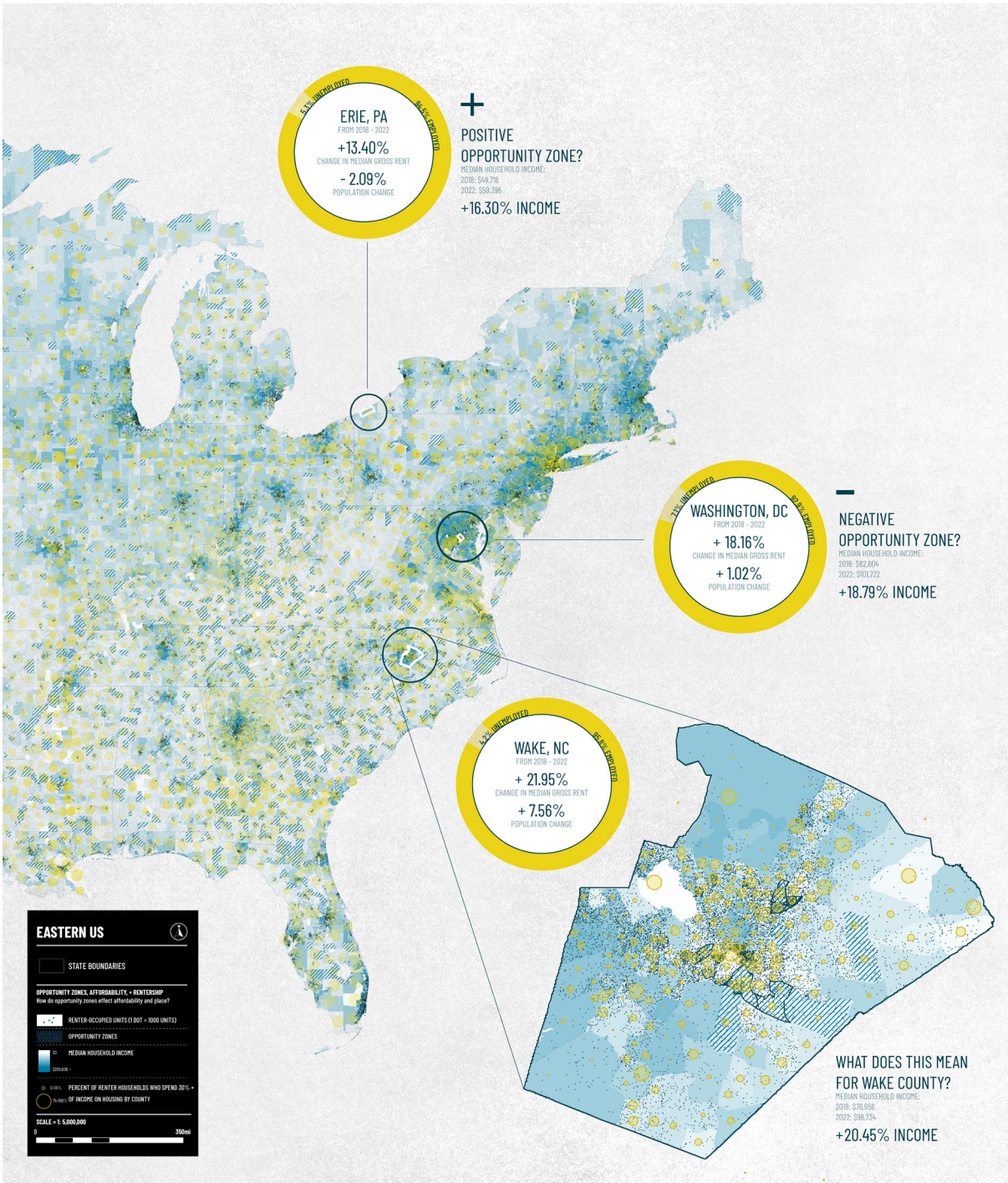
*Tracing the Impacts of Climate Change on the Housing Crisis*





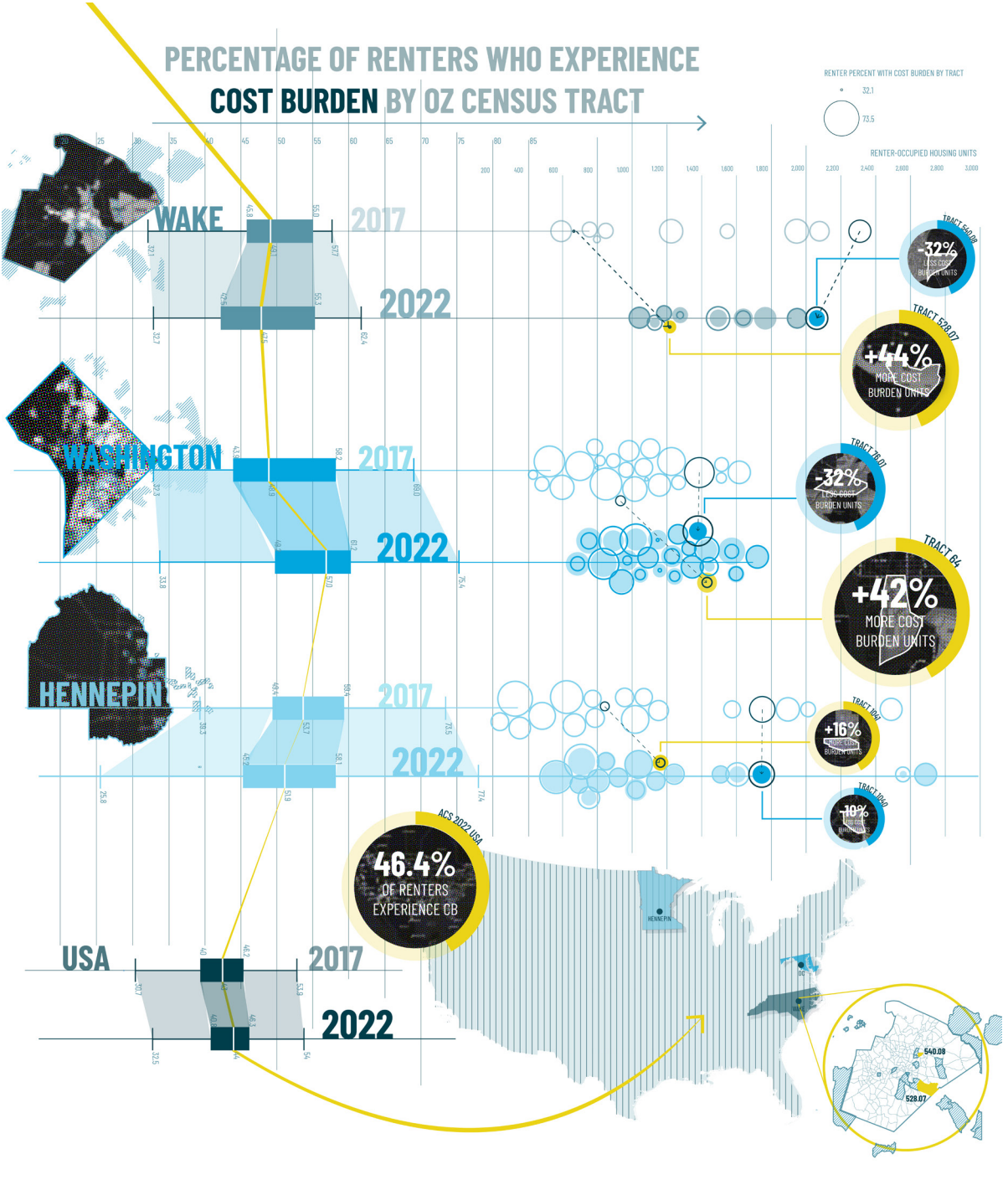
Examining Income and Rentership within OZs

This map series look at the impact of Opportunity Zone designations on neighborhood displacement and overall housing burden. Signed into law by the 2017 Tax Cuts and Jobs Act, Opportunity Zones (OZs) were originally launched as a place-based tax credit to encourage investment in impoverished communities, but have since faced a large degree of controversy.



Are Ozs Helping or Hurting?

This map features two contrasting cases, Erie PA and Washington DC, exemplify the debate around OZs. US Treasury analysis reveals that 48% of zones do attract investment, but funds are often concentrated in isolated fractions of the whole zones. According to the NLIHC, targeted OZs often experience economic growth and renter displacement prior to investment. For Wake County, tracking OZ developments is crucial to examine who they serve and if they are contributing to equitable development.



Renter Cost Burden in OZs

This map highlights change in rates of rent cost burden within OZs from three disparate countries, Wake (Raleigh), Washington DC, and Hennepin (Minneapolis), from 2017 to 2022 through box plot and beeswarm visualizations. The most extreme cases of either an increase or decrease of cost burden within each county is shown by tract.



Delineating the Fringe: OZs and Housing

This map records observations of the Southern Gateway OZ along the Lake Wheeler corridor in Raleigh NC. Within a half-mile three extremes of housing conditions were observed: new high-rise apartments, existing single-family homes, and people experiencing homelessness. This map raises complex questions concerning the impacts and opportunities of increased density and redevelopment fueled by OZs.

# Opportunity Zones

Maggie Kroening

*Exploring Policy, Place and Rentership*