Neighborhood-scale indictors of waterfront revitalization and human well-being in Great Lakes AOCs and coastal communities

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The contents of these slides neither constitute nor necessarily reflect US EPA policy

Waterfront Revitalization (verb)

Policy implementation or action (e.g., AOC projects) in terrestrial waterfront or adjacent aquatic areas which promote improvements in human physical, mental, or socioeconomic well-being, while also protecting or improving natural capital for all native species. The goal is a sustainable waterfront space incorporating man made, hybrid, and natural capital amenities.

Projects may include AOC, Brownfield redevelopment, climate adaptation, green infrastructure, whatever

Where does this research come from?

Review

Goals, beneficiaries, and indicators of waterfront revitalization in Great Lakes Areas of Concern and coastal communities

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ABSTRACT

Cleanup of Great Lakes Areas of Concern (AOCs) restores environmental benefits to waterfront communities and is an essential condition for revitalization. We define waterfront revitalization as policies or actions in terrestrial waterfront or adjacent aquatic areas that promote improvements in human socioeconomic well-being while protecting or improving the natural capital (the stocks of natural assets, biodiversity) that underlies all environmental, social, and economic benefits. Except for economic measures such as development investments, visitation rates, or commercial activity, evidence of waterfront revitalization in the Great Lakes is mostly anecdotal. We offer a perspective on waterfront revitalization that links indicators and metrics of sustainable revitalization to community goals and human beneficiaries. We compiled environmental, social, economic, and governance indicators and metrics of revitalization, many of which are based on or inspired by Great Lakes AOC case studies and community revitilization or sustainability plans. We highlight the role of indicators in avoiding unintended consequences of revitalization including environmental degradation and social inequity. Revitalization indicators can be used in planning for comparing alternative designs, and to track restoration progress. The relevancy of specific indicators and metrics will always depend on the local context.

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What data at what spatial scale?

National/regional datasets that report at or can be aggregated at the US Census Tract scale.

This is the finest-scale available in most cases.

- US Census Bureau (American Community Survey)
- CDC (500 Cities)
- EPA (ACRES, EnviroAtlas, Superfund)
- NOAA (natural and artificial shorelines)
- Crowd-sourced amenity maps (OpenStreetMap)

Our overarching objective for this study is to identify indicators and metrics that can be extracted from available datasets to predict and track the human wellbeing impacts of changes at the waterfront using recent publicly-available data for census tracts in five coastal Great Lakes cities

Where are the census tracts?

-Duluth, Cleveland, Chicagoland, Milwaukee, Green Bay

-The Great Lakes cities with EnviroAtlas community-scale data (census tract scale)

-All 5 include Great Lakes AOCs

What are the indicators?

Natural capital indicators of waterfront attributes
    Green amenities (greenspace, tree cover)
    Hybrid features (partly built: developed trails)
    Recreation access amenities (boat ramps)
Indicators of human well-being benefits
    Socioeconomic (educational attainment)
    Personal health (amount of exercise)
Covariates at census tract scale (improve models)
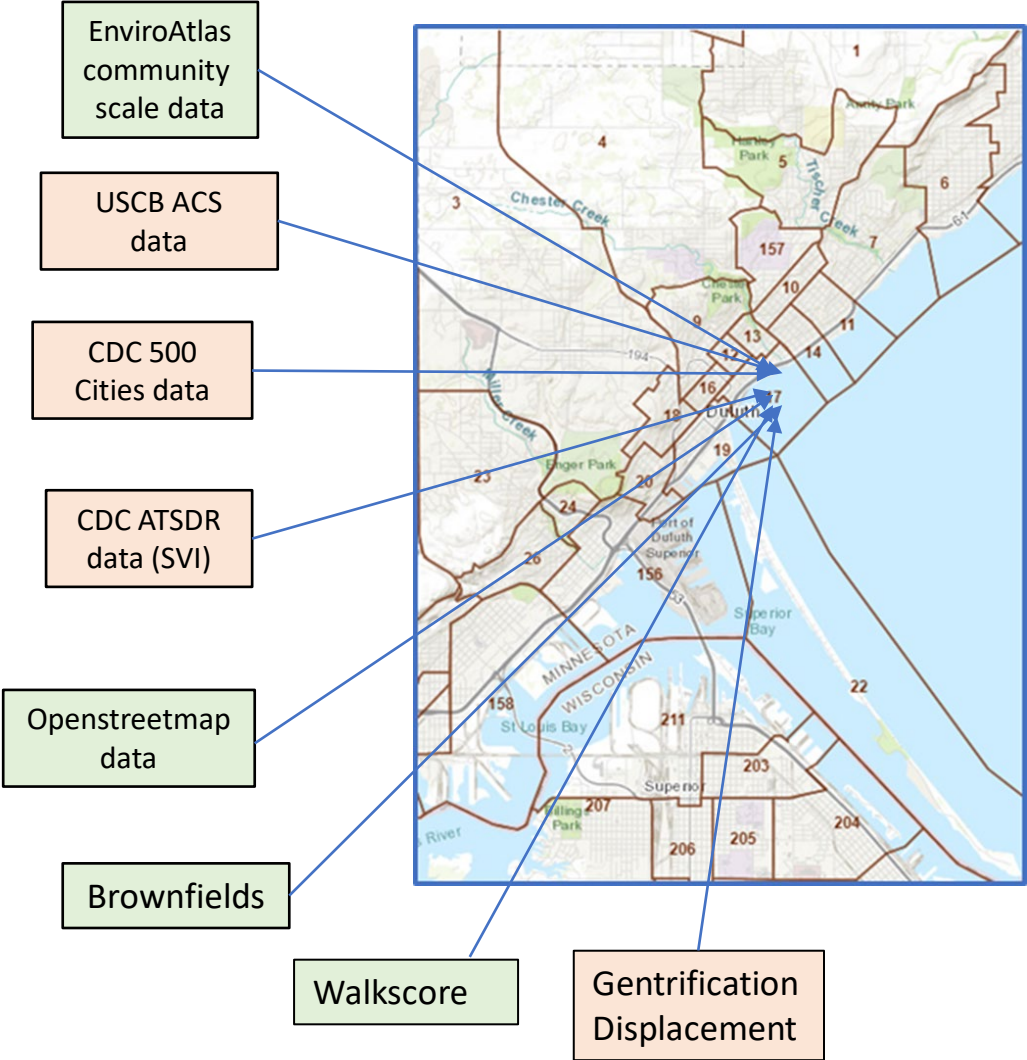   Income
    Population density
    Racial diversity
    Urbanicity

Indicator type	Data source	Example metrics (census tract scale)	Number of metrics
Natcap Amenity	NOAA OCM	Shoreline type by percent (beach, artificial)	2
	Openstreetmap	% greenspace, % bluespace, recreational amenities	13
	UEPA EnviroAtlas	Greenspace per capita, percent of residences with water views	18
	USEPA ACRES	Count of properties with Brownfield grants, acres cleaned up	3
	Walkscore.com	Walkscore index, Bikescore index	2
	Superfund	Number of sites	1
Wellbeing Benefit	CDC 500 Cities	Prevalence of obesity, amount of exercise	8
	CDC USALEEP	Life expectancy at birth	1
	CDC/ATSDR	Social vulnerability indices	2
	GLTED (from ACS)	Gentrification status, racial displacement	3
	USCB ACS	Educational attainment, household income	20
	USCB Opportunity Atlas	Incarceration rate, percent in top 20% based on individual income	3
	Neighborhood Atlas	Area Deprivation Index	2

Compile data

Attribute census tracts with Indicators in ArcGIS

Analysis example

EnviroAtlas community scale data

USCB ACS data

CDC 500 Cities data

CDC ATSDR data (SVI)

Openstreetmap data

Brownfields

Walkscore

Gentrification Displacement

Community 1

WF census tract Well-being indicator

Community 2
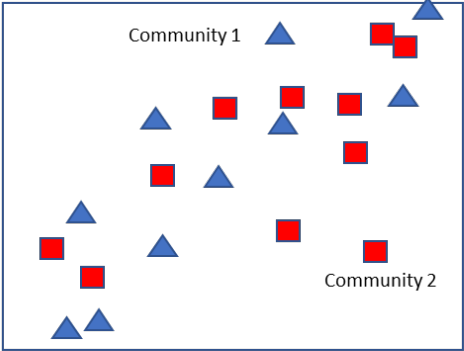
WF census tract amenity indicator value

R³ Database/mapper products

Duluth Area Waterfront
Census tracts
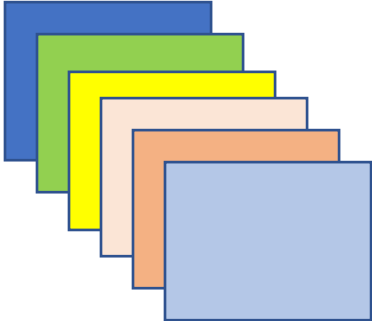
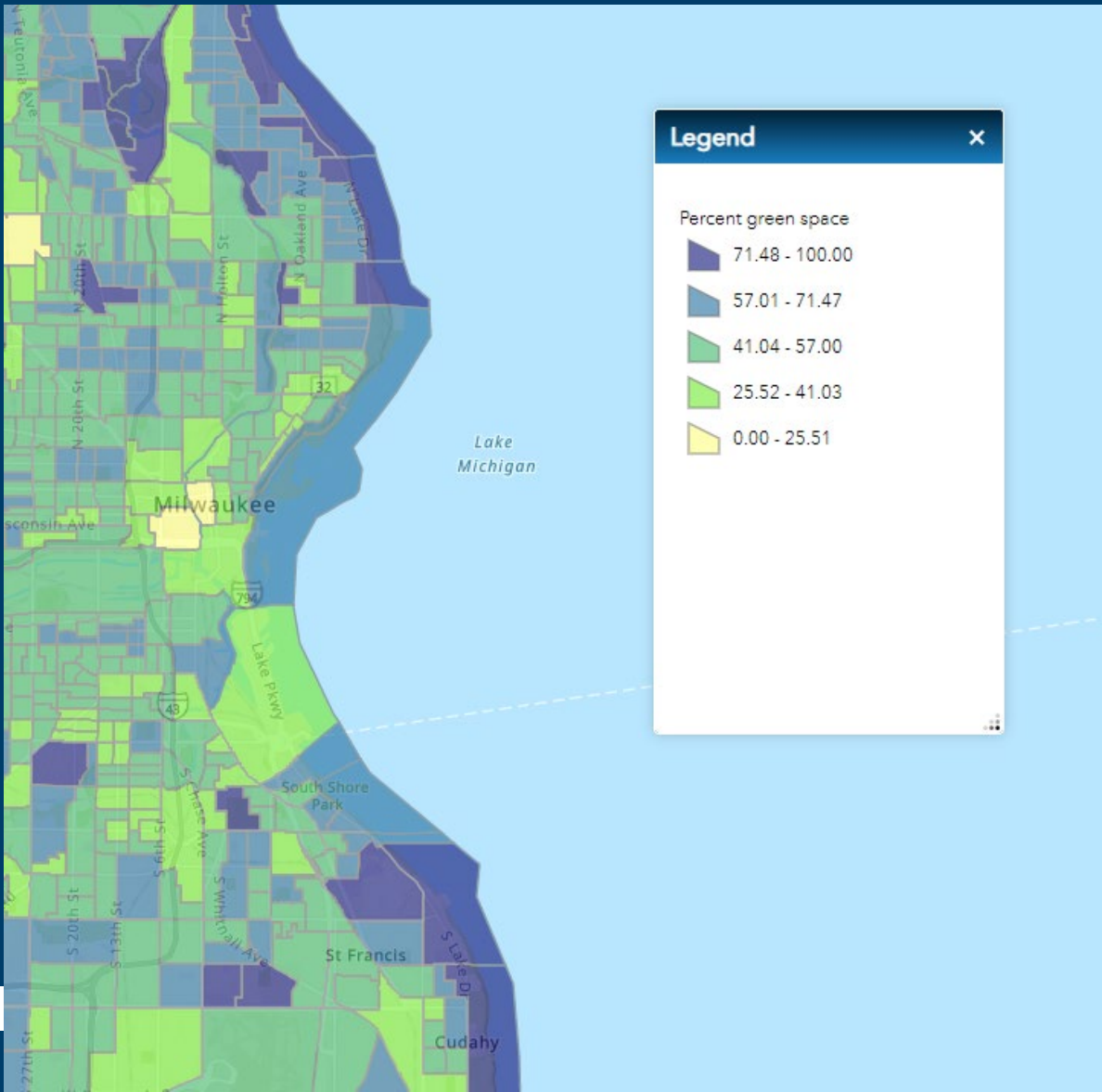# Assessment, Cleanup and Redevelopment Exchange System (ACRES)
224 Brownfield sites in waterfront census tracts
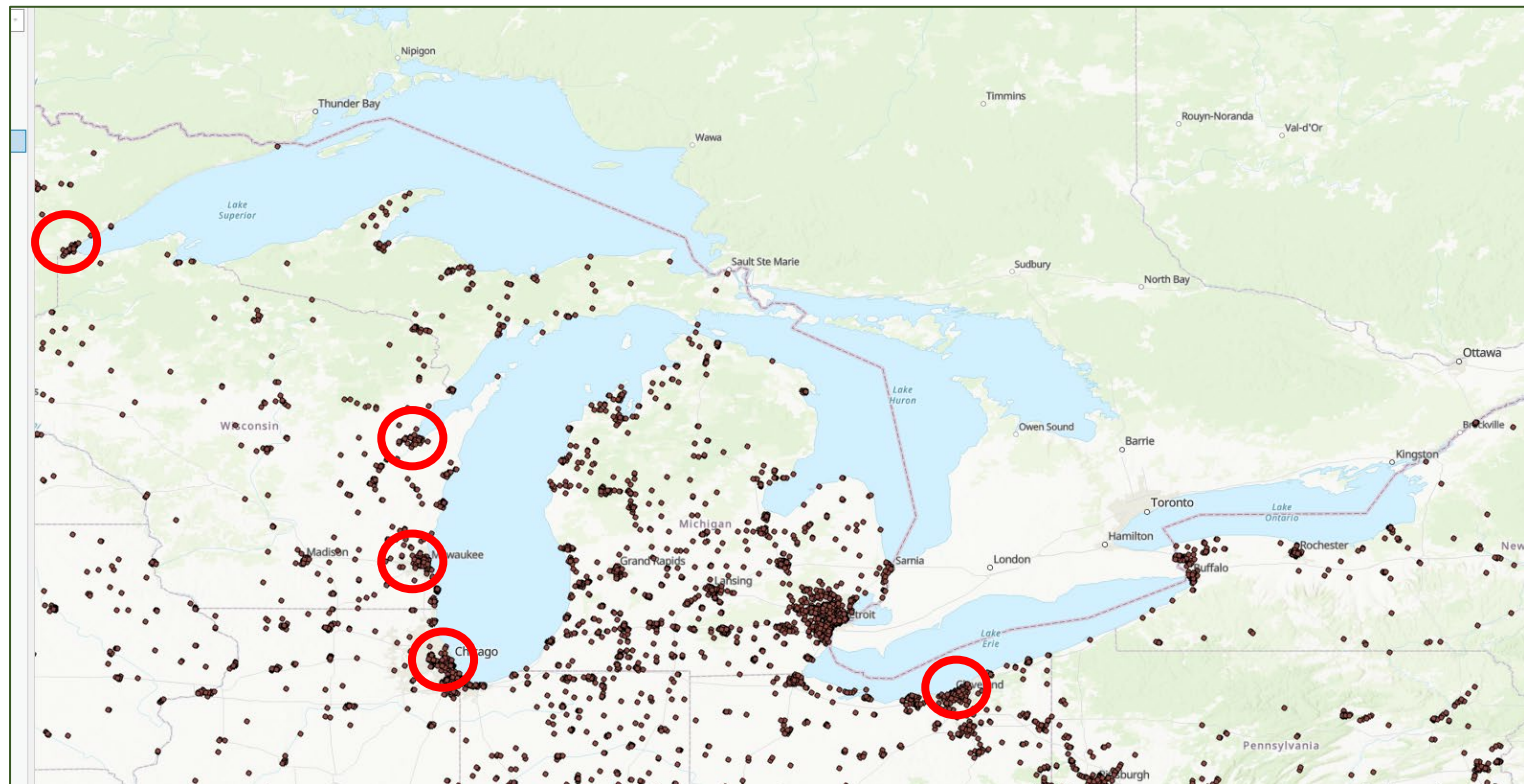
Indicators: site count, "leveraged accomplishments"
(acres of greenspace created, acres cleaned up, number of jobs created)

Map showing percent
Green space for Milwaukee
From EPA's EnviroAtlas tool
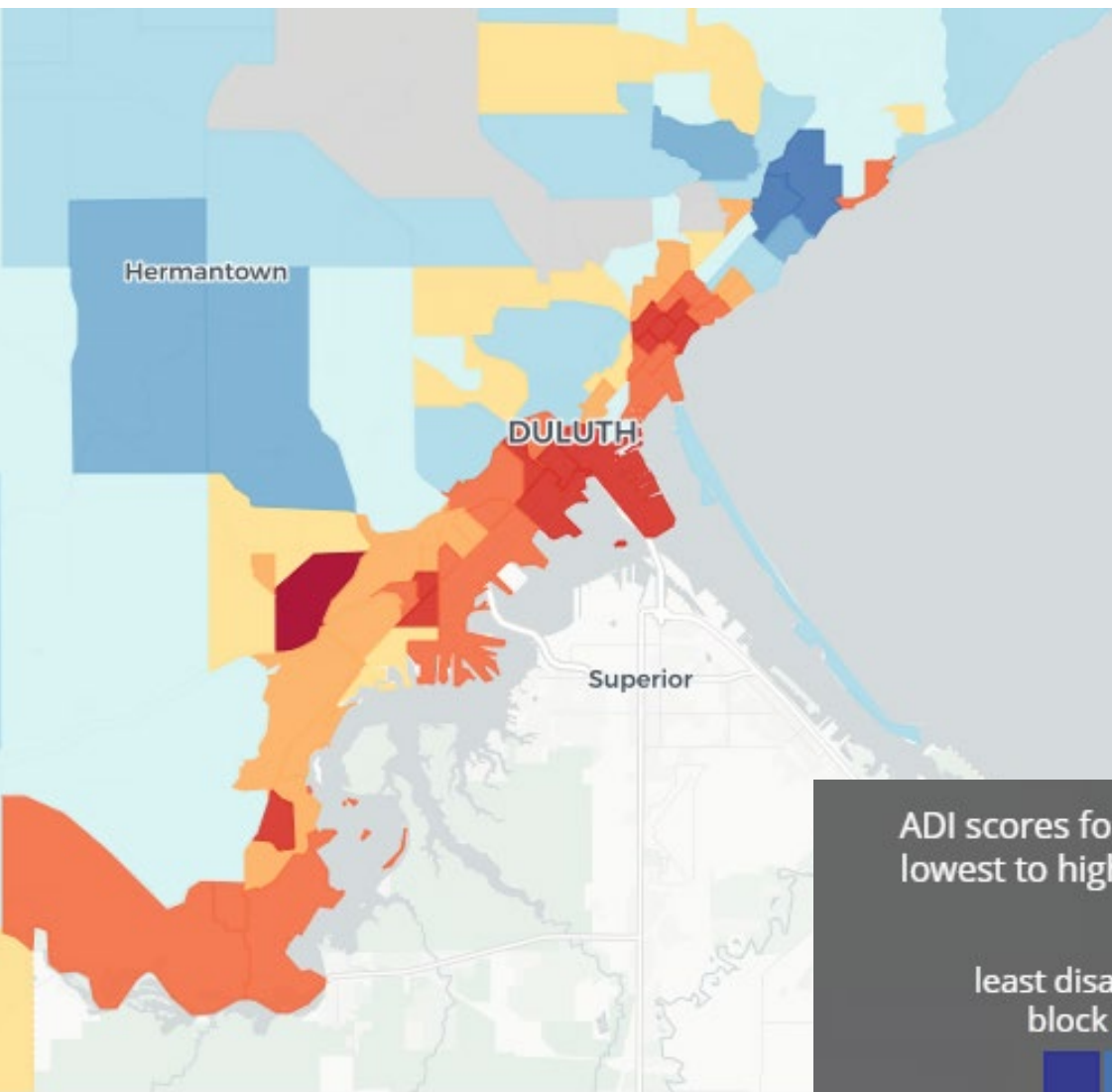
Map showing local variation in Area Deprivation Index (ADI) from Neighborhood Atlas

An indicator of social and economic challenges based on education, employment, housing, transport, and demographic metrics

ADI scores for the entire United States are ranked from lowest to highest, then divided into percentiles (1–100).

least disadvantaged block groups — most disadvantaged block groups

1-10 11-20 21-30 31-40 41-50 51-60 61-70 71-80 81-90 91-100

All map data relies on US Census Bureau geographies (Census Block Groups).

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Green gentrification and racial displacement metrics

Gentrification status (has occurred/ has not occurred) is calculated based on decennial change in home value, change in educational attainment, change in median household income
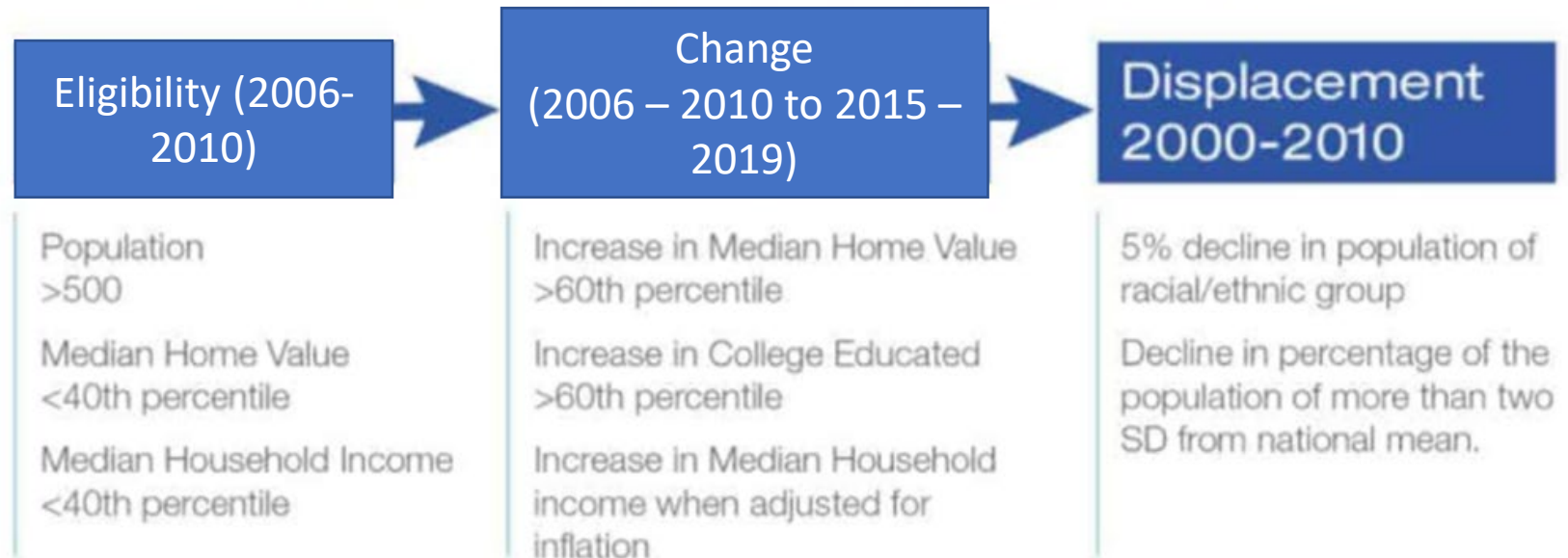
Displacement is calculated based on change in racial composition (Δ% percent non-white in the census tract in 10 years)

Change in median gross rent is another metric we can look at as a driver.

There may be a stronger signal for more urbanized waterfronts than in Duluth

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SHC 9.3.1 update

SHC 9.3.1 update

Gentrification and Displacement Criteria

| Eligibility (2006-2010)	Change (2006 – 2010 to 2015 – 2019)	Displacement 2000-2010
Population >500	Increase in Median Home Value >60th percentile	5% decline in population of racial/ethnic group
Median Home Value <40th percentile	Increase in College Educated >60th percentile	Decline in percentage of the population of more than two SD from national mean.
Median Household Income <40th percentile	Increase in Median Household income when adjusted for inflation	

NCRC.ORG

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Walkscore.com data as an indicator of a "hybrid" amenity
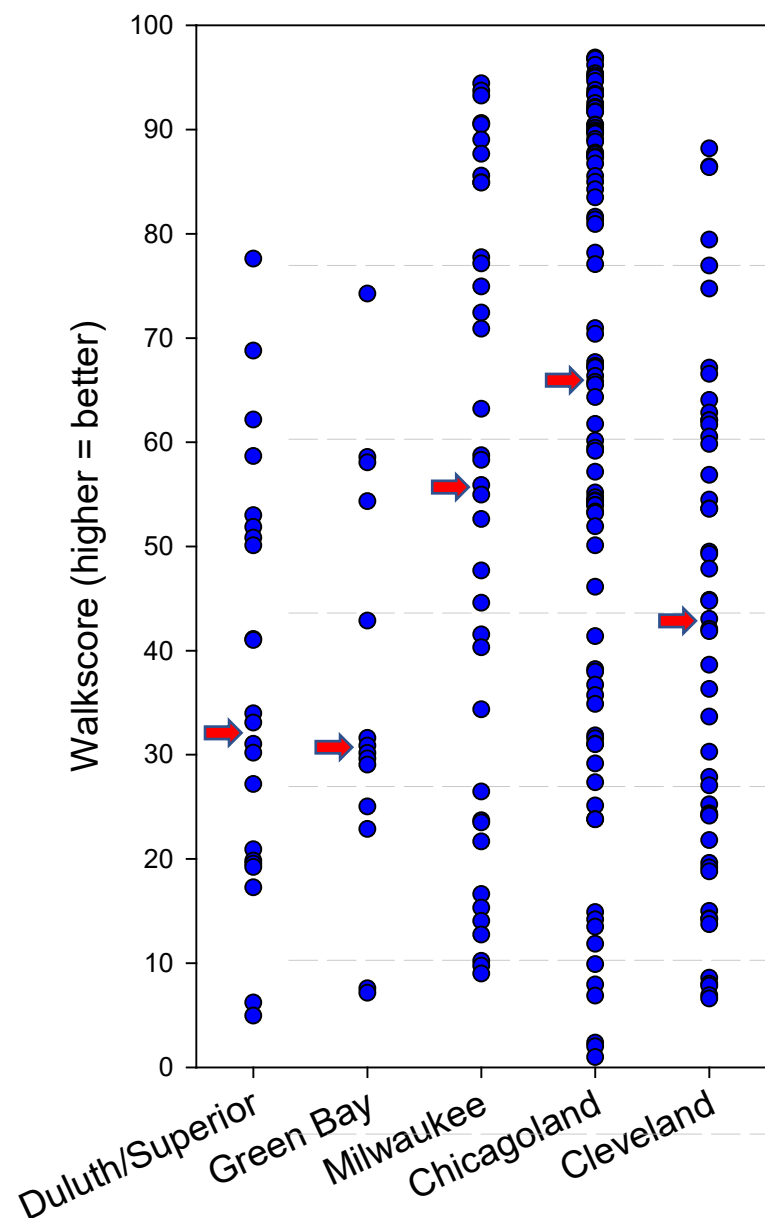
Walk Score measures distance to amenities and "pedestrian friendliness" by analyzing population density and road metrics such as block length and intersection density. Data sources include Google, Factual, Great Schools, Open Street Map, the U.S. Census, Localeze, and places added by the Walk Score user community.

Walk Score®	Description
90–100	**Walker's Paradise** Daily errands do not require a car.
70–89	**Very Walkable** Most errands can be accomplished on foot.
50–69	**Somewhat Walkable** Some errands can be accomplished on foot.
25–49	**Car-Dependent** Most errands require a car.
0–24	**Car-Dependent** Almost all errands require a car.

*Also have Bikescores

Product Status

- GIS model runs for Duluth data successful (Jon Launspach)

- Refining the models and building them out for other cities

- Will update ACS data to 2019 5-year averages when available

- Building our own gentrification metrics from 2010 → 2019 ACS data

- Statistical analysis to start in early 2021

Why waterfronts?

- AOC project locations are typically at or adjacent to the waterfront

- Mix of aquatic, riparian, and terrestrial amenities and benefits

- Reduces some sources of variation

- Likely strongest signals (most legacy problems, broad recreational use, high-profile natural capital amenities, largest climate impacts)

I recognize a gradient from green feature to built features

Natural and hybrid capital ⟷ Built capital

Childers, DL, et al. 2019. Urban Ecological Infrastructure: An inclusive concept for the non-built urban environment. *Elem Sci Anth*, 7: 46. DOI: https://doi.org/10.1525/elementa.385

Δ Natural capital amenities (or attributes)	Δ Well-being benefits
Change that happens in a Waterfront census tract	*Change that happens to a person or population living in a waterfront census tract*
Δ Park/trails	Δ Income
Δ Access to water	Δ Educational attainment
Δ Aesthetics/views	Δ Obesity
Δ Green Space	Δ Exercise
Δ Gardens	Δ Physical health
Δ Trees	Δ Mental health
Δ Blue Space	Δ Risky behaviors
Δ Brownfields	Δ Social vulnerability
Δ Hybrid amenities	Δ Equity
Δ Climate resilience	Δ Personal fulfillment

In this analysis, spatial variation among waterfront census tracts substitutes for temporal change within a census tract