Chicago's New Nature: Innovative Climate Planning Tools for the Adaptation Gap

Strategies for Adaptation and Ecological Co-Existence

Şevin Yıldız, PhD
Assistant Professor @ Urban Planning and Policy
University of Illinois Chicago

TOWN+GOWN MAWAC-ENAR Presentations, February 2024

The arrival of the 'Unprecedented'

Tropical Storm Hilary and Southern California

Image: The Globe and Mail


A Freak Storm in Spain, Summer 2023

Climate change is redrawing the disaster map

From tropical storms to wildfires, climate disasters aren't confined to the places we're used to seeing them.

By **JUSTINE CALMA** | August 22, 2023 2:42 pm

Vehicles and housing structures are partially submerged after Tropical Storm Hilary flooded a community of unhoused people on August 21st, 2023, in Cathedral City, California.

Newsletters

CRAIN'S CHICAGO BUSINESS

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Crain's Forum on climate migrants

Climate change could make Chicago a sweet home for migrants

Once the place people sought to escape because of its weather, the metropolitan area could beckon as a safe harbor from climate change.

By **Cassandra West**

Reprints Print Share

Credit: Getty Images

The Chicago River

CRAIN'S FORUM

From the pension crisis to gun violence, the city and state face a whole host of seemingly intractable problems. Crain's explores these issues in depth with the goal of respectfully and objectively raising the conversation, and in some cases, suggest possible solutions.

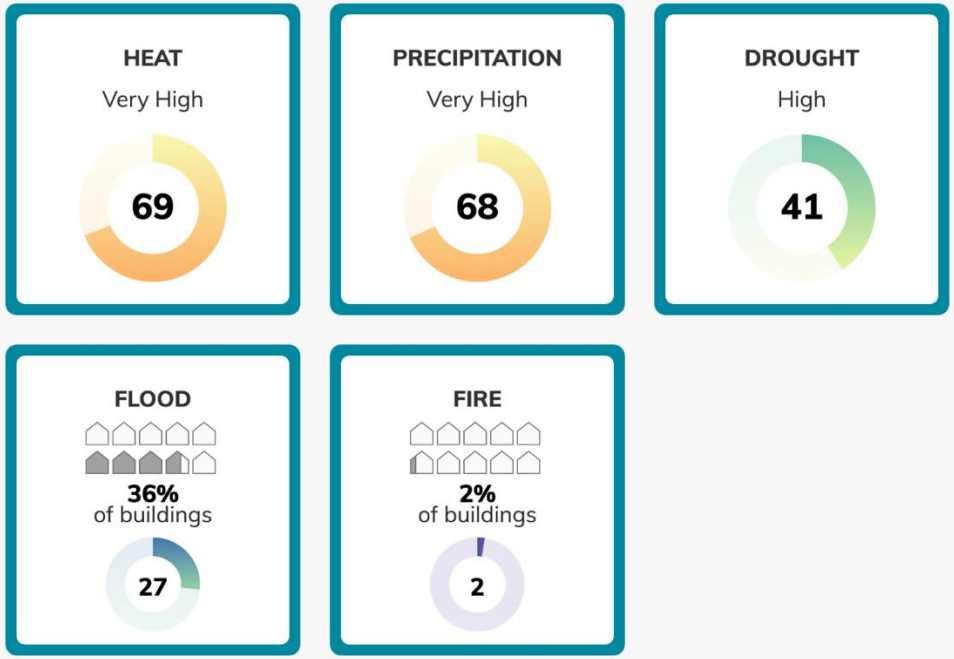
See complete Forum on climate

The ‘Historic’ Visits Chicago, Summer 2023

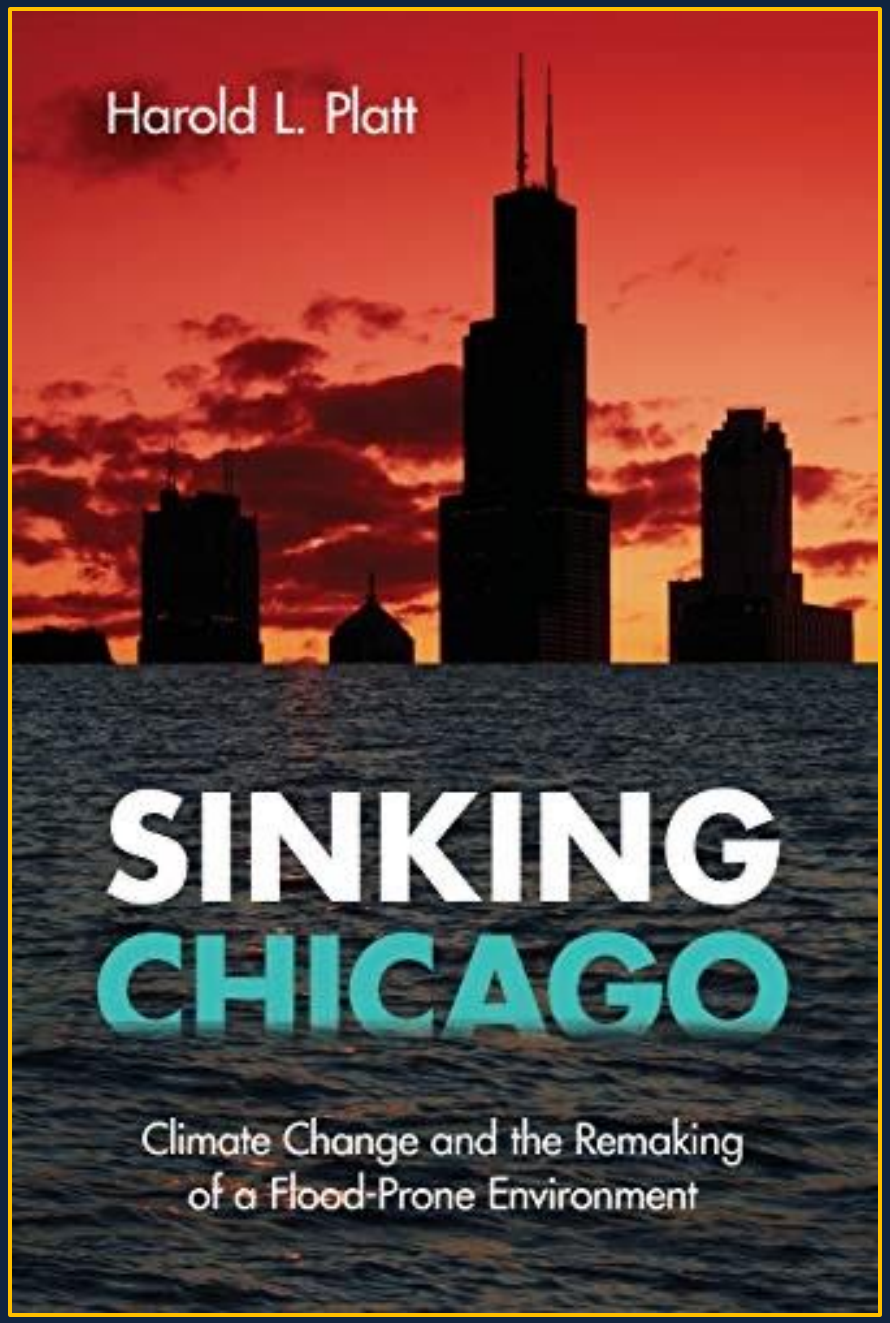
Risk Snapshot

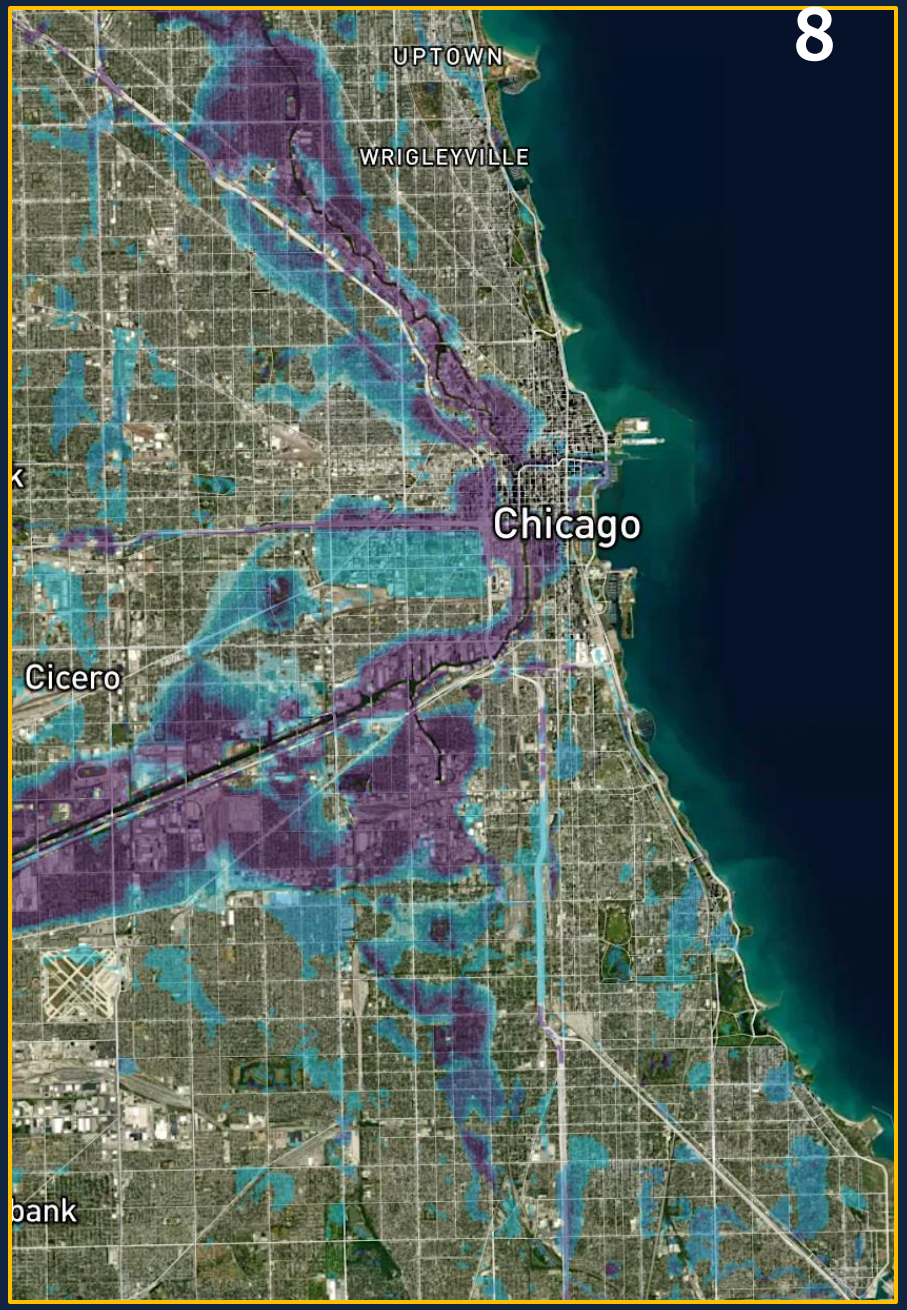
Climate Change Hazard Ratings for Chicago, IL

Ratings represent risk relative to North America. 100 is the highest risk for the hazard and 1 is the lowest, but does not indicate no risk. Flood and fire are rated based on the buildings in Chicago exposed to these hazards. See hazard sections below and check your address for details.



The Irony of the Missing Sense of Urgency





Smithsonian MAGAZINE

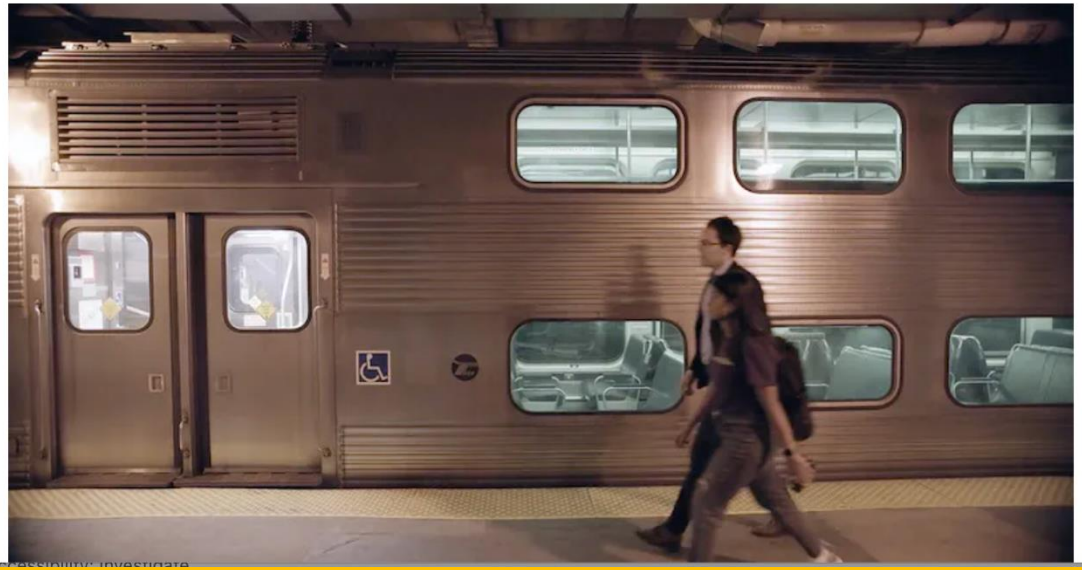
Chicago May Be Slowly Sinking Because of 'Underground Climate Change'

The ground beneath the Windy City is shifting as heat escapes from buildings and transit systems, posing a threat to infrastructure, a study finds

Margaret Osborne

Daily Correspondent

July 20, 2023

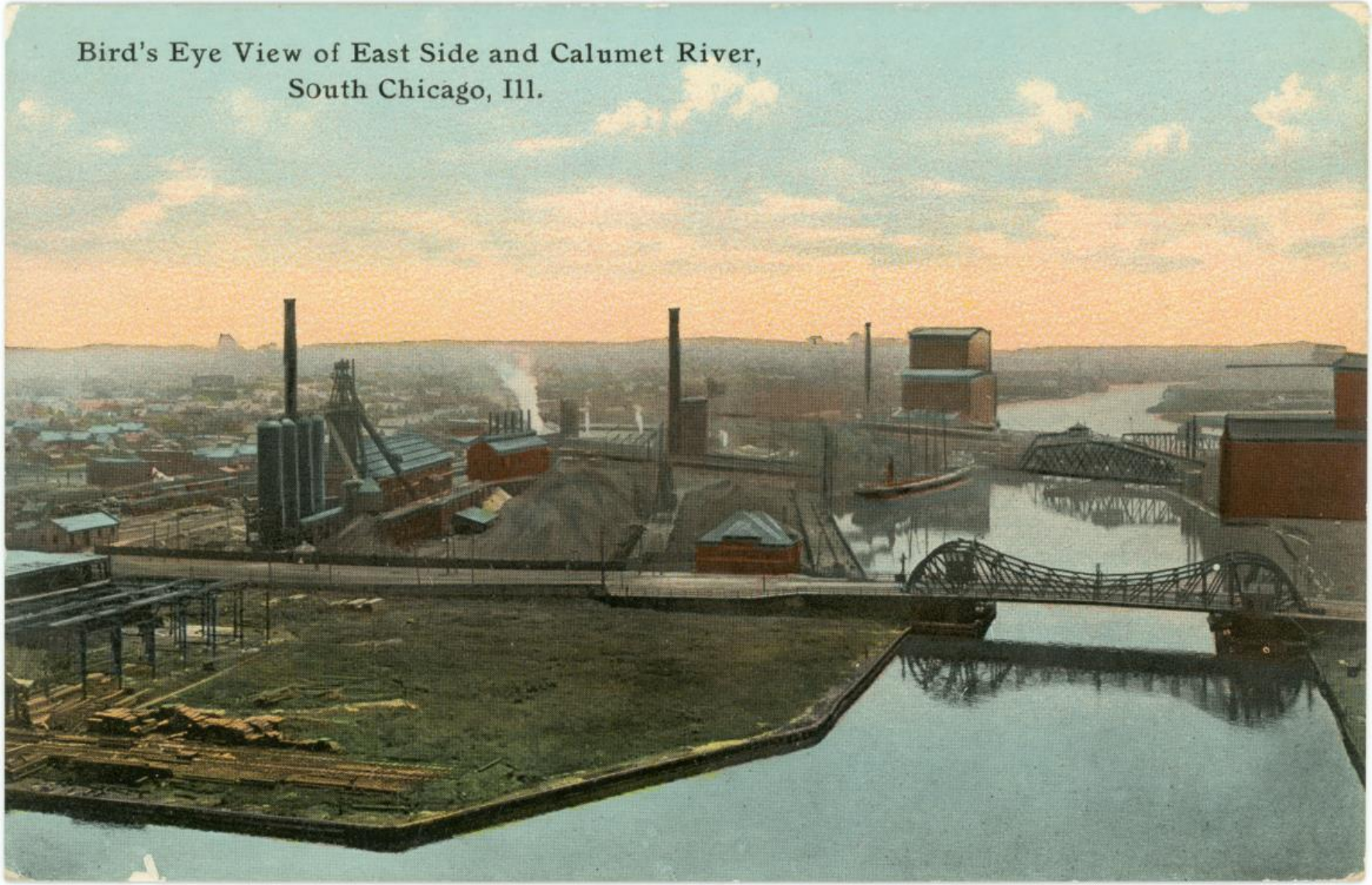


A forensic approach:

How did Chicago alter its natural systems radically in the past two centuries?

The Complex Infrastructural Terrain and In Search for Soil

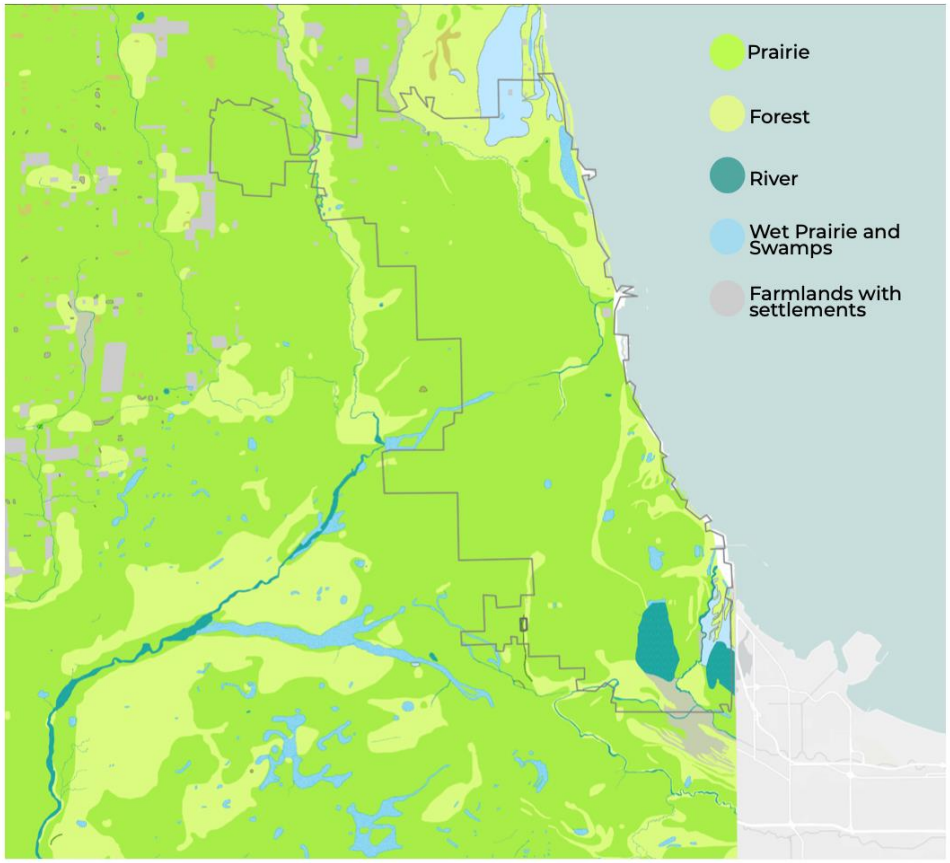
The Complex Infrastructural Terrain and In Search for Soil



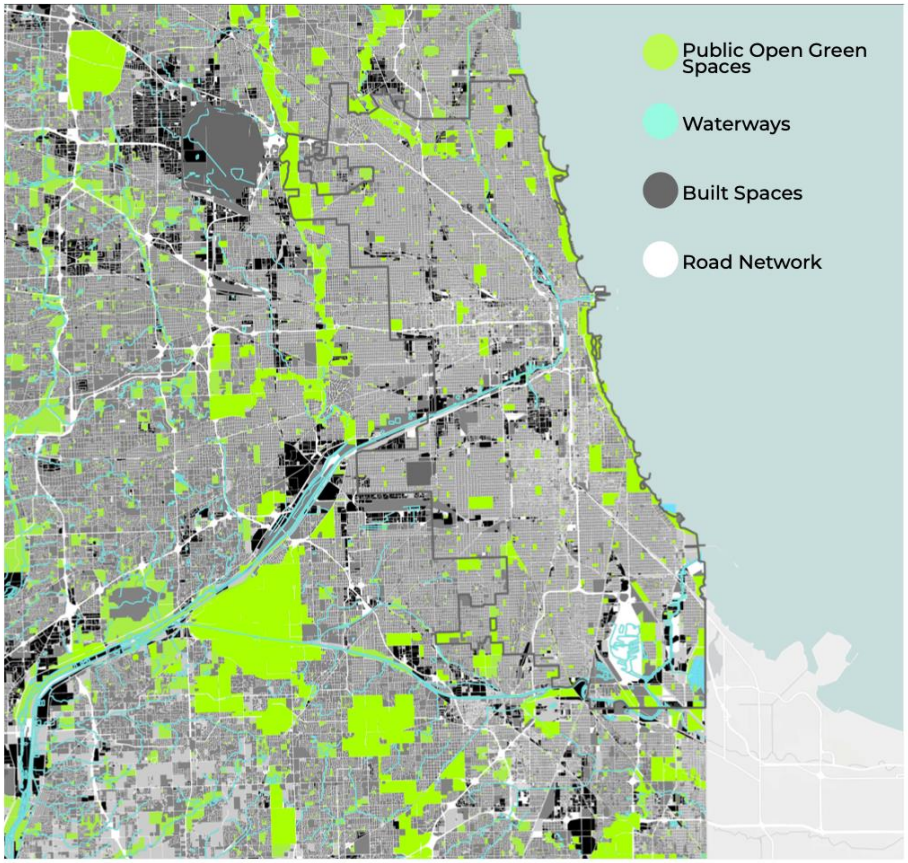
Chicago now

Urban sprawl

1800's Chicago



2018 Chicago



From our design studio work with grad students at UIC CUPPA, 2023

A New Set of Conditions and Problems

Old Sets of Regulations and Toolkits

The Irony of the Missing Sense of Urgency

storyful. | Storyful

'Worst Flooding I've Ever Seen': Waves Topping 20 Feet Slam Chicago's Lakefront

11 January 2020

'Unreal' rains flood homes, knock out power and put Chicago on the cusp of wettest May ever

By PATRICK M. O'CONNELL, WILLIAM LEE, MICHAEL HAWTHORNE and KATHERINE ROSENBERG-DOUGLAS
CHICAGO TRIBUNE | MAY 19, 2020 AT 10:59 AM

SCIENCE & NATURE

Lake Michigan's High Water Level Breaks 30-Year Monthly Record

Blair Paddock | February 5, 2020 7:17 pm

Flooding in the Chicago area has been so bad in the past decade that only places ravaged by hurricanes sustain more damage

By MICHAEL HAWTHORNE and MORGAN GREENE
CHICAGO TRIBUNE | MAY 10, 2019 AT 9:15 AM

New flood maps tell us we aren't doing enough to stop rising waters

Chicago and the region need to step up fast to reduce flooding and protect inhabitants and businesses.

By CST Editorial Board | Jul 5, 2020, 7:00am CDT

CLIMATE FWD:

Chicago's Big Climate Problem

It's not heat or drought. It's the level of Lake Michigan.

SCIENCE & NATURE

New Analysis Shows Large Swaths of Chicago at High Flood Risk

Erica Gunderson | July 6, 2020 6:26 pm

E&E NEWS
ENVIRONMENT

Chicago Takes a Beating as Lake Levels Surge

High water and 12-foot waves are eroding shorelines on Lake Michigan

In Chicago, Flooding Overwhelmingly Strikes Communities of Color

Chicagoans swamp city with flood complaints after spring's record rain

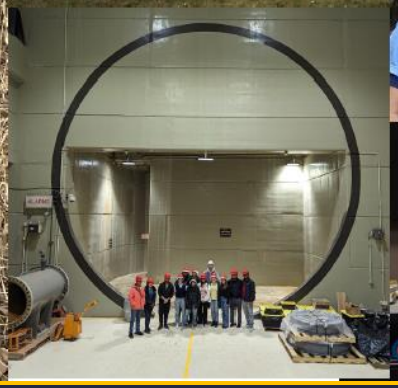
A Sun-Times analysis shows the city received more than 27,000 reports to 311 about flood-related problems in the past two years.

How do we innovate and

break down silos between climate science and spatial strategies?

- Flexible adaptation
- Risk/Uncertainty admission in design and spatial planning
- Co-existence with natural systems (beyond the sustainability paradigm)
- Possibilities of Repurposing

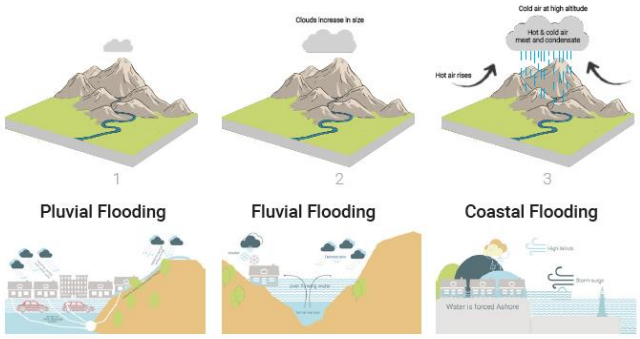
Studio Process



Infrastructural Repurposing Strategies for Downtown Chicago (2021-2022)

Cloudburst flooding is caused by sudden, substantial rainfall events that can overwhelm stormwater systems and lead to excess water pooling across a city.

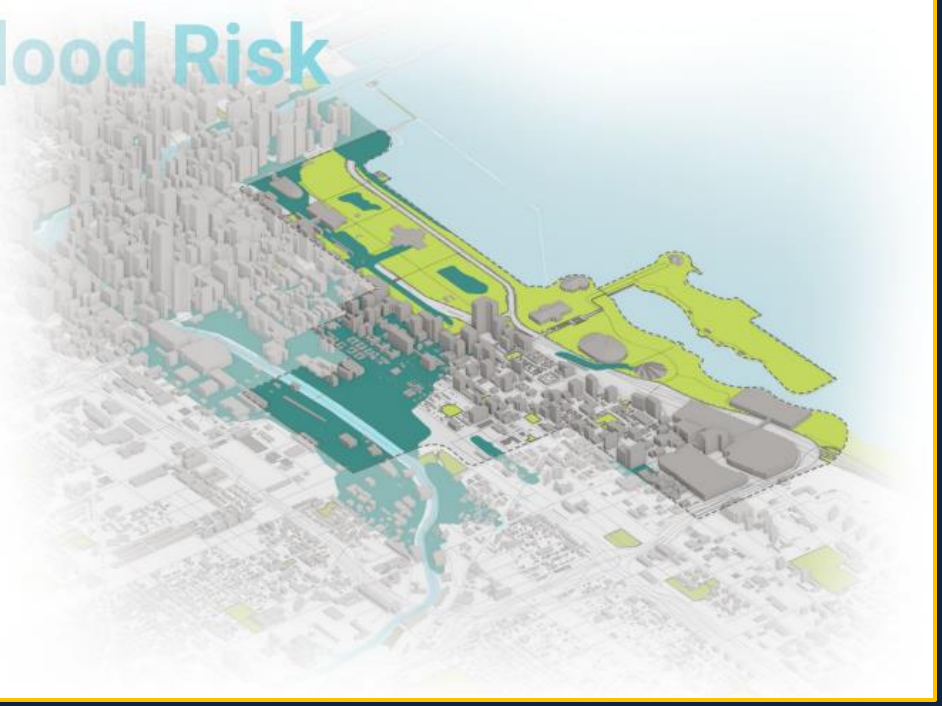
Partially due to Chicago's unique location on the precipice of two major environmental systems - the Mississippi River watershed and the Great Lakes basin - adverse and extreme precipitation events are expected to increase in coming years. Acknowledging this now is crucial to address concerns for the years ahead. Cook County's Tunnel and Reservoir Plan (TARP) was commissioned in the 1970's at a time when climate change's impact on weather was not fully understood. Creating additional stormwater capacity through sustainable solutions is critical to contend with coming storms.



The Cloudburst Studio Team (UIC)

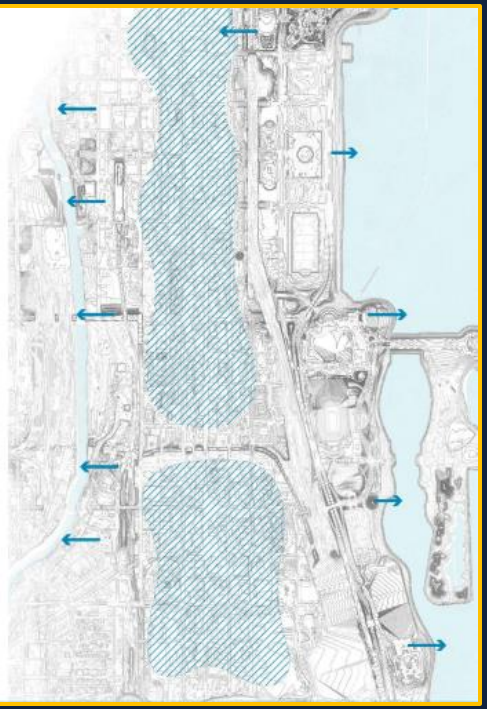
Future Flood Risk

36% of land is at an increased risk of flooding in the future



Water Flow

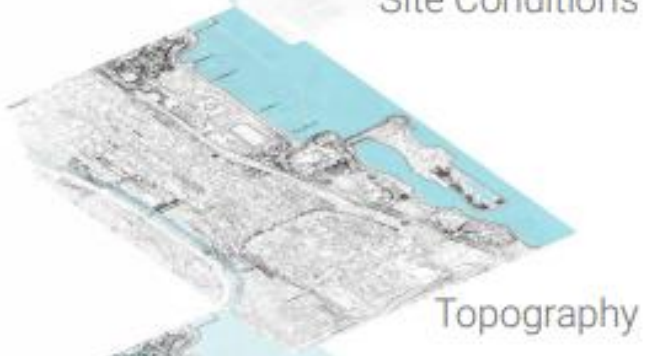
Water wants to return to water



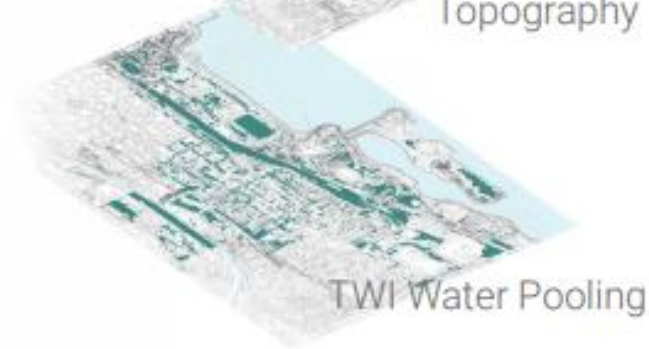
The Cloudburst Studio Team (UIC) 2022

Street Analysis

Site Conditions



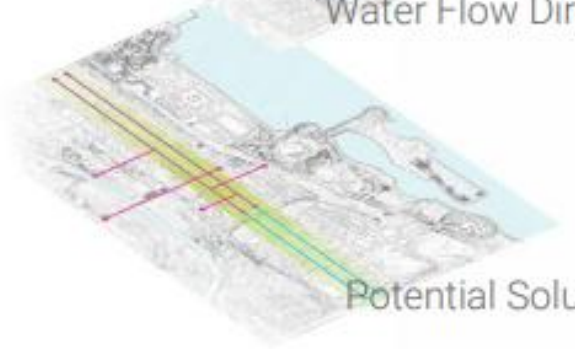
Topography



TWI Water Pooling

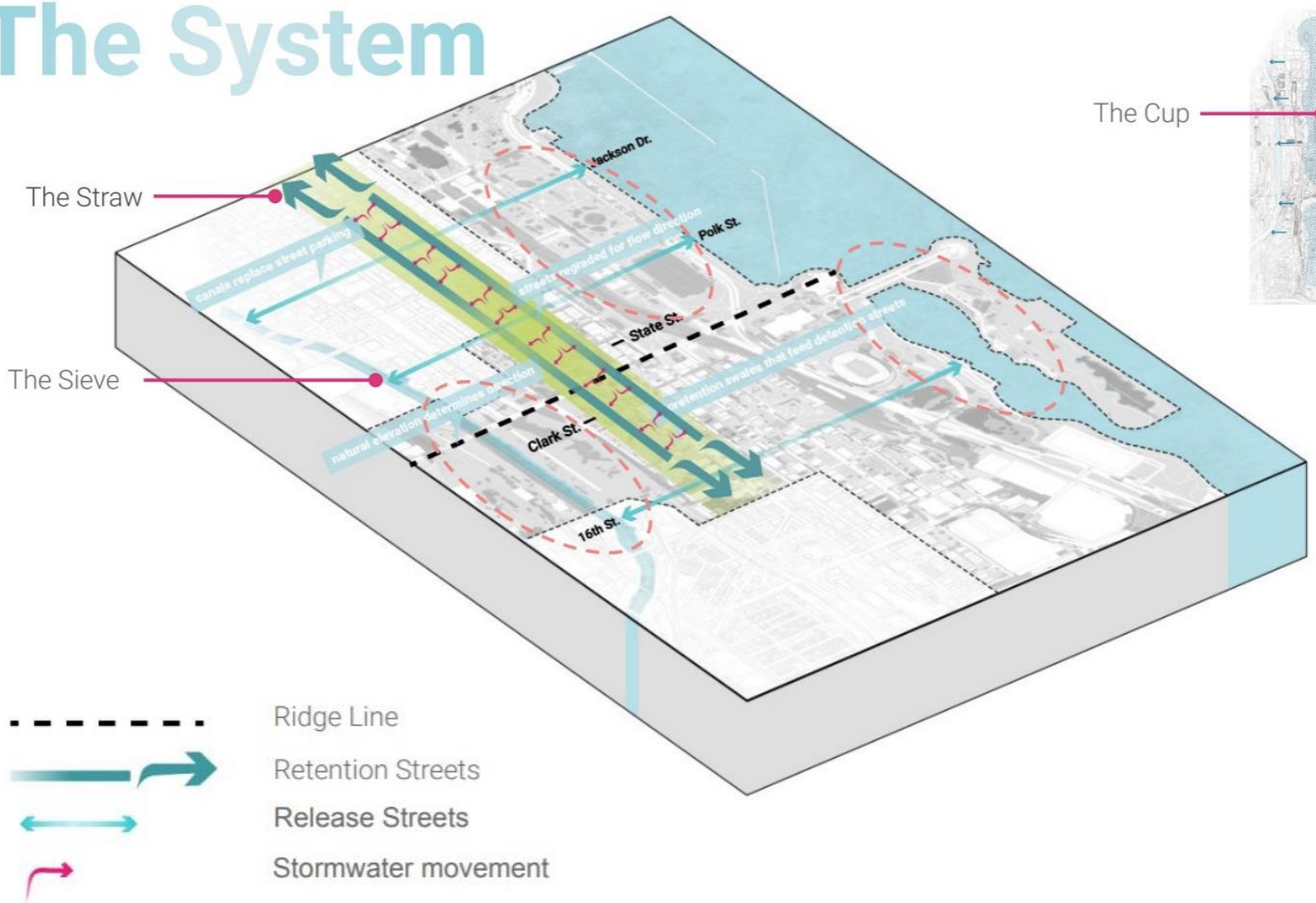
Right of Way Width

Water Flow Directionality

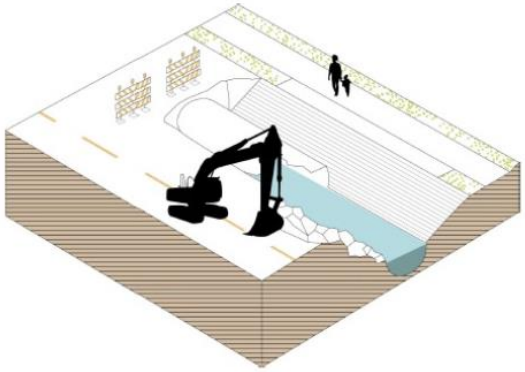


Potential Solutions

The System

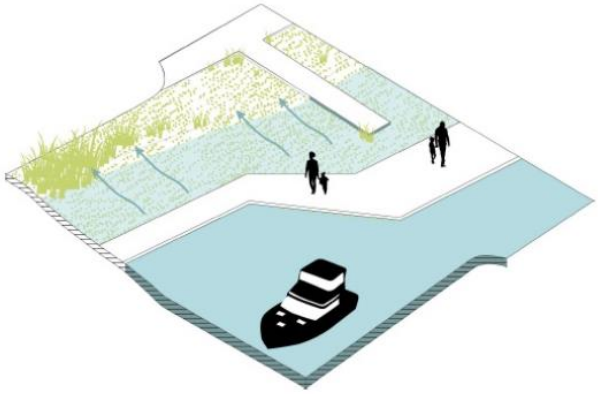

The Straw
The Sieve
The Cup
Jackson Dr.
Polk St.
State St.
Clark St.
16th St.
canals replace street parking
streets regraded for flow direction
natural elevation determines direction
retention swales that feed detention streets
Ridge Line
Retention Streets
Release Streets
Stormwater movement

Toolkit



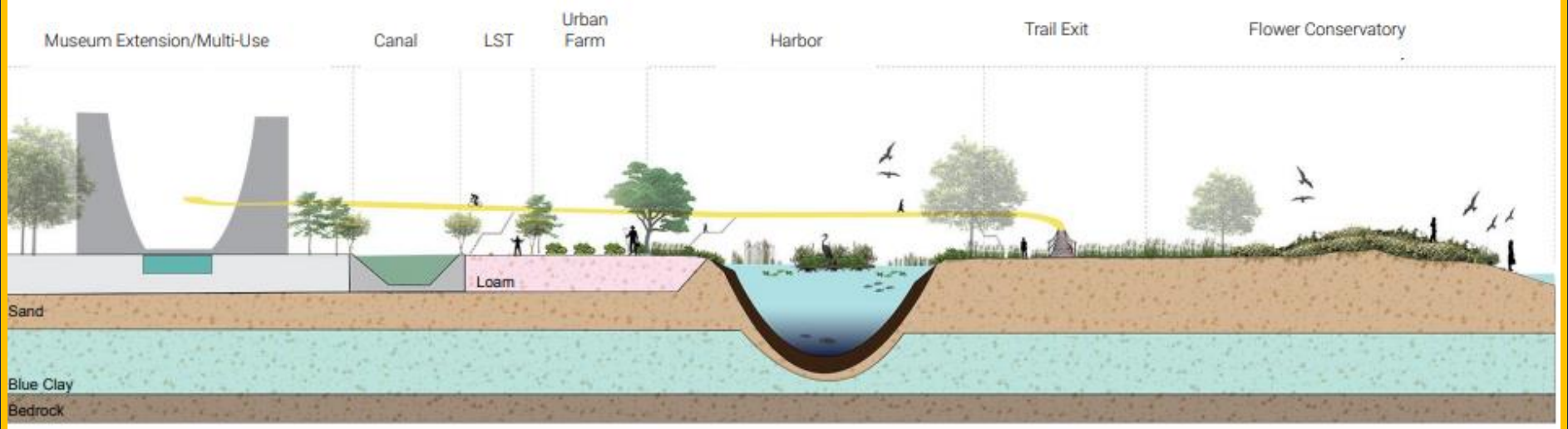
Repurposed Tunnels

Wildlife Intervention



Reimagining the River

Northern Section



Nearly 2 billion gallons of new water storage
Additional ~natural~ capacity on top of TARP

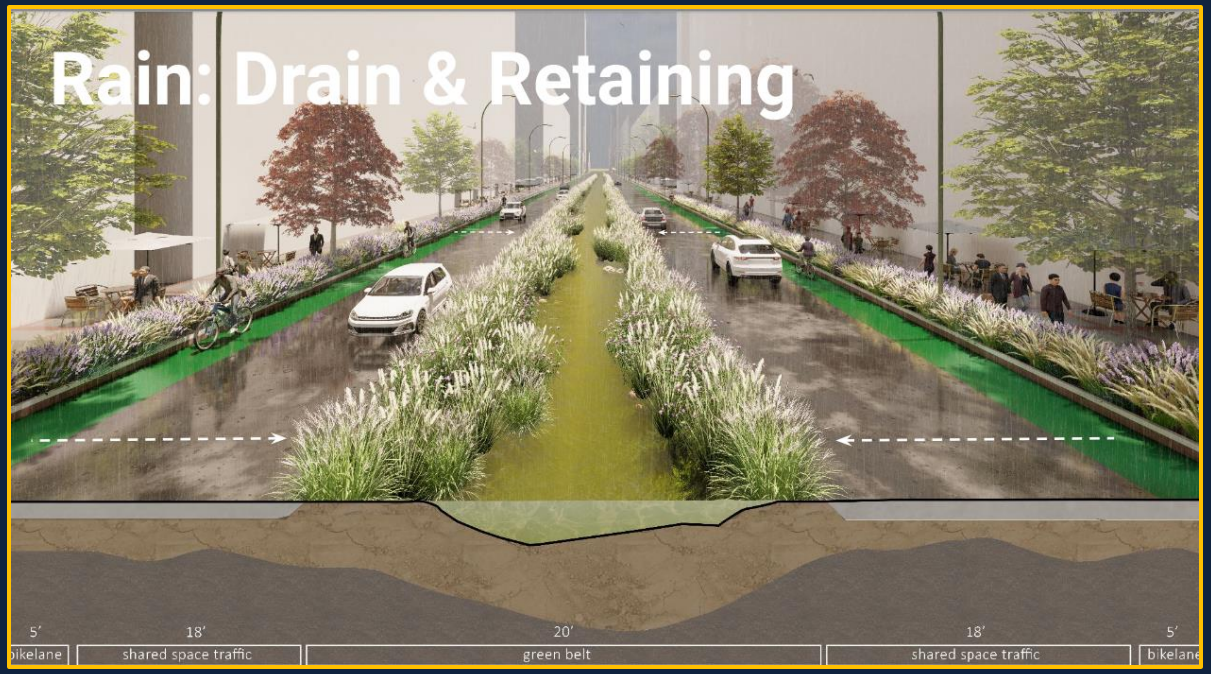
- **More than 400 acres of land for native species introduced**
- **60,000 metric tons of CO2 retention**

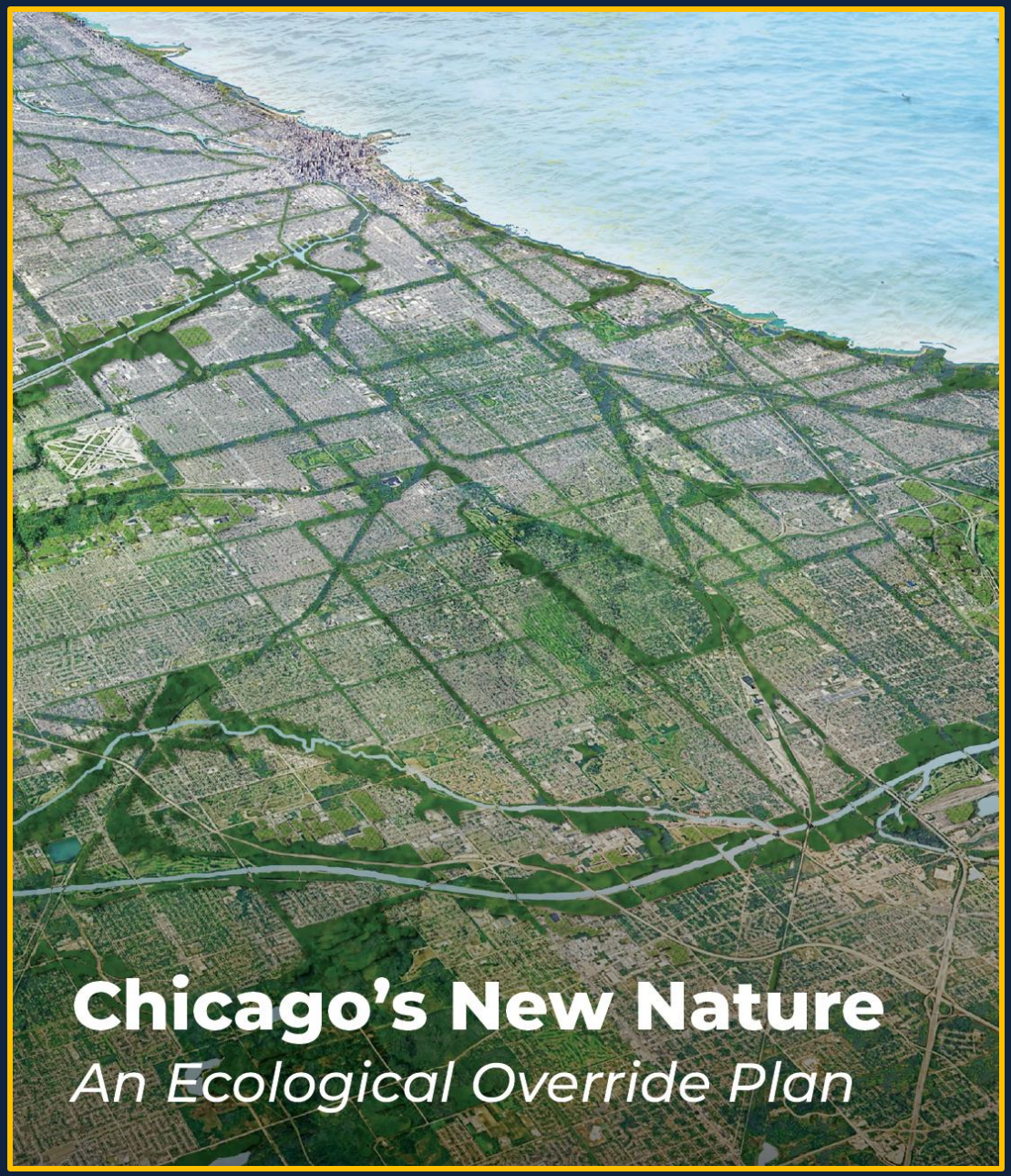
Over 1,000 birds are saved annually from the re-interpretation of East McCormick alone
Millions of dollars are saved annually
Naturalized soil, welcoming wildlife, tamping temperatures, slowing water rise

Grant Park

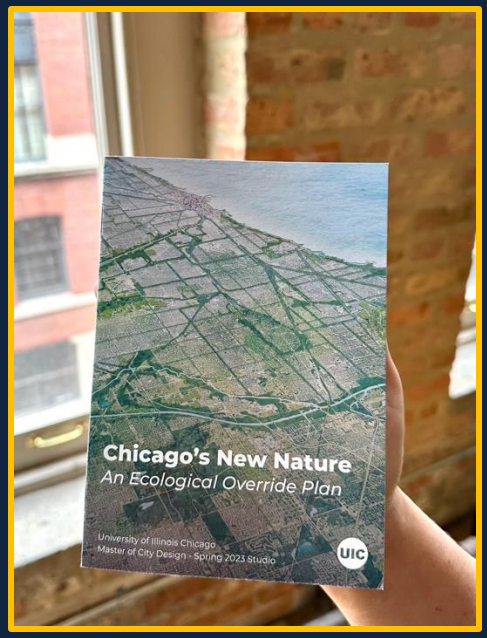
Additional water capacity:
400 million gallons

New naturalized land:
170 acres




Chicago's New Nature
An Ecological Override Plan


APA IL
American Planning Association
Illinois Chapter
Making Great Communities Happen
2023 STUDENT PROJECT AWARD
Presented for
Chicago's New Nature:
An Ecological Override Plan
Presented September 11, 2023
UIC


Chicago's New Nature
An Ecological Override Plan
University of Illinois Chicago
Master of City Design - Spring 2023 Studio
UIC

Studio Framework

The Spring 2023 Override Studio is a provocation to reconsider existing systems.

- **Open Space Networks of Chicagoland** A network of different type of reserve zones and programmed parks propose a new version of a natures Nolli map of built up areas proposing a new string of override zones and gradients. *(Regional Scale)*
- **Green Roof Master Plan** The studio will develop strategies for proactive green roof master planning. Repurposed structures, due to high post-covid vacancies and the typologies of the past open new avenues for rooftop catchment areas and canopy planning. *(City-wide scale)*
- **Override Conjunctions** Chicagoland is a complex system of underground and above ground. Underground tunnels that are not used, the dense high-rise blocks that stand out as islands, open park spaces and edge typologies such as vast parking garages are accumulated layers of past planning + design practices. The studio aims to map out these relationships to explore new typological arrangements for override conjunctions. Students will identify a series of encounter corridors. *(City-wide scale)*
- **Catalysts** These are structures that will function to reorganize overrides in conjunctions. They can take on the form of a dual-function infrastructure, a highly flexible cluster of built structures, or a time and modality-based land uses. *(Special Zone scale)*

Rewilding needs to be considered as a serious option

REWILDING OUR CITIES COULD REDUCE IMPACTS OF EXTREME WEATHER, SAYS NEW REPORT

READ A REWILDING SUCCESS STORY

SUPPORT OUR CONSERVATION WORK

WRITTEN BY

ZSL

Zoological Society of London

22 September 2022

A landmark report by ZSL shows how increased urban rewilding efforts could boost wildlife and buffer city dwellers from the worst impacts of climate change.

The Missing Links: Rewilding and Native Plants

"Wildlife species, throughout their interaction with the environment, are the missing link between biodiversity and climate.

This interaction means rewilding can be among the best nature-based climate solutions available to humankind."

At least 1,000 birds died from colliding with one Chicago building in one day

McCormick Place, the largest convention center in North America, is largely covered with glass, making it a lethal obstacle for birds

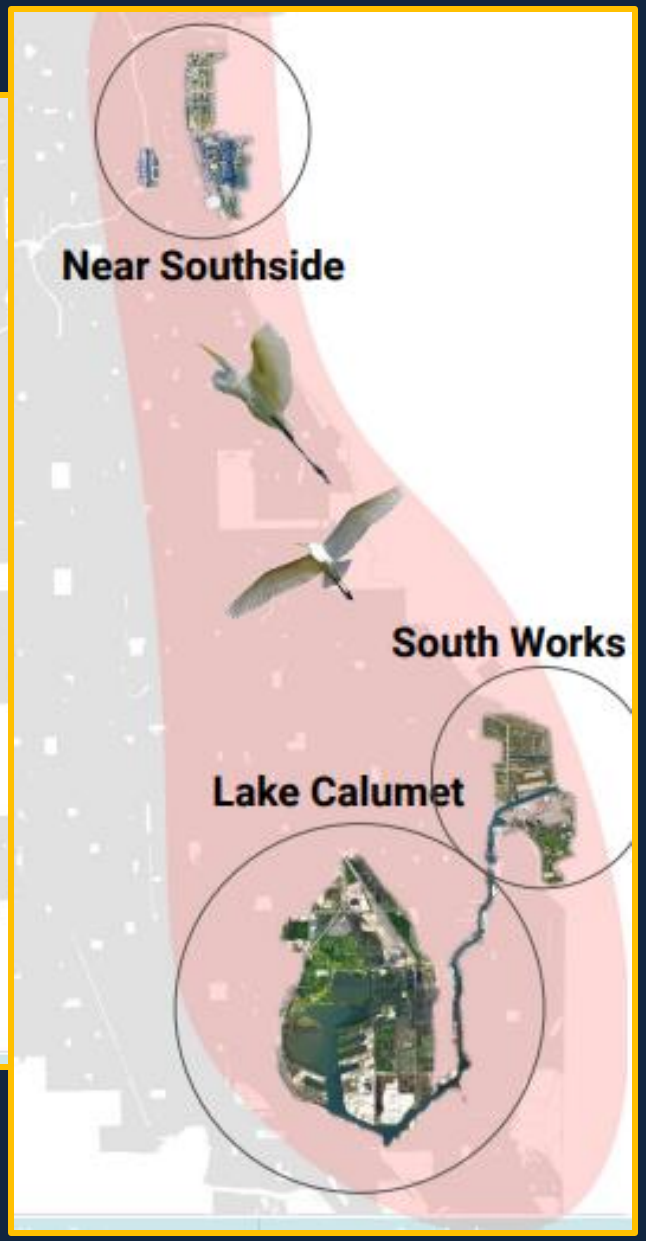
Some of the many birds that were killed when colliding with McCormick Place in Chicago. Photograph: Lauren Nassef/AP

Waterscapes and wildlife conflicts

Our 2022 Cloudburst work led to unexplored avenues for 2023

Chicago Bird Flyway

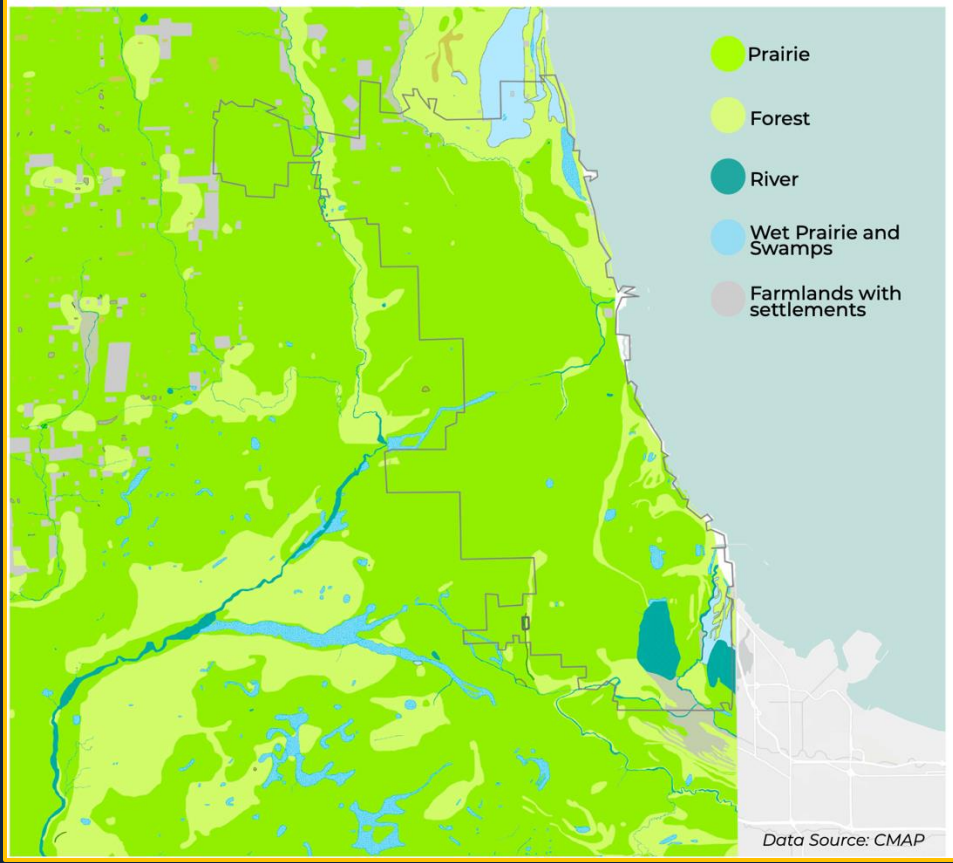
- Chicago has been labeled one of the **most dangerous** cities for birds because it's the **largest urban area along a major migratory route.**
- Migration is a long & grueling journey. Birds need places to **stop, rest, feed and recover**.
- The Chicago Bird Flyway is a **response to the destruction of natural habitat caused by development**.
- The CBF could serve as a regional system that returns some of the land to the birds, in turn **restoring natural habitat and introducing wetlands that will offset carbon, absorb stormwater and slow warming temperatures.**



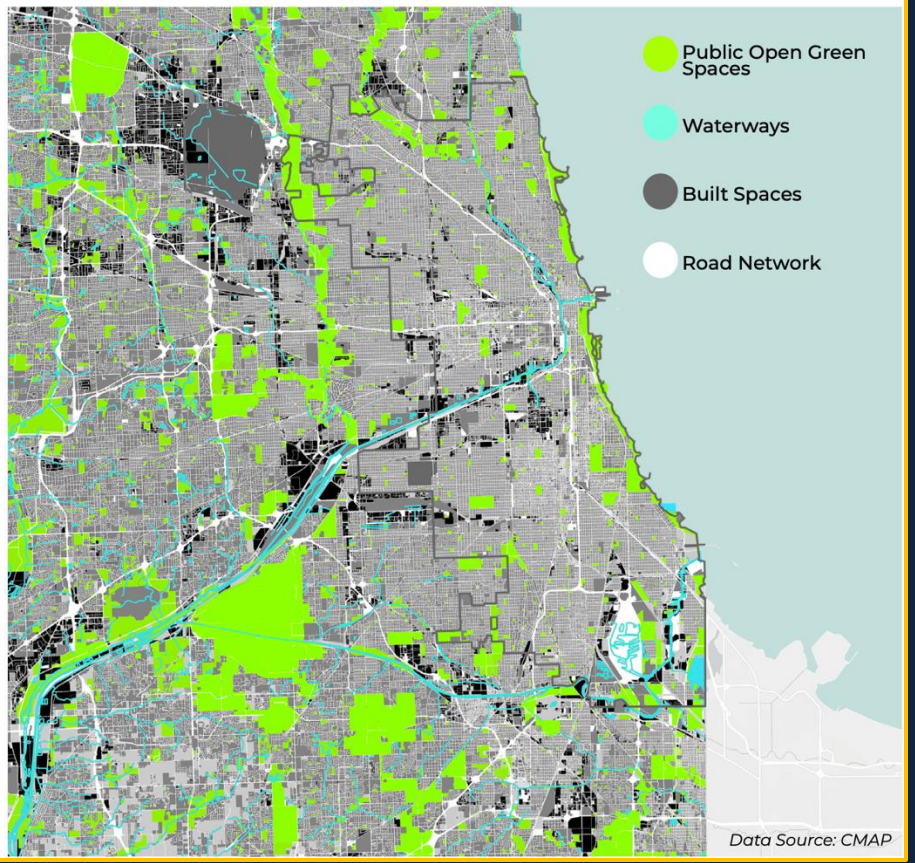
Chicago Now

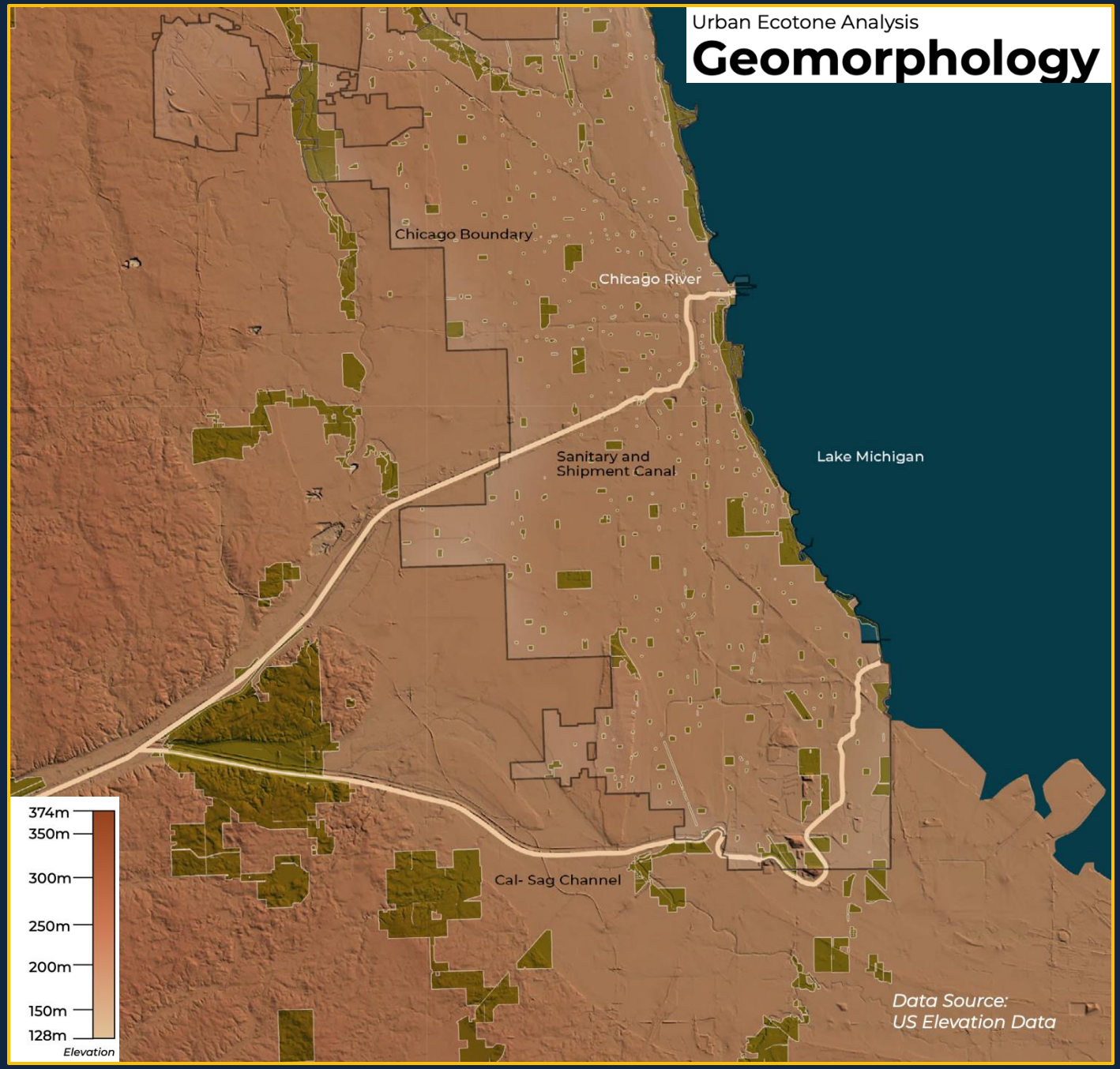
Urban sprawl

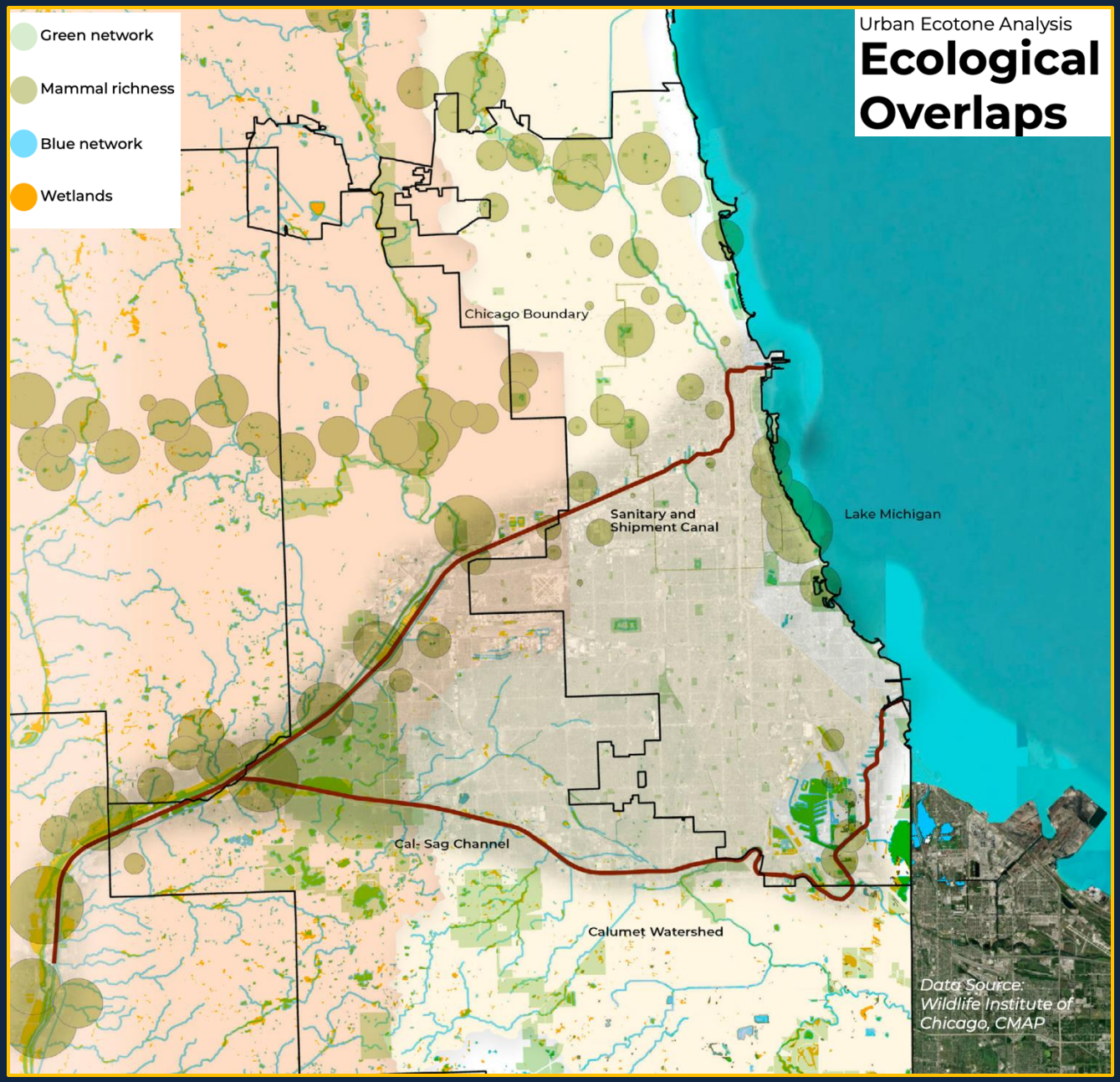
1800's Chicago

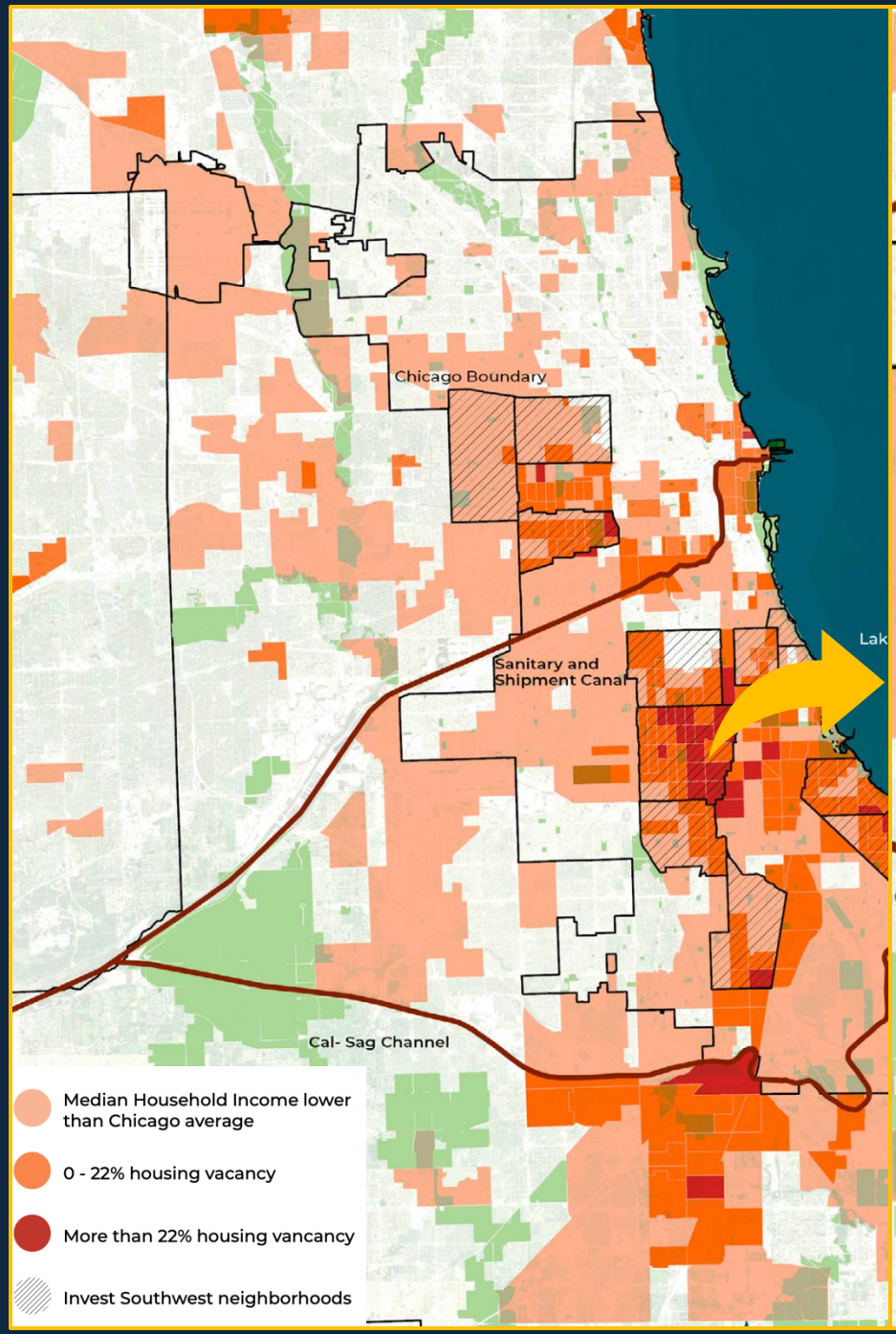


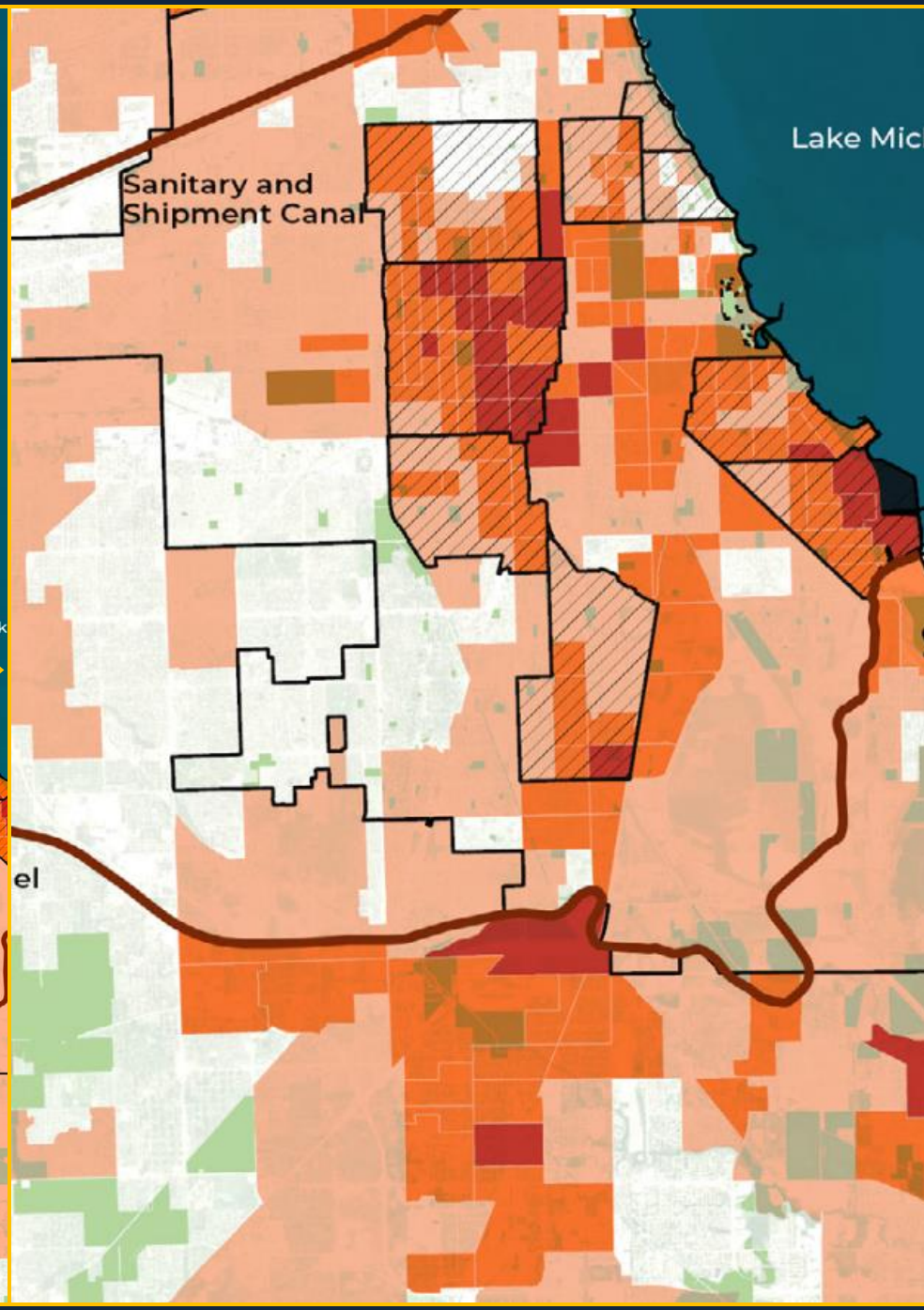
2018 Chicago



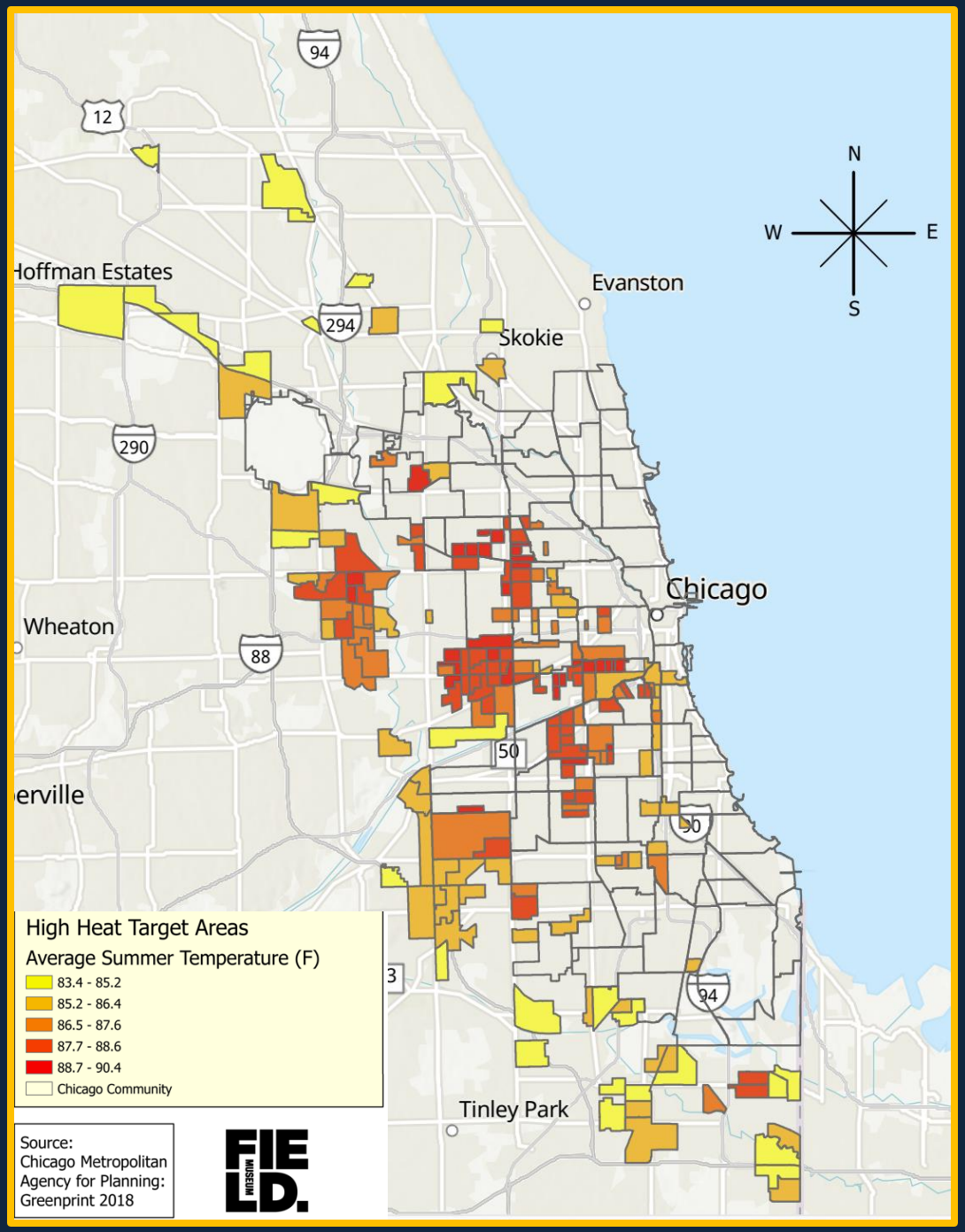

Urban Ecotone Analysis
Geomorphology
Chicago Boundary
Chicago River
Sanitary and
Shipment Canal
Lake Michigan
Cal- Sag Channel
374m
350m
300m
250m
200m
150m
128m
Elevation
Data Source:
US Elevation Data


Green network
Mammal richness
Blue network
Wetlands
Urban Ecotone Analysis
Ecological Overlaps
Chicago Boundary
Sanitary and Shipment Canal
Lake Michigan
Cal- Sag Channel
Calumet Watershed
Data Source: Wildlife Institute of Chicago, CMAP

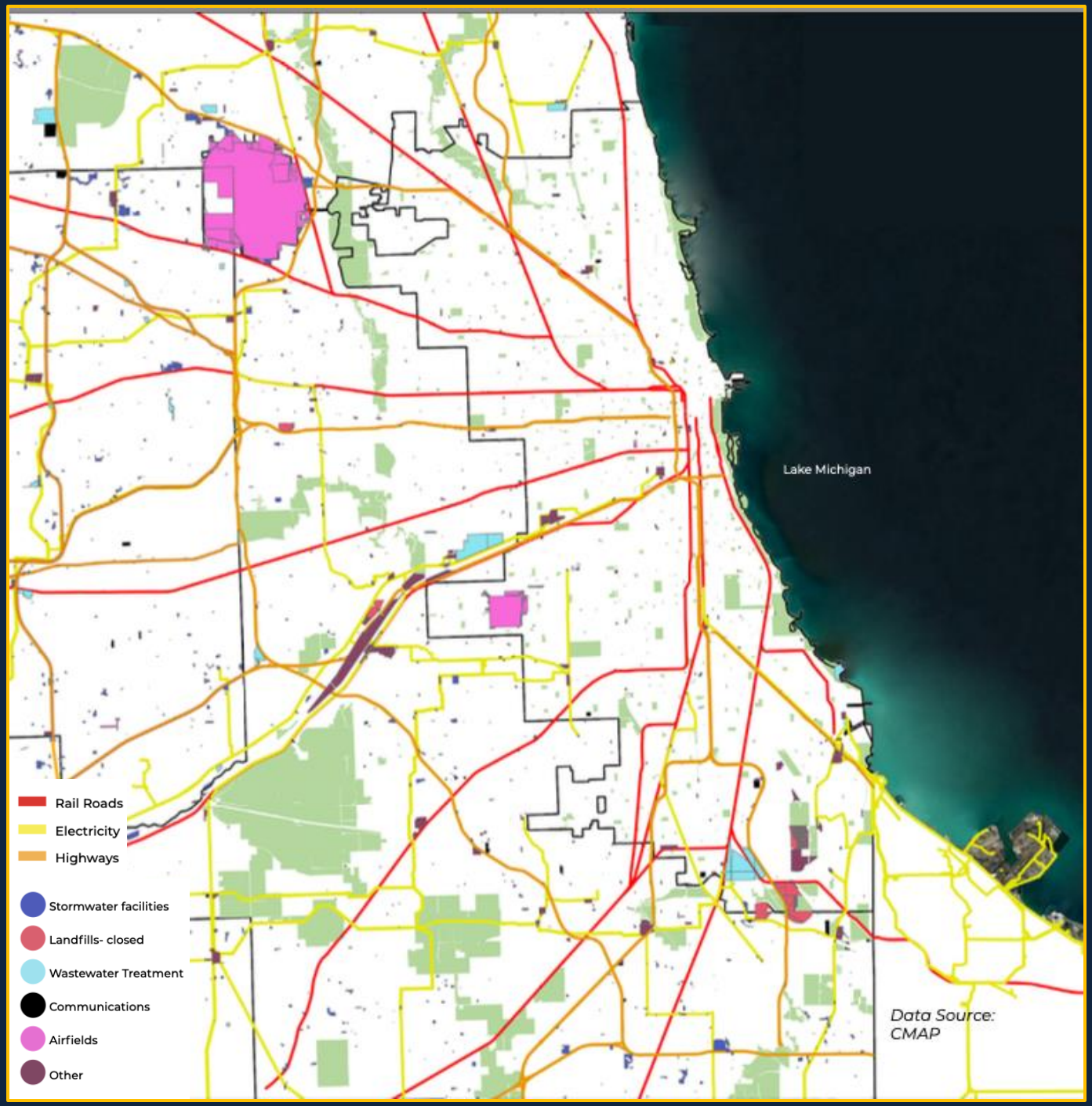

Chicago Boundary
Sanitary and
Shipment Canal
Cal- Sag Channel
Median Household Income lower than Chicago average
0 - 22% housing vacancy
More than 22% housing vancancy
Invest Southwest neighborhoods


Sanitary and
Shipment Canal

Urban Heat Island Effect



Map by CMAP

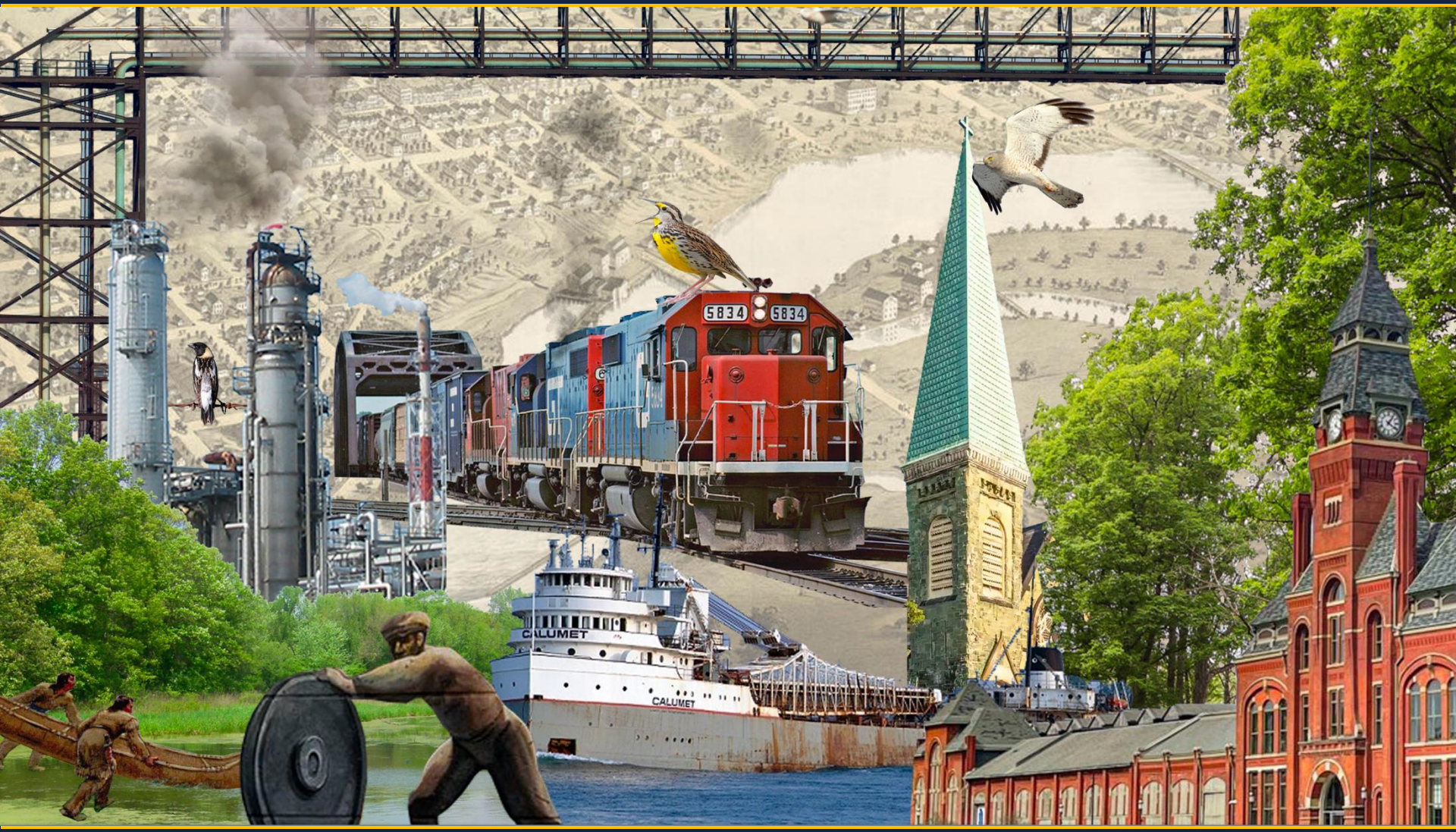

Lake Michigan
Rail Roads
Electricity
Highways
Stormwater facilities
Landfills- closed
Wastewater Treatment
Communications
Airfields
Other
Data Source:
CMAP

Utility landscapes of South Chicago

Utility landscapes of South Chicago

Utility landscapes of South Chicago

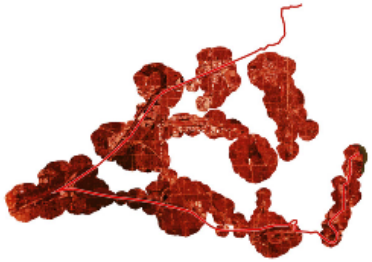
The New Nature work entailed understanding *placetypes* – the palimpsestic products of land use over centuries



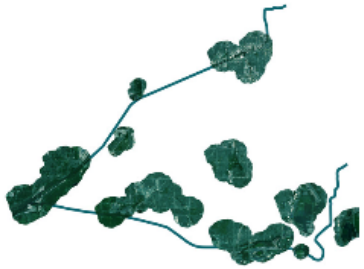
The New Nature work entailed understanding *placetypes* – the palimpsestic products of land use over centuries

Placetype Zones

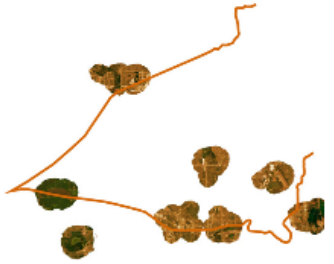
The Zones



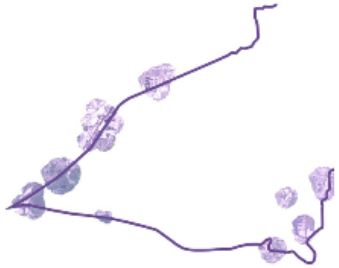
Grid Disruptors
Natural and built systems that disrupts the city grid.



Eco-Remnants
Natural areas that are cut off from their ecological point of origin but retain similar characteristics.



Dynamo-scapes
Built and natural systems in proximity to each other which influence one another and trigger a ripple effect.



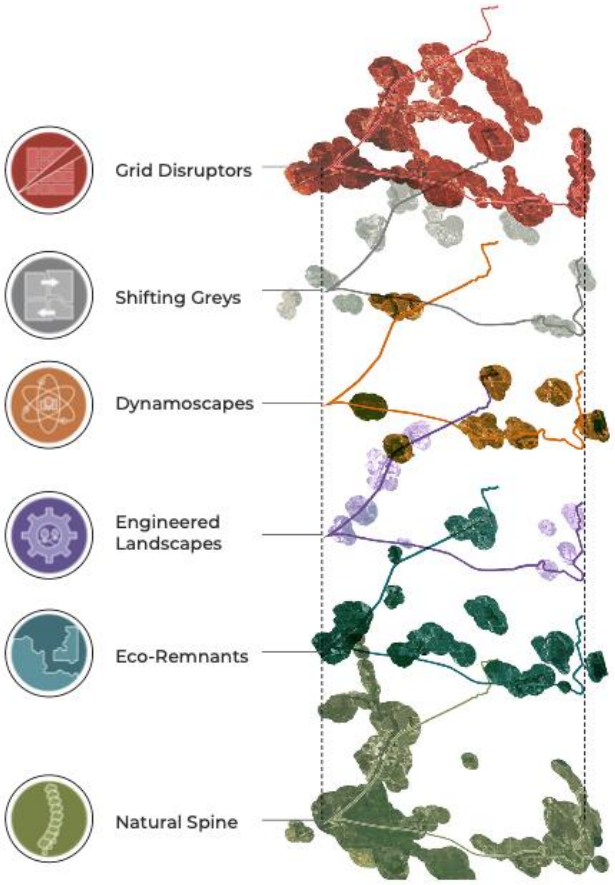
Engineered Landscapes
Where natural systems have been engineered for changed functionality.

Natural Spine
Protected ecological hotspots that should be retained to connect to other natural areas and integrate into the built environment.

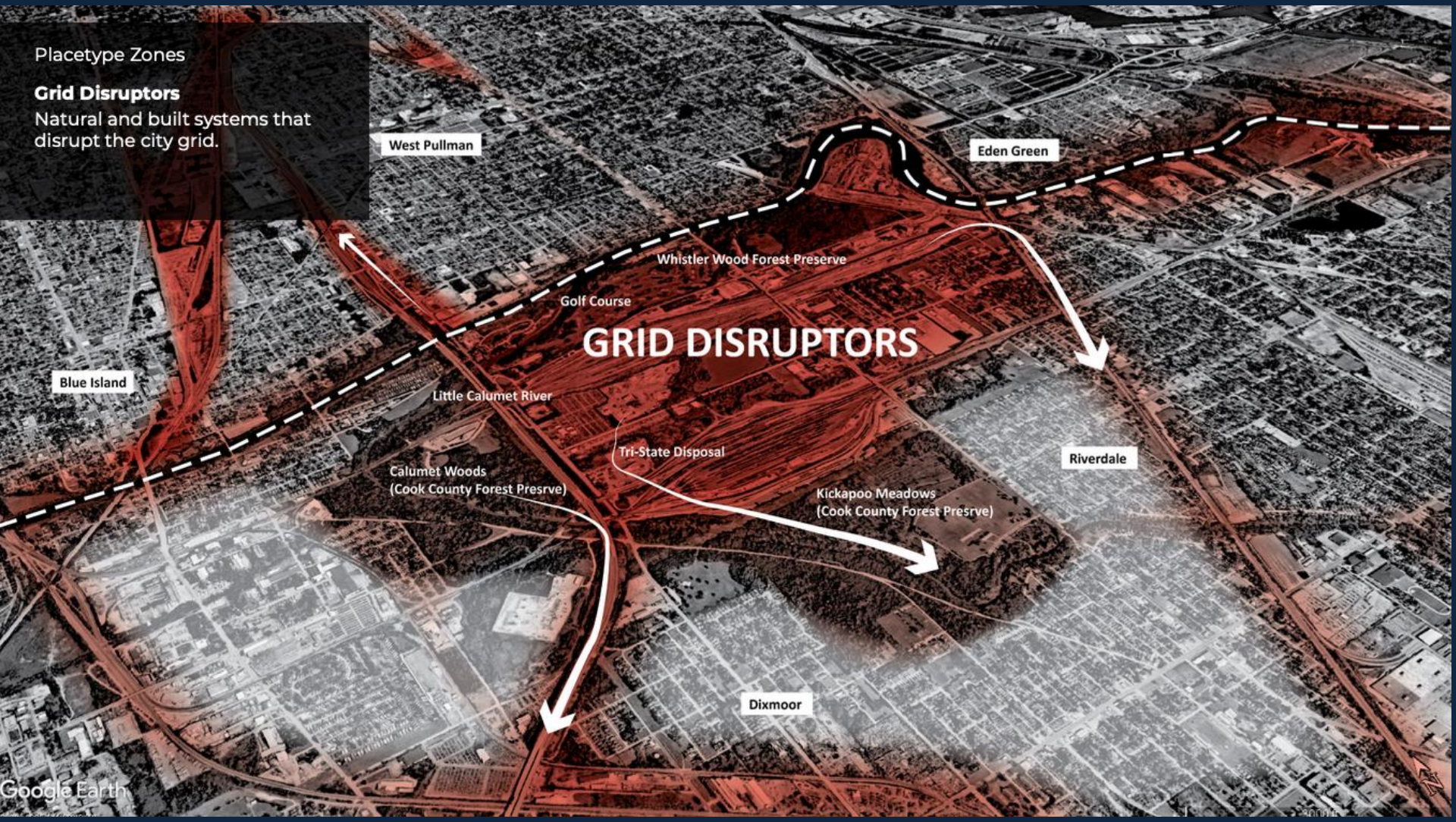
Shifting Greys
Utility and industrial corridors shaping nearby land uses.

Placetype Zones

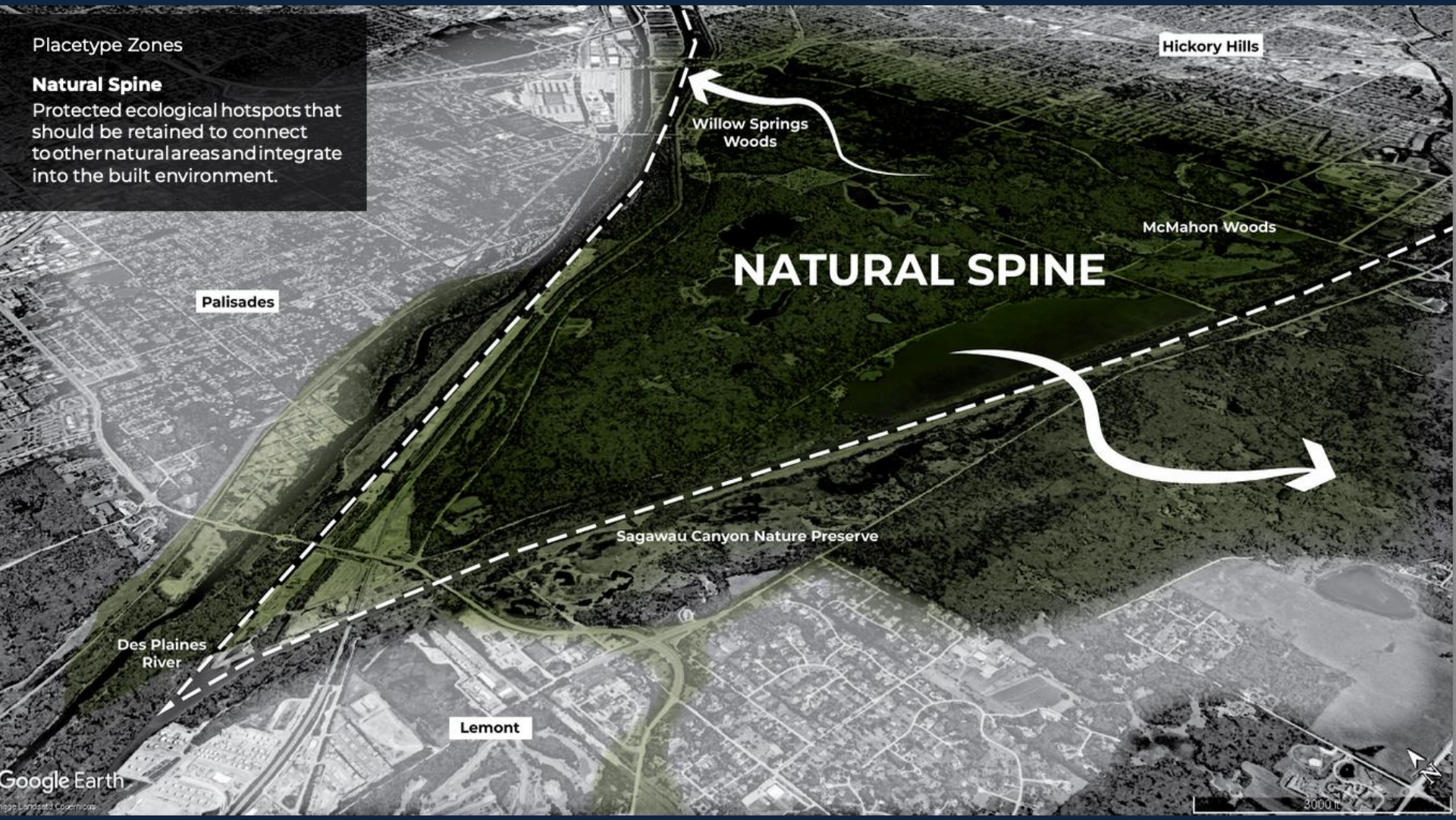
Identifying Hotspots



These are critical crossings for spatial buffer strategies



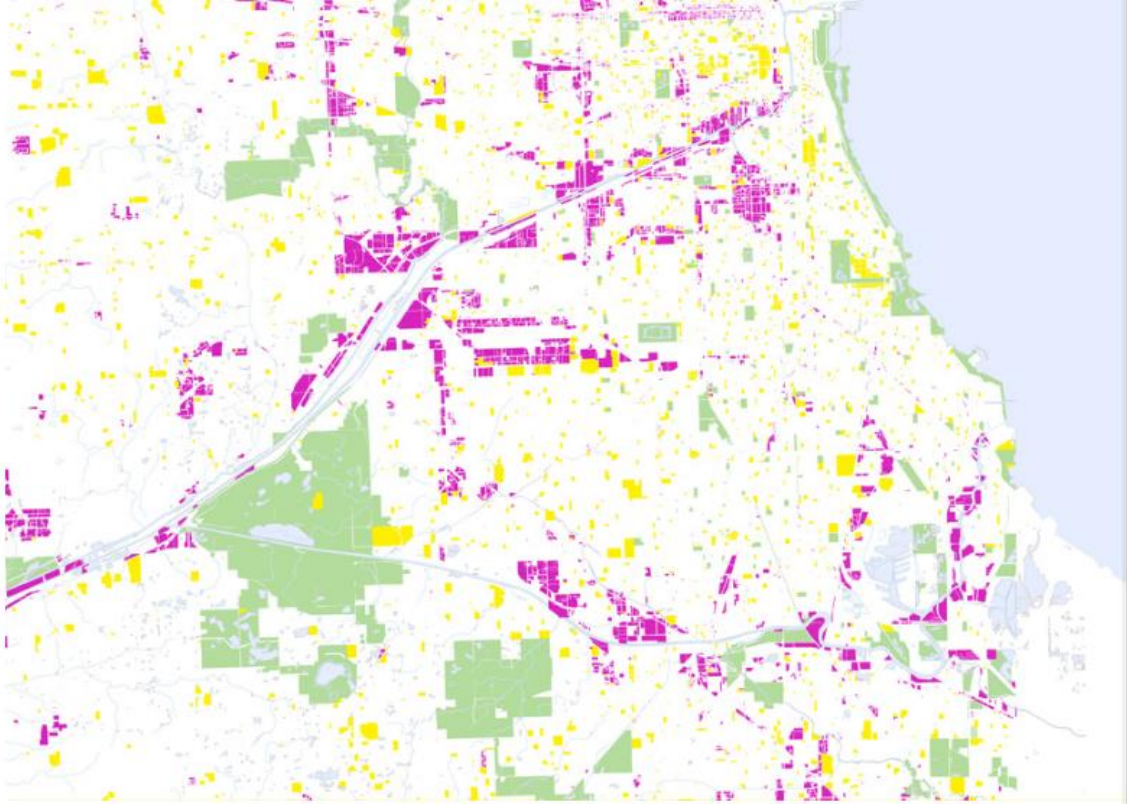
Ecological fragmentation is a major contributor to climate adaptation gap

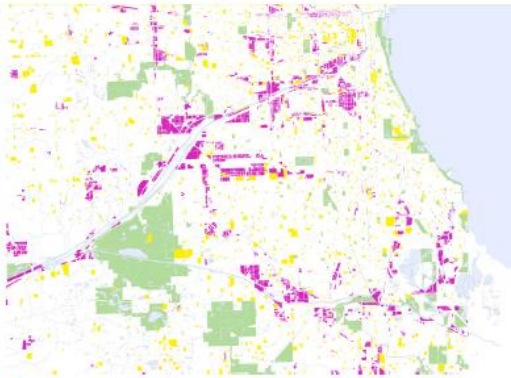


Policy Overrides

Policy	Short Term	Long Term	Outcomes
Enact Climate Setbacks	Add public access easements.	Public buyout of land along waterways as industries phase out. Land is placed in a land bank for community ownership.	Restored natural systems, flourishing independent ecosystems, increased community access to the river, deepened understanding and appreciation of nature.
Repurpose Underutilized Land	Create accessible pathways for community control over redevelopment with a focus on environmental programming.	Implement anti-gentrification measures through property tax, demolition freezes, and community land trusts.	Increased open space, improved stormwater management.
Regional green roof network	Develop green roofs on civic buildings. Include an ecologist to review and consult on the construction.	Offer tax incentives to existing industrial and private businesses who develop green roofs. Require new developments to add a green roof feature.	Reduced heat island effect, improved air quality, and enhanced biodiversity.

Image courtesy : Terry Evans





Industrial Civic

14,000 + acres
of roof reimagined as green roofs.

50+ miles
of connected green roofs forming an aerial green network.

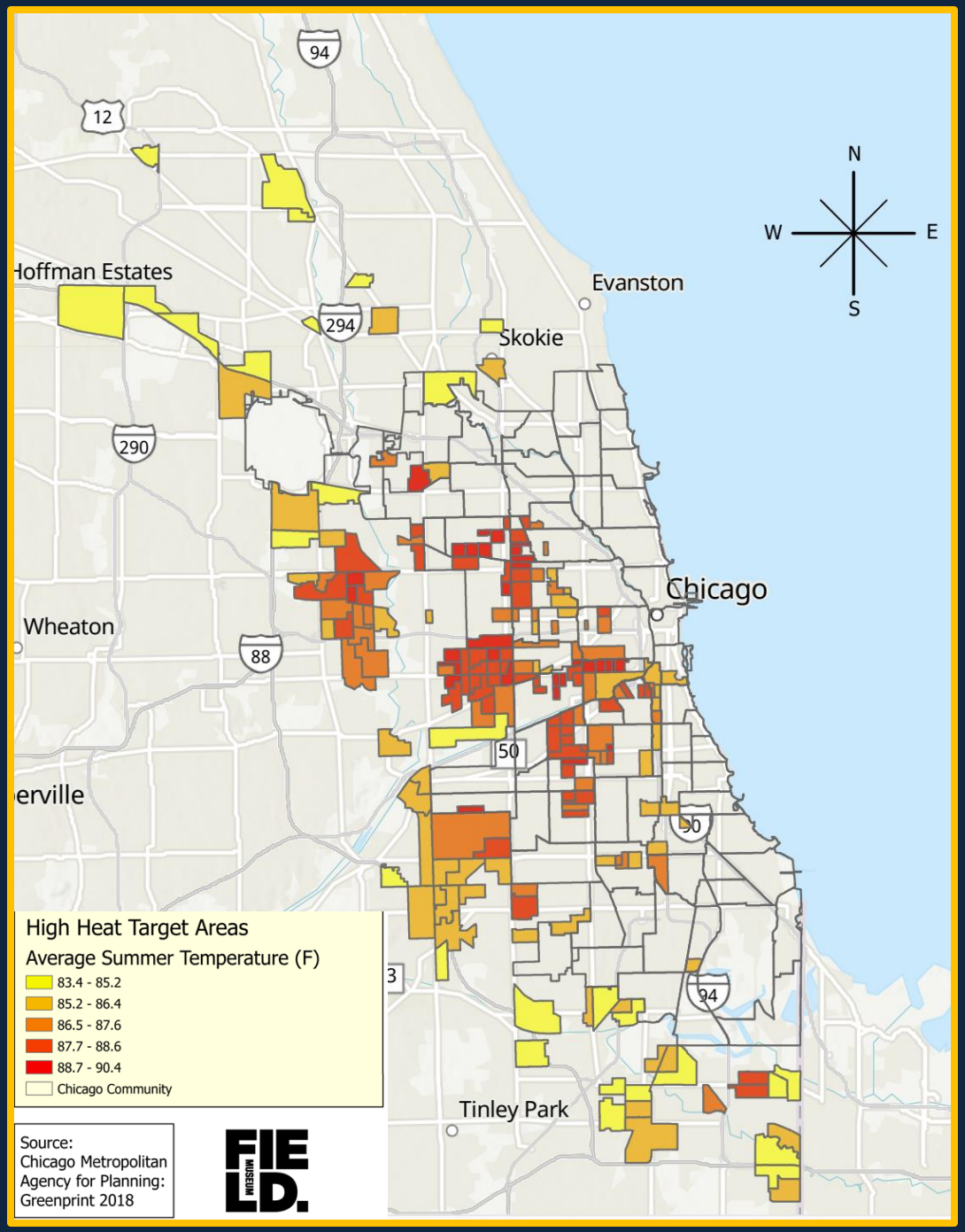
Develop green roofs on civic buildings.

Include an ecologist to review and consult on the construction.

Offer tax incentives to existing industrial and private businesses who develop green roofs.

Require new developments to add a green roof feature.

Urban Heat Island Effect

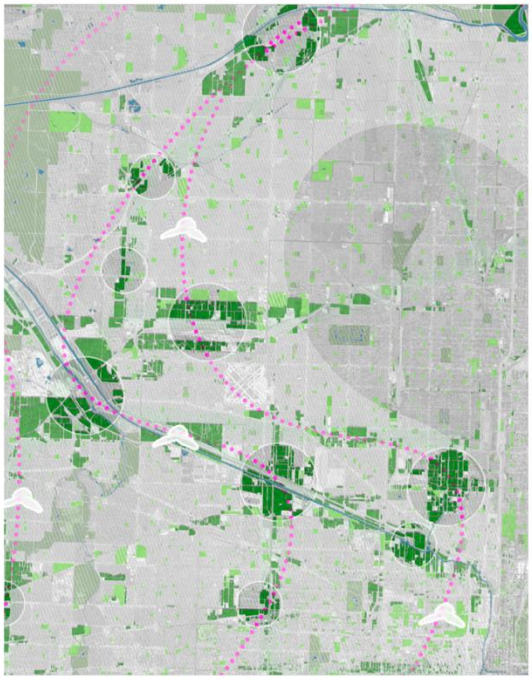


Map by CMAP


Chicago Wilderness
Green Infrastructure Vision
Northeastern Illinois
Recommended Resource Protection Areas
Existing Public Open Space
County Boundaries
State Boundaries
Streams and Rivers
Lake Michigan
Open Water

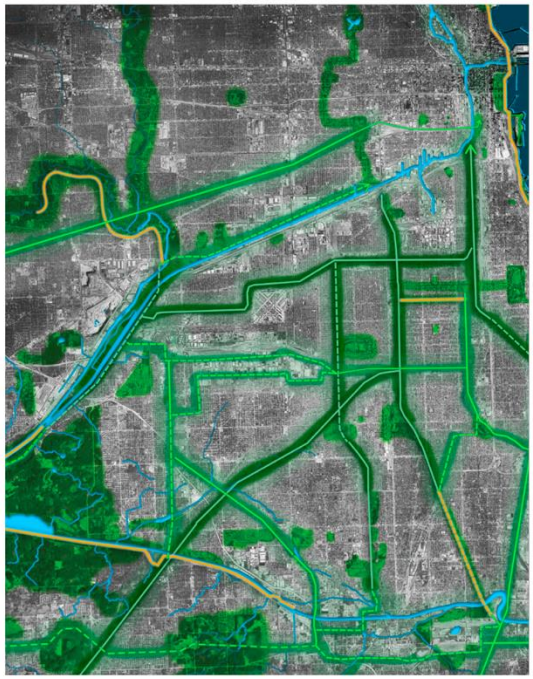
Regional Prototype Tools

Regional Scale



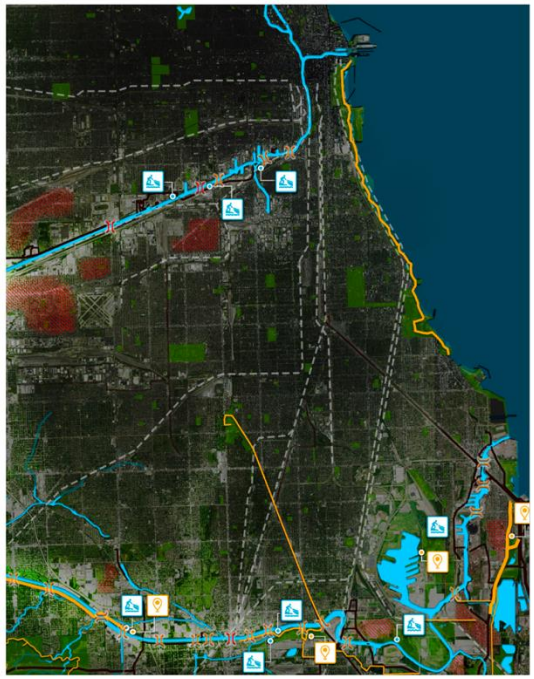
Green Roof Masterplan

Opportunity areas for green roof development and financial and tax incentive recommendations.



Reimagined Infrastructure

Re-imagined infrastrucure connections along abandoned and exisitng railway corridors and utility lines.



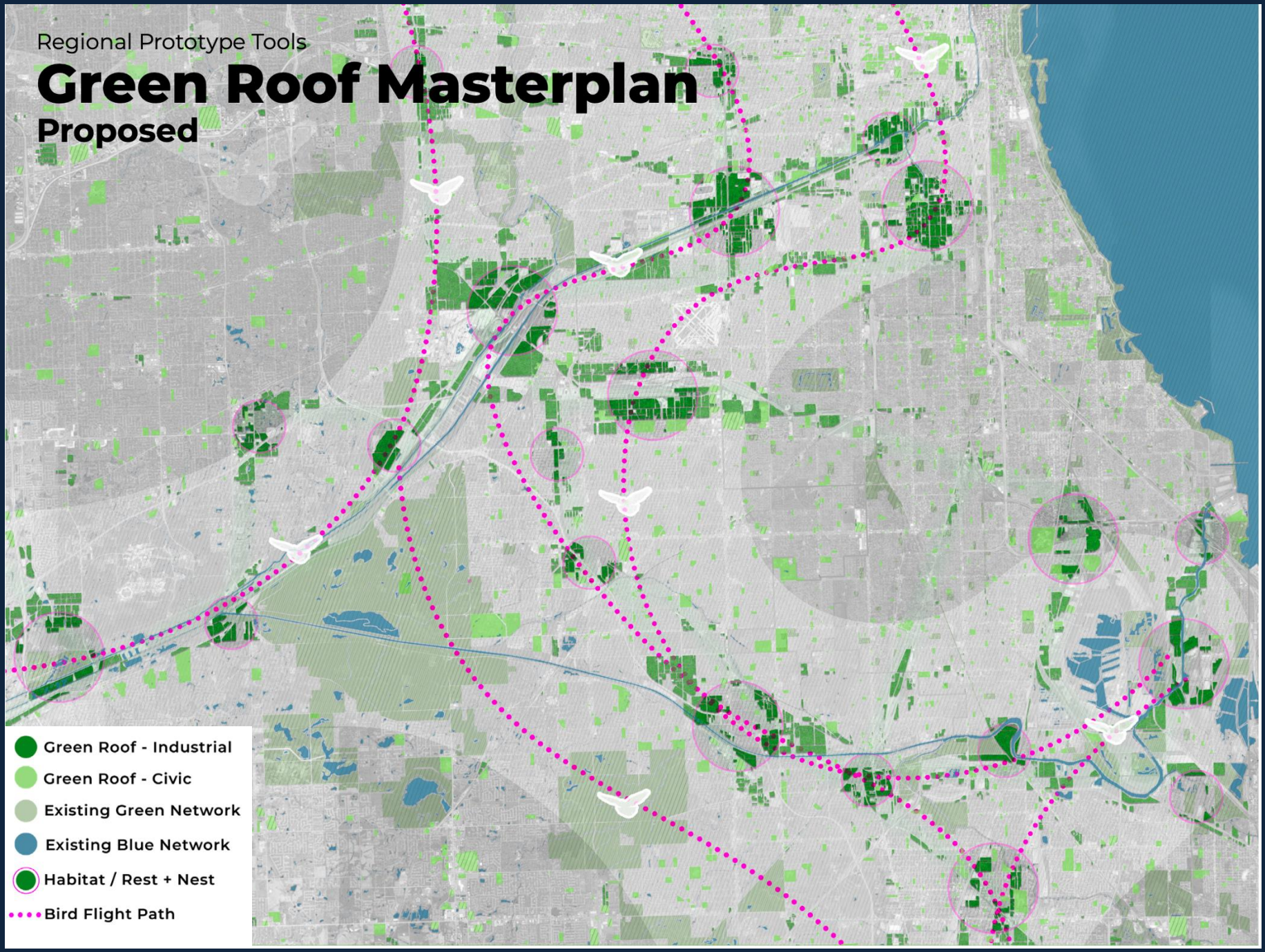
Waterway Adjacencies

Opportunities and challenges along the river corridor. Proposed landscapes and design recommendations.

Regional Prototype Tools

Green Roof Masterplan

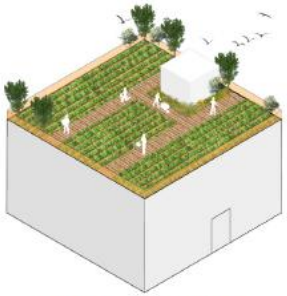
Proposed



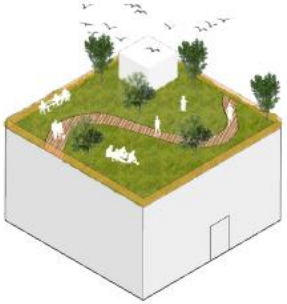
Regional Prototype Tools

Green Roof Masterplan

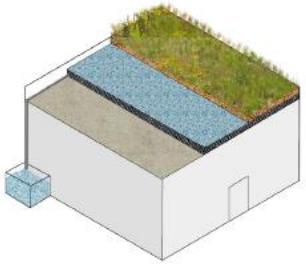
Proposed



Urban Farming

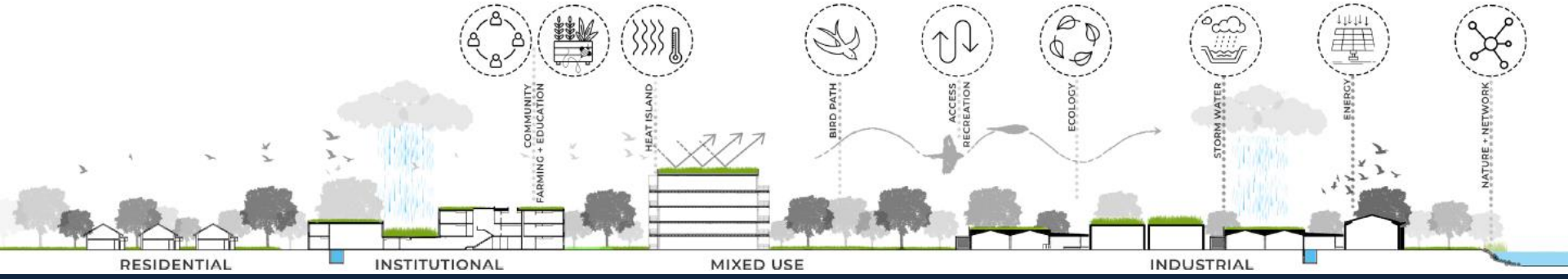


Recreational



Sponge

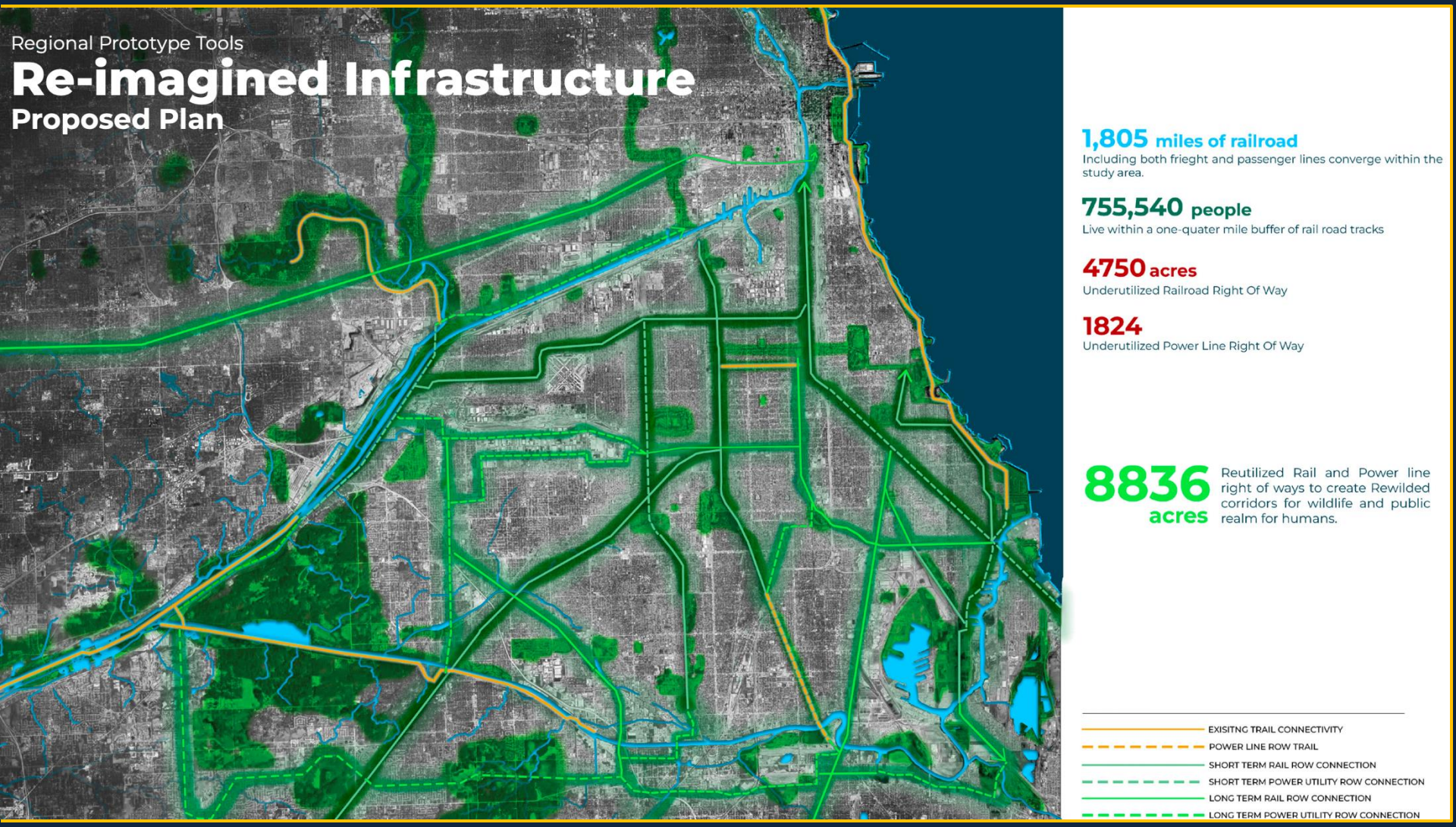
Bio-diversity



Green Roof Network


Regional Prototype Tools
Green Roof Masterplan
Exisiting Landscapes

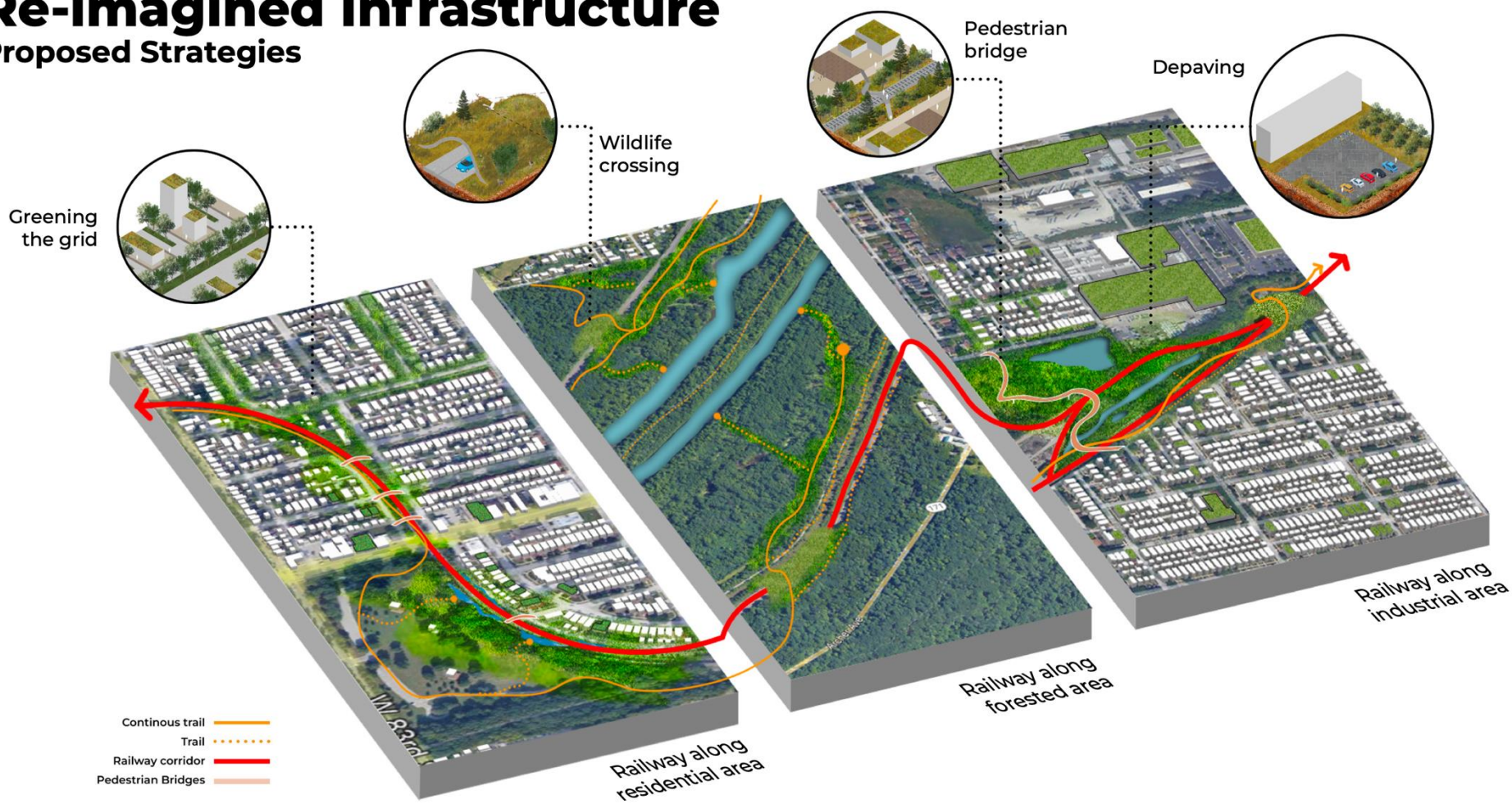

Regional Prototype Tools
Green Roof Masterplan
Proposed Landscapes


Regional Prototype Tools
Re-imagined Infrastructure
Proposed Plan
1,805 miles of railroad
Including both frieght and passenger lines converge within the study area.
755,540 people
Live within a one-quater mile buffer of rail road tracks
4750 acres
Underutilized Railroad Right Of Way
1824
Underutilized Power Line Right Of Way
8836 acres
Reutilized Rail and Power line right of ways to create Rewilded corridors for wildlife and public realm for humans.
EXISITNG TRAIL CONNECTIVITY
POWER LINE ROW TRAIL
SHORT TERM RAIL ROW CONNECTION
SHORT TERM POWER UTILITY ROW CONNECTION
LONG TERM RAIL ROW CONNECTION
LONG TERM POWER UTILITY ROW CONNECTION

Regional Prototype Tools

Re-imagined Infrastructure

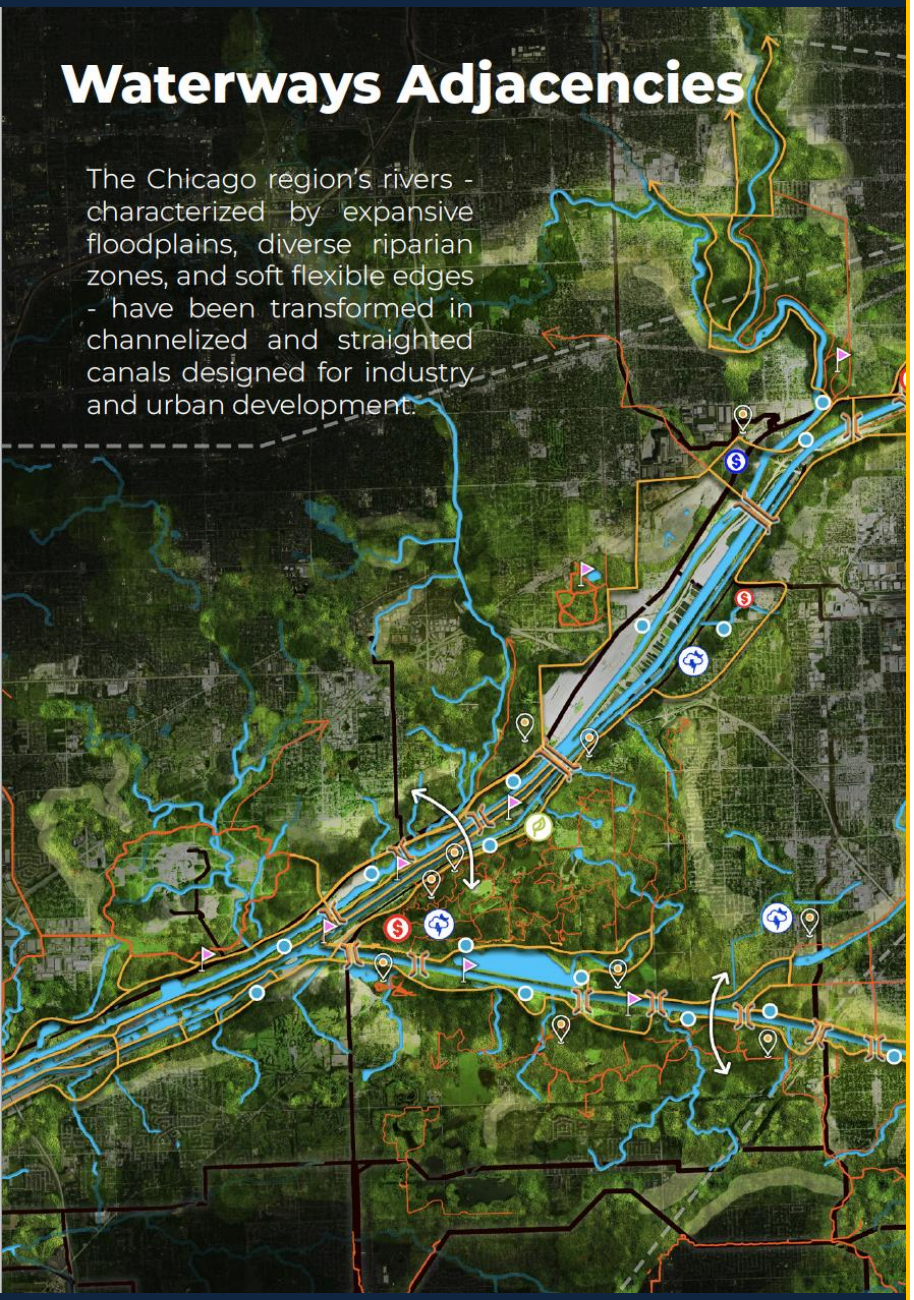
Proposed Strategies




Railways Ecological Setback
Magic Train
Greening the Grid

Waterways Adjacencies

The Chicago region's rivers - characterized by expansive floodplains, diverse riparian zones, and soft flexible edges - have been transformed in channelized and straighted canals designed for industry and urban development.



60 Miles

Continous River Corridor in length in southern Chicago along Des Plaines, Chicago and Calumet rivers.

671,970 People

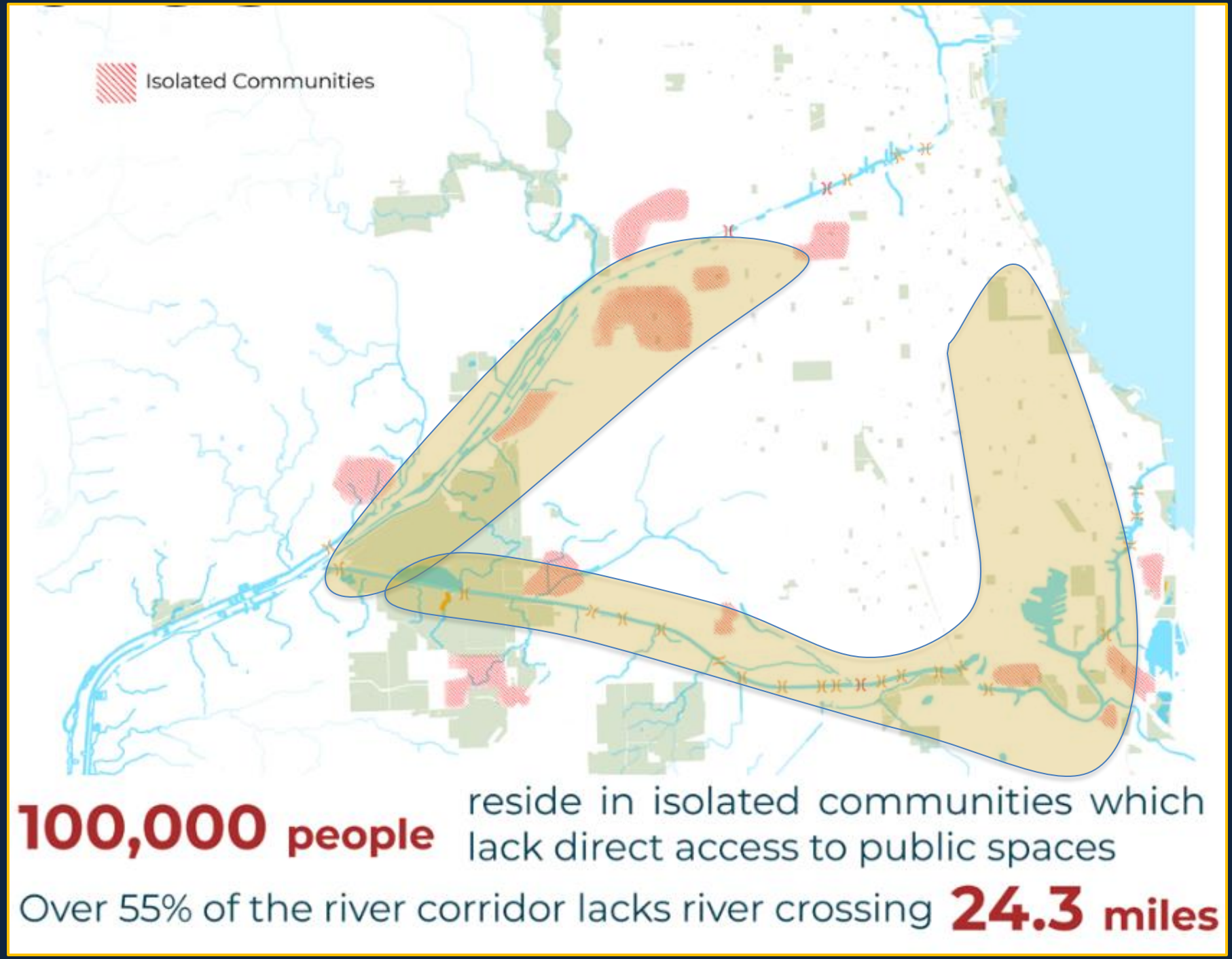
Live within one mile of River Corridor

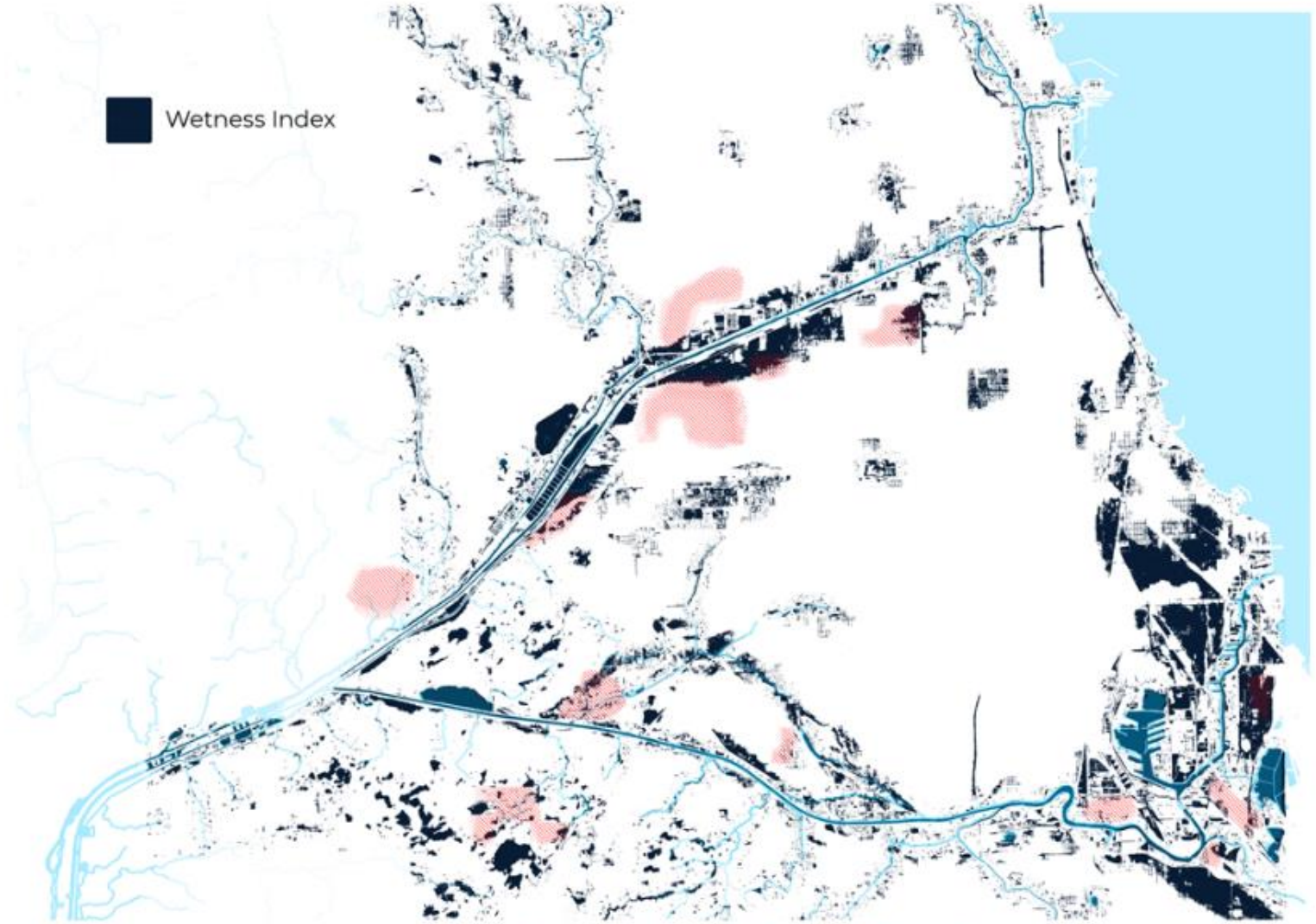
21 Miles existing connect

Exisiting trail corridors along the river corridor

39 Miles missing Connect

Over 65% of the river corridor is missing trial connectivity


Isolated Communities
100,000 people
reside in isolated communities which lack direct access to public spaces
Over 55% of the river corridor lacks river crossing 24.3 miles



439.64 acres need protection from flooding along the river corridor

Area available for climate mitigation along river corridor **1971.8 acres**

Improved last-mile connectivity

Creating inviting destinations + recreation spots

Continuous public realm

COMED LINES

PUBLIC WATER ACCESS

RECREATION HOTSPOTS

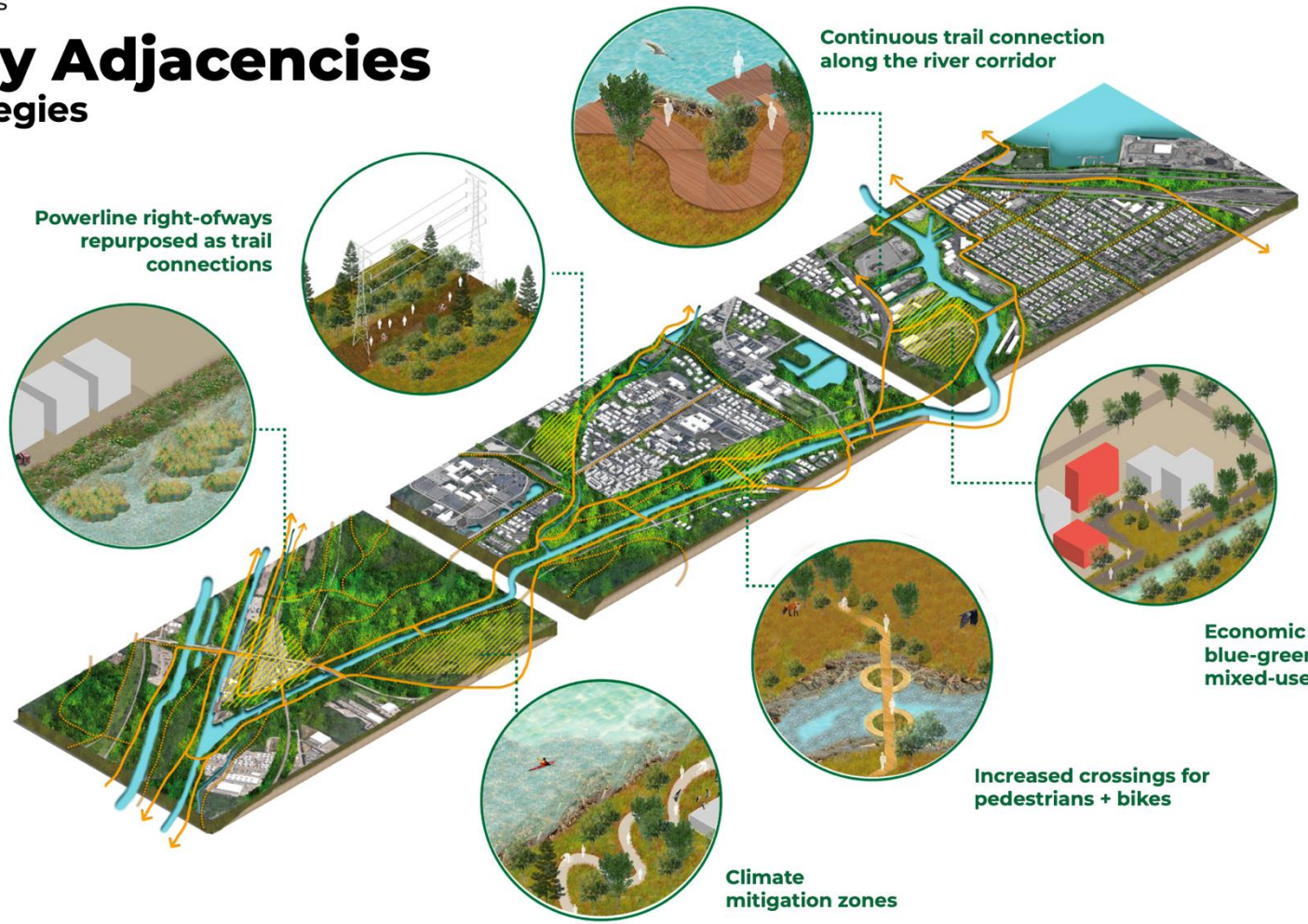
CLIMATE MITIGATION

LAND USE REMIDIATION

Regional Prototype Tools

Waterway Adjacencies

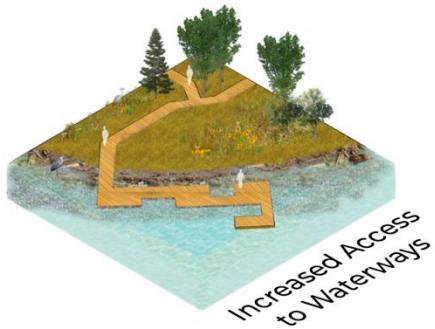
Proposed Strategies



Prototype Toolkit

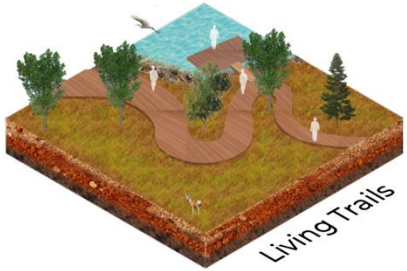
Connect

Wildlife Crossing Bridge

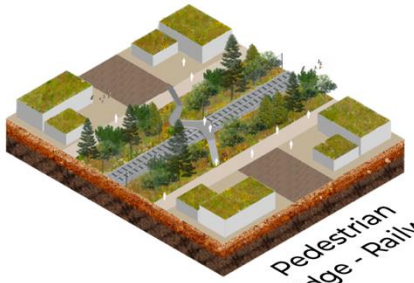


Increased Access to Waterways

Wildlife Crossing- Tunnel

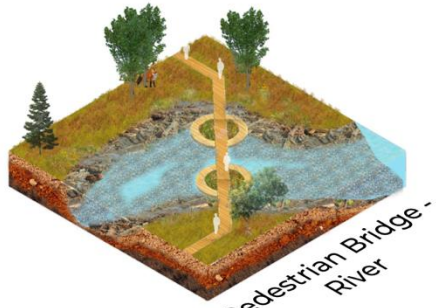


Living Trails



Pedestrian Bridge - Railway

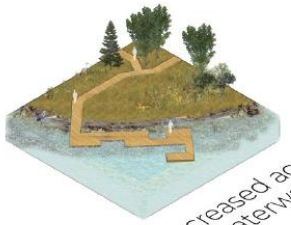
Wildlife Crossing - Canopy



Pedestrian Bridge - River

Repurpose


Wildlife crossing - bridge

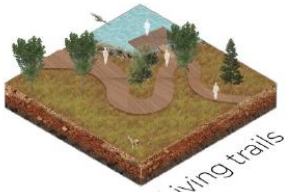

Increased access to waterways


Wildlife crossing - tunnel

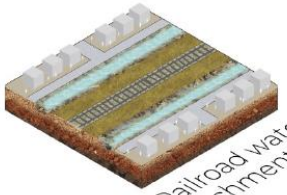

Pedestrian bridge - railway


Wildlife crossing - canopy


Pedestrian bridge - river


Living trails

Adapt


Railroad water catchment

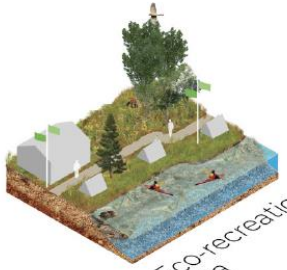

Railroad rewilding


Blue-green industry


Vacant lot repurposing - river


Magic train


Vacant lot repurposing - community


Eco-recreation area


Climate zoning - urban heat island effect

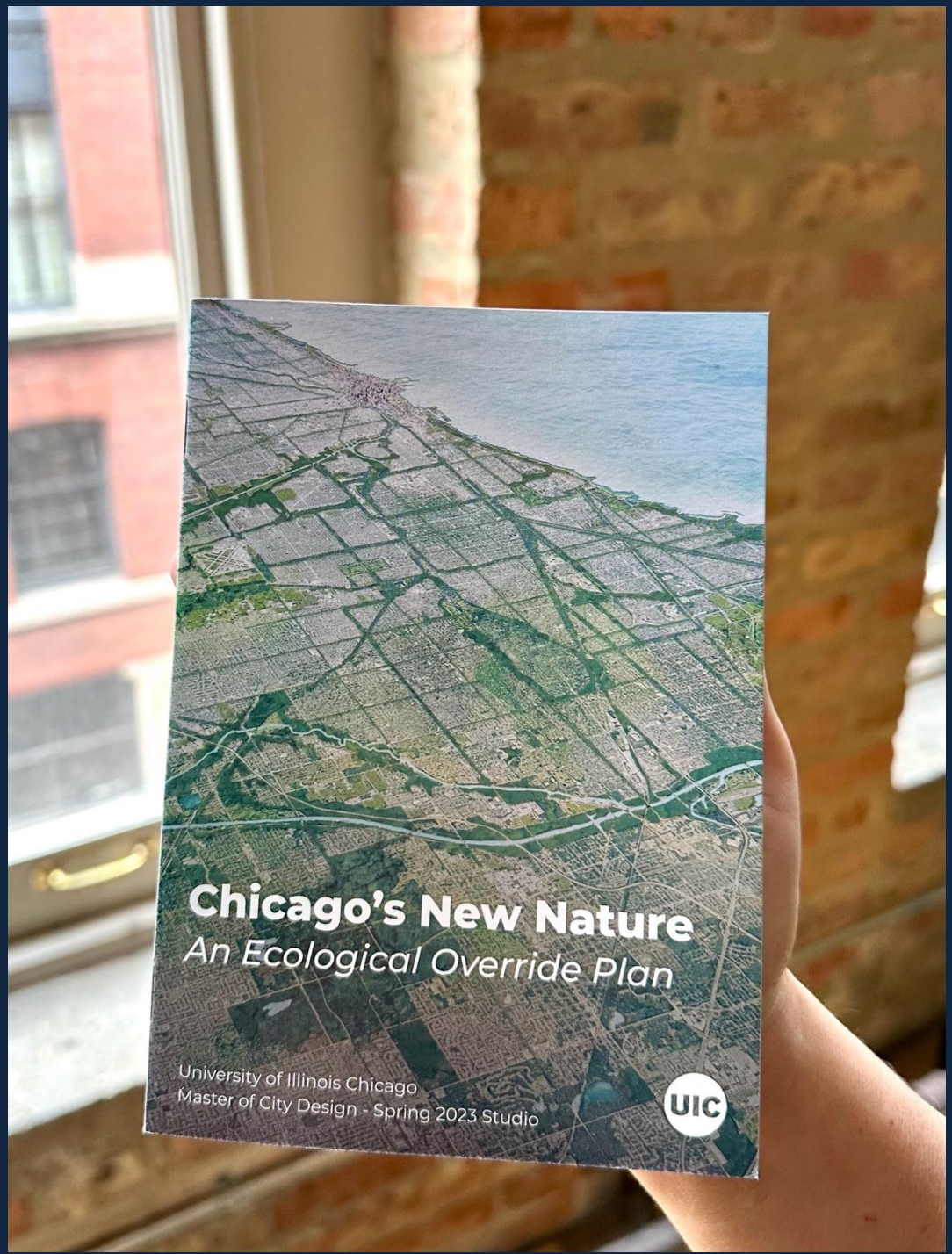
1.28 million
people living in the 'C' impacted by *Chicago's New Nature*

14,000+ acres
of new green space across the Green Roof Network

12,500+ acres
of remediated and rewilded land

2000 miles
of newly connected ecological corridors

A vision for a resilient & vibrant Chicago region



Thank you!

seviny@uic.edu