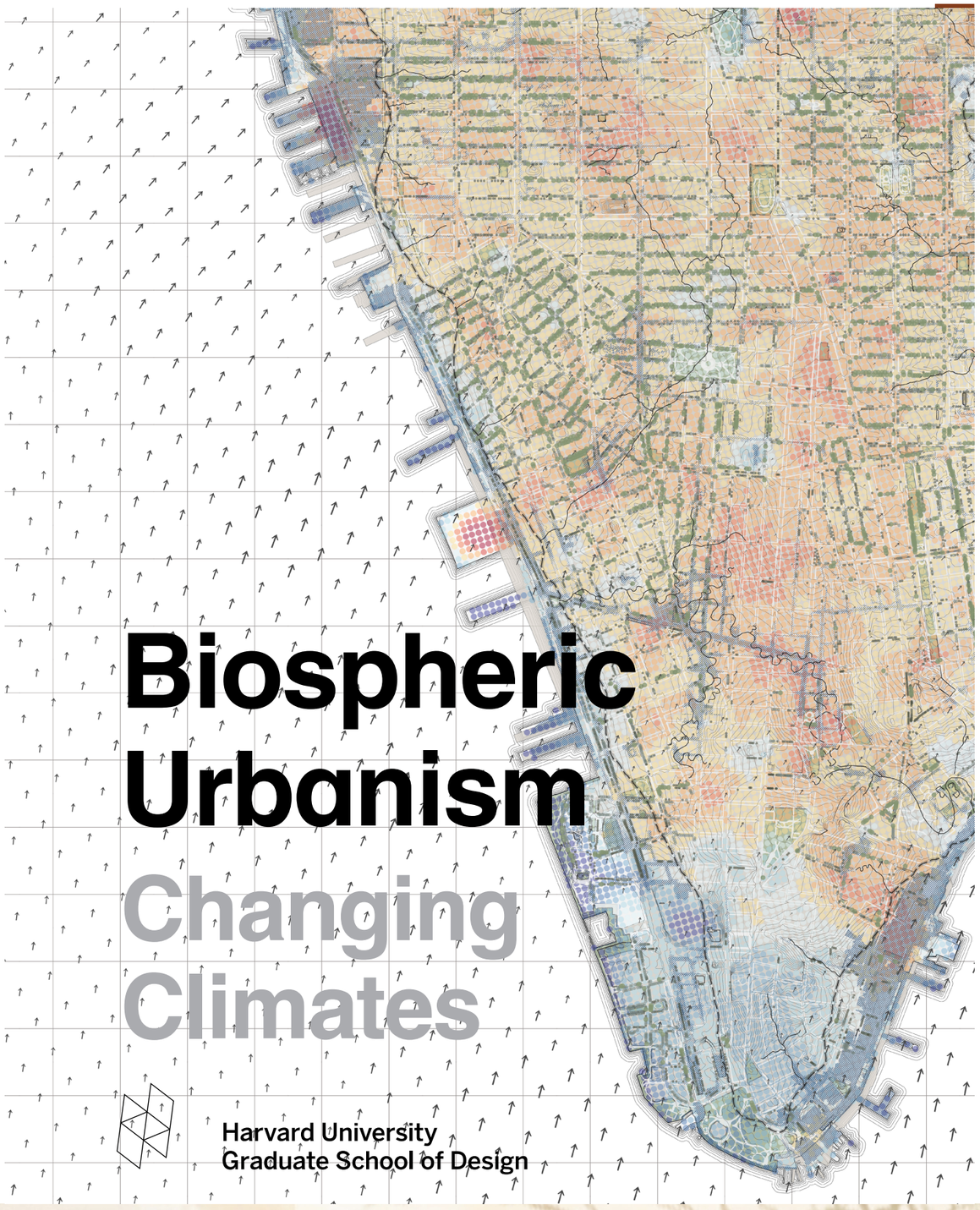

Biospheric Urbanism

Changing Climates

Harvard University
Graduate School of Design

Country /City	Cambridge, Massachusetts
University / School	Harvard Graduate School of Design
Academic year	2022/2023
Title of the project	Biospheric Urbanism Changing Climates
Authors	Jiyoung Baek, Li Jin, Tristan Kamata, Julia Li, Angelica Oteiza, Chanwoo Park, Austin Sun, Parama Suteja, Jessie Xiang, Weiran Yin, Sunjae Yu, Zheming Zhang

TECHNICAL DOSSIER

Title of the project	**Biospheric Urbanism: Manhattan**
Authors	**Jiyoung Baek, Li Jin, Tristan Kamata, Julia Li, Angelica Oteiza, Chanwoo Park, Austin Sun, Parama Suteja, Jessie Xiang, Weiran Yin, Sunjae Yu, Zheming Zhang**
Title of the course	**Biospheric Urbanism: Changing Climates**
Academic year	**2022/2023**
Teaching Staff	**Gary R. Hilderbrand (Chair of the GSD Department of Landscape Architecture), Bas Smets (Studio Instructor), Austin Sun (Teaching Assistant)**
Department / Section / Program of belonging	**Department of Landscape Architecture**
University / School	**Harvard Graduate School of Design**

12

Biospheric Urbanism: Manhattan

Critical Moment: The climate crisis poses the urgent question of how to make cities more resilient to atmospheric changes such as heat islands, rising temperature, intensified rainfall, atmospheric river events, and more severe droughts. This unprecedented crisis represents an opportunity, and equally a responsibility, for landscape architecture to radically rethink its field.
The City as a Myriad of Microclimates: Cities account for over 70% of global carbon dioxide emissions worldwide, while taking up around 3% of the land space. Therefore, cities present a crucial opportunity to combatting the causes and mitigating the impacts of climate change. We understand the city as an imbrication of myriad microclimates. Buildings change wind patterns and sunlight exposure, while the streetscapes define soil permeability, runoff, and radiation.
Biospheric Urbanism: Biospheric Urbanism studies the built environment as the interface between meteorology and geology. It uses the logics of nature to transform the critical zone above and below the city surface.
Studio Prompt: The Biospheric Urbanism Studio is planned for five cities, globally. The first project, in Manhattan, is composed of three acts: mapping climate data, choosing a project based on mapped conditions, and transformation of the site as a modified microclimate. Innovative climate software and modeling techniques are standard for the course.

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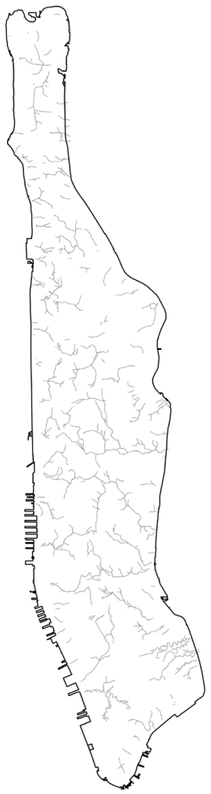
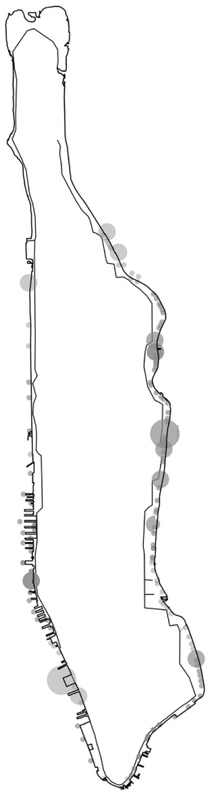
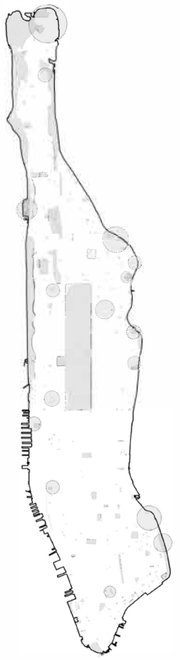
12th International Biennal Landscape Barcelona

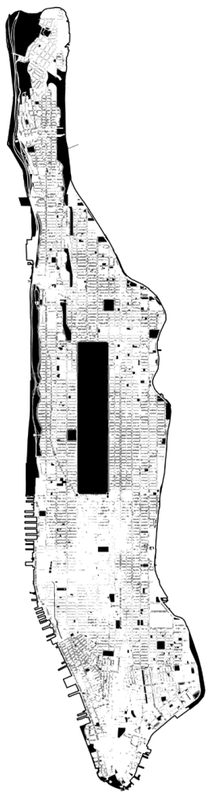
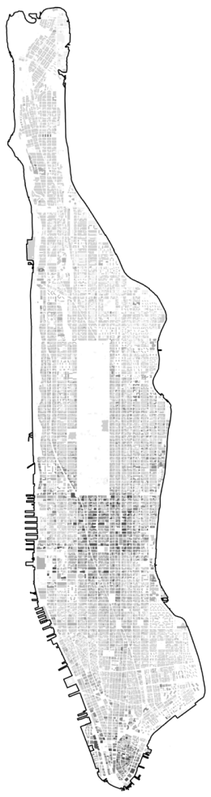
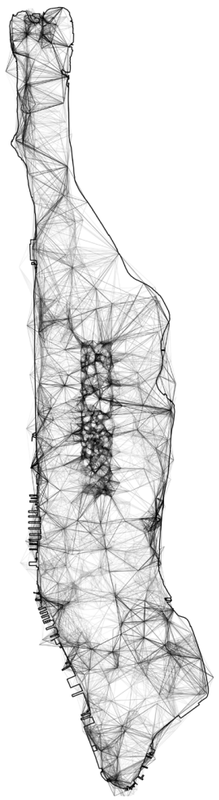
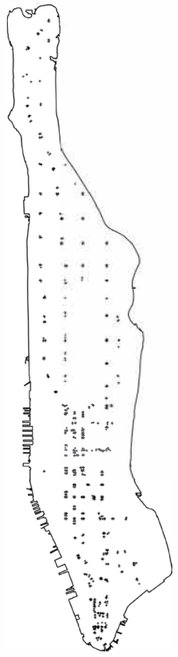
Barcelona **November 2023**

SCHOOL PRIZE

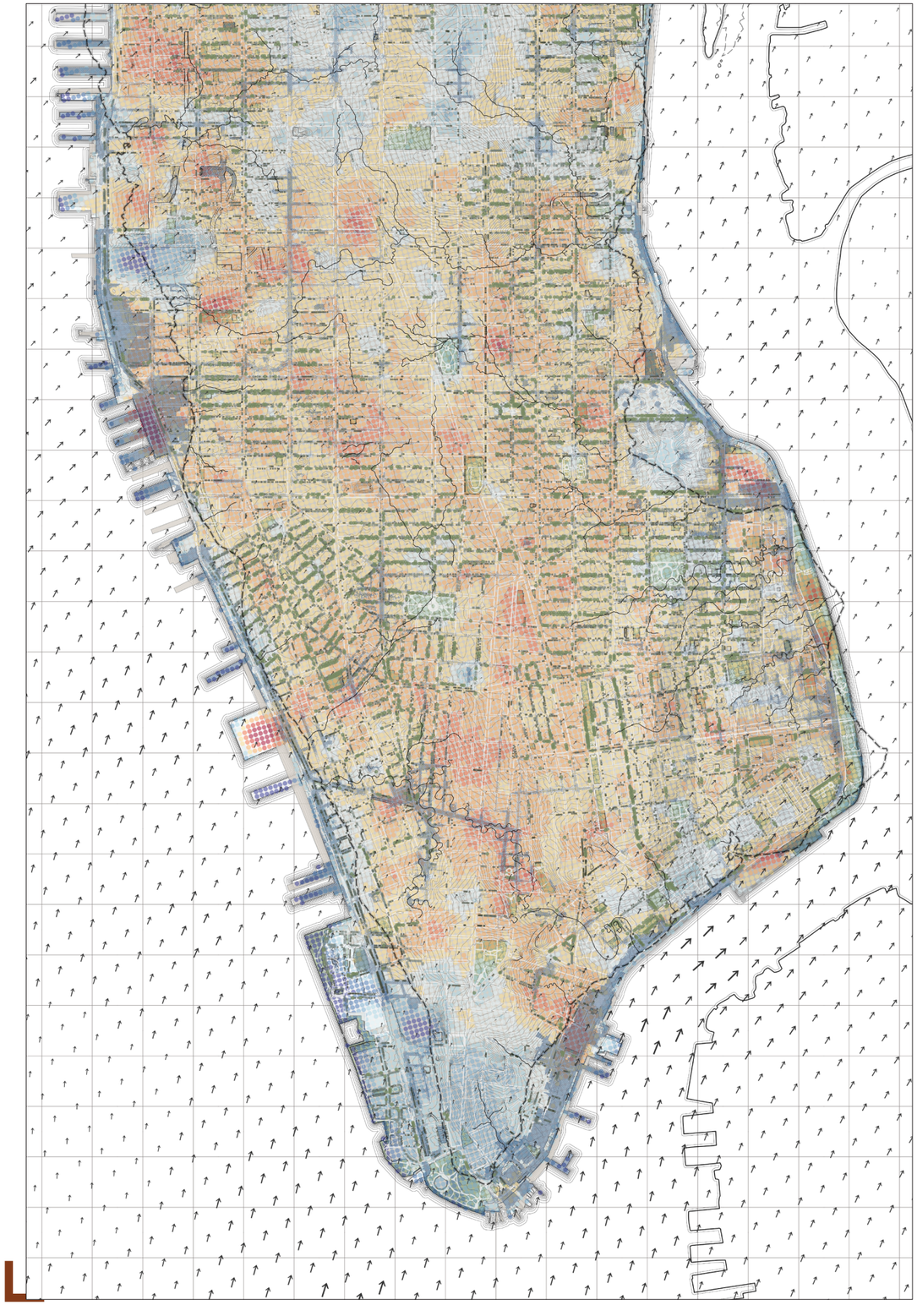


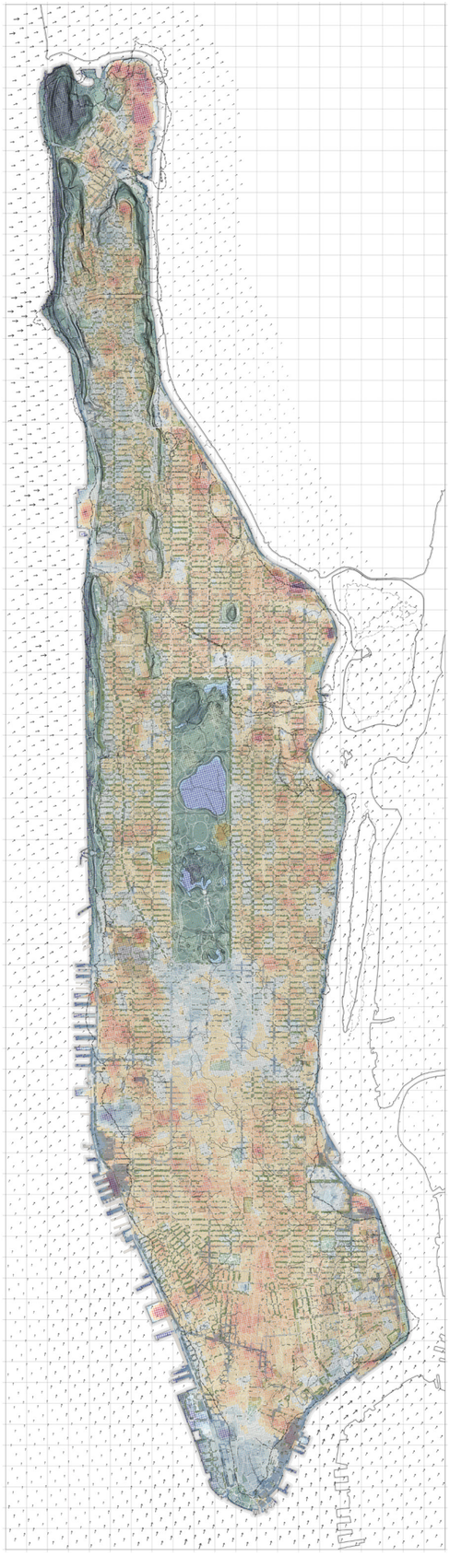




Urban Climate Map





Boundary

- Current Manhattan Boundary
- Old Mannahatta Shoreline
- Old Streams
- Topography Contours (2ft)

Surface Types

- Soft Surface / Parks
- Water / Lakes
- Pesdestrian Paving

Flood Risks

Predicted Sea Level in 2080

- Nuisance Flooding (Less than 1 ft)
- Deep Flooding (More than 1 ft)
- Future High Tides 2080

Street Trees (inch)

Trunk Diameter

- Less than 6.0
- 6.1 to 12.0
- More than 12.0

Wind Speed (ft/s)

Predominant Wind of Summer Season

- 1.0
- 9.5

Surface Temperature (°F)

Median Surf. Temp. of Summer Season

- 80.0
- 106.0

Permanent Temporality
Manhattan Porticoes

Jiyoung Baek

Imagine you are walking down the street during a summer month in Manhattan, and all of a sudden, you realize that it is not burning hot anymore. You may be under a tree canopy, but there is a higher chance of you being under a structure made with steel pipes and wood planks. Sidewalk sheds are everywhere, and it creates an 8-billion-dollar industry every year.

The history of sidewalk sheds goes back to 1979. After a student was killed by falling masonry, the city mandated every building taller than 6.5 floors to inspect its façade every 5 years to protect pedestrians from unsafe building facades. If the building owner does not repair the hazardous condition before the next inspection cycle, the building is marked unsafe, and sidewalk sheds have to be installed. Usually, the repair job is more expensive than the penalty fine and scaffolding price combined, so a lot of the building owners choose not to repair the façade and keep the sidewalk sheds installed. That created a temporary but, at the same time, permanent streetscape unique to Manhattan. The total linear length of all the scaffoldings combined is 252 km, and when multiplied by 15 feet width, it covered nearly 34% of Central Park. There are about 600 sidewalk sheds that are older than 3 years. The story of sidewalk sheds changing the streetscape of Manhattan is very similar to that of Bologna's porticoes. It started spontaneously to increase living spaces for the increasing population in the 13th century. Manhattan has a four times more linear length of covered sidewalk than Bologna.

Now people think it is just an eyesore or an ugly structure that has to be removed as soon as possible. If we have to live with them because it does serve a purpose of protecting people, we may need to think differently and find potential in them. This ubiquitous structure has the potential to create a new series of microclimates in the city because it is so ubiquitous.

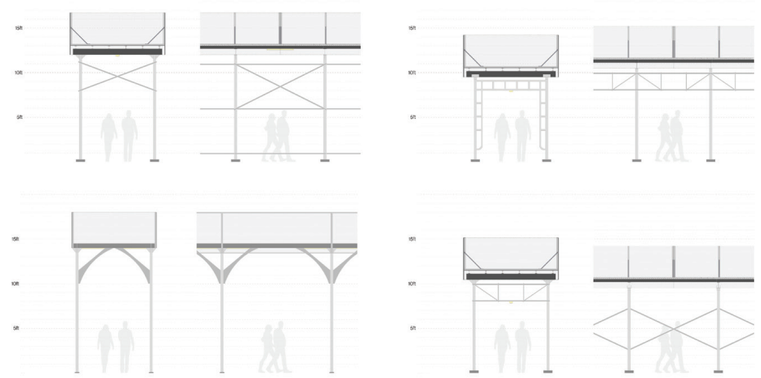
Jiyoung Baek
STU 1410
Biospheric Urbanism

ACT 02

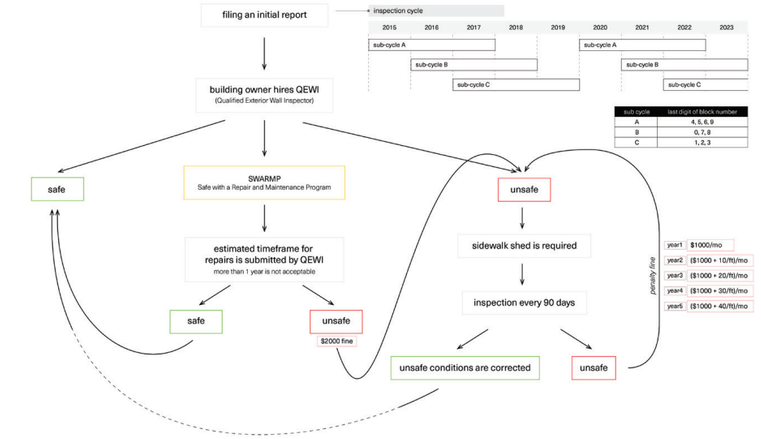
Site Analysis

Jiyoung Baek
STU 1410
Biospheric Urbanism

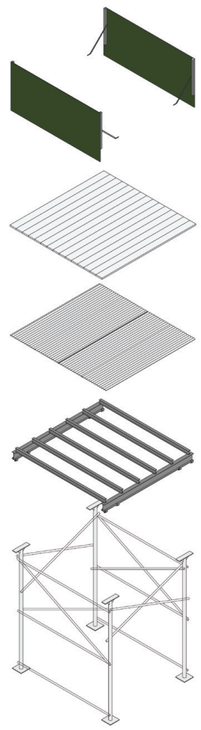
Sidewalk Sheds Typologies



Façade Inspection & Safety Program (FISP)

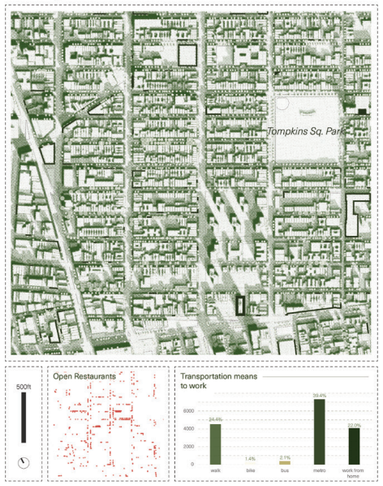


Typical Sidewalk Sheds

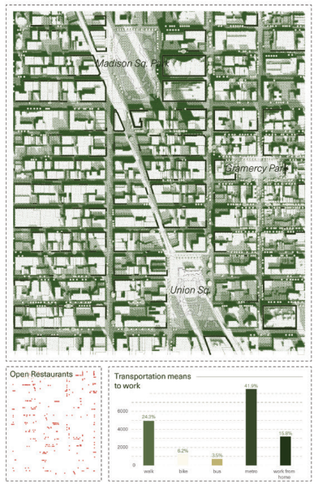


Sample Sites

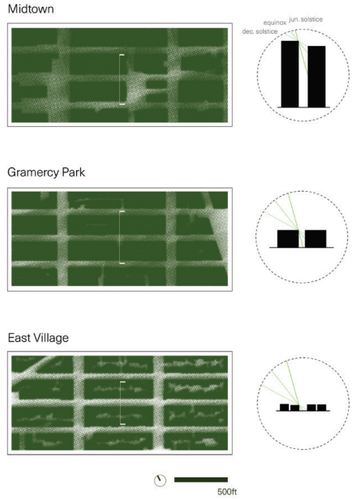
East Village



Flatiron District



Shade Conditions in Different Neighborhoods

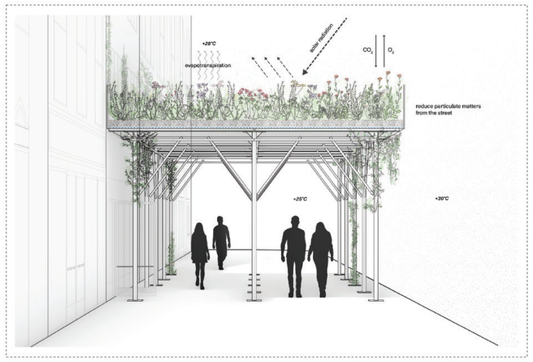


ACT 03

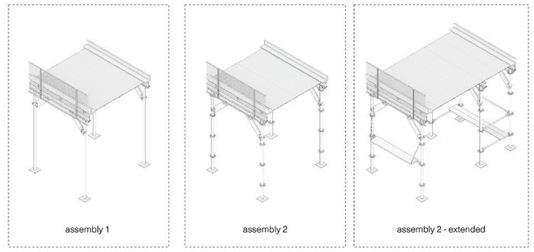
Design Proposal

Jiyoung Baek
STU 1410
Biospheric Urbanism

Climatic Impact



New Sidewalk Shed Assemblies



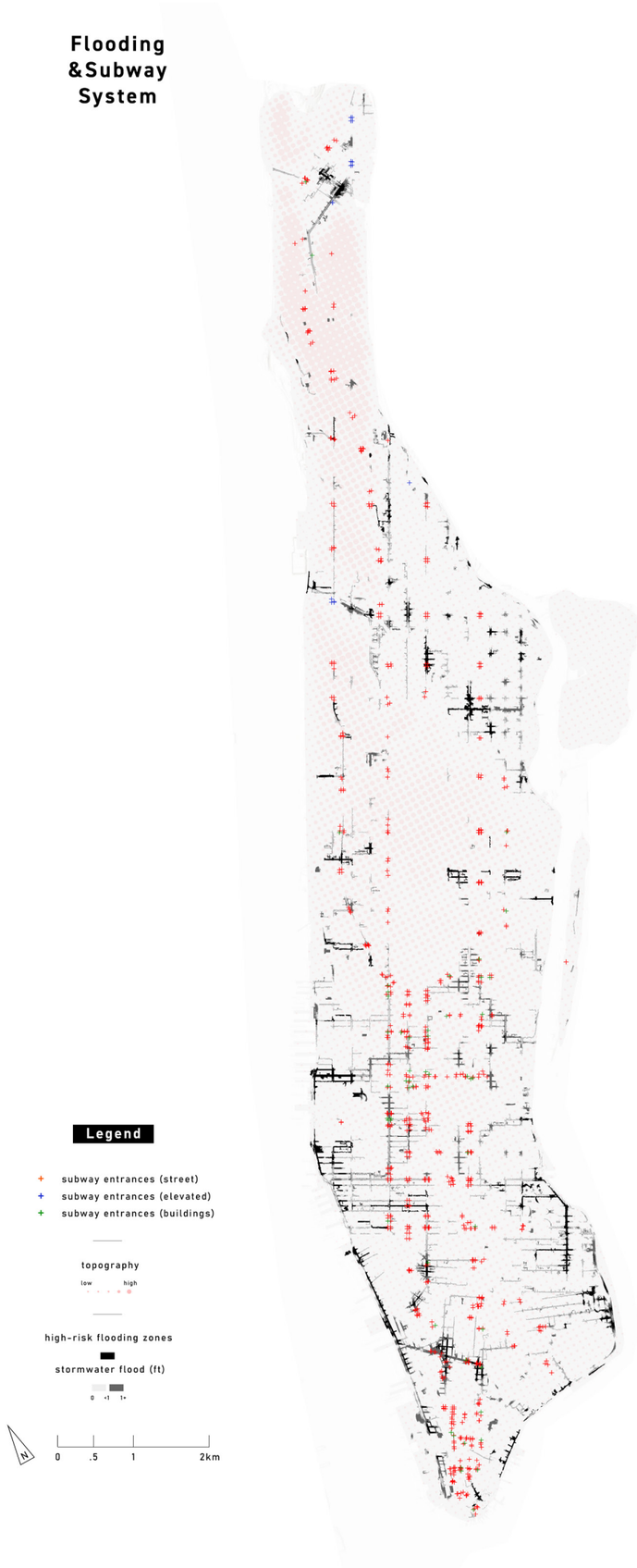
Implementation Plan

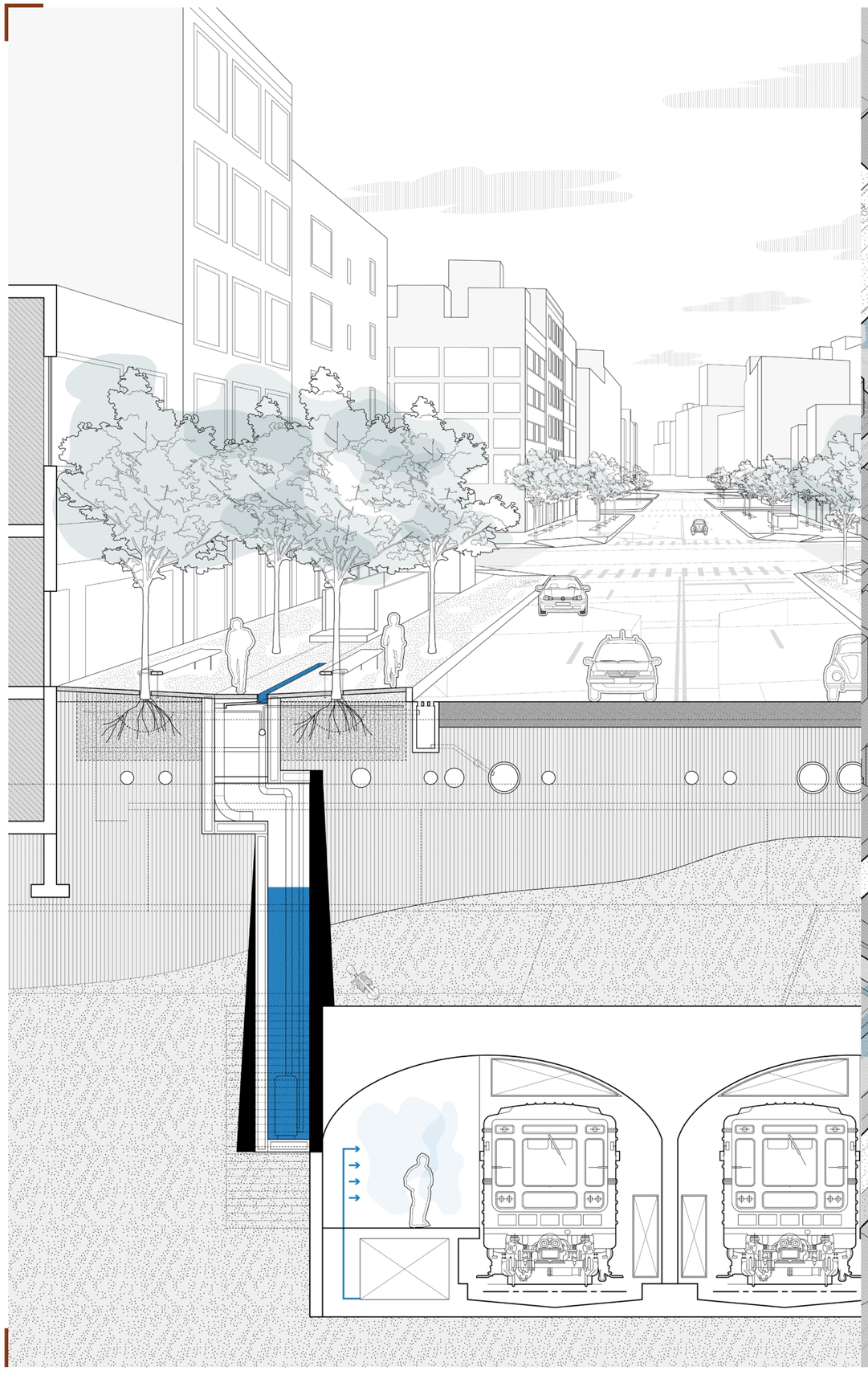
Subway Dry-Land

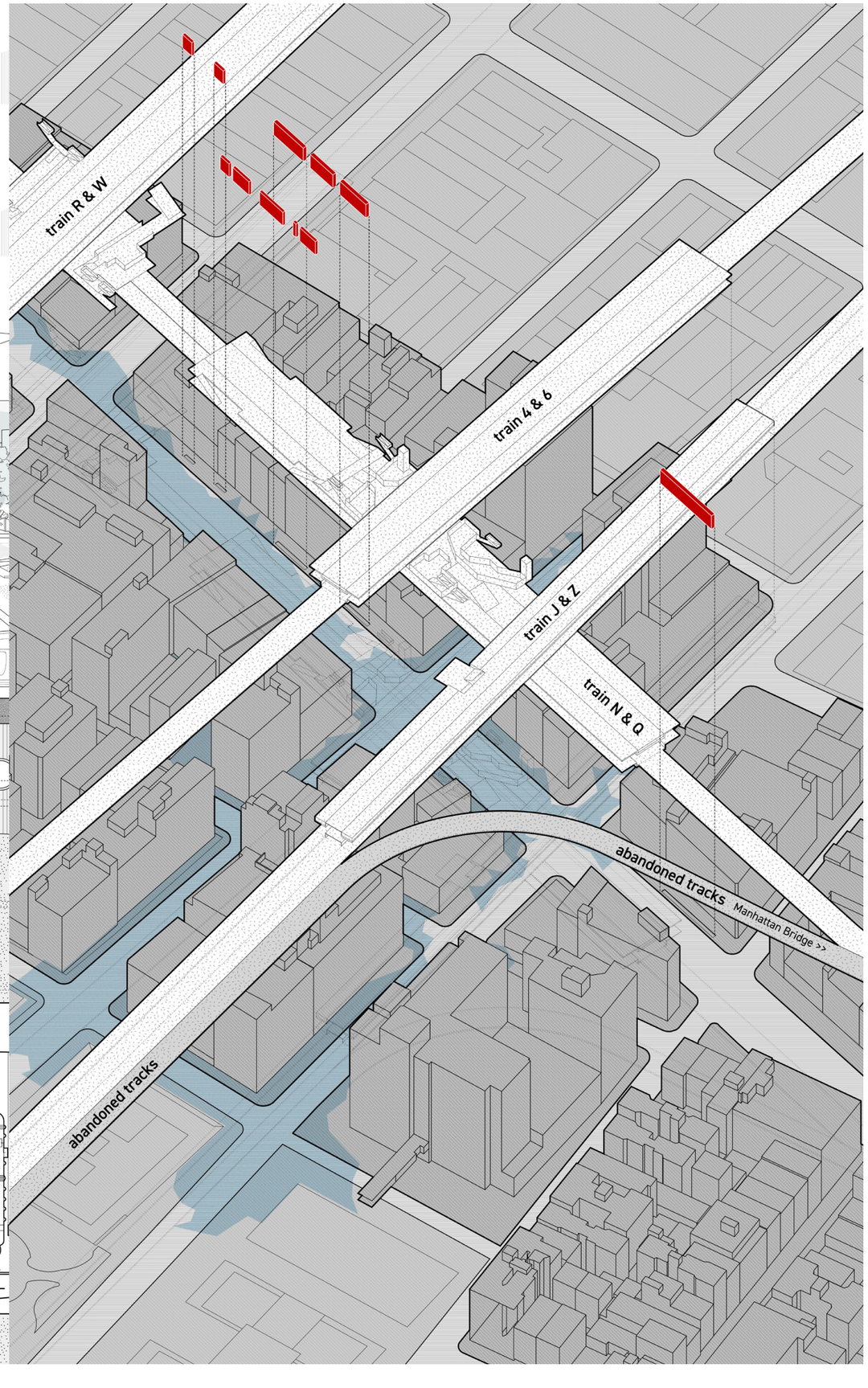
Li Jin

In 2012, Sandy flooded the subway tunnels with millions of gallons of saltwater from the Atlantic Ocean, corroding the power cables and lines that keep the system running and causing more long-term damage.
In recent years, with record-breaking storms in the summer, the New York City subway system was flooded during heavy rainfalls. For example, during Hurricane Ida in 2021, a record from Central Park shows 7.19” of rain within 24 Hours (Nearly all of that fell within just 3 hours). A Regional Plan Association analysis found that 20 percent of subway station entrances could be swamped during extreme rains..
The MTA’s drainage system can siphon off about 1.5 inches of rain per hour back to the street level, according to transit officials, and is equipped with 289 sump pump rooms alongside the tracks that funnel excess water from leaks, rain or rapid snowmelt into the sewer system. A 100-year storm in NYC is defined as approximately 3.5 inches of rain falling in one hour.
The riskiest points for subway flooding issues are the entrances and the street ventilation openings.The overlay of the flooding map and subway entrances shows how the high-risk flooding zones overlap with subway entrances. I picked the Canal Street subway station in Chinatown as my site. Eight different lines stop at this station and form a subway complex on this site. The local overlay of entrances and vents with the flooding map indicates the most problematic spots along Canal Street that need mitigation.
The typical methods to prevent water in the subway vents are to block the water in different ways on the surface level. My proposal is instead about reusing the available space for water storage. Along with topographical manipulation of the site for the entrances, the proposed scheme can significantly reduce water directly flowing into the subway stations.

Flooding
&Subway
System






train R & W
train 4 & 6
train J & Z
train N & Q
abandoned tracks
Manhattan Bridge >>
abandoned tracks

Park, Shift, Adapt: Parking Structures to Microclimatic Parkland

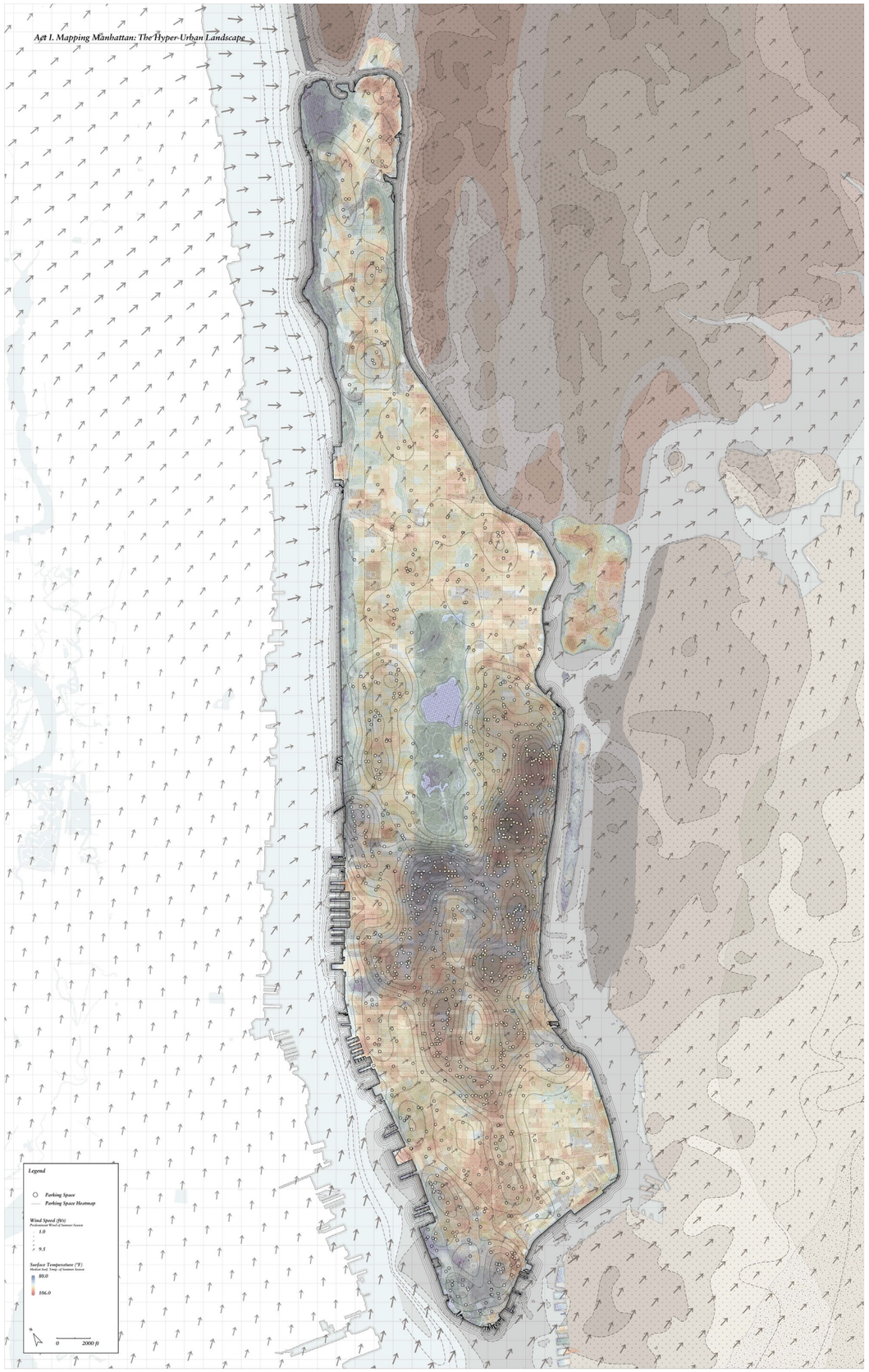
Chanwoo Park

The project examines Manhattan as a hyper-urban landscape, probing the possibilities for reimagining existing parking structures as green parklands amid the city's shift towards a carless future.

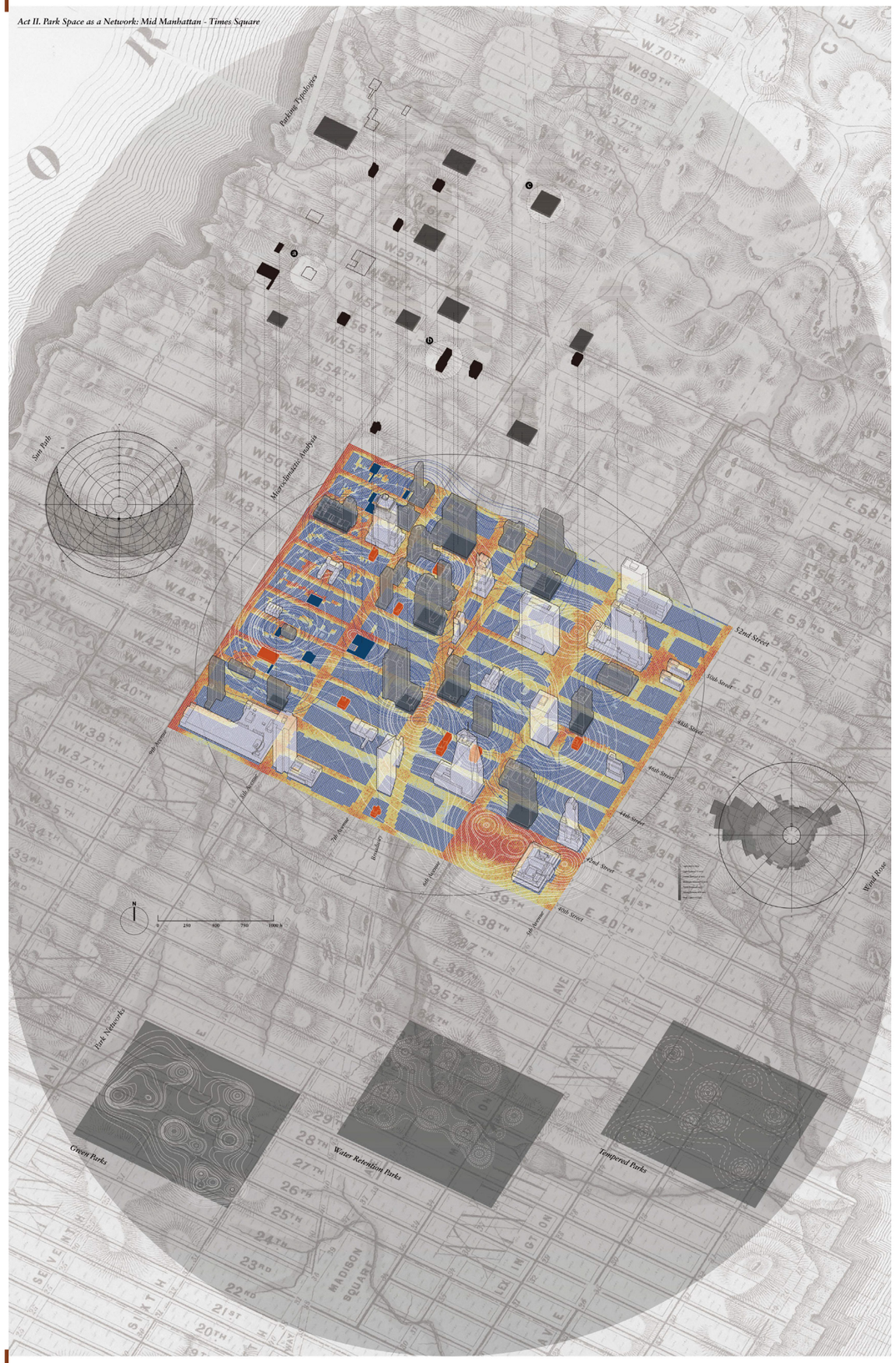
Through an interdisciplinary lens, the study analyzes Manhattan's urban density and its consequential microclimatic phenomena, leading to the development of a flexible and scalable framework for the transformation of parking structures to mitigate such issues.
The research shows that these transformations can enhance urban sustainability and resiliency, fostering a new paradigm of biospheric urbanism in Manhattan and beyond.

The existence of over 1,000 licensed parking spaces across the island presents a unique opportunity to reimagine these spaces as a network of interconnected small parks, forming a constellation of green spaces. By classifying parking structures into three distinct typologies, design solutions can be developed for each category, such as transforming open-air parking lots into pocket gardens, repurposing enclosed parking garages into botanical gardens, and converting underground parking spaces for mushroom cultivation.

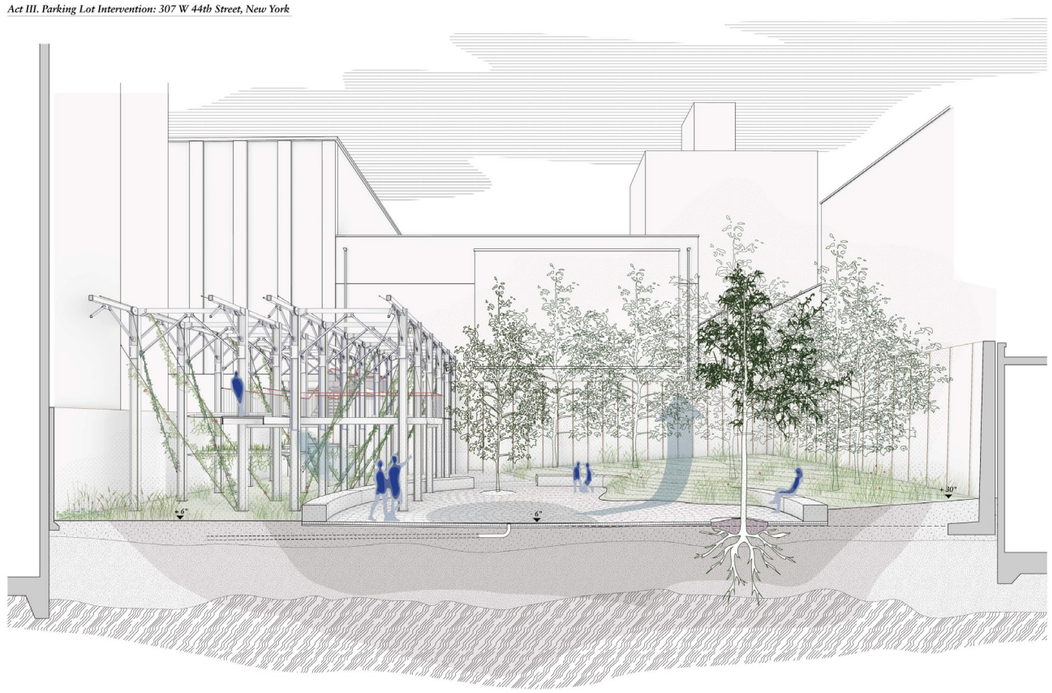
In depth, the open-air parking lot at 307 West 44th Street illustrates the potential to convert an asphalt-covered area for 75 cars into a lush softscape park adorned with 15 tall trees, hundreds of shrubs and various plant species, and a plaza providing respite for the local community. Adopting a methodological approach that combines mapping exercises and microclimatic research, the project aspires to weave together these reimagined parking structures, thus contributing to a more sustainable and interconnected urban fabric.



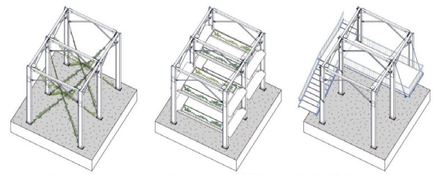
Act II. Park Space as a Network: Mid Manhattan - Times Square



Act III. Parking Lot Intervention: 307 W 44th Street, New York



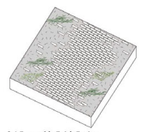
Typological Design Approach



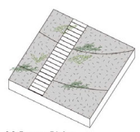
1.1 Vine Garden

1.2 Planter Box on Automobile Trays

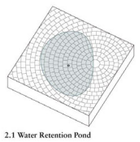
1.3 Elevated Walkway



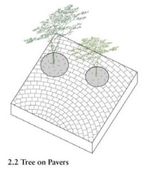
3.1 Permeable Brick Paving



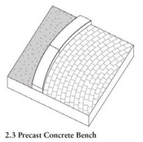
3.2 Concrete PAving



2.1 Water Retention Pond

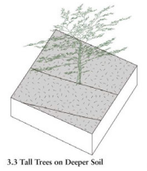


2.2 Tree on Pavers

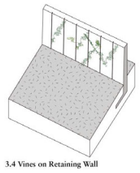


2.3 Precast Concrete Bench

2.4 Landscape Integrated Bench



3.3 Tall Trees on Deeper Soil



3.4 Vines on Retaining Wall

Resurfacing Mannahatta

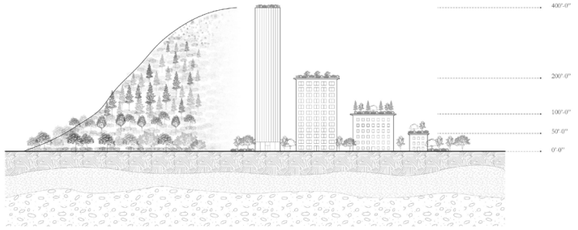
Parama Suteja

The name Manhattan originated from the word “Mannahatta”, which can be traced back to the Indigenous American’s Lenape language, meaning “island of many hills.”

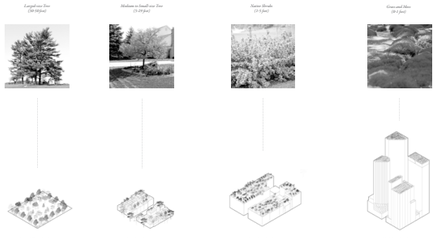
This project aims to resurface Mannahatta, transforming the current Manhattan to its natural landscape, reconnecting it with nature, and harnessing the city’s power to thrive in harmony. Urbanization has resulted in a loss of green spaces and ecological disruption, leading to issues like flooding and the urban heat island effect.

The proposal suggests creating a “third landscape” on rooftops, utilizing abandoned and inaccessible spaces throughout the city.
These rooftops would be transformed into natural habitats with native plants and trees, promoting biodiversity and providing ecological services. The project envisions a revitalized Manhattan skyline that seamlessly blends nature with the existing built environment, harnessing the city’s intrinsic energy to sustain itself and thrive harmoniously with the environment.

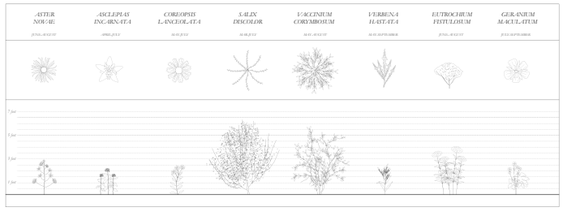
Ultimately, this undertaking aspires to cultivate a more ecologically balanced and biodiverse urban environment that not only supports native wildlife but also enhances the overall quality of life for its residents.



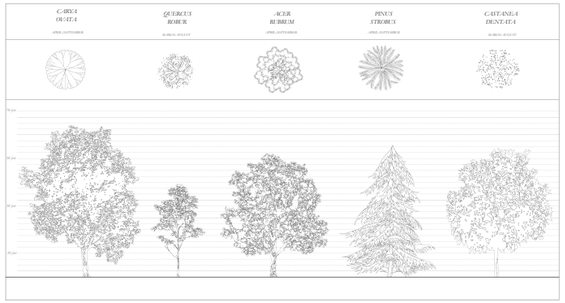
Hill and Building Relationships



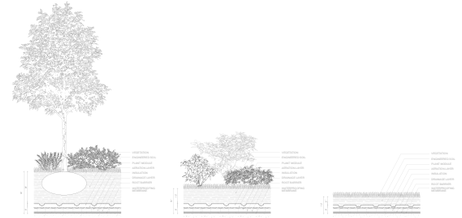
Vegetations and Building Relationships



Native Plants of New York

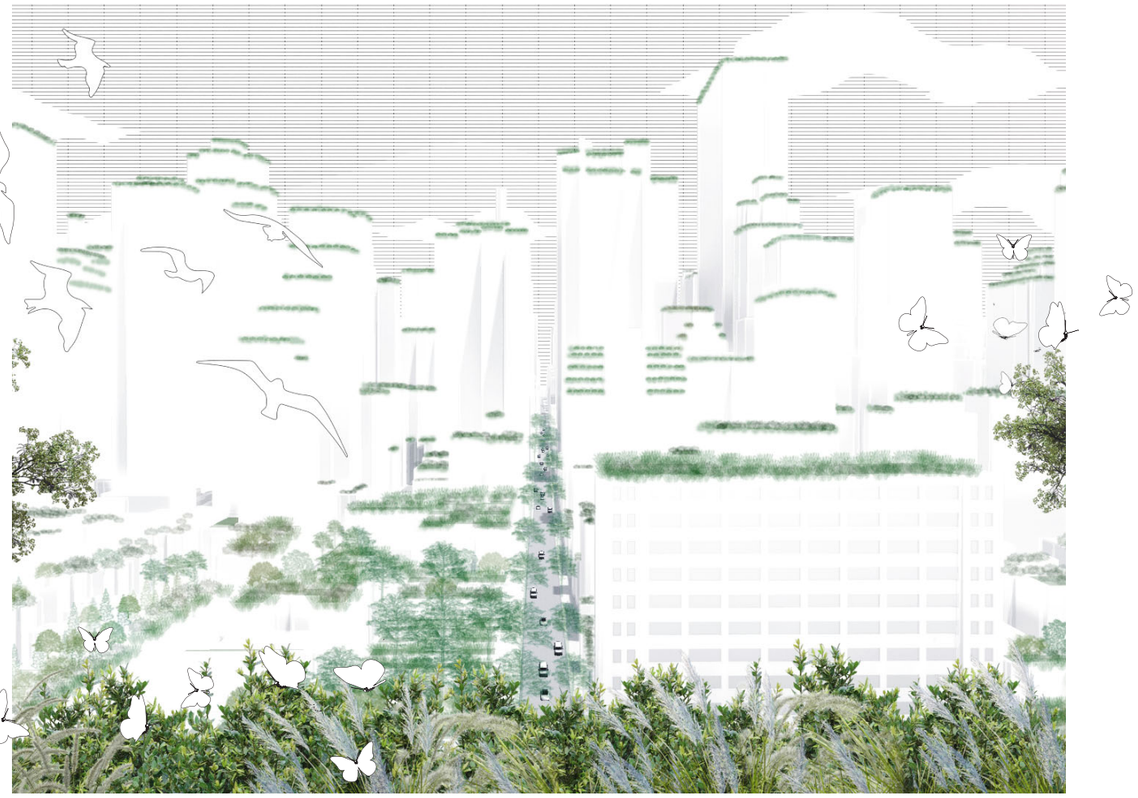


Native Trees of New York

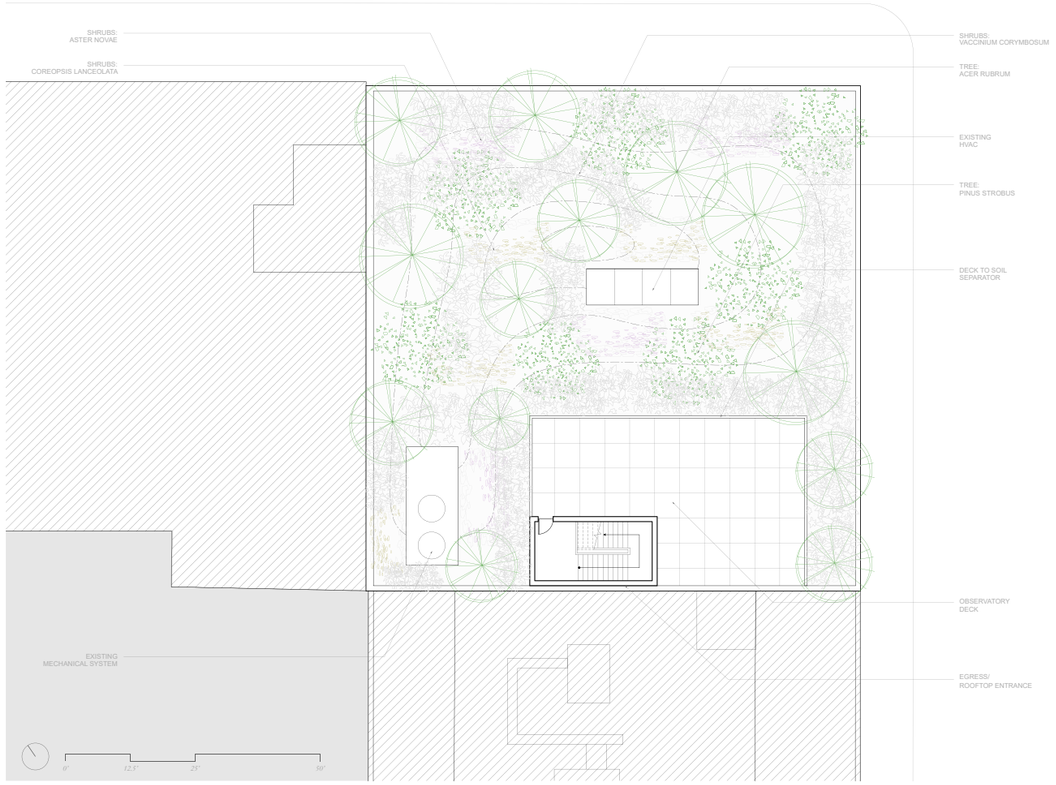


Section Details

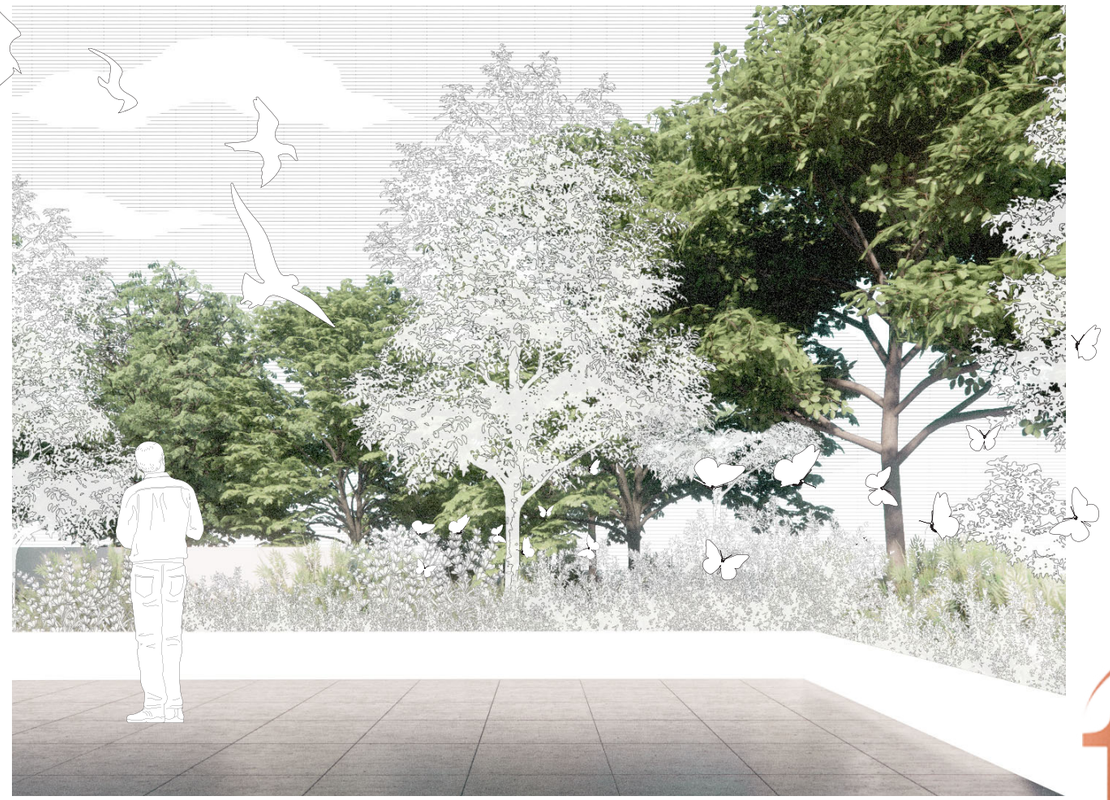
Rooftop - West 45th Street and 8th Avenue



Exterior Perspective View - Resurfaced Mannahatta



Exterior Perspective View - Resurfaced Mannahatta



Exterior Perspective View - Roof Deck for Observatory Juxtaposed with The Third Landscape

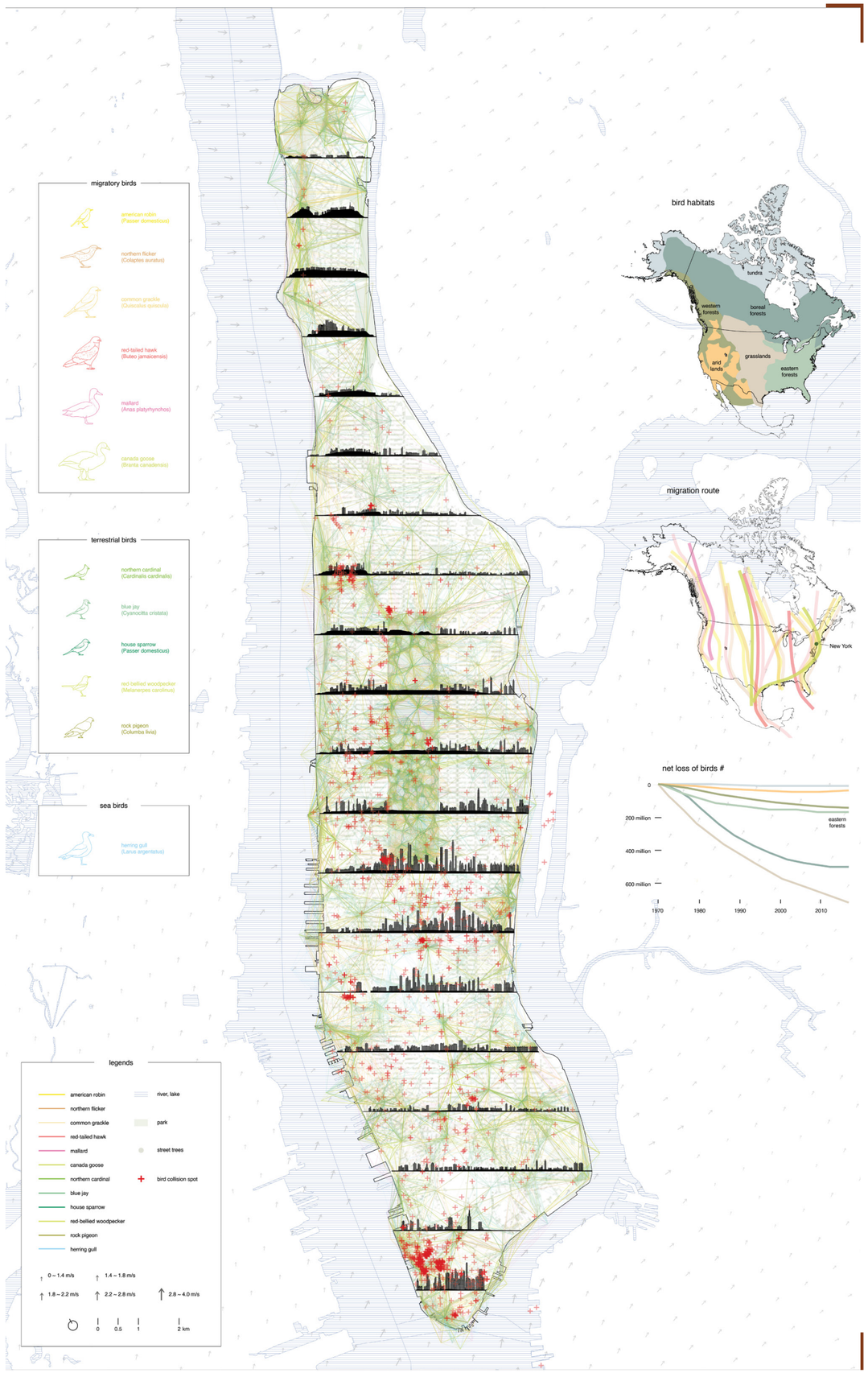
A Bird's Eye View of Manhattan: thinking of a symbiotic microclimate in a city

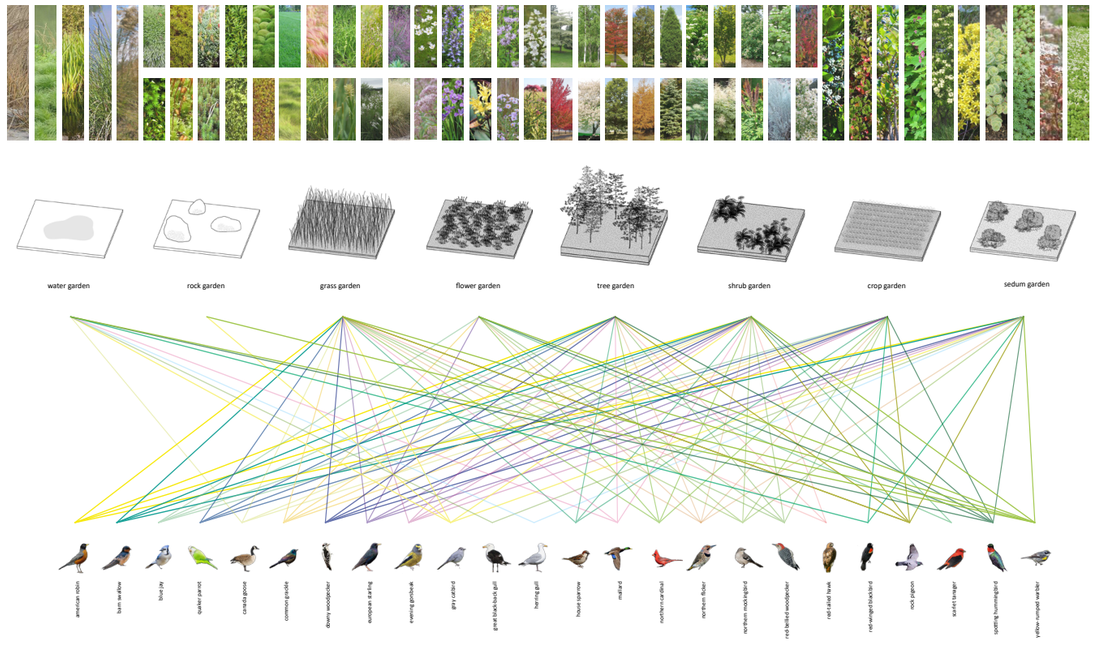
Sunjae Yu

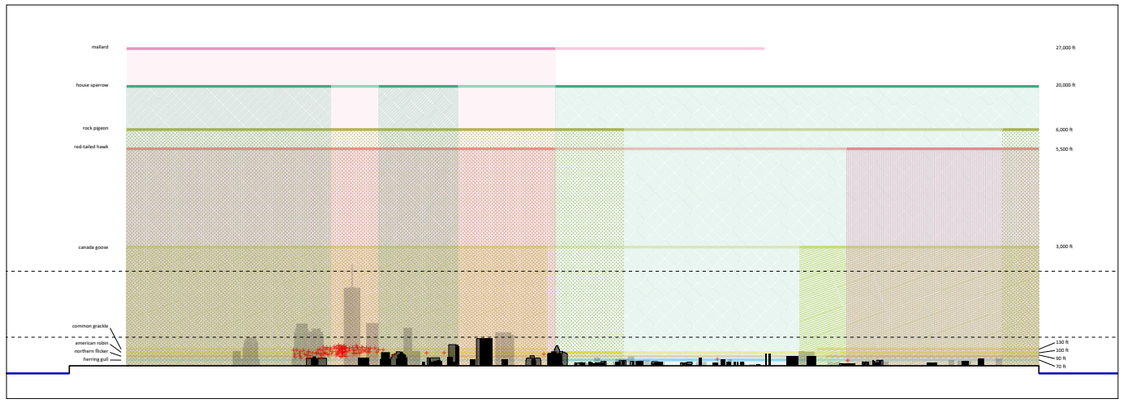
This project aims to create a network of livable rooftop gardens in Manhattan to protect and promote urban bird populations. Avian species in cities confront constant danger due to unfriendly surroundings and end up crashing into buildings.

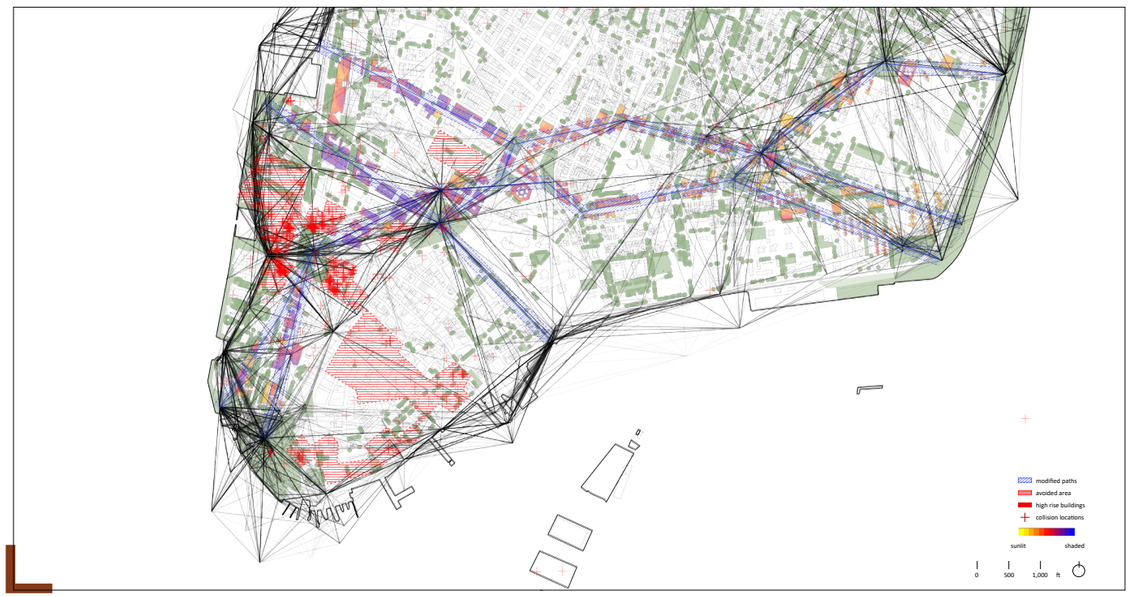
Modifying their trajectories by providing consecutive roof gardens will not only protect them from those threats but also contribute to the whole ecosystem by offering habitats for a variety of bird species in urban.

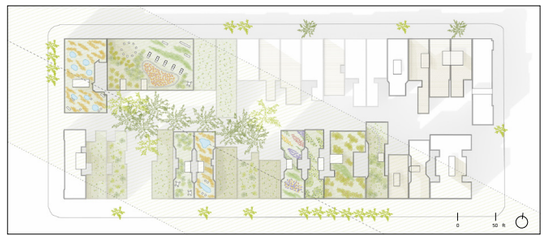
By transforming unused rooftops into thriving gardens, we can create a more sustainable, bird-friendly urban environment that benefits both humans and wildlife alike.

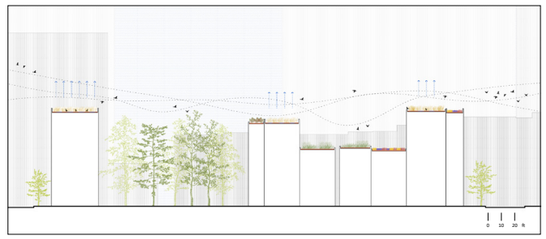


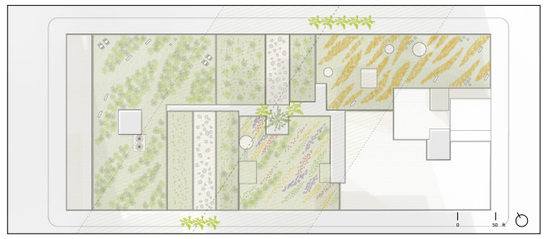

water garden
rock garden
grass garden
flower garden
tree garden
shrub garden
crop garden
sedum garden
american robin
barn swallow
blue jay
budgie parrot
canada goose
common grackle
downy woodpecker
eastern kingbird
evening grosbeak
great crested flycatcher
great horned owl
herring gull
house sparrow
mallard
northern cardinal
northern flicker
northern mockingbird
red-bellied woodpecker
red-tailed hawk
red-winged blackbird
rock pigeon
scarlet tanager
spotted hummingbird
yellow-rumped warbler

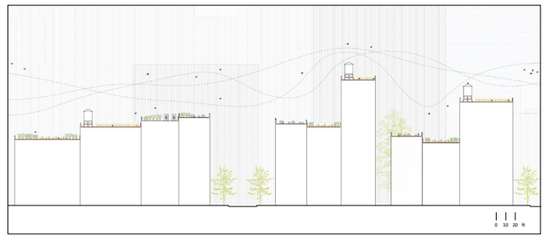

mallard
house sparrow
rock pigeon
red-tailed hawk
canada goose
common grackle
american robin
northern flicker
herring gull
27,000 ft
20,000 ft
6,000 ft
5,500 ft
3,000 ft
130 ft
100 ft
90 ft
50 ft


modified paths
avoided area
high rise buildings
collision locations
sunlit
shaded
0
500
1,000
ft

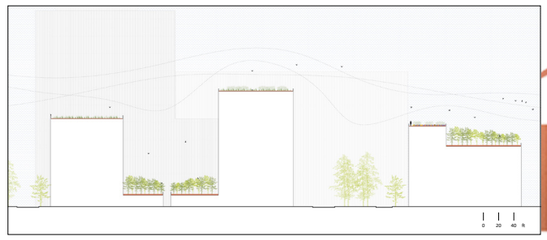

0
50
ft


0
10
20
ft


0
50
ft


0
10
20
ft


0
50
ft


0
20
40
ft

Biospheric Urbanism:

Changing Climates

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Guest Critics

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