

MENG-SYUN SUNG

Portfolio

2025- 2026

Master of Architecture
Columbia University GSAPP

Content

The Hydrological Metabolic Commons	01
Urban Metabolism x Coastal Restoration Advanced Architecture Studio V 2026	
Invisible Light Archive	02
How invisible light affect the tundra ecology Advanced Architecture Studio IV 2025	
The Hydro Firebreak	03
Hydro-Adaptive Infrastructure Advanced Architecture Studio III 2025	
Symphony of Fermentation	04
An Interactive Sonic Exploration of Microbial Architecture Edible Summit 2026	



The Hydrological Metabolic Commons

Urban Metabolism x Coastal Restoration

01

Academic Project | Individual Work
Selected for the Student Project Summit

Year: 2026

Studio: Advanced Architecture Studio V

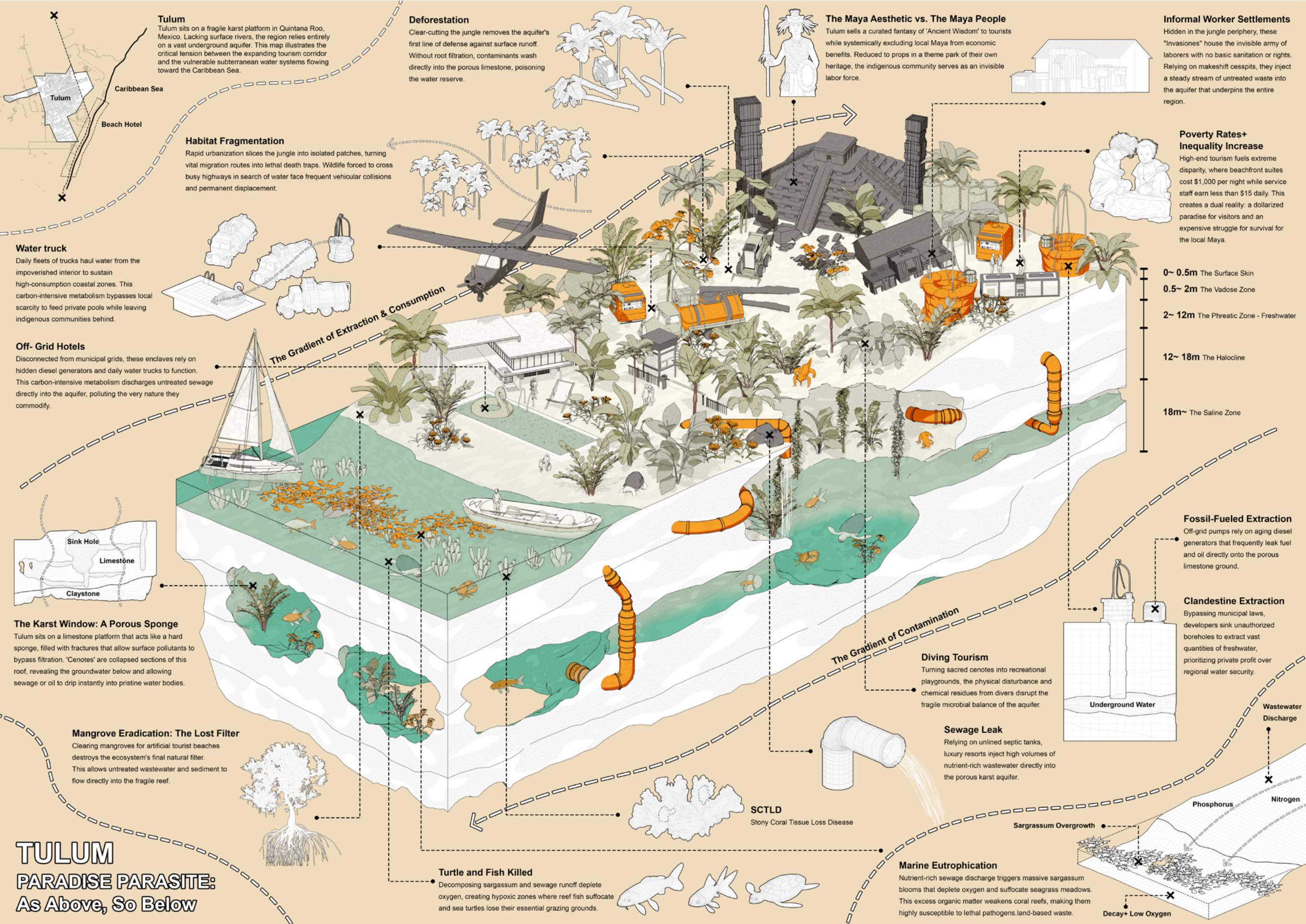
Location: Tulum, Mexico

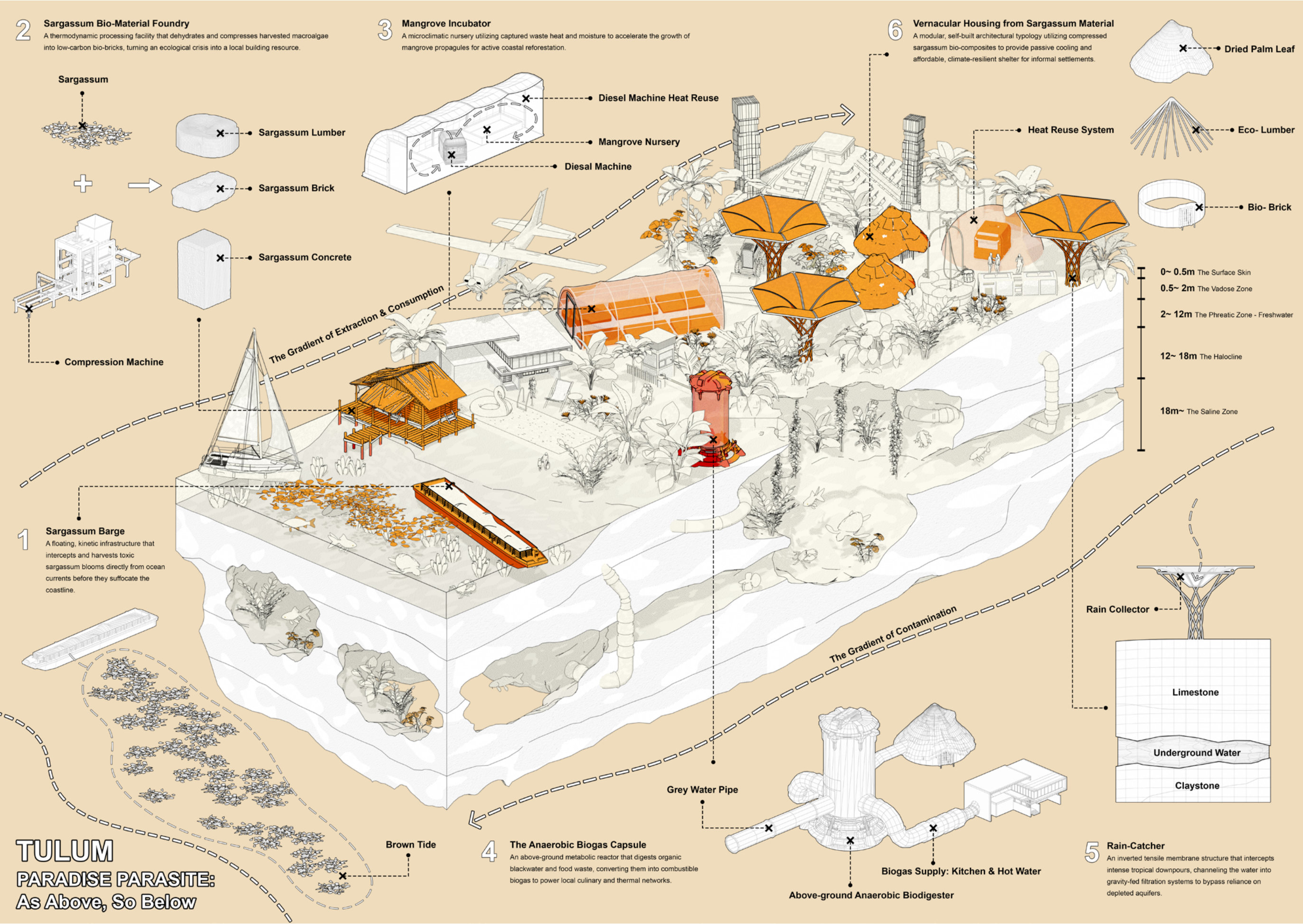
Instructor: Mireia Luzárraga

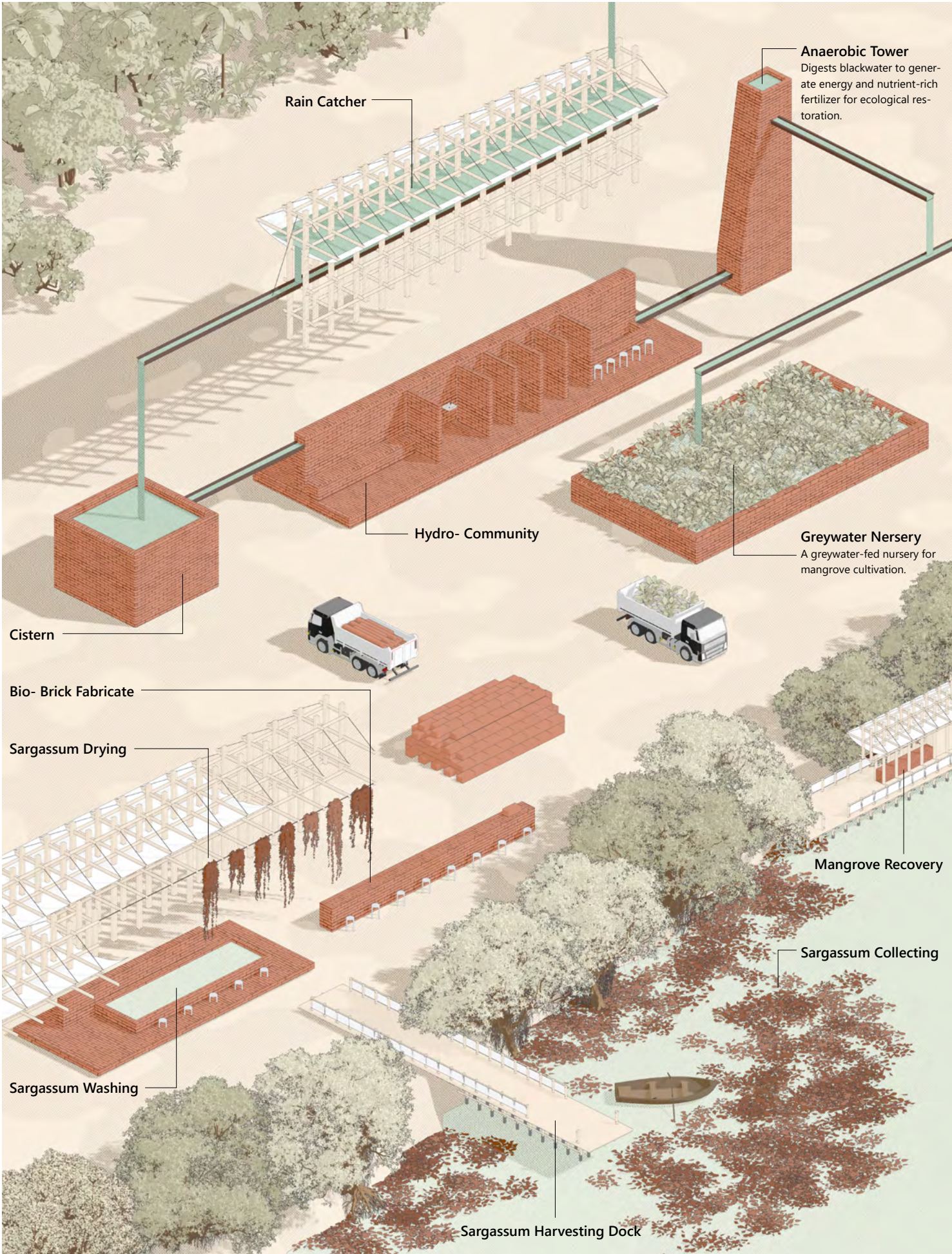
Can the "Gradient of Contamination" Become a Cycle of Repair?

In Tulum, rapid tourism development has decimated purifying coastal mangroves. Drawn by employment, laborers are forced into informal settlements lacking reliable water and sanitation. Beneath the surface of this fragile karst landscape, a hidden "gradient of contamination" reveals untreated wastewater infiltrating the porous limestone aquifer, ultimately causing coastal eutrophication and massive sargassum blooms.

My proposal, *The Hydrological Metabolic Commons*, introduces a reparative cycle of extraction and consumption. Overabundant sargassum is harvested, processed into bio-bricks, and continuously woven into the dynamic fabric of the informal built environment. New urban apparatuses are deployed to harvest rainwater and utilize anaerobic towers to digest blackwater. The resulting effluent nourishes mangrove nurseries. Once mature, these saplings are relocated to coastal and cenote observation stations for shoreline restoration. Through lightweight architectural interventions, this project seeks to mitigate the systemic socio-ecological crises facing both human and more-than-human inhabitants.







Canopy & Cables

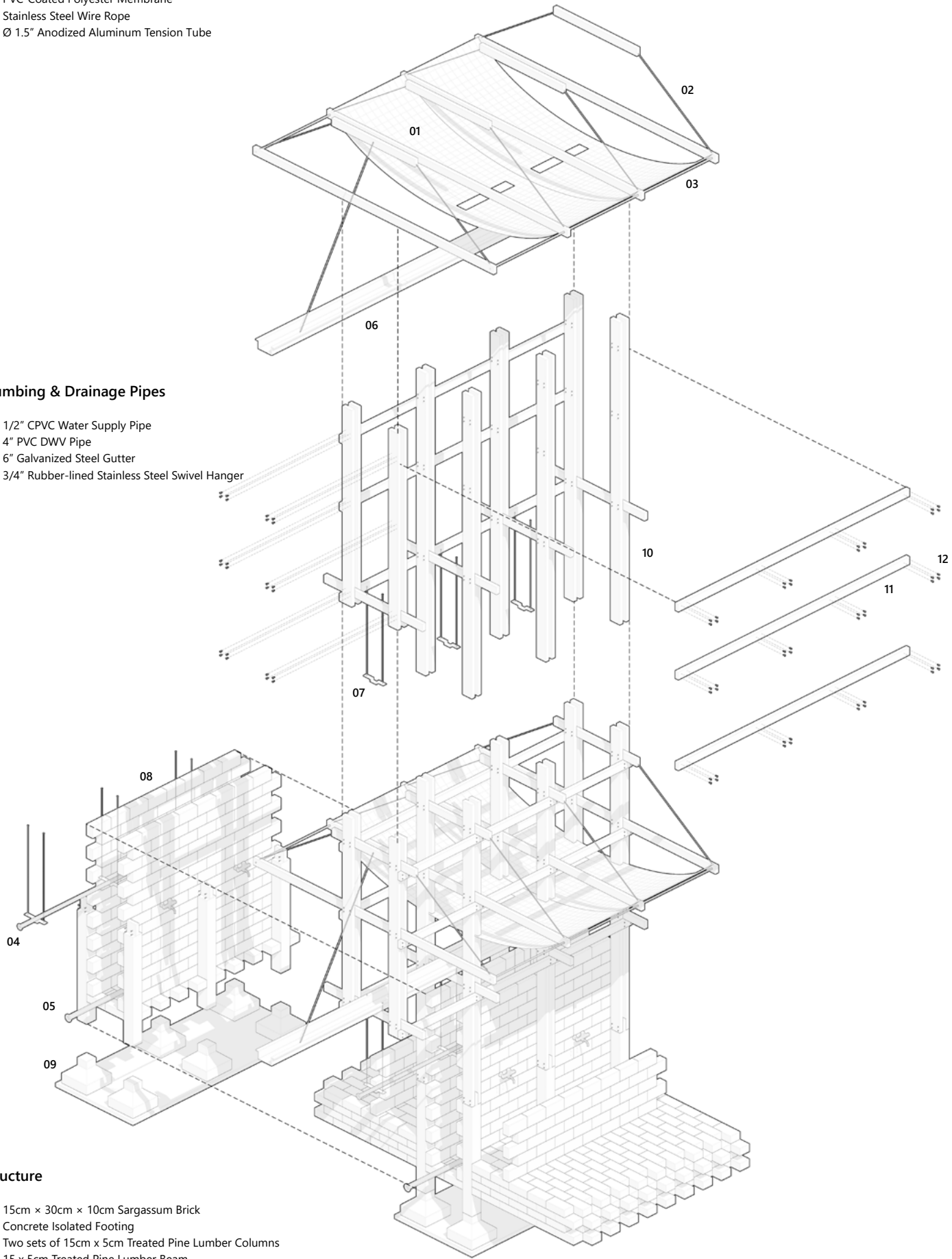
- 01 PVC-Coated Polyester Membrane
- 02 Stainless Steel Wire Rope
- 03 Ø 1.5" Anodized Aluminum Tension Tube

Plumbing & Drainage Pipes

- 04 1/2" CPVC Water Supply Pipe
- 05 4" PVC DWV Pipe
- 06 6" Galvanized Steel Gutter
- 07 3/4" Rubber-lined Stainless Steel Swivel Hanger

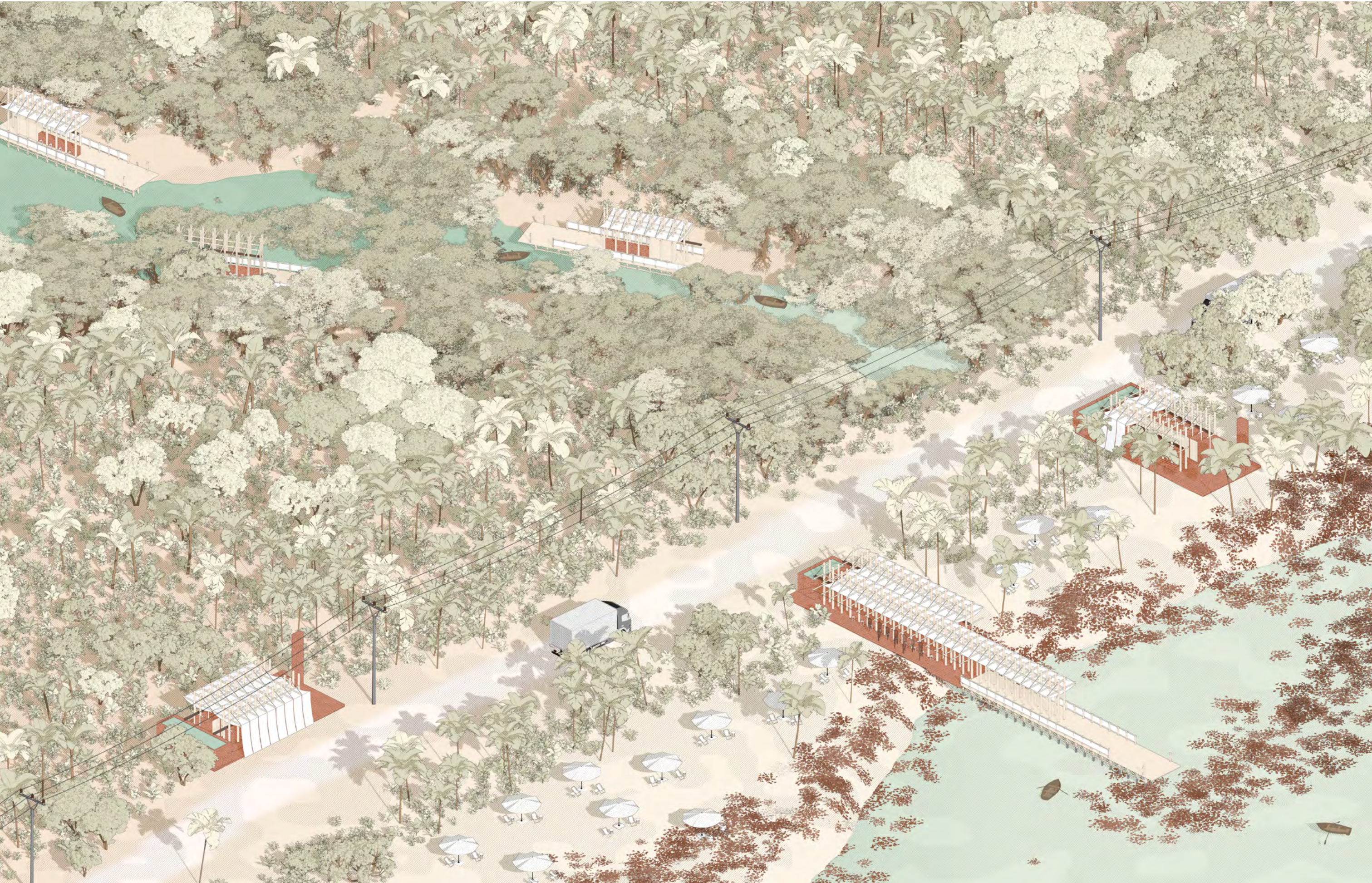
Structure

- 08 15cm x 30cm x 10cm Sargassum Brick
- 09 Concrete Isolated Footing
- 10 Two sets of 15cm x 5cm Treated Pine Lumber Columns
- 11 15 x 5cm Treated Pine Lumber Beam
- 12 Hot-Dip Galvanized Hex Bolt + Steel Washer+ Hex Nut





Informal Settlement



Eco- Chic Seashore Area



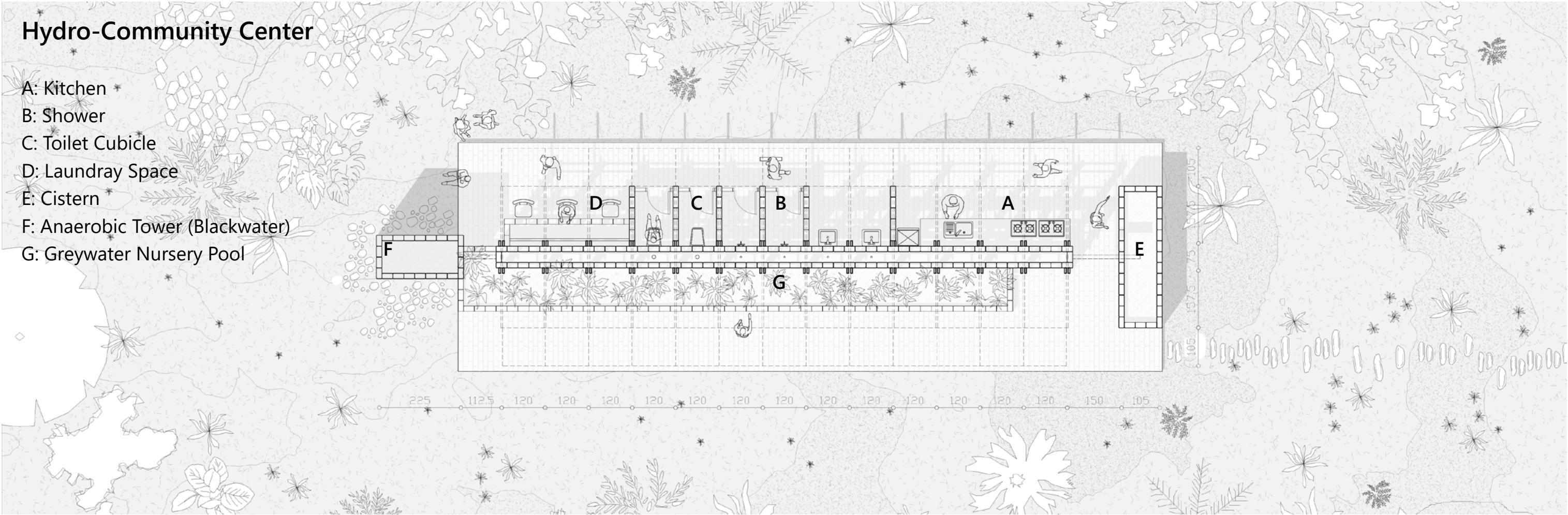
Phases of Metabolic Housing Transformation

A: Bed Room
B: Interstitial Living Space
C: Cistern



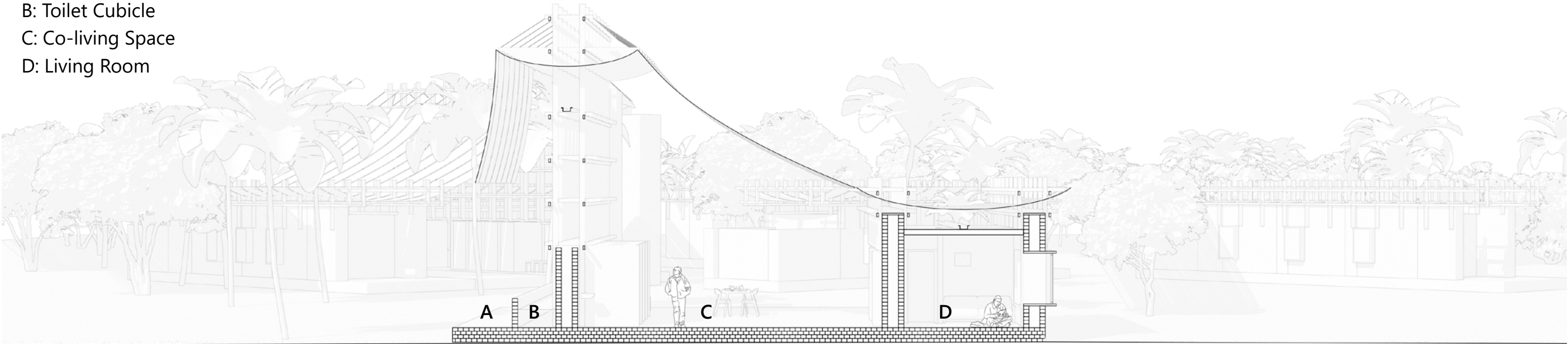
A: Bed Room
B: Interstitial Living Space
C: Cistern



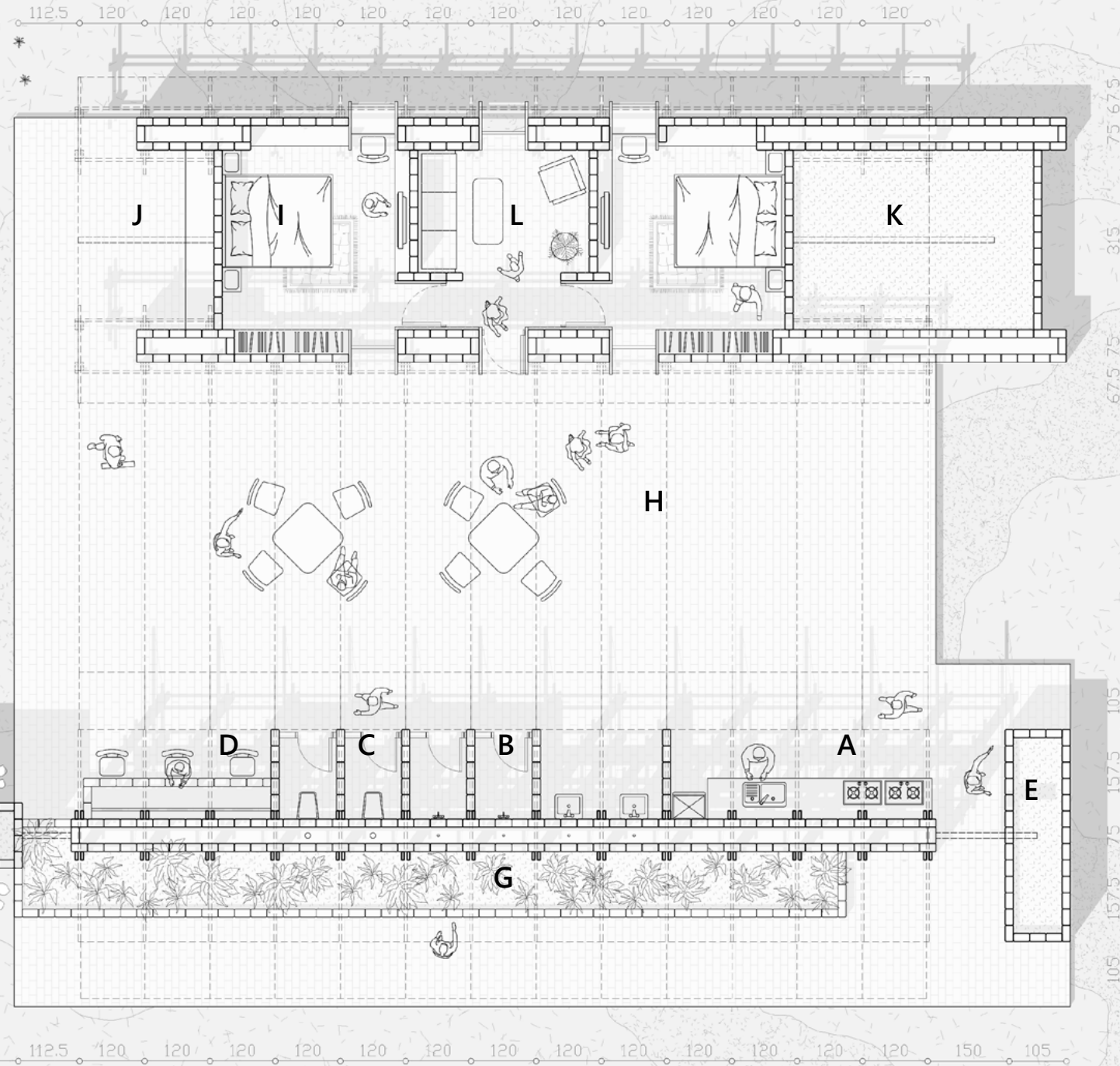


Hydro-Community Center+ Dwelling Unit Section

- A: Greywater Nursery Pool
- B: Toilet Cubicle
- C: Co-living Space
- D: Living Room

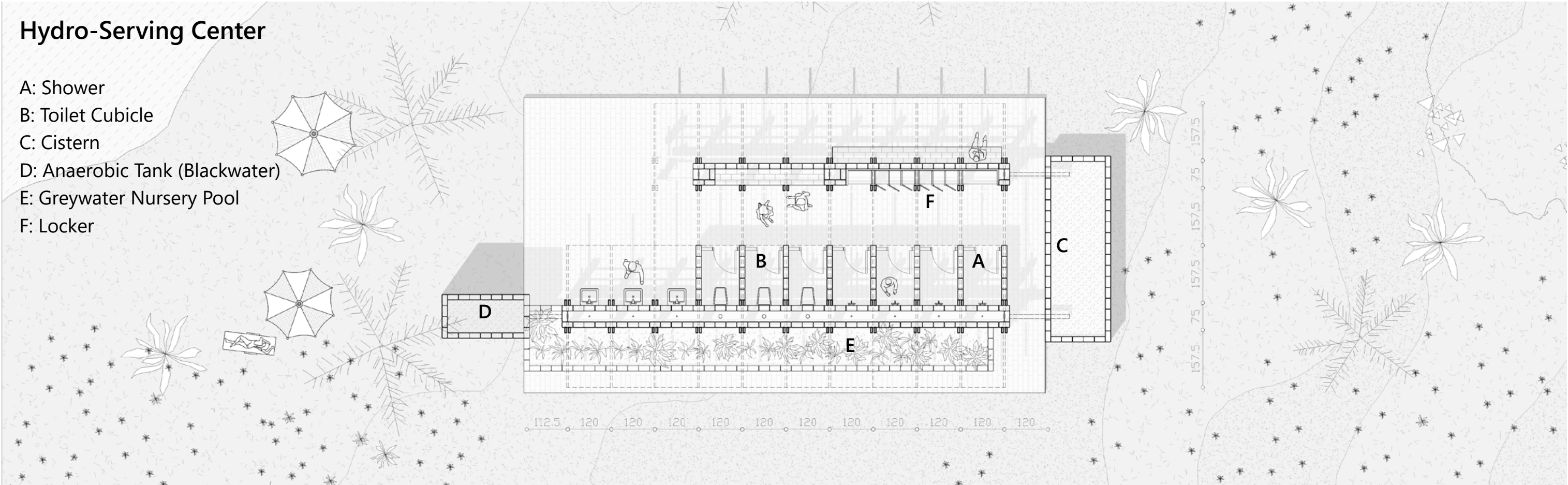


A: Kitchen
B: Shower
C: Toilet Cubicle
D: Laundry Space
E: Cistern
F: Anaerobic Tower (Blackwater)
G: Greywater Nursery Pool
H: Co-living Space
I: Bed Room
J: Interstitial Living Space
K: Cistern
L: Living Room



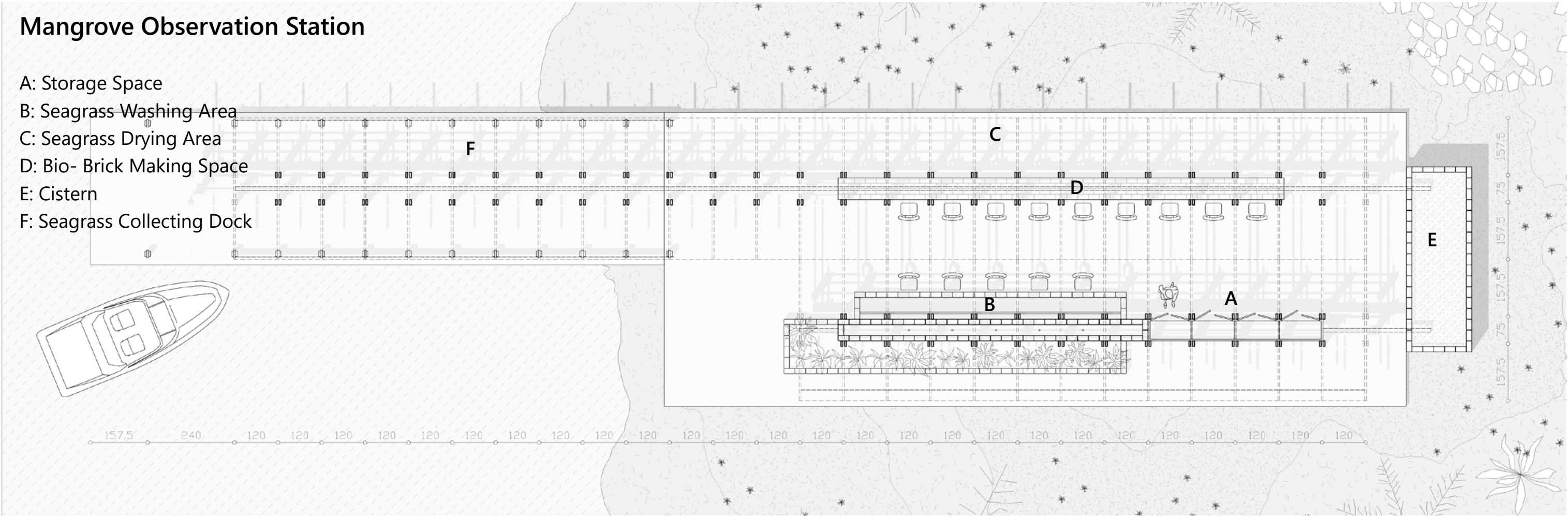
Hydro-Serving Center

- A: Shower
- B: Toilet Cubicle
- C: Cistern
- D: Anaerobic Tank (Blackwater)
- E: Greywater Nursery Pool
- F: Locker



Mangrove Observation Station

- A: Storage Space
- B: Seagrass Washing Area
- C: Seagrass Drying Area
- D: Bio- Brick Making Space
- E: Cistern
- F: Seagrass Collecting Dock





Invisible Light Archive

How invisible light affect the tundra ecology

02

Academic Project | Team Work

Selected for the Student Project Summit

Year: 2025

Studio: Advanced Architecture Studio IV

Location: Churchill, Canada

Team: Meng-Syun Sung , Hyunju Kim (2)

Instructor: Leslie Gill

Can architecture restore an tundra ecosystem by manipulating the invisible spectrum?

This project addresses the ecological collapse of the tundra triggered by increasing intensities of Ultraviolet (UV) and Infrared (IR) light. These invisible spectrums disrupt the floral patterns essential for pollinator navigation and accelerate permafrost melt, destabilizing critical avian nesting grounds. The proposed "Inverse Preserve" operates through a dual-architectural system: experimental "Outposts" first measure how varying roof angles and materials can restore UV cues and stabilize ground temperatures, while a centralized "Archive" utilizes tall, overlapping shadow-roofs to create restorative microclimates. By reversing UV fading and soil degradation, the Archive preserves vital habitats amidst a changing landscape. In Churchill, visitors participate in this reparative metabolism by receiving propagated plants to expand the restoration network. Through these lightweight interventions, the project transforms invisible light into a tangible architectural tool for systemic ecological repair.

Waterside Nestler



Long-tail Duck



Lesser Yellowlegs

From June-July, species like Loons and Tundra Swans build nests by tundra waters, relying on stable levels for defense. Permafrost thaw, however, causes unpredictable flooding or lake drainage, devastating countless nests and transforming critical wetland habitats.

Dryground Nestler



Buff-breasted Sandpiper



Red knot

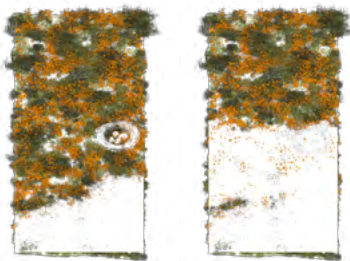
From June-July, species like Plovers and Arctic Terns nest on dry, open tundra, using camouflage against sparse vegetation. Yet, permafrost thaw and shrubification disrupt this delicate balance, exposing countless nests to predators and altering crucial breeding grounds

Pollinators

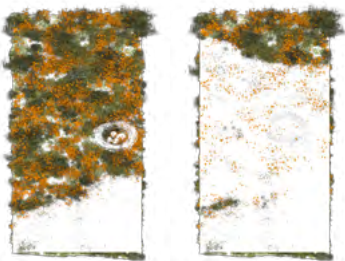


Bumblebees

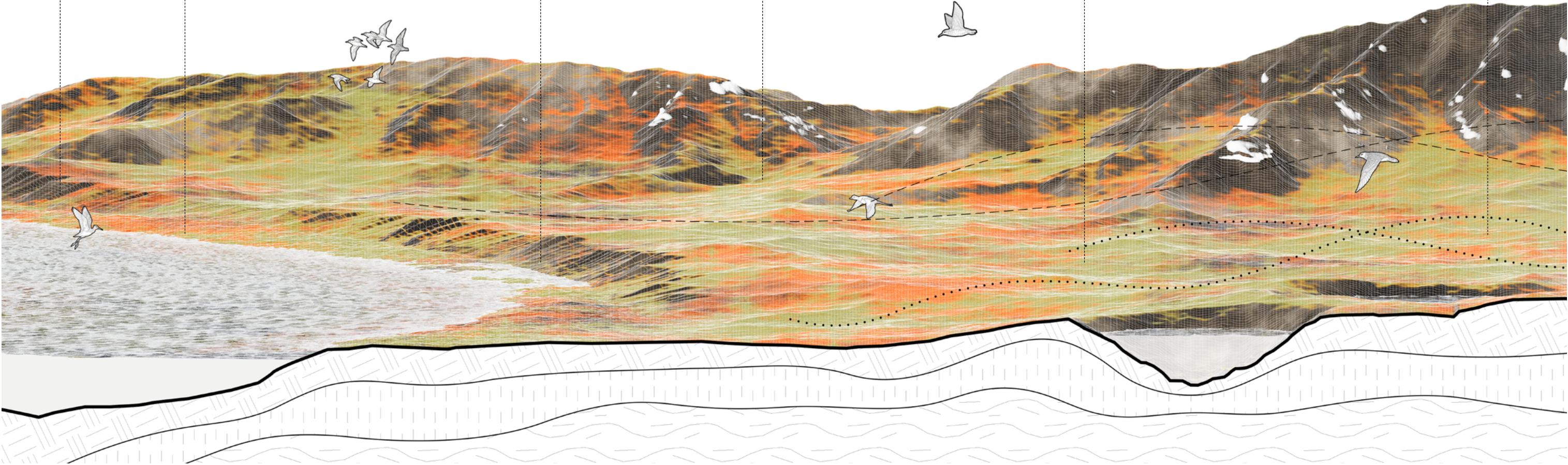
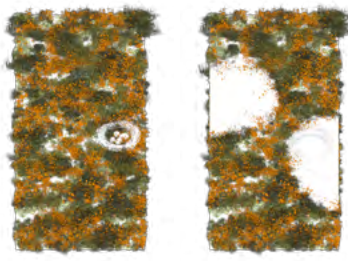
River degradation



Flood



Thermakrast



Pollinators



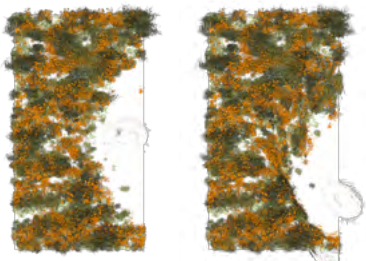
Bumblebees



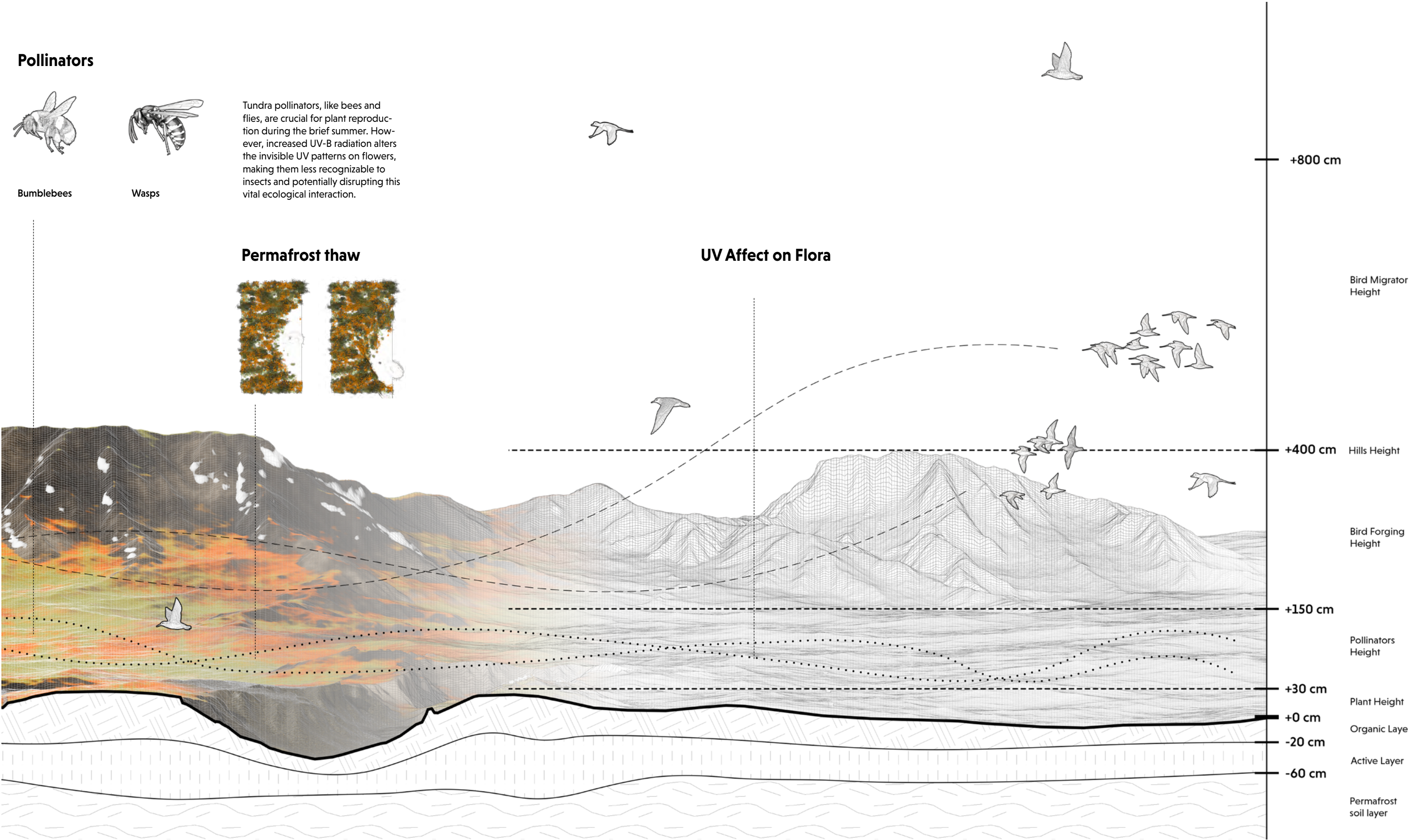
Wasps

Tundra pollinators, like bees and flies, are crucial for plant reproduction during the brief summer. However, increased UV-B radiation alters the invisible UV patterns on flowers, making them less recognizable to insects and potentially disrupting this vital ecological interaction.

Permafrost thaw



UV Affect on Flora



Bird Migrator Height

Hills Height

Bird Forging Height

Pollinators Height

Plant Height

Organic Layer

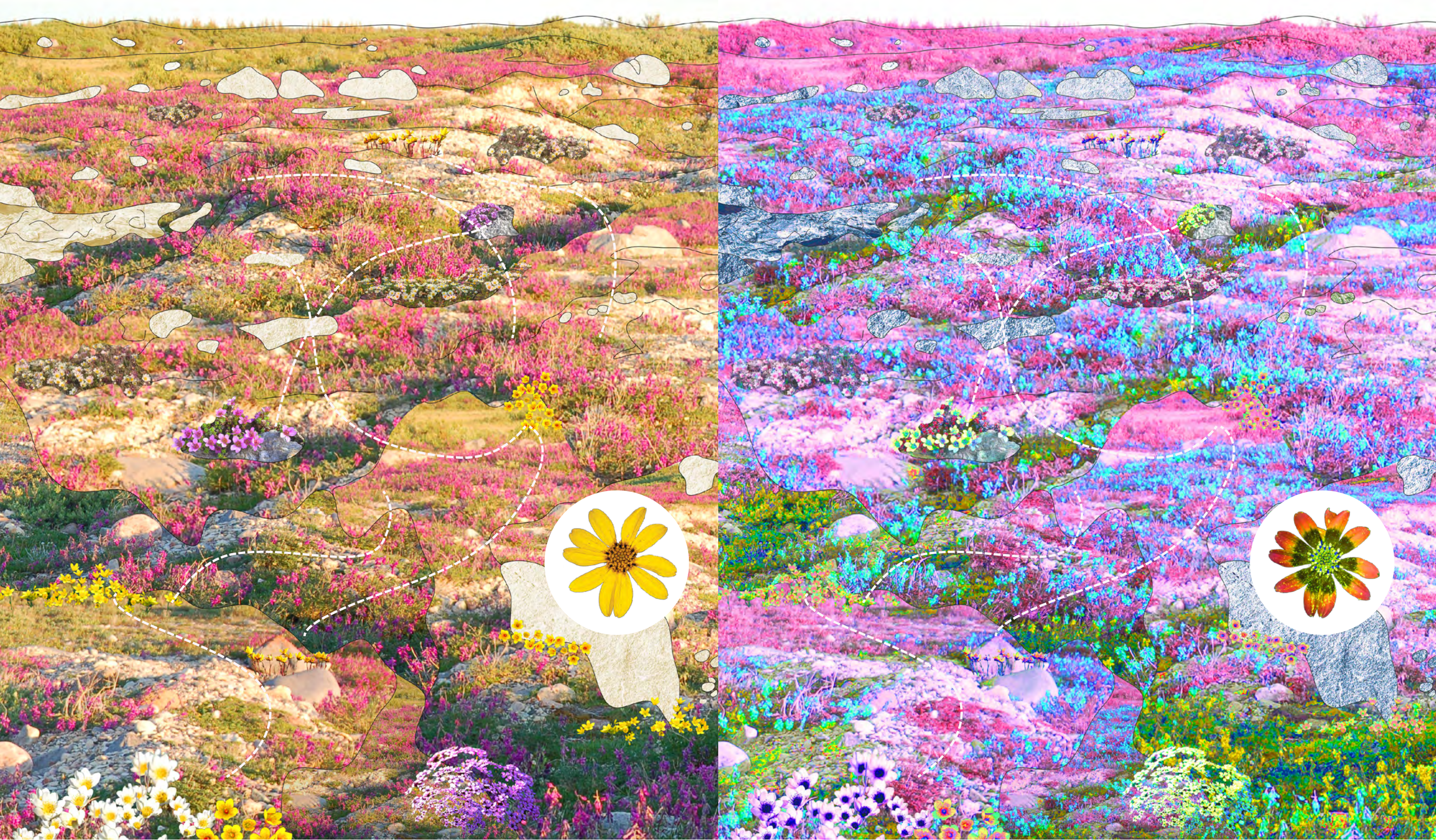
Active Layer

Permafrost soil layer

human perspective

PRESENT

pollinators perspective

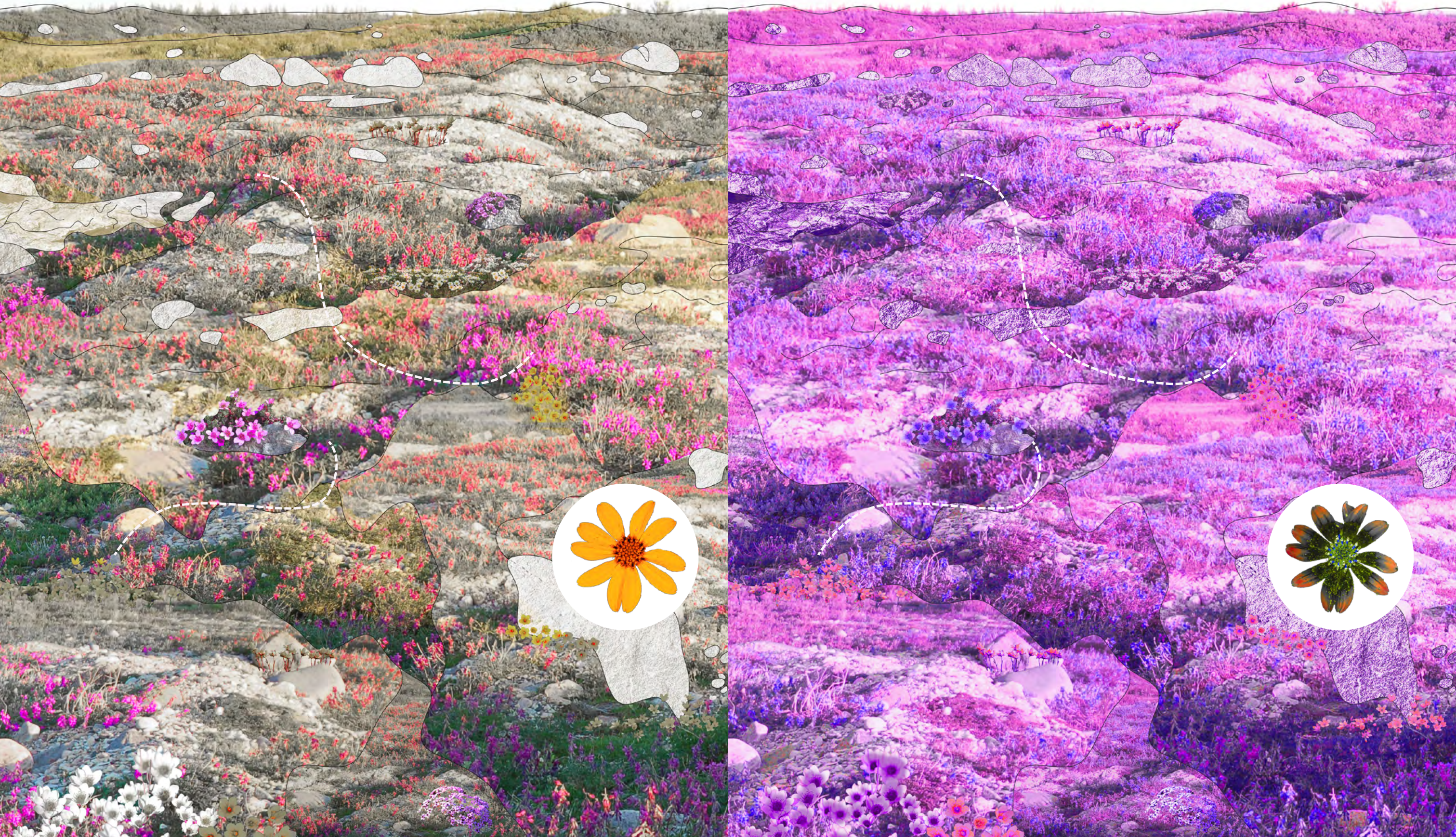


UV light: Insects Perspective vs Human Perspective

human perspective

FUTURE

pollinators perspective



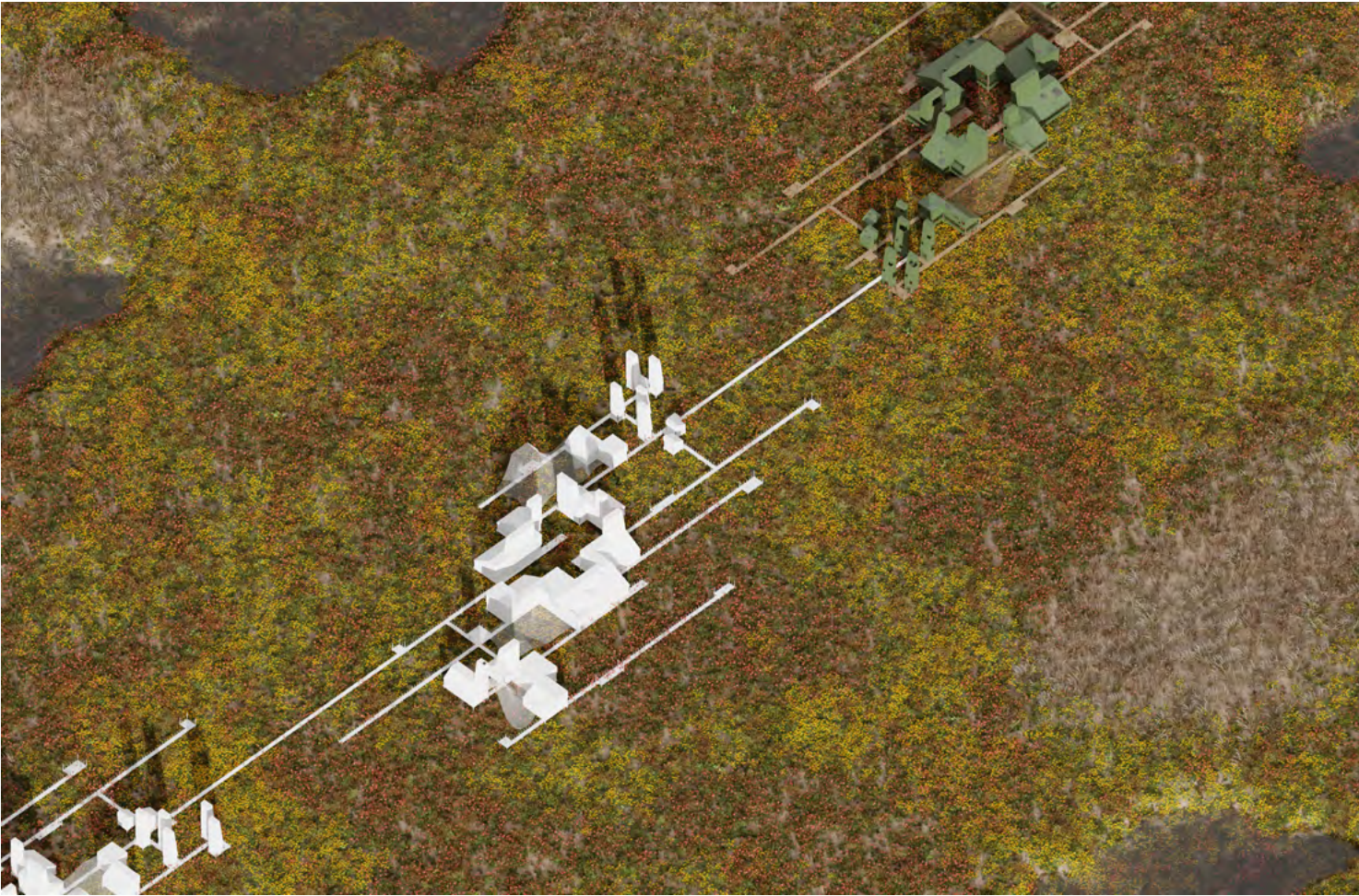
UV light: Insects Perspective vs Human Perspective



Outpost Elevation and Plan Drawing

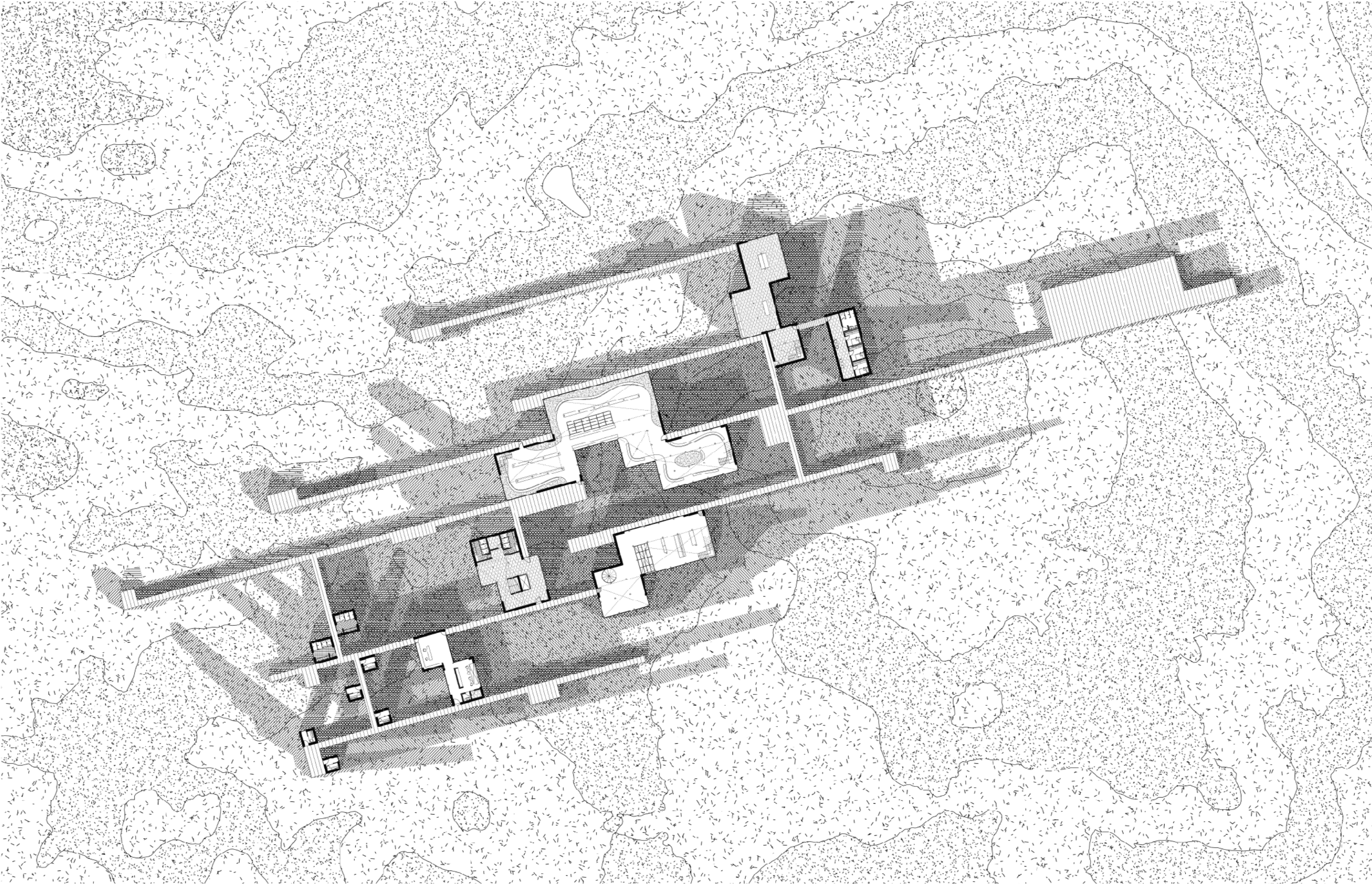


Outpost Section Drawings



Shadow as Restoration: Reclaiming the Tundra through Strategic Microclimates.







Archive Perspective Drawing



Archive Perspective Drawing



The Hydro Firebreak

Hydro-Adaptive Infrastructure

03

Academic Project | Team Work

Year: 2025

Studio: Advanced Architecture Studio III

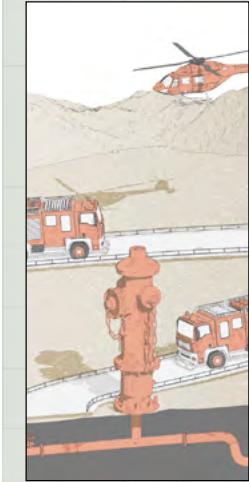
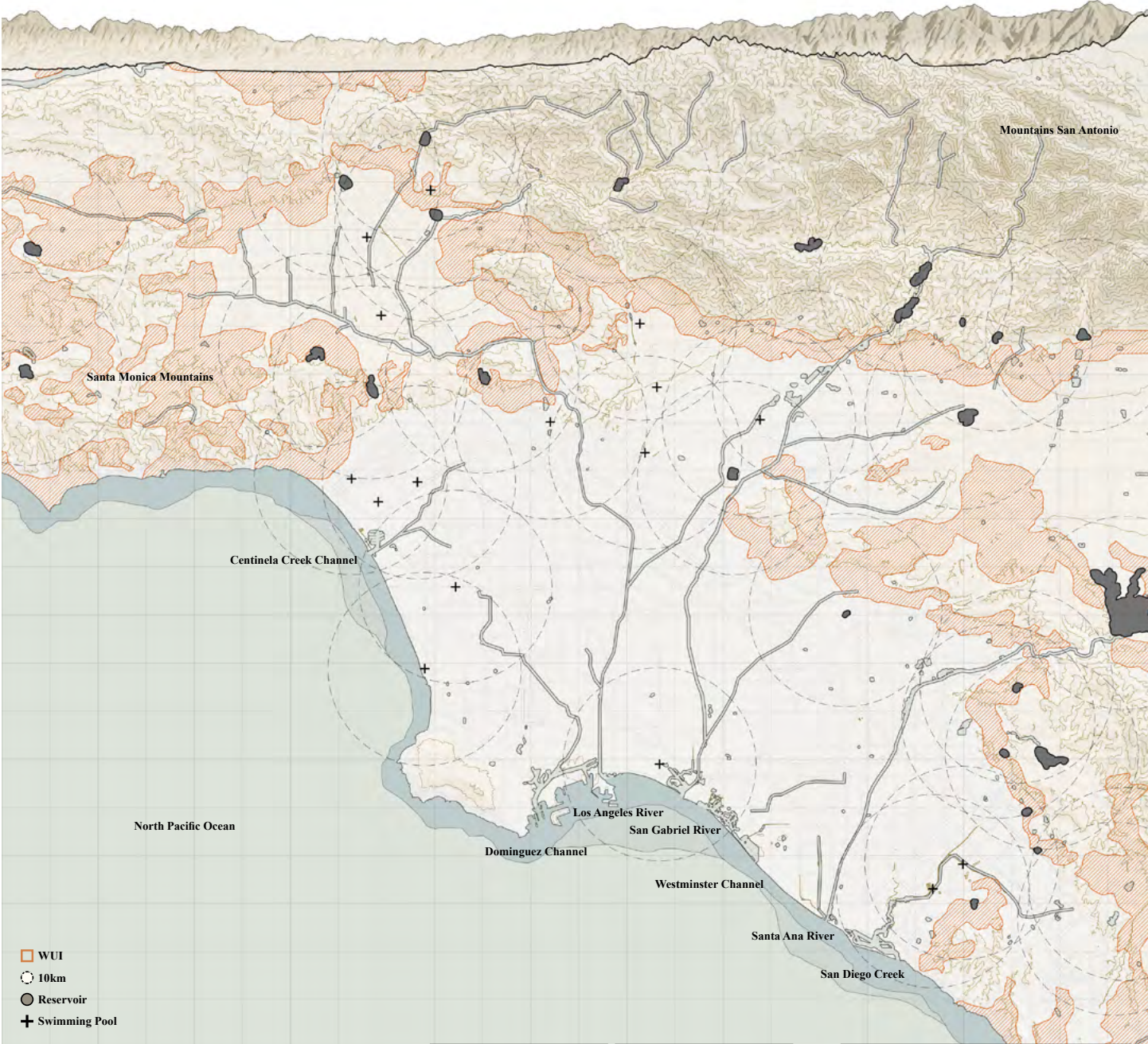
Location: Los Angeles, USA

Team: Meng-Syun Sung , Minjae Kim, Seungho Yang (3)

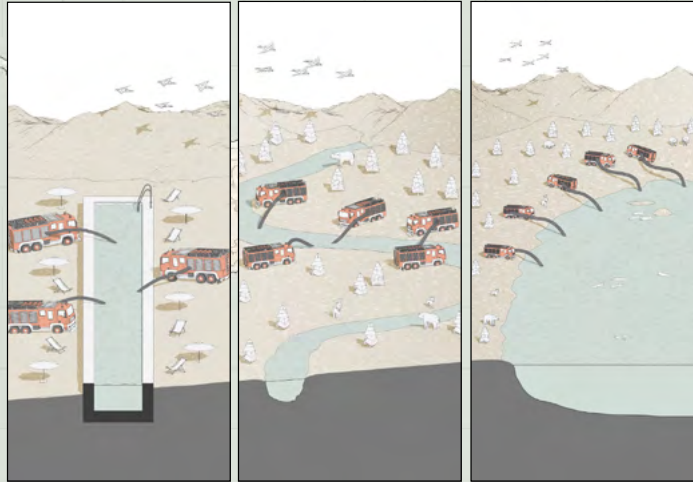
Instructor: David Eugin Moon

Can infrastructure bridge the rift between urban protection and ecological restoration?

This project proposes a "Hydro Firebreak" along LA's State Route 57 to transform a divisive highway into a restorative spine. By utilizing a modular, rainwater-harvesting structure, the design creates a dual-purpose system: a public linear greenbelt for residents and a high-capacity reservoir for active wildfire suppression. During emergencies, the structure replenishes fire trucks and deploys external irrigation to extinguish flames. Complementing this axis are lightweight, adaptable pavilions near existing creeks that serve as community hubs and temporary shelters. Integrating eco-bridges to reconnect fragmented habitats, the proposal reclaims infrastructure as a vital metabolic link between nature and the city.



Municipal Water System
The Los Angeles Fire Department relies on fire hydrants in the municipal water system, maintained by the DWP. Fire truck tanks provide limited water for initial firefighting, but low hydrant pressure can hinder efficiency.



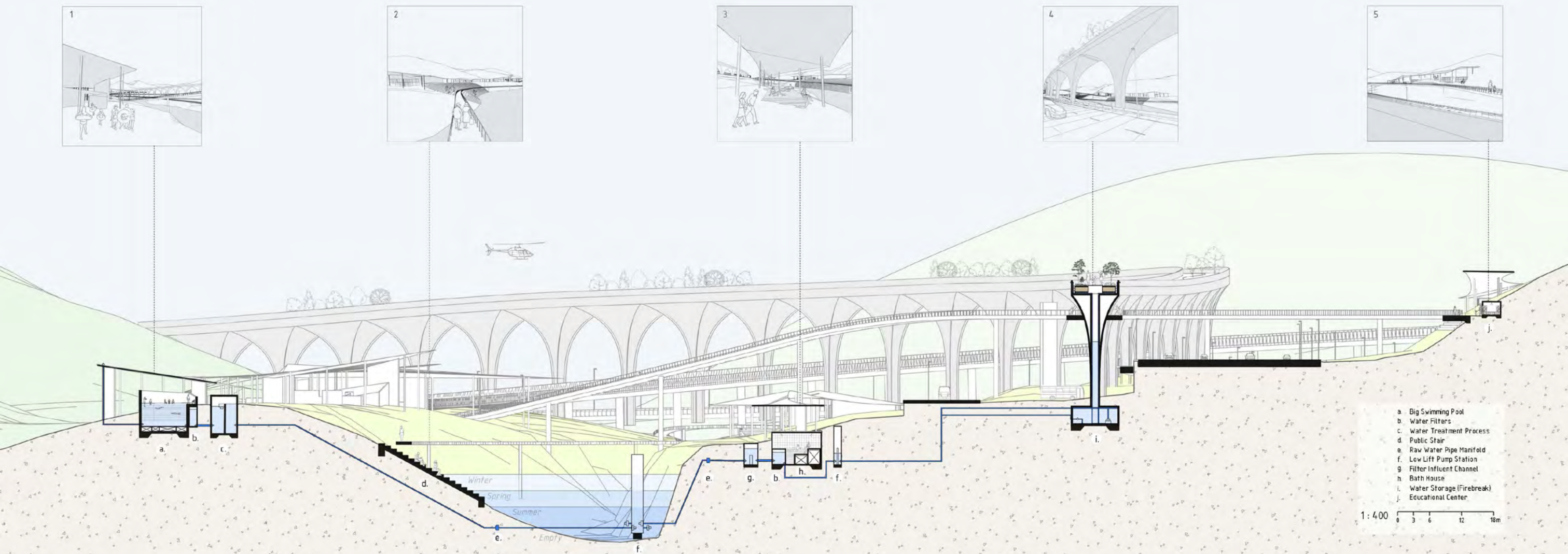
Backup Water Source- Pool, River, Reservoir
When fire hydrants lack pressure, firefighters turn to backup water sources like rivers, reservoirs, or natural water bodies, and artificial sources such as swimming pools or retention ponds. In the 2025 LA wildfires, the Pacific Palisades Reservoir dried up, forcing firefighters to draw water from street puddles or distant pools, highlighting severe shortages. The distance and accessibility of these sources, especially in WUI zones, directly impact firefighting efficiency and fire control.



Resource Gaps in WUI zones
Overlay analysis reveals that WUI zones with limited backup water sources (e.g., reservoirs and swimming pools) within a 10 km drive are highly vulnerable to wildfires. The 2025 LA wildfires exposed these gaps, hindering firefighting efforts. These areas are potential sites for architectural interventions to bolster firefighting resources.











Symphony of Fermentation

An Interactive Sonic Exploration of Microbial Architecture

04

Academic Project | Team Work
Selected for AAD Edible Summits

Year: 2026

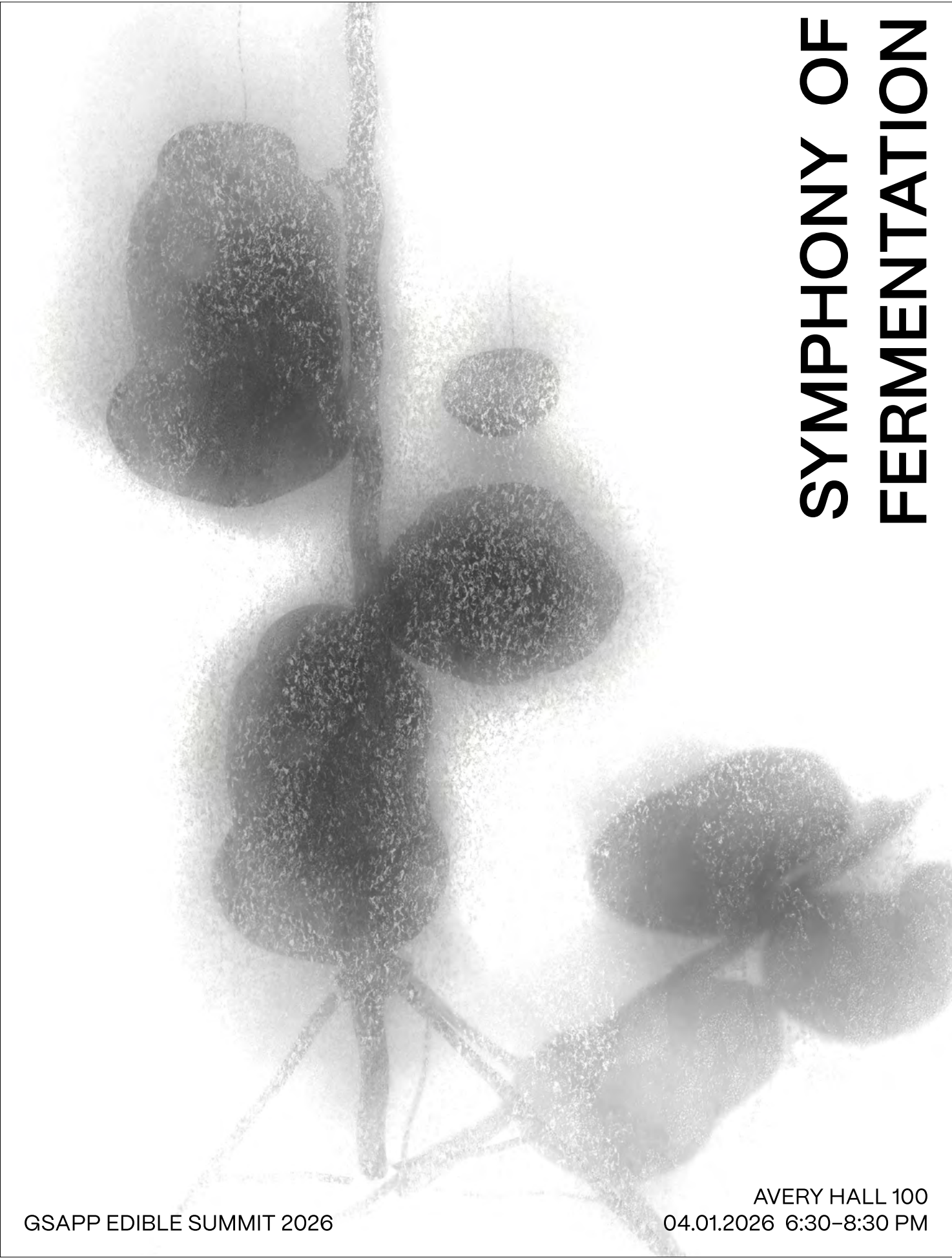
Location: Avery 100, New York

Team: Meng-Syun Sung , Hyeseong Kim, Sungjik Kin, Nicole Kertzhus (4)

Can architecture be heard through the rhythms of microbial life?

Fermentation explores the invisible world of microorganisms, transforming biological processes into an immersive sonic environment. Featuring seven pedestals—from kombucha to sourdough—the installation translates the three stages of fermentation into a living soundscape. Through physical pulleys and interactive triggers, visitors engage with microbial bubbling and activity, layering individual sounds into a collective, organic symphony. By providing recipes for home cultivation, the project extends beyond the gallery, challenging us to view architecture not as a static object, but as a temporal, living system shaped by interaction and biological time.

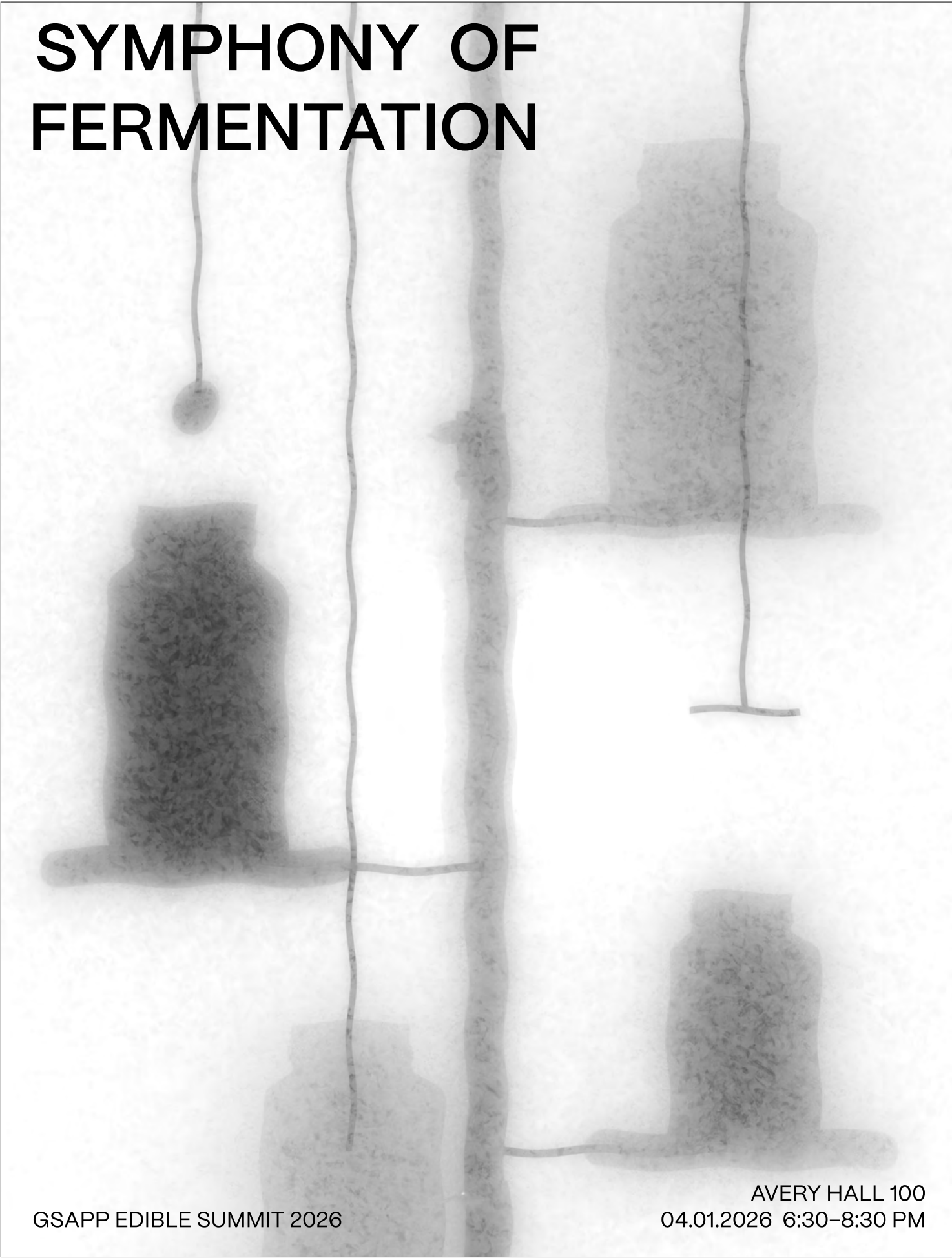




SYMPHONY OF FERMENTATION

AVERY HALL 100
04.01.2026 6:30–8:30 PM

GSAPP EDIBLE SUMMIT 2026



SYMPHONY OF FERMENTATION

AVERY HALL 100
04.01.2026 6:30–8:30 PM

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