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Rethinking the Design of Refugee Camps

THE ISSUES

- Sanitation and hygiene** are a major issue in refugee camps as they are often crowded, quickly constructed, and exceed their design capacity.
- Access to clean water is a problem in many parts of the world, but in refugee camps, water shortages occur regularly, so water must be trucked in, which is time and resource intensive.
- Greenspace is rarely considered when constructing a camp, but when implemented, it provides a microclimate that minimizes dust and heat, provides communal space, and has proven trauma healing properties.

Refugees are recovering from traumatic circumstances, coping with the loss of their homes, communities, and potentially their families. This is compounded by the stress of camp life.

Refugees in camps have little control over their physical, economic, and communal environments as there are few opportunities for employment or community building.

Refugee camps are chronically underfunded and reliant on outside food sources. Thus much of the food is highly processed and food shortages are common.

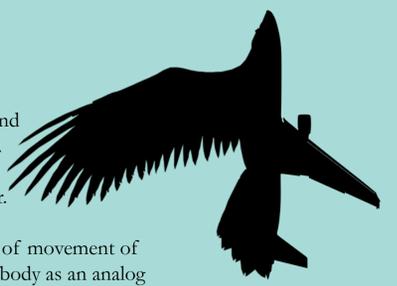
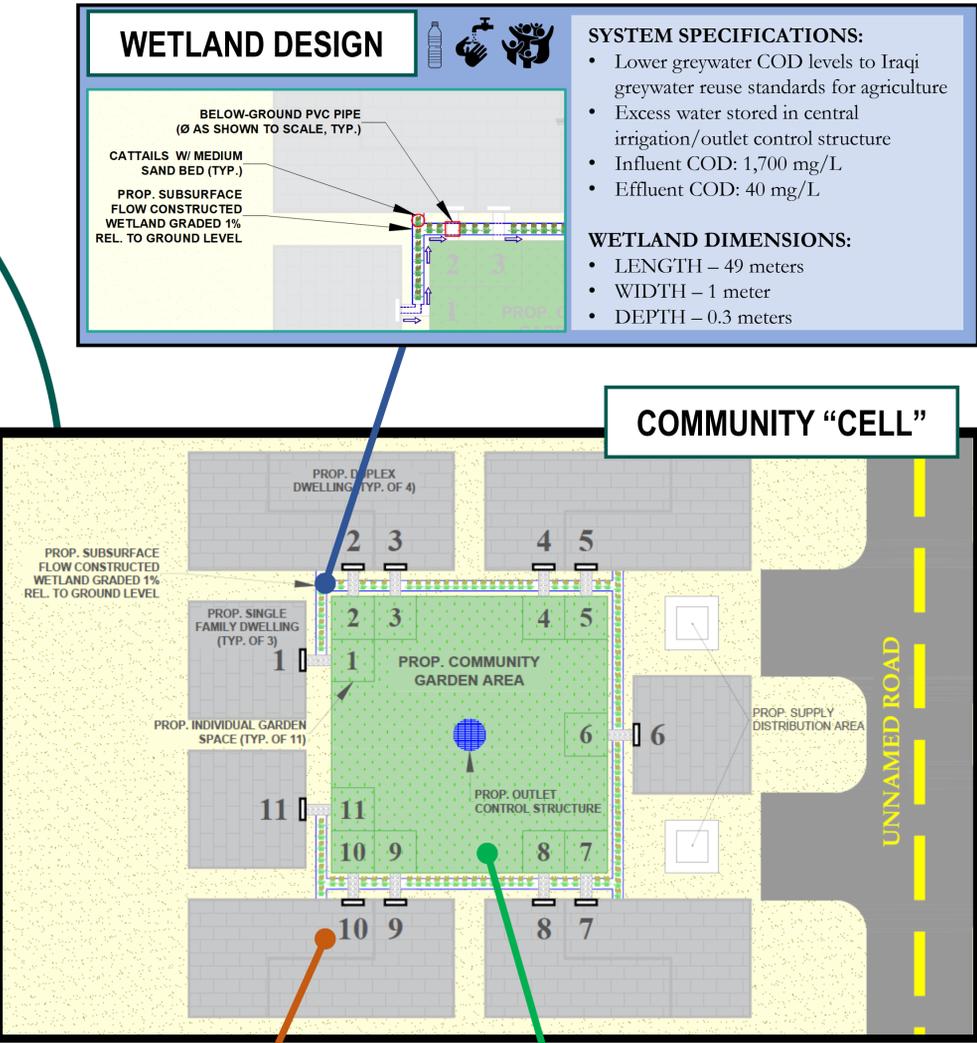
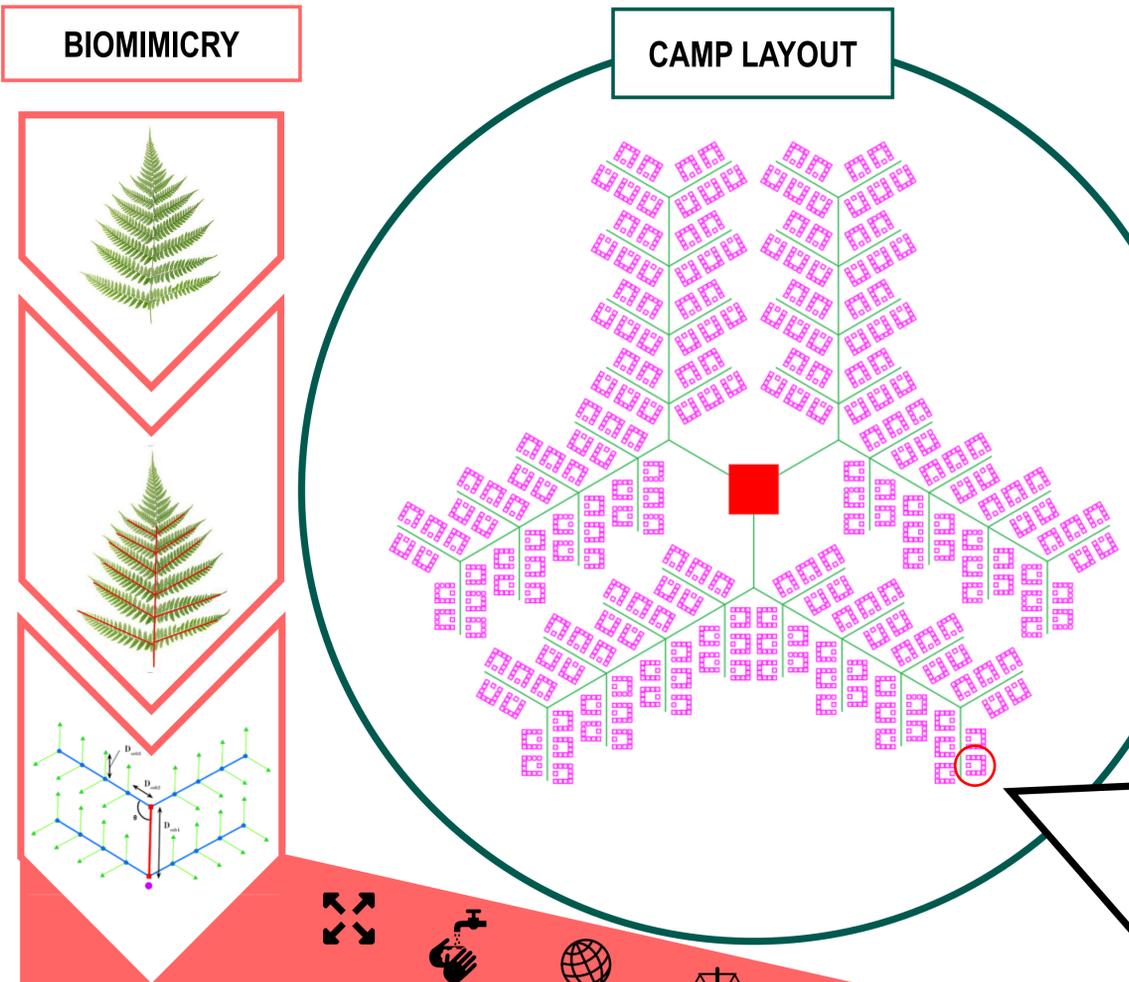
DESIGN GOALS

- EXPANDABILITY:** We looked to biological processes that involved growth so our layout would be able to expand as more refugees came. Camps that are designed to be static often struggle with populations exceeding the designed capacity and cannot accommodate the modifications a mature camp requires.
- SPACE UTILIZATION:** In refugee camps, efficient use of space might seem synonymous with a high population density. In reality, to best use the space we are given, we had to consider the other possible uses of camp space, such as informal markets, communal spaces, and modifications as a camp matures.
- SUSTAINABILITY:** We valued processes that maintained and supported the local environment, but also the economics and social components of the host and refugee community.
- EQUITY:** We found that many camps struggled to provide equitable access to centralized resources due to the nature of the layout. By creating a more radial layout, we enhanced the equity of access.
- ADAPTABILITY:** Refugee camps vary greatly depending on the location and constituents of the camp. Creating systems that could be modified for different needs was a major goal in the hopes that it would lead to a more universal design.

BIOMIMICRY

Biomimicry is a process that requires nature and biology to be the core inspiration for a design. However, a nature-inspired design often goes far beyond what biology could have hoped for.

In our layout, we aimed to look at the pattern of movement of resources between the fern leaves and central body as an analog for roads and pathways moving people and resources between central locations and smaller communities in the camp.

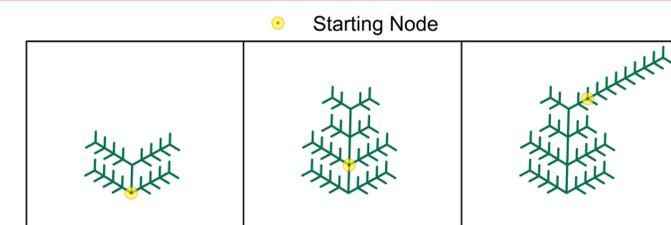



ARCGIS LAYOUT PLANNING TOOL

DESCRIPTION: An ArcGIS geoprocessing tool created allow camp-planners to most effectively implement the fern inspired layout in a manner that optimizes *expandability* and *adaptability*.

HOW TO USE IT: Users input the starting node, desired population and max number of subbranches per branch. Combined, these parameters define the shape and size of the layout.

TECHNICAL DETAILS: The tool uses a fern fractal classification system, storing the layouts geometry in points and polyline feature classes with a coordinate system of the user's choice. The tool then uses a fractal plotting algorithm to create new geometry upon each run of the tool.

Population: 7,000 Population Change: +7,000 Max Level 1 Nodes: None Max Level 2 nodes: 4	Population: 10,500 Population Change: +3,500 Max Level 1 Nodes: None Max Level 2 nodes: 2	Population: 10,500 Population Change: +3,500 Max Level 1 Nodes: None Max Level 2 nodes: 2
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SHELTER LAYOUT

DESCRIPTION: Shelters are arranged around a centralized greenspace courtyard to provide equitable access and community.

KEY FEATURES:

- Each dwelling is assumed to house 4 adults and is sized based on the UNHCR guideline of 45 square meters per person
- Each "Cell" contains 11 dwellings, total "Cell" population is 44 residents
- Corner plots are built as interlocking "L" shapes to optimize equitable access to the central resources.

GREENSPACE DESIGN

DESCRIPTION: Residents of each "Cell" have access to a central greenspace courtyard, providing opportunities for enhanced mental health, better livelihood, and resource supplementation.

KEY FEATURES:

- Each dwelling allotted 16 m² of private greenspace in addition to the shared community garden
- Residents have control over specific planting and use of their private plots and the shared greenspace area
- Watered using subsurface textile irrigation (SSTI)
- Water supplied by effluent from greywater treatment system

ACKNOWLEDGEMENTS

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