FANTASY ISLAND

Karen M'Closkey

GRADUATE OPTION STUDIO • DEPARTMENT OF LANDSCAPE ARCHITECTURE • UNIVERSITY OF PENNSYLVANIA

Image by Luke Van Tol

This book is a collection of select projects that were completed in 2017-18 in the department of landscape architecture at the University of Pennsylvania. The studio, guided by Karen M'Closkey, focused in and around Puerto Baquerizo Moreno on San Cristóbal Island, the Galápagos Islands, Ecuador. Together, the projects offer a landscape-based framework for future development as the island continues its rapid population growth.

Book Designer: Zhexuan Liao + Yang An + Dorothy Jacobs

ACKNOWLEDGMENTS

Though only seven projects are included here, this studio benefited from the efforts and inspiring work of each and every student who took part in the studio. I am grateful to them and to all of those in Ecuador who shared their time with us on our studio trips. In particular, I would like to thank: Michael Weisberg, who first invited us to work in the Galápagos; Ernesto Vaca, our intrepid guide; Fausto Rodriguez and Bonnie Arcos from Galápagos Best. This studio was supported by funding from a Penn Global Grant, a Penn Making a Difference Grant, and Penn's Program in Environmental Humanities. Many thanks are also owed to the Dean's Office at the Stuart Weitzman School of Design. Our adventurous travels would not be possible without this support. I would also like to thank Dorothy Jacobs, Toni Rinaldi, and Keith VanDerSys for collating and distilling the studio work into the drawings that precede the individual student projects.

CONTEXT

Instead of asking what capitalism does to nature, we may begin to ask how nature works for capitalism.[1]

Image by Zhexuan Liao

The "Galápagos Paradox"

Ecotourism employs capitalist mechanisms to address problems of capitalist development itself.[2]

Islands hold a special place in the imagination, perhaps none more so than the Galápagos Islands, Ecuador, a place long considered a "natural laboratory" and "secular pilgrimage site" ever since it provided the locus for Charles Darwin to develop his theory of evolution by natural selection. Named a UNESCO World Heritage site in 1979, the archipelago is considered scientifically significant due to its high rates of endemism. Given the absence of an indigenous population and the late arrival of humans–settlement did not begin until the early to mid-nineteenth century–the archipelago remained relatively untouched by people, giving scientists a window through which to witness and study evolutionary processes free of human "disturbance." Ninety-seven percent of the land is conserved by the Galápagos National Park (est. 1959), and another 50,000 square miles are protected in the Galápagos Marine Reserve (est. 1998). No one, including residents, can enter most of these areas without a paid guide and thus many residents do not spend time in this "97%." In an attempt to protect the biodiversity of the islands, immigration was banned in 1998, yet population continues to grow from births as well as migration of mainland Ecuadorians in search of jobs. Tourism, the archipelago's biggest industry, is threatening the very nature it was meant to preserve. Though ninety-five percent of the islands' pre-human biodiversity remains intact, due to how the islands have been managed this relatively pristine natural environment faces challenges, as do the island's human inhabitants.

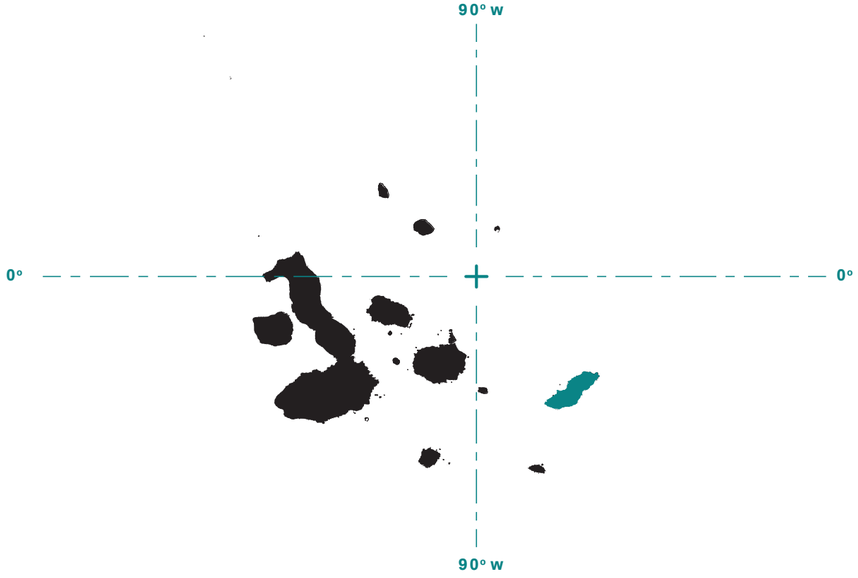
When Charles Darwin first set foot on San Cristóbal Island in 1835, there were only a few hundred inhabitants in the Galápagos (a penal colony on Floreana Island). Today, there are at least 30,000 residents living on four islands (Santa Cruz, San Cristóbal, Isabela, and Floreana). Most of this growth has occurred in the last forty years due in large part to the creation of a market for ecotourism as a means to preserve the Galápagos. This has resulted in what is referred to as the "Galápagos Paradox." The islands are promoted as a pristine place to visit, thereby increasing the flow of goods and tourists, which introduces new species and requires an increasing population to supply labor. Conversely, tourist-generated revenues provide much of the funding to protect and maintain the national park. The cycle continues. There is no simple "fix" for the Galápagos Paradox–there are divergent ideologies at play in how nature is valued, what nature is valued, and for whom.

In 1969, the Galápagos Islands were the first place in the world to be designed an ecotourism destination.[3] The archipelago was imagined as an example to the rest of the world–or at least to the western imagination–as a place where one could step back in time and experience the bounty of an untouched landscape. This proved to be very popular, and profitable. Between 1990-2009, the number of tourists rose from 40,000 to over 160,000 per year. In 2007, UNESCO declared the Galápagos Islands a World Heritage Site at Risk–the following year tourist numbers increased. Current estimates put annual tourist visits at over 200,000.

As a means to minimize impact on the terrestrial ecosystems, tourism was initially water-based. Visitors stayed on "boat-hotels" where all food and amenities were supplied. The problem was that this did not benefit Galápagos' residents who were not directly involved in tourism. This has changed in the last two decades or so–recent estimates put land-based tourist visits at 45% (55% remain water-based, which is much more expensive). And though tourism accounts for 65%-70% of the islands' GDP, some estimate that the amount retained in the archipelago is only between 7-15%. Whether land or water-based, workers are needed to support the increase in tourism. Population growth rates are at least triple what they are on mainland Ecuador. Immigration to the islands (other than through marriage) was banned in 1998, while tourism growth has not been successfully limited even though the pressures on the local environment and people originate from developing the Galápagos as a tourism destination. In addition to lack of controls on tourism, several obstacles to preventing further habitat degradation and pollution have been cited: abandoned farmland, which has higher rates of invasive species; exploitation of resources for short-term profit; limited knowledge by residents–especially those who were not born there–about the uniqueness of the Galápagos; and decision-making that is based in mainland Ecuador and at the hands of internationally-based NGOs, which have failed to politically engage Galapagueños. This last condition is rooted in a mind-set that has long seen science and conservation as politically neutral.

The Islands provide a concentrated place to consider the tension between biodiversity conservation and economics rooted in the cross-section between the global discourse of "ecotourism" and the local livelihoods that have been left out of conversations about prohibitions on island activities. By rooting the problems in the 3% unprotected area, a binary between nature and society–conservation and people–is reinforced; it is a line that ignores the permeability between these spheres. In this studio, students were asked to operate on these lines of demarcation in order to locate conceptual, material, and programmatic areas of permeability.

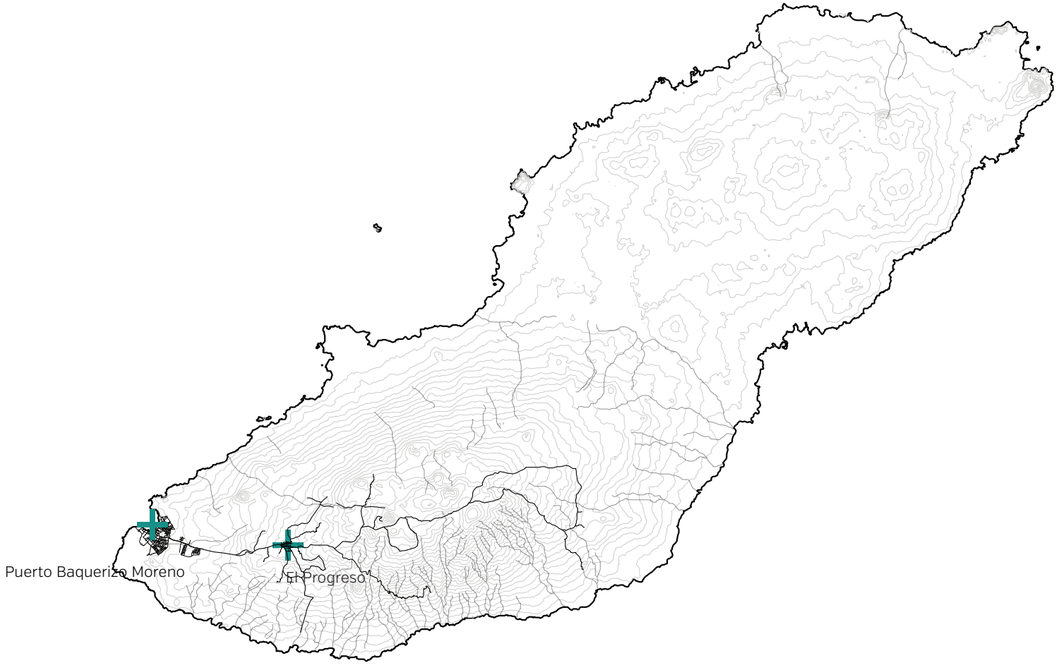
[1] Jason W. Moore, Capitalism in the Web of Life (2015), 12.
[2] Robert Fletcher and Katja Neves, "Contradictions in Tourism: the Promise and Pitfalls of Ecotourism as a Manifold Capitalist Fix," *Environment and Society: Advances in Research* 3 (2012): 60.
[3] Filippo Celataa and Venere Stefania Sanna, "The post-political ecology of protected areas: nature, social justice and political conflicts in the Galápagos Islands," *Local Environment* 17: 9 (October 2012): 981.



SAN CRISTÓBAL ISLAND

San Cristóbal is the easternmost island in the Galápagos archipelago, as well as one of the oldest geologically. It is administratively part of San Cristóbal Canton, Ecuador.

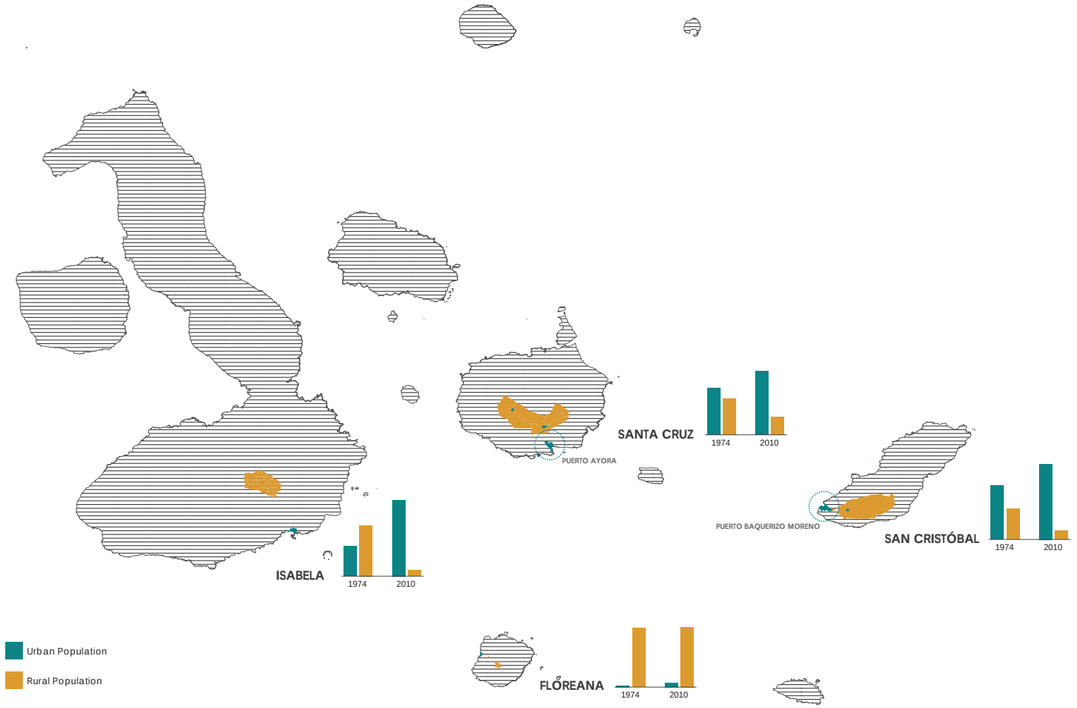
San Cristóbal Island is roughly 215 square miles with a peak elevation of 2,400 feet. It is the second most populous island in the archipelago, after Santa Cruz. Puerto Baquerizo Moreno, a town of at least 8,000 residents, is located at the south-western tip of San Cristóbal.



Right: Drawing by Zhexuan Liao

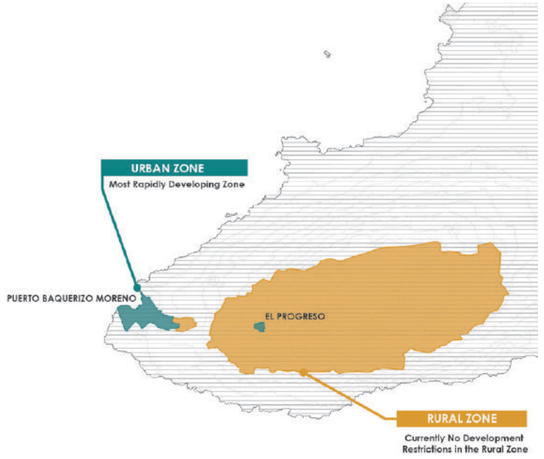
Galápagos Town Growth

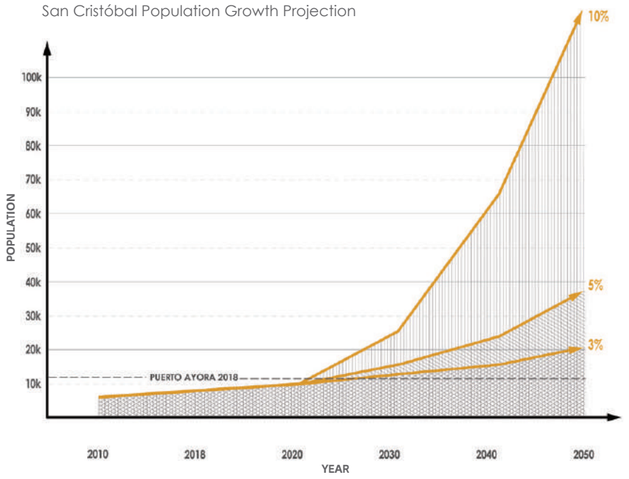
Due to the growth of tourism, rural residents gradually move to the towns. While the urban areas remain the same physical size, the urban population density has increased dramatically during the past 30 years.



Resource: TourismReport_Charles Darwin Foundation/ Galápagos Report 2011-2012

San Cristóbal Town Growth

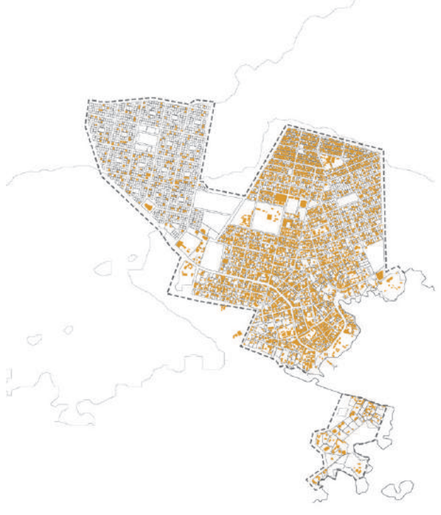




Puerto Ayora - Puerto Baquerizo Moreno Comparison

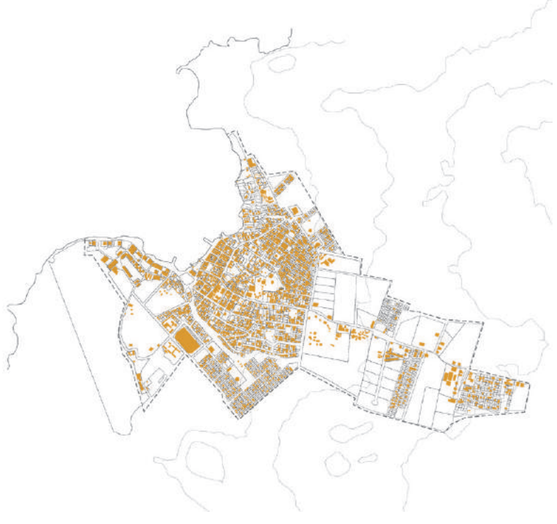
PUERTO AYORA - 2018

Estimated Population: +/- **20,000**



PUERTO BAQUERIZO MORENO - 2018

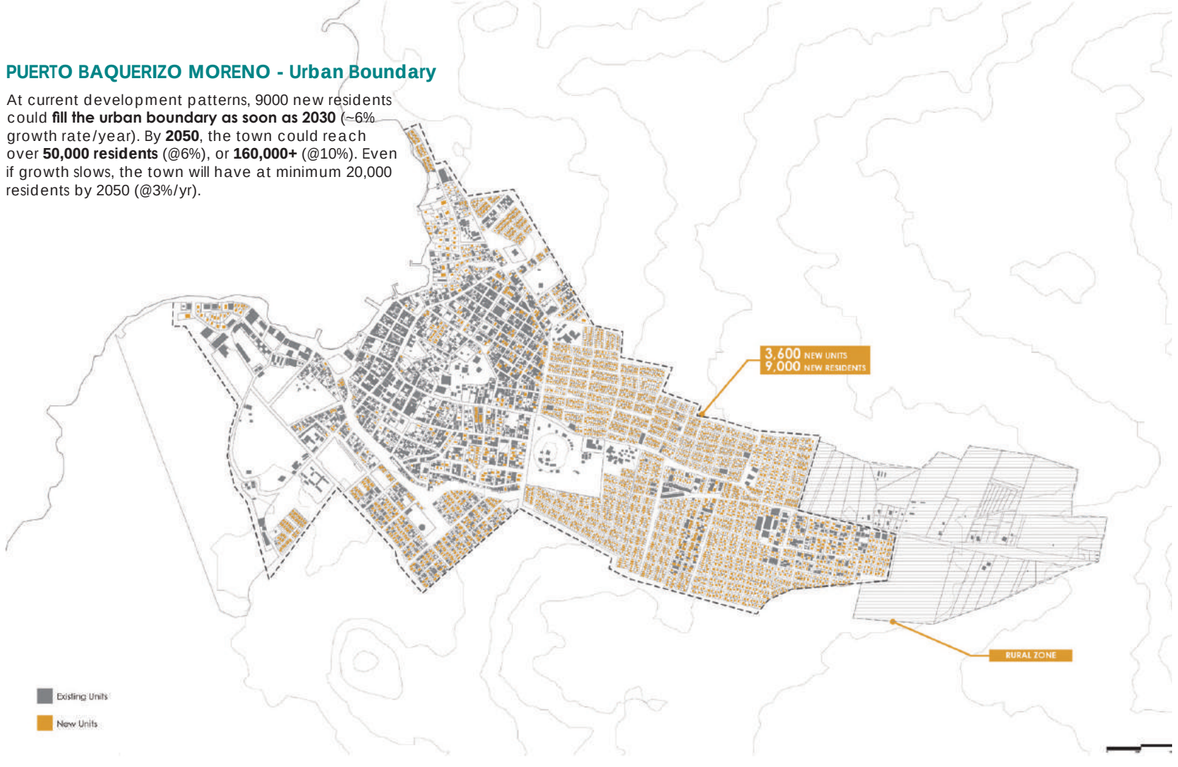
Estimated Population: +/- **8,000**



Puerto Baquerizo Moreno - Current Development Trend

PUERTO BAQUERIZO MORENO - Urban Boundary

At current development patterns, 9000 new residents could **fill the urban boundary as soon as 2030** (~6% growth rate/year). By **2050**, the town could reach over **50,000 residents** (@6%), or **160,000+** (@10%). Even if growth slows, the town will have at minimum 20,000 residents by 2050 (@3%/yr).



Ravines

Section 1

Section 2

Section 3

Section 4

Section 5

Section 6

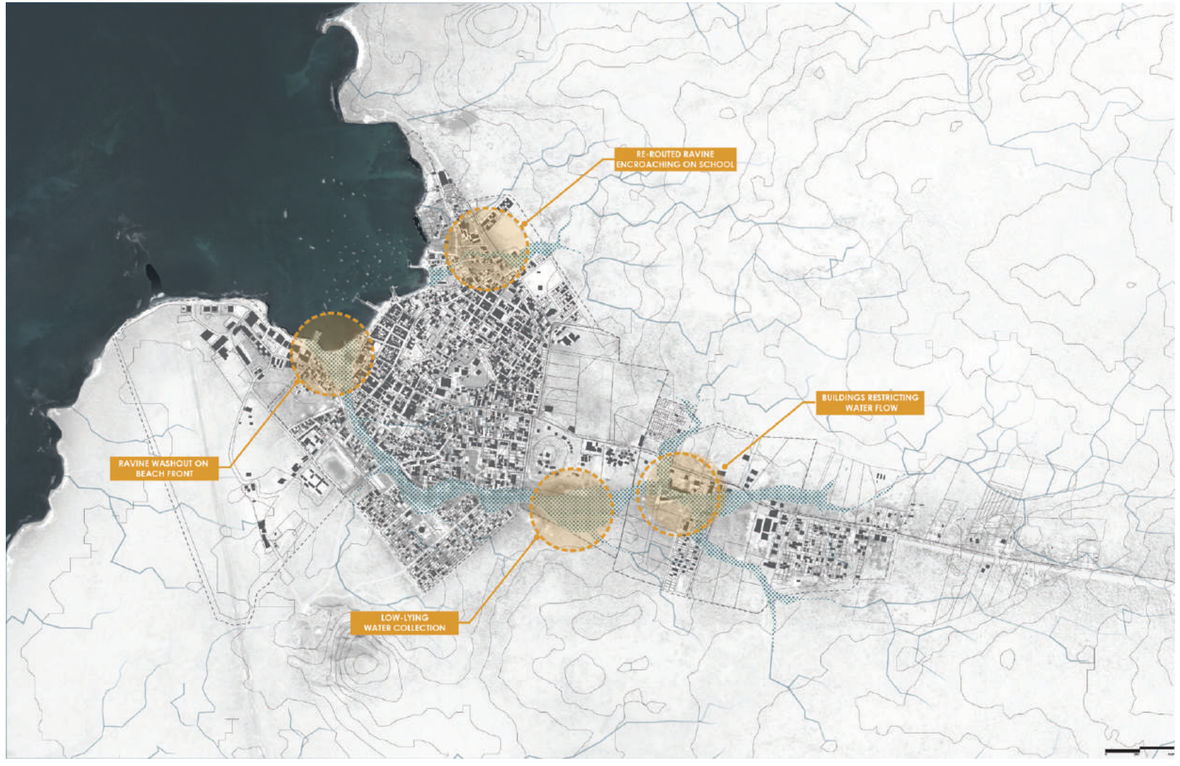
Section 7

Section 8

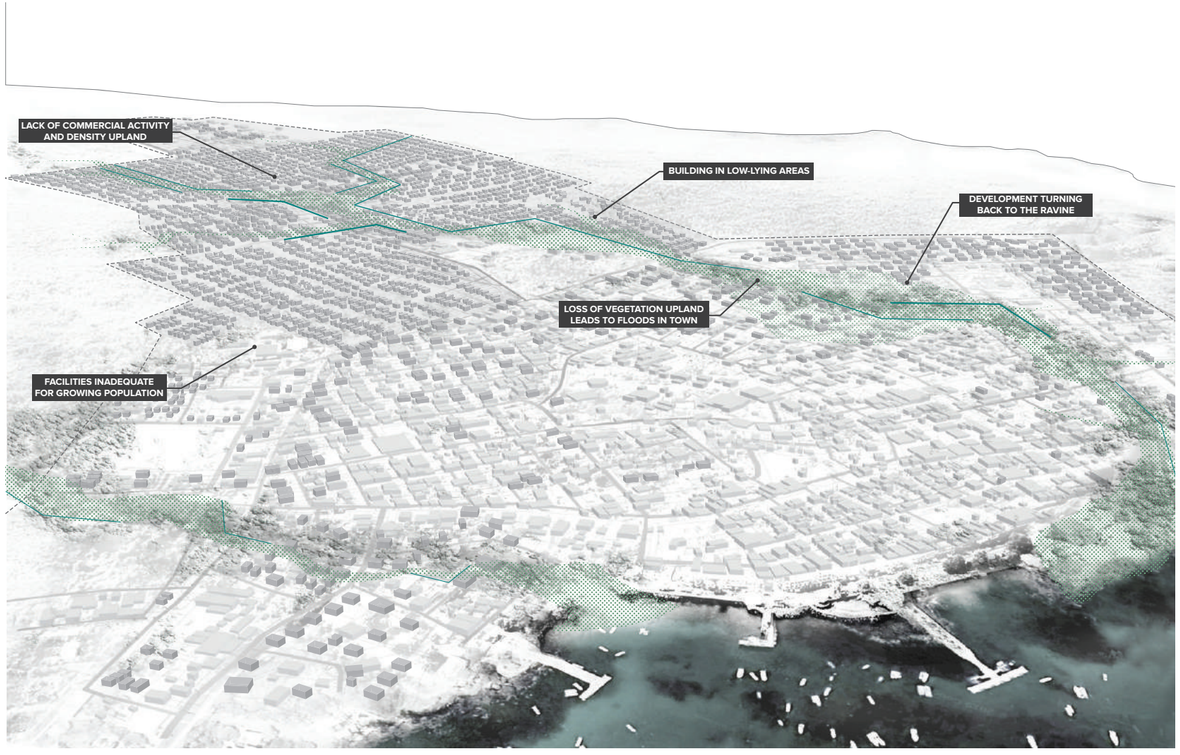
Development close to Ravine

Ravine & Road Intersection

Ravines Threatened by Construction Upland

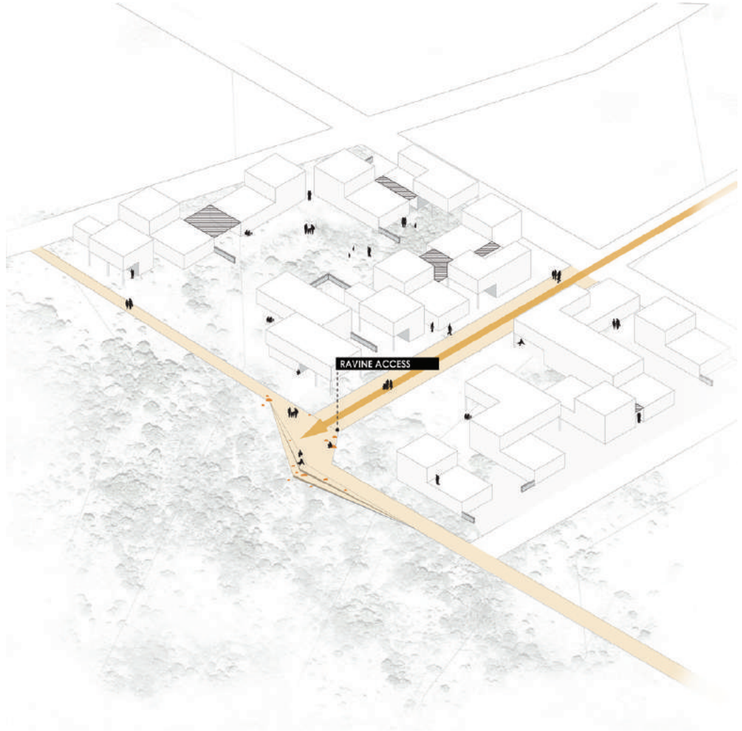


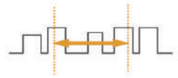
Puerto Baquerizo Moreno - Current Development Trend



Potential Development Strategies

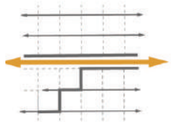
Establish the Ravine as Public Space and Create Local Access Points



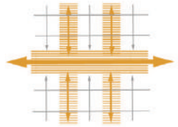


Current: Construction in the Ravine and other Collection Points

Proposed: Preserve the Ravine as Public Space with Community Access



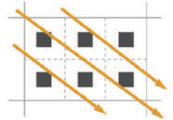
Current: Development Turning Back to the Ravine



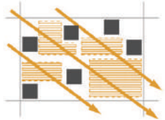
Proposed: Design Streets to Maintain Access to the Ravine

Because roads have been constructed to run parallel to the ravines, residents tend to construct their homes along these main roads, facing away from the ravine. This blocks access to the ravines and causes them to be perceived as abandoned spaces rather than shared assets. Enforcing building setbacks and providing continual access to the ravines will help transform people's perception of them as shared public space.

Protect Low-lying Areas and Vegetation



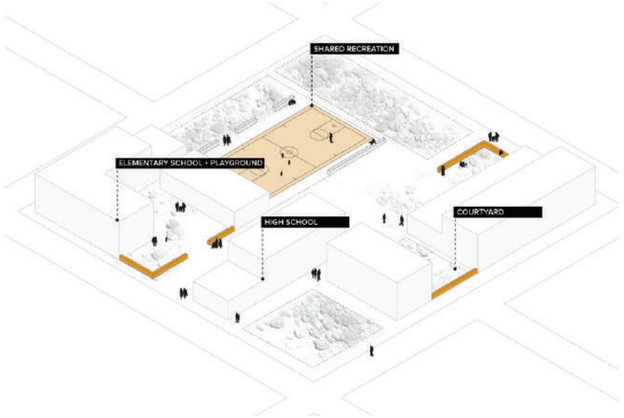
Current: Development Grid Ignores Water Flow and Mature Vegetation

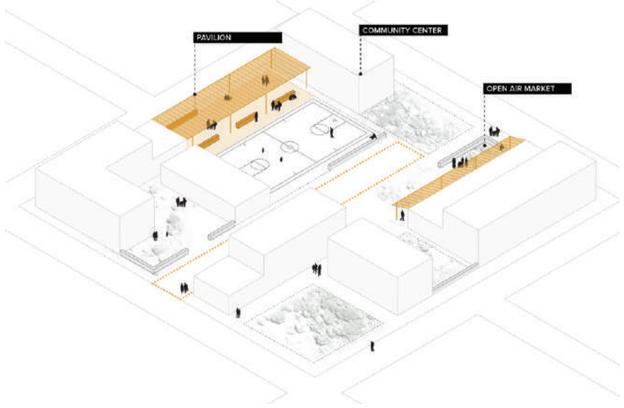


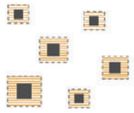
Proposed: Shift Development to Accommodate Water Flows

The majority of land that is likely to be developed outside of the town center is covered with vegetation, which acts as a filter that slows down the water flow from the highlands before it reaches the ravines in town. Completely stripping this area of its existing vegetation for new development would greatly exacerbate the flooding in town. However, this impact can by lessened by creating areas within the new developments that accommodate local flows and preserve the existing vegetation. These areas can become public spaces that form a larger network to connect different neighborhoods.

Create Shared Community Facilities





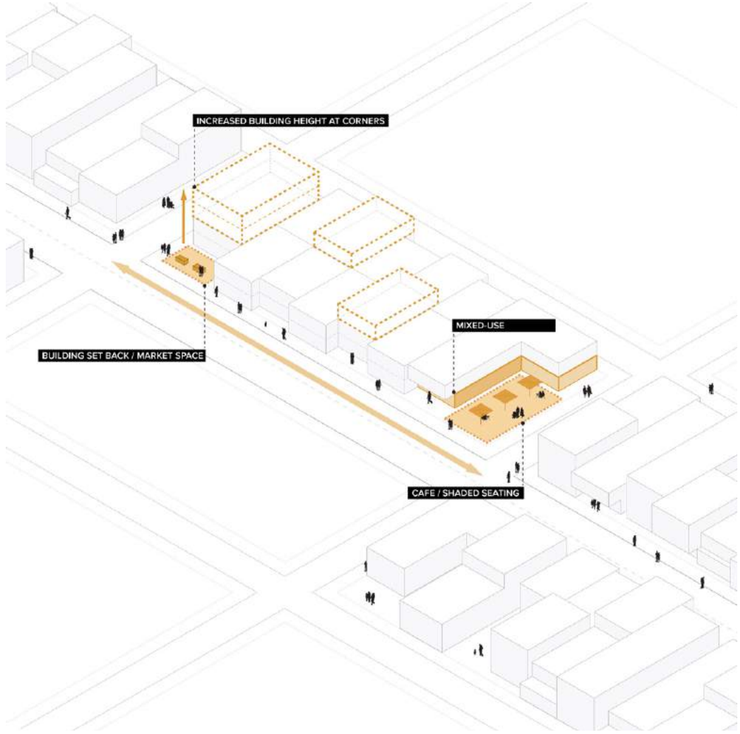


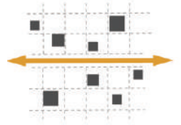
Current: Facilities Inadequate for Growing Population

Proposed: Create Shared Community Facilities to Accommodate Growing

In order to accommodate the growing population, the island will need to create several new schools and other community facilities. Creating larger shared facilities would transform these places into community hubs that are designed to perform a number of different functions for residents.

Densify Corridor





Current: Evenly Dispersed Development Accelerates Loss of Land

Proposed: Continue Mixed-Use development patterns; consider adjusting height restrictions on select streets

Currently, the only area with relative density in Puerto Baquerizo Moreno is along the waterfront. In contrast, more recent developments are following a pattern of single-use residential buildings that are centered in the middle of a lot. Continuing mixed-use development further upland would create opportunities for other businesses. In addition, it is vital to strategically plan areas of denser development to help preserve land for public amenities and to respond to topography and water flow.

STUDIO WORK

Notes and Citations

METHOD

How might students engage the apparent dualisms arising from how the archipelago has been understood and managed, which is based on the construction of many oppositions and boundaries? In order to address this question, the studio began with assignments focused on several exploratory tracks that assisted students in the formation of their designs.

+ Borderlines

Exchanges + Crossings

Though well-intentioned and having provided many positive aspects in terms of wildlife conservation, the boundaries constructed through the management of the Galápagos Islands have sometimes had negative consequences that undermine the very reasons they were devised in the first place. Potential borderlines for investigation included:

- Land and Water: Coastline
- Rural and Urban: Highlands/Lowlands
- Three-percent and 97%: urban/rural v. national park
- Mainland and archipelago: autonomy v. dependence

+ Manifold Structures

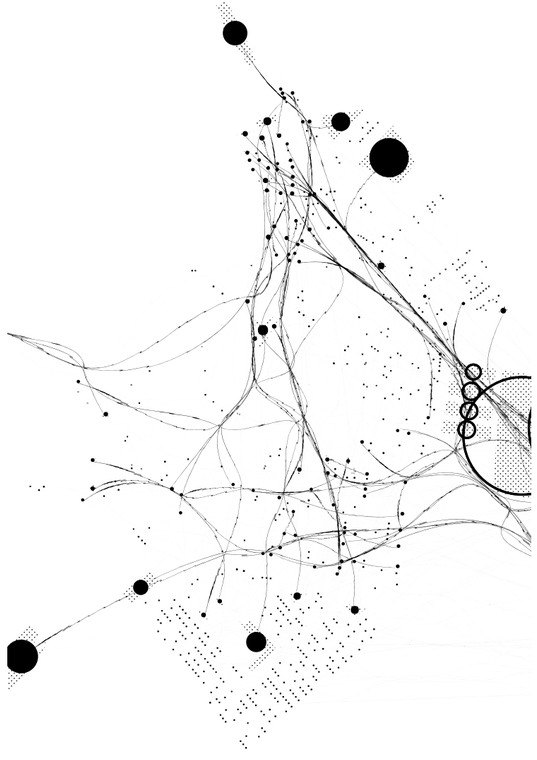
Connections + Overlaps

Students identified existing lines in the landscape, such as hard infrastructure or political boundaries, which provided the basis upon which to build a multiplicity of lines, intersections, and overlaps. They developed drawing methods that enabled them to operate on these physical and legal lines of demarcation, in order to locate conceptual, material, and programmatic areas of permeability. The goal was to identify the potential for hybrid spaces and programs that serve multiple functions–environmental, social, recreational, educational, etc.

+ Liminal Zones

Gradients + Timeframes

In addition to understanding physical, legal, or programmatic interconnections (i.e manifold structures), students were asked to explore their sites in time by visualizing the forces and flows that constitute it under multiple conditions, whether looking at seasonal and cyclical changes, projections pertaining to population growth or climate change, or both.



Drawing by Zhexuan Liao

FOCUS AREAS

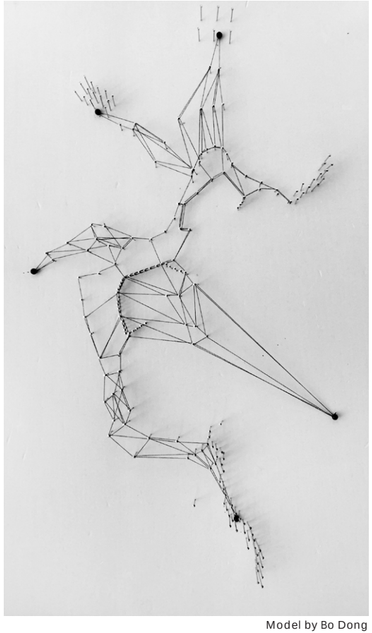
The Galápagos Islands are volcanic, sitting on a continually eastward moving tectonic plate called the Nazca–the islands furthest to the east and south are the oldest and have no volcanic activity while those to the west are active, with new formations still occurring. At least three and a half million years separate the youngest and oldest islands, thus creating vast differences among them. The Galápagos are unique among other islands and archipelagos due to their location–they are equatorial (sitting between one-degree latitude north and south) but are heavily influenced by cool ocean currents, resulting in a mixture of tropical and temperate environments.

+ San Cristóbal Island

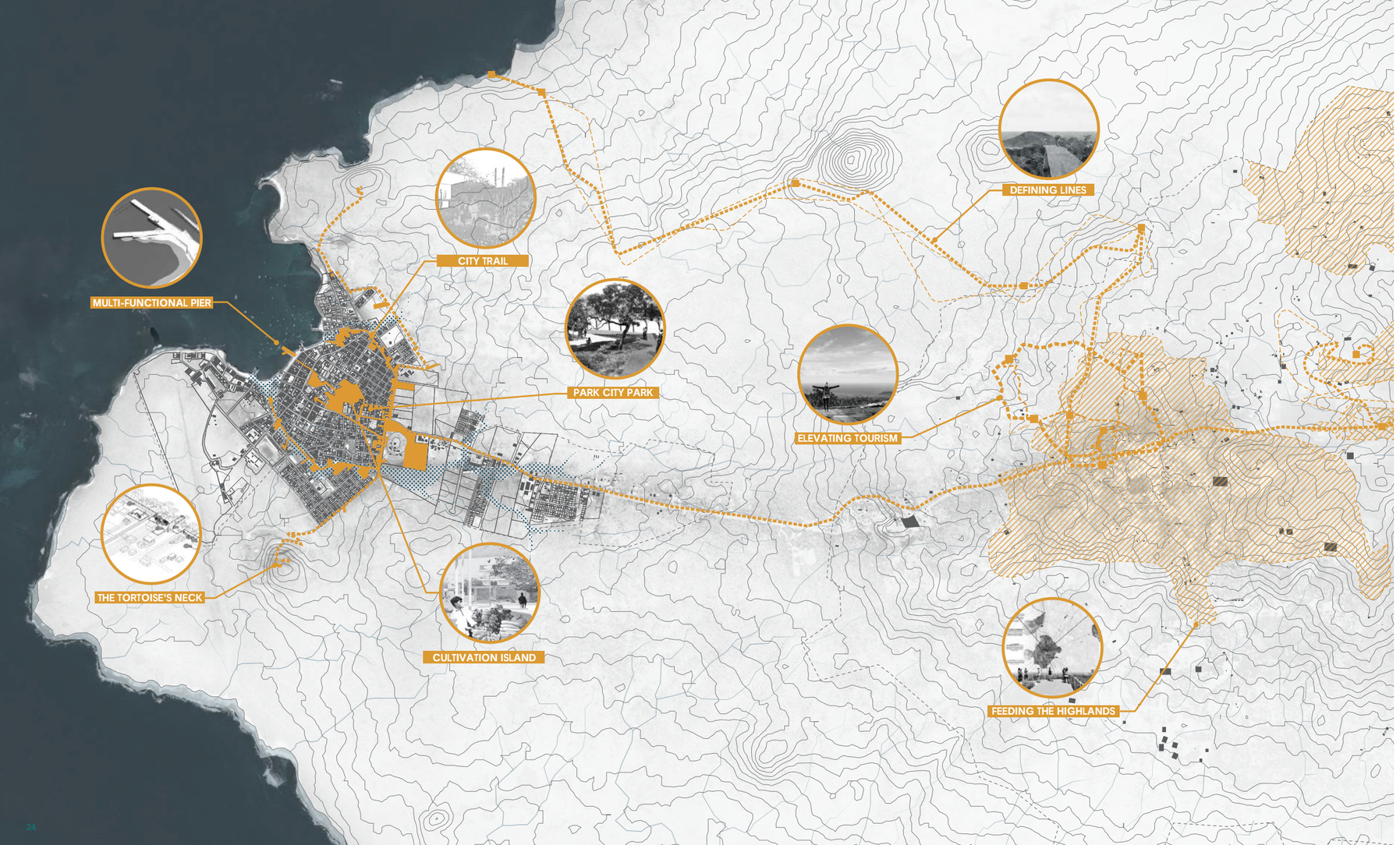
San Cristóbal Island–the famed site of Charles Darwin's first landing spot–is the eastern most island in the Galápagos and the second most populous in the archipelago. It is the most fertile island in terms of arable land and the only one with a fresh water source. Subsistence agriculture has declined but there are some small farms in the highlands that grow cash crops, including coffee and plantains, as well as cattle for beef exports. El Progreso (established in 1869, pop. 500), a town in the highlands of San Cristóbal, remains the oldest surviving settlement in the Galápagos; however, the largest population on San Cristóbal resides in Puerto Baquerizo Moreno, which now numbers at least 8,000 residents. As a port town, it is the site of introduction of many exotic and sometimes invasive species.

The enormous amount of attention that has been paid to the natural environment of the Galápagos has not been extended to the developable areas. There is little to no urban planning and residents suffer from lack of clean water and limited health care facilities. While some concerns are beyond the scope of our studio, there are pressing issues where landscape visualization and design can play an important role: with an economy dependent almost solely on water-based activities–tourism and fishing–sea-level rise could adversely impact waterfront use and access, and more volatile weather patterns will have wide-ranging effects on the flora and fauna. The coastal areas must be designed to adapt to such changes and benefit both human and animal residents. A more immediately pressing issue is to consider where an increasing population will live. At a current growth rate of 6.4%/year, compared to 2% on the mainland, San Cristóbal's population will double in just over ten years, and development is already butting up against the National Park border. Lastly, development of public space amenities are focused primarily on the waterfront, frequented by tourists, and constructed with a seawall that removed the mangrove and beaches along most of the town. Though residents can use this waterfront and remaining beaches, the town is lacking other forms of public space, and recreational areas tend to be mono-functional or underutilized.

Our task was not to provide single solutions to problems; rather, the projects are speculations that are grounded in the realities of the Galápagos and hold together complex and conflicting positions, using visualization and design as a means to negotiate among them. Each proposal was developed in response to one or more of the issues outlined above, and its specific location and programming were based on what students discovered in the first four weeks of the semester and studio trip. Throughout the studio, students were asked to "test" their position and proposal with different assumptions (of which they had no control, such as population trends or climate change), and, within those scenarios, they had to continually to ask who or what benefited from any proposed changes.



Model by Bo Dong



01

DEFINING LINES

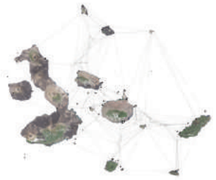
Dorothy Jacobs

The boundary between the National Park and the inhabited areas of San Cristóbal has created a divide which unfairly prioritizes certain areas of the island, leaving the inhabited areas neglected. The island's preservation and local economy is dependent on the revenue brought in by tourism. However, the nature of the tourism industry in the archipelago reinforces the divide within the island. The reliance on water-based tourism has caused the land within the Highlands to be disregarded, leading to abandonment and widespread invasive coverage. The creation and construction of an expansive trail network in the Highlands will begin to mend this division and draw more tourists into the Highlands. The three distinct trails connect visitors across the Highland's rich ecologic, geologic, and cultural features, expanding visitors' expectations and understanding of the island. These trails will function as a way to puncture the psychological barrier that exists around the park and serve as a protective line through the trail's maintenance and management. In addition, the process of constructing the trail will encourage more collaboration between the different governing institutions and provide more job opportunities for the island's growing population.

SITE ANALYSIS

Water-Based Tourism

On these excursions, tour operators show visitors a curated vision of the islands as the epitome of Pristine Nature. In order to uphold this vision of untouched islands, the boat tours are managed in a way that visitors are not supposed to see another tour boat. This almost mythical view of the islands promotes a vision of a place without inhabitants that leads to a staggering inequality in the overall revenue brought in by tourism.



90%
Of Tourist Sites are in the Coastal/Arid Zones

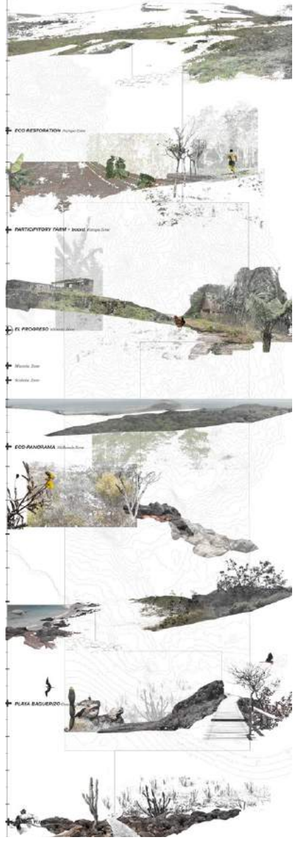
American + Mainland Cruise Ships, Airlines & Travel Agencies maintain majority of revenue

Of the Revenue stays on the Island

$418
million / year

4%
Of Tourist Expenses are spent on the Island

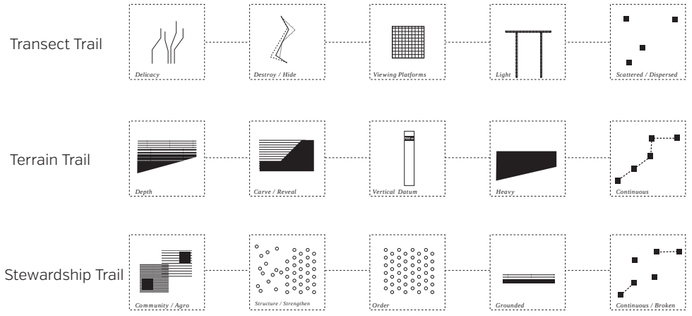
Highland Diversity

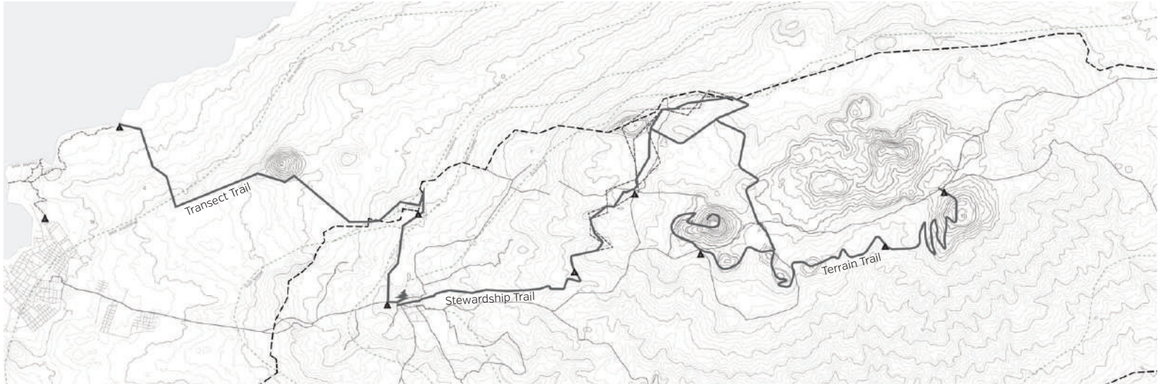


TRAIL PROPOSAL | HIGHLAND ACTIVATION

Trail Strategies & Operations

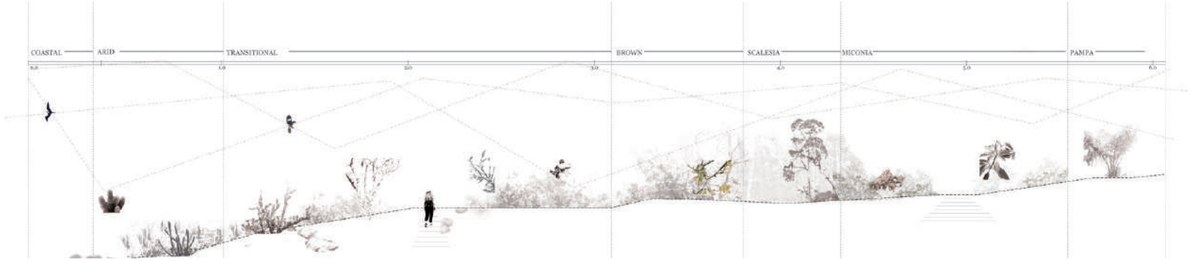
In order to highlight the unique ecological, geological, and cultural features in the Highlands, the proposed trail network is comprised of three distinct trails. Each trail is accessible.

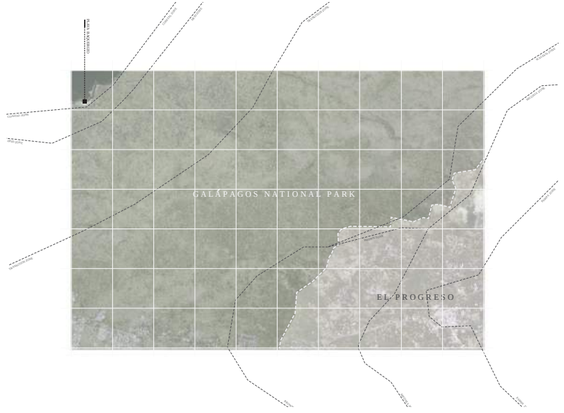




TRANSECT TRAIL

Ecologic Transect





Divided Landscape | Connected Ecosystems

While the island maintains a diversity of connected ecosystems and ecological conditions, the park's border rigidly defines and divides the systems as protected and unprotected. This not only prioritizes certain ecological zones, but it leaves others vulnerable. The Transect Trail connects users through all seven of the island's ecological zones, highlighting the uniqueness of each zone through a series of viewing platforms.

DELICACY AND DISPERSAL

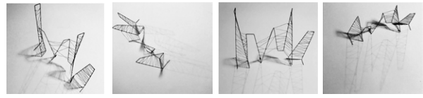
Viewing Platforms

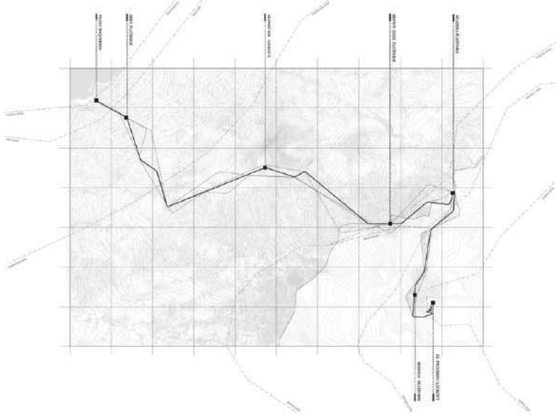
Across the trail, visitors will approach seven distinct platforms that correspond to each of the seven ecological zones. Each platform is meant to make visitors pause and appreciate the unique landscape.

El Progreso Lookout

Scalesia Platform

Delicacy Studies



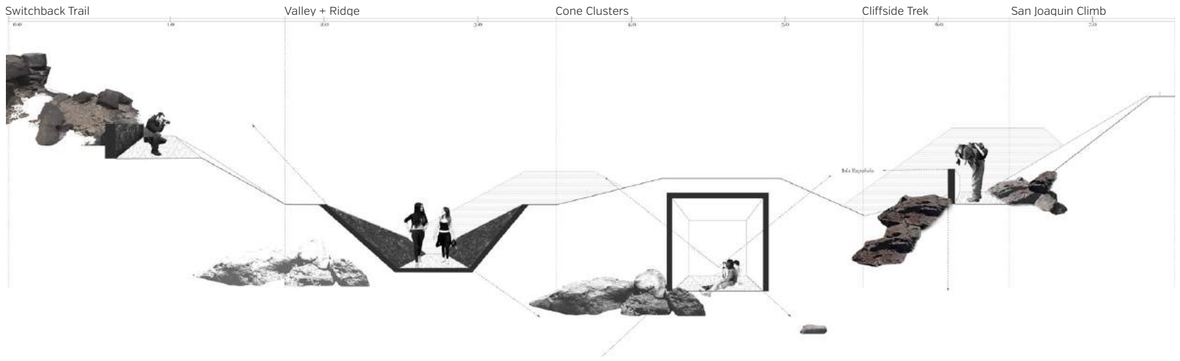


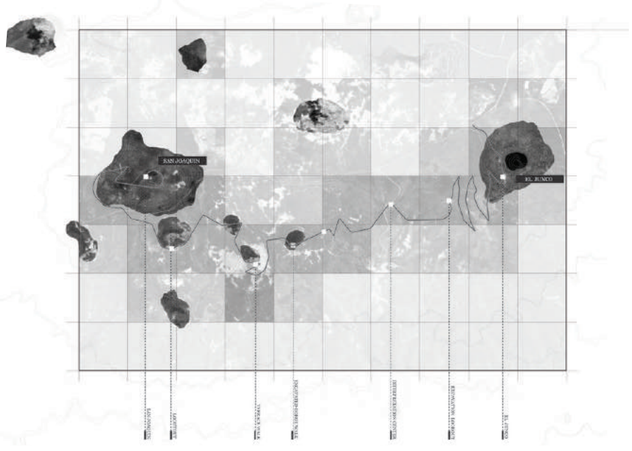
Dispersal

Because the Transect Trail passes through such delicate ecosystems within the National Park, the trail is meant to shift throughout time. As one trail begins to become degraded, park managers can stake out a new trail or decide to make certain routes entirely inaccessible. This would mean that certain viewing platforms would be temporarily unreachable.

TERRAIN TRAIL | DEFINING

Trail Experiences



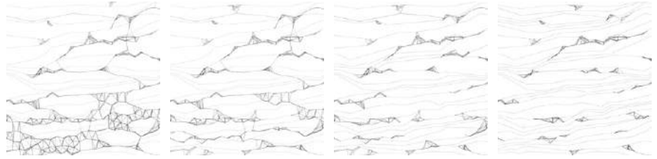


Experiential Terrain

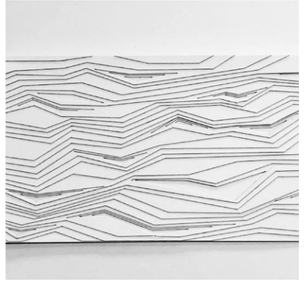
The Terrain Trail connects visitors to the island's largest volcanic cones, El Junco and San Joaquin, while reclaiming portions of the island that have been overrun with invasive species. Along the trail, visitors will go through various topographic conditions unique to this part of the island. The trail carves into the land in order to reveal the island's rich volcanic layers.

CARVE AND REVEAL

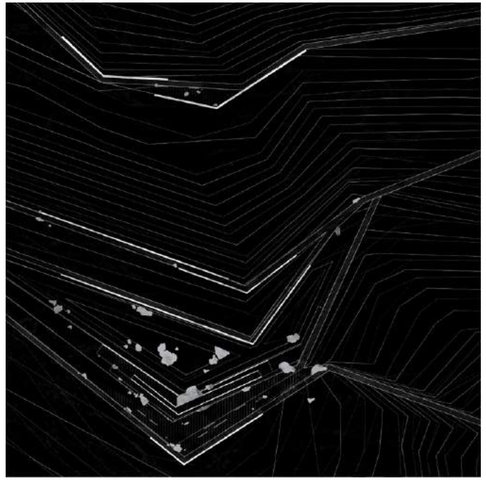
Drawing Studies



Topography Study



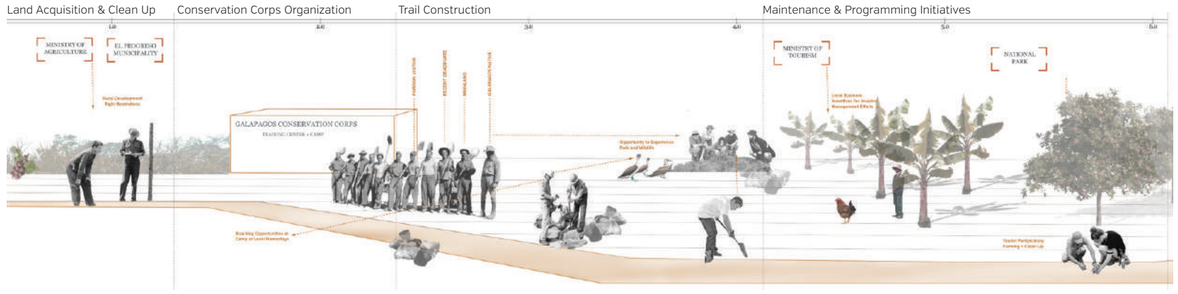
Design Application



Volcanic Rock Reveal

STEWARDSHIP TRAIL | DEFINING PROTECTION

Galápagos Conservation Corps



Galápagos Conservation Corps

The formation of this new organization would connect the existing governing institutions behind the shared purpose of protection. The Conservation Corps would provide more job opportunities to young workers on the island and on the mainland, and give them the opportunity to experience the National Park in a different way.

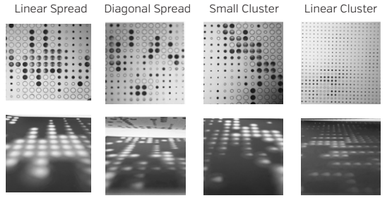
Purchasing Feasibility

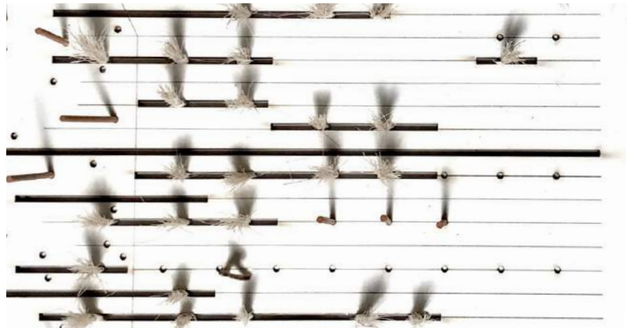
250,000 Tourists / Year → **$5** Entrance Fee = **$1,250,000** Restoration + Trail Budget → **125** Purchased Highland Hectares / Year

STRUCTURING BORDERS

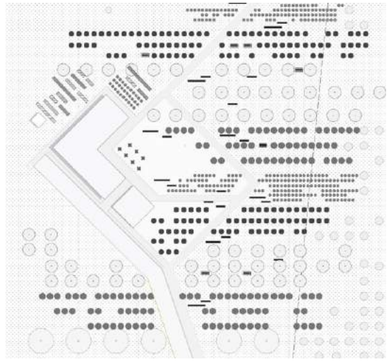
Canopy Shadow Studies

The structure of the canopy along the trail will serve as a marker for the trail. This maintained border will serve to protect the park from parts of the Highlands that are still overrun with invasive species.

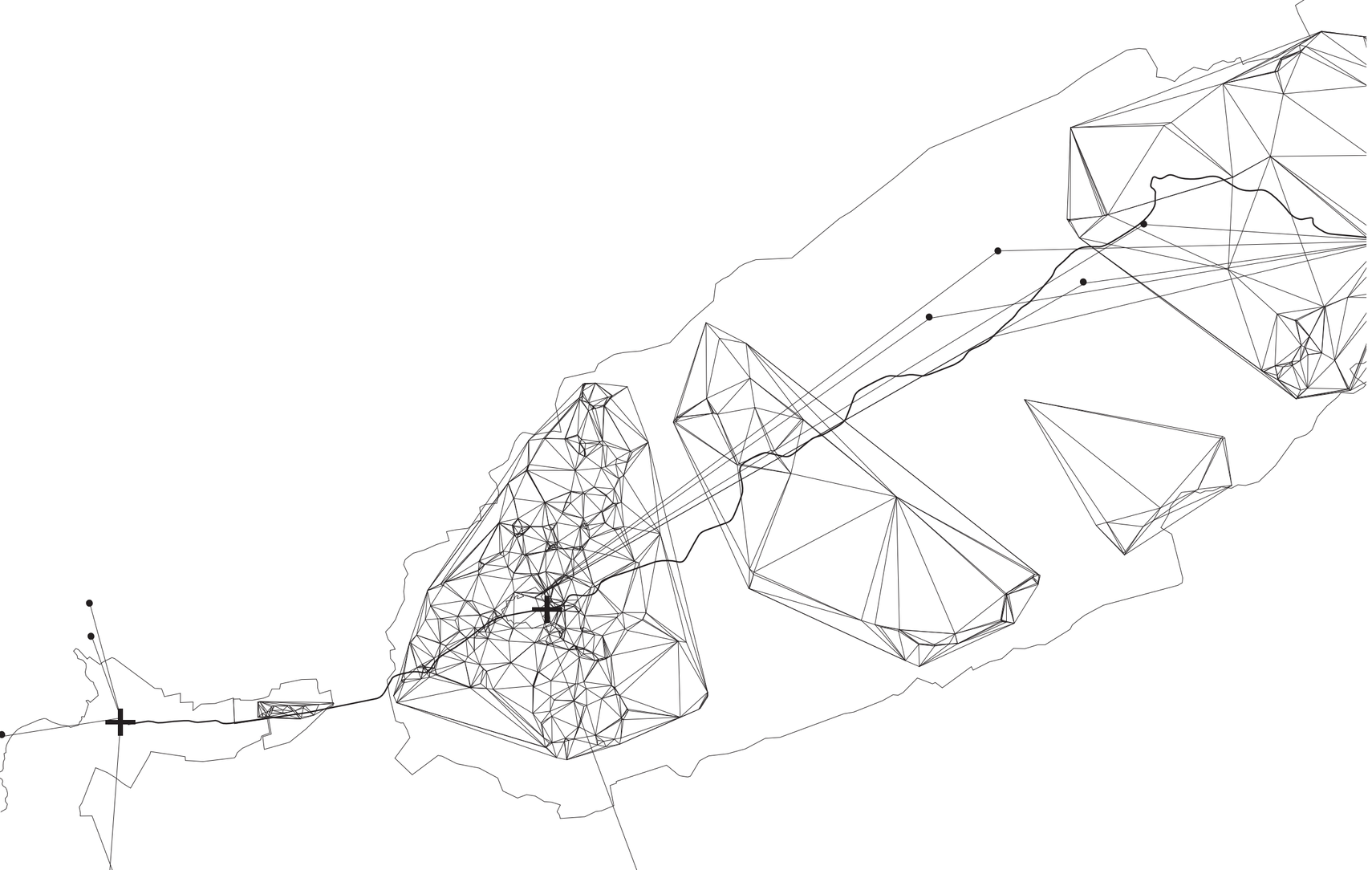




GCC Training & Education Center



Local Business Opportunities



02

ELEVATING TOURISM IN THE HIGHLANDS

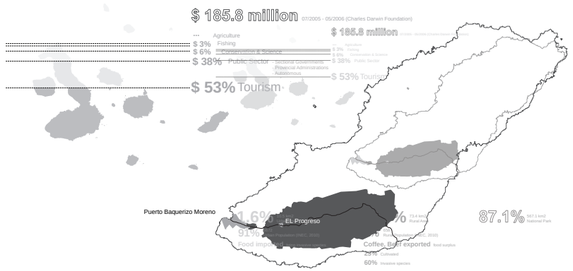
Zhoufei Zhu

The small highland town of El Progreso was the first place on San Cristóbal Island to be settled, as access to fresh water in the highlands made farming possible. Today, approximately ninety-five percent of San Cristóbal's residents live in the waterfront town of Baquerizo Moreno, and most of them rely on tourism for their livelihood. As residents abandon farming and the highlands, invasive species have more opportunity to take root – only twenty-three percent of the former farmland is cultivated, but sixty percent of it is overrun by introduced and invasive species, which threaten the unique ecosystem. The National Park employs eradication strategies for invasive species within the conservation area, and has cooperated with farmers near the park boundary. Cultivating the land for farming would help with invasive species control. However, for residents, the highlands and farms are less profitable than the waterfront, and for tourists, the highlands are a pass-by spot along the main road. Although the San Cristóbal government has expressed a strong concern about developing the rural area, no official plans have been produced [as of October 2017].

This project aims to highlight the value of the highlands using agricultural-tourism to draw people's attention to the farmland and hopefully to help with the land management of it. In distinction to the current small-scale and spontaneous projects like wall painting or farmers' restaurants, I believe that the government should develop agriculture-tourism as a systemic strategy.

Site Analysis

Potential & Opportunity

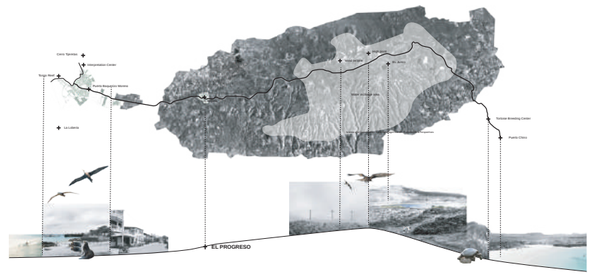


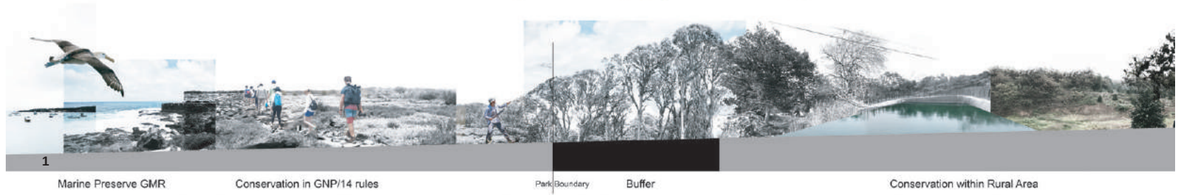
1.6% 10.5 km2 Urban Area
91% 6672 Urban Population (INEC, 2010)
Food imported bring invasive species

11.3% 73.4 km2 Rural Area
9% 658 Rural Population (INEC, 2010)
Coffee, Beef exported food surplus
23% Cultivated
60% Invasive species

87.1% 567.1 km2 National Park

+ The town of El Progreso is within the rural highlands and not subject to the same rules as the National Park
+ "Buffer" zone, the Scalesia Forest can only be found in the Galápagos
+ Featured farms with water conservation, coffee, fruit production
+ Sugarcane Mill relic indicates the history of the highlands





Trail System

Trail Network

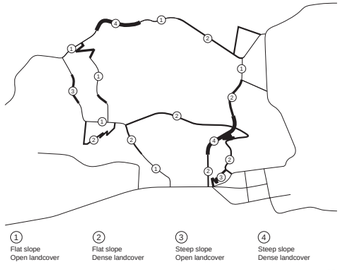
Agriculture Tourism Concept Consist of 3 Aspects

+ Sugarcane Mill Relic as an Agriculture Tourism Interpretation Center, capitalizing on the farming and human history from 1879 - 1904
+ The trail network brings people to the featured destinations
+ The featured destinations (featured farms open to the tourists)

Existing Road & Proposed Road

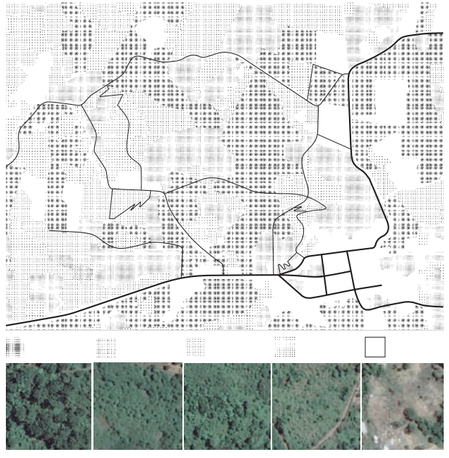
Transportation

Trail Experience Category

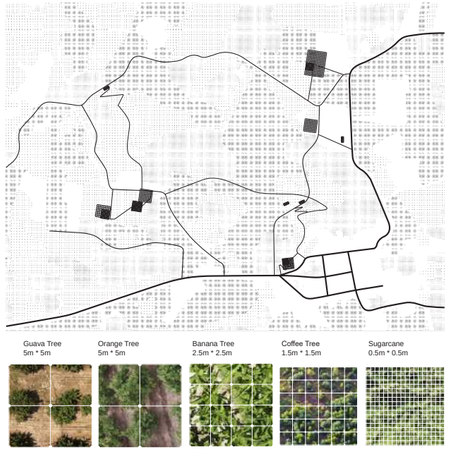


Trail Network

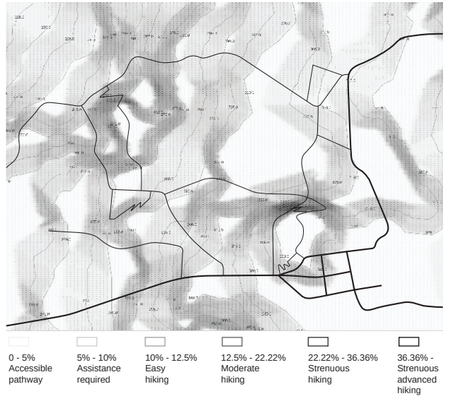
Existing Land Cover Category



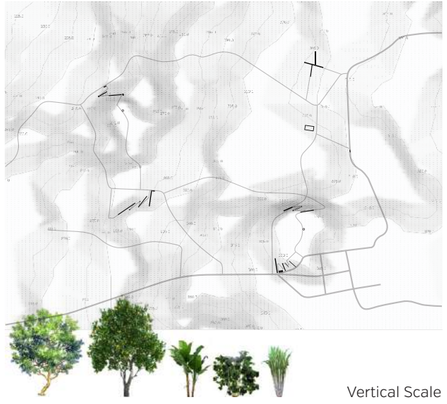
Clearance & New Planting



Slope Analysis



Retaining Wall & Way Finding



Interpretation Center

Trail Experience

View Point to the Ocean

Walking Trail

View Point to the Ocean

Walking trail

Trail Experience

Water Conservation

Harvesting Tour

Water conservation

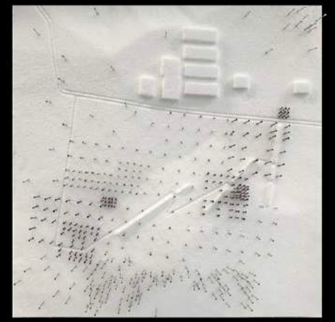
Harvesting tour

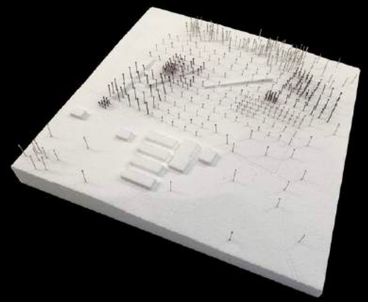
Future Growing Opportunities

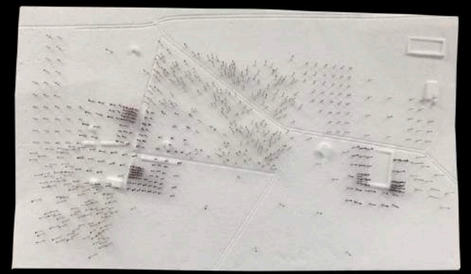
Expansion from EL Progreso

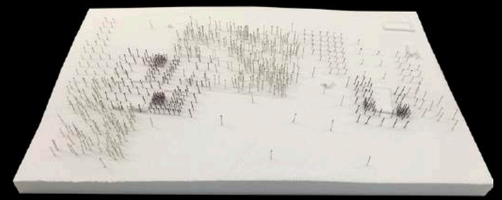
Multiple Centers

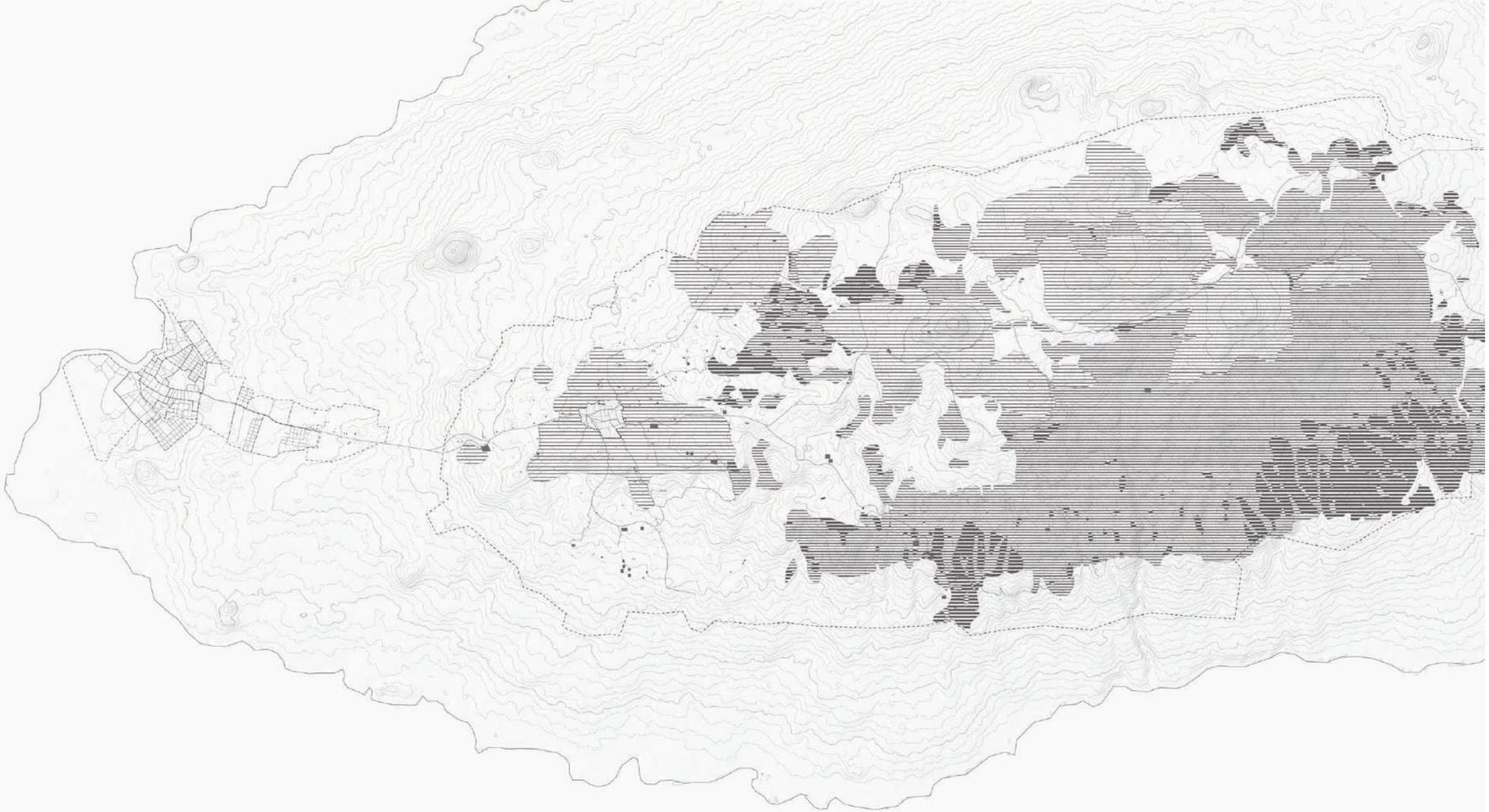
Study Model











03

FEEDING THE HIGHLANDS

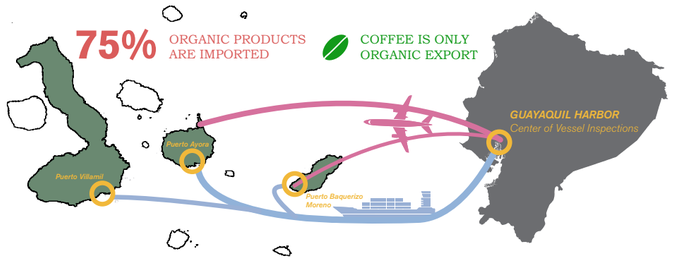
Stefan Molinaro

The Highlands of San Cristóbal Island are 8306 hectares and, historically, provided food for islanders when agriculture was the primary source of sustenance with the founding of El Progreso in 1866. As the islands have shifted to an urban and touristic economy, the agricultural region, like much of the world, has faced increasing neglect culturally, economically, and environmentally. This project presents a conservation land-use framework based on a careful reading of the highland topography, soils, and hydrology.

The island is becoming increasingly reliant on expensive and slow processes to cope with population and tourism growth. This proposal outlines a land-use framework focused on cultivation as a unique asset for food and tourism. Within the regional scale, it relies on a land-use plan that is driven by analyzing areas most conducive to conservation, agriculture, and tourism in contrast to the very generalized development/ agricultural plan developed by the government. This proposal also provides a vision for how parcels or hamlets could be reorganized based upon a conservation and cultural agenda.

Systems of Conflicts

Galápagos Islands' Food System

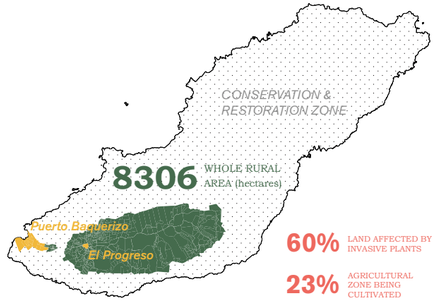


+$ PRICES INCREASE DUE TO: DELAYS, INVASIVE SPECIES, CONFISCATED SHIPMENTS

2 NUMBER OF SHIPS WITH PROPER LOADING EQUIPMENT & COLD STORAGE

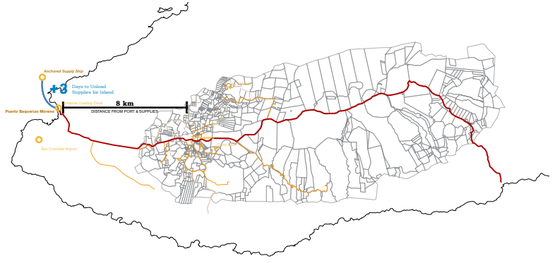
60% FOOD PRODUCTS CONFISCATED (2000-2008)

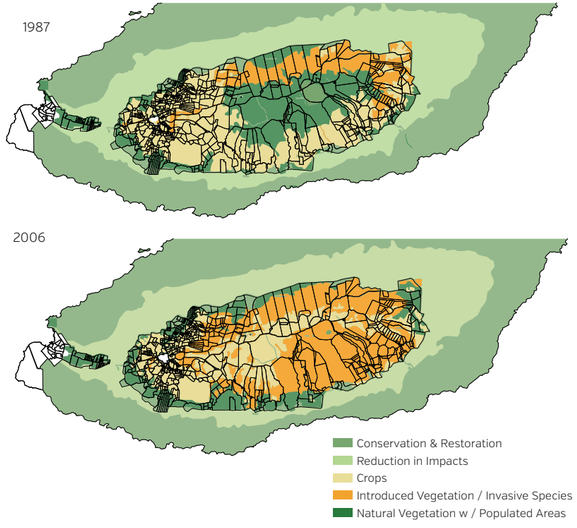
Invasive Plant Growth



Generalized Future Land Use Plan

Waterfront to El Progreso Supply Chain





Land-Uses Through Conservation Methods

	STRICT NATURE RESERVE	WILDERNESS AREA	NATIONAL PARK (Current Land Management Practice)	NATURAL MONUMENT OR FEATURE	HABITAT/SPECIES MANAGEMENT AREA	PROTECTED LANDSCAPE/ SEASCAPE	PROTECTED AREA WITH SUSTAINABLE USE OF NATURAL RESOURCES
Primary Objectives	- Conserve large-scale ecosystems and geodiversity - Protect biodiversity - Strict control of limited human interaction - Preserved for scientific objectives	- Protect large-scale ecological integrity - Protect biodiversity - Strict control of human habitation and scientific interactions	- Protect large-scale biodiversity - Protect associated ecological processes -Promote education and recreation -Contribute to local economies through tourism	- Protect small natural features - Protect associated biodiversity and habitat - Protect natural sites with associated spiritual/cultural value	- Maintain, conserve, restore specific species or habitats - Protect fragments of habitat -Develop public education and appreciation - Provide urban residents access to protected area	- Protect important areas with constant human interaction - Maintain balance interaction between nature and culture - Encourage conservation of agro- and aquatic biodiversity - Provide natural products, environmental services, socioeconomic activities	- Protect natural ecosystems while extracting resources - Promote socioeconomic benefits to local community - Facilitate recreation and tourism - Facilitate scientific research and environmental monitoring
	Urwald Rothwald Austria	**The Everglades Florida, USA**	**Galápagos Islands (Land Cover)**	**Victoria Falls Zambia/Zimbabwe**	**Bon Secour National Wildlife Refuge Alabama**	**Apo Island seascape Philippines**	**Galápagos Islands (Marine Area)**

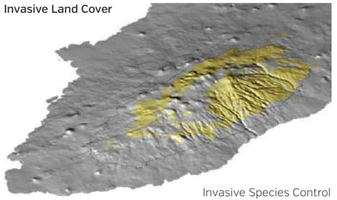
Site Analysis

The site analysis is split into environmental and built aspects of the region and prioritized per programmatic category.

Conservation Priority _Typology of Land Management

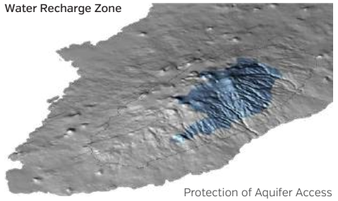
The National Park is the only method of conservation the islands practices surrounding the highlands. My framework prioritizes which land to practice different types of conservation within the highlands to preserve and promote the land, ecology, and identity of the Highlands.

Invasive Land Cover



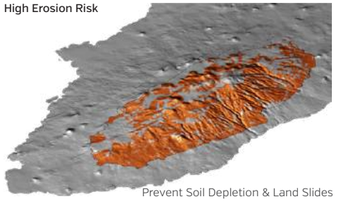
Invasive Species Control

Water Recharge Zone



Protection of Aquifer Access

High Erosion Risk

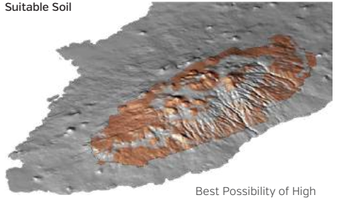


Prevent Soil Depletion & Land Slides

Cultivation Priority_A Typology for Land Management and Identity

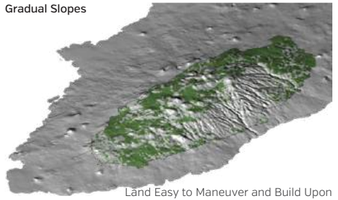
The island used to rely heavily on the crops and livestock that were harvested in the Highlands. Urban life and tourism have moved people and the workforce to the Port. My framework places harvesting as a method of conservation through prioritizing land suitable for agriculture.

Suitable Soil



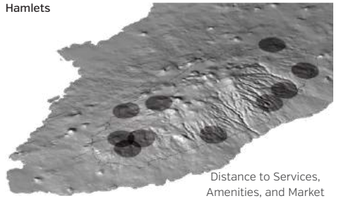
Best Possibility of High

Gradual Slopes



Land Easy to Maneuver and Build Upon

Hamlets

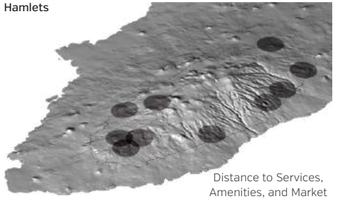


Distance to Services, Amenities, and Market

Tourism Priority_An Economic Driver within Land Management

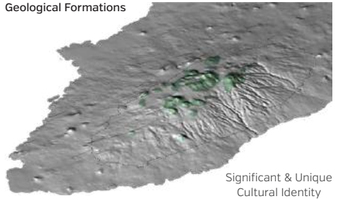
Ecological and Marine Tourism is a growing economic pressure that the city increasingly moves to rely on. Tourism moves through and around, but does not land within the Highlands. My framework prioritizes land and interventions where tourism can fall within the Highlands.

Hamlets



Distance to Services, Amenities, and Market

Geological Formations



Significant & Unique Cultural Identity

Paved Main Roads

Easy Access to Services Amenities & Market

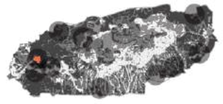
Prioritization Scheme

Through a layering of the analysis elements, prioritized land is identified for each conservation land use: Habitat Management, Protected Landscapes, and Natural Monuments.

Conservation Priority

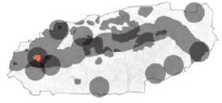
Ideal Land for Conservation

Cultivation Priority



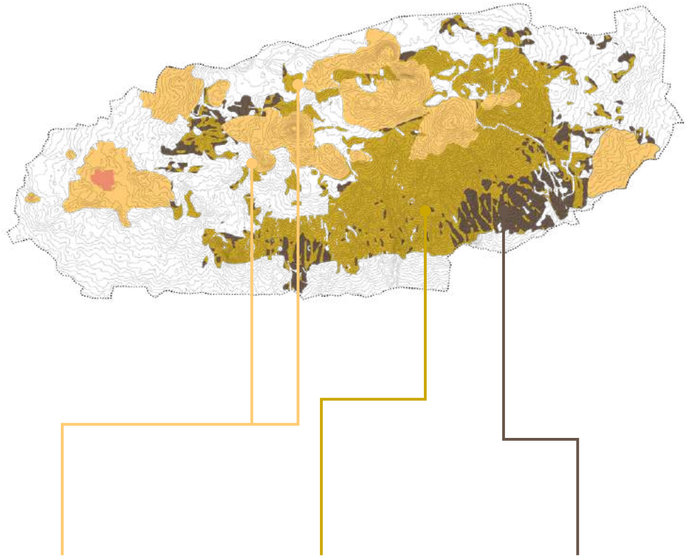
Ideal Land for Cultivation

Tourism Priority



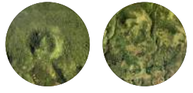
Ideal Land for Tourism

New Land Use Through Conservation Methods



NATURAL MONUMENTS

Associated Plots with Inactive and Sunken Volcanoes

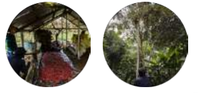


HABITAT MANAGEMENT

Managed and Protected Land - Unoccupied with Light Tourism Access

PROTECTED LANDSCAPES

Cultivation Associated with Agro- and Ecotourism

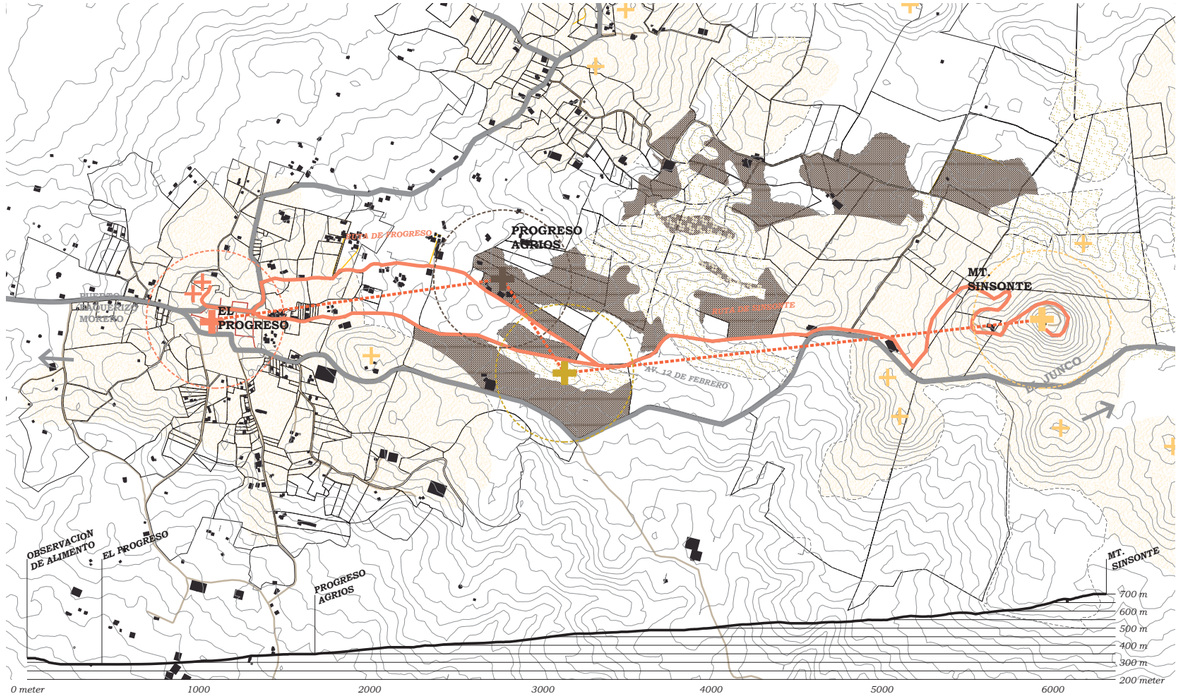


LAYERING OF PRIORITIES

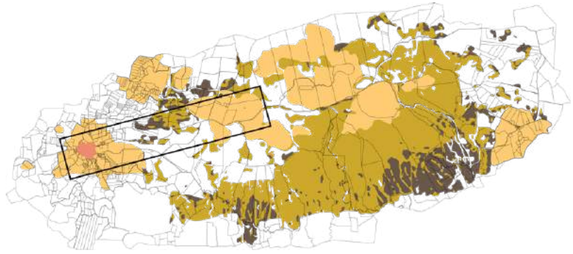
- Highest Priority
- El Progreso
- Outside Priority
- Suitable, but not Priority

Parcelization Through Conservation Boundaries

Through reparcelization from the conservation land use boundaries created, the region can be redesigned to provide touristic, agricultural, and habitat conservation programs.



Advertising the Highlands



Existing Parcel Boundaries

Leftover Parcel Boundaries

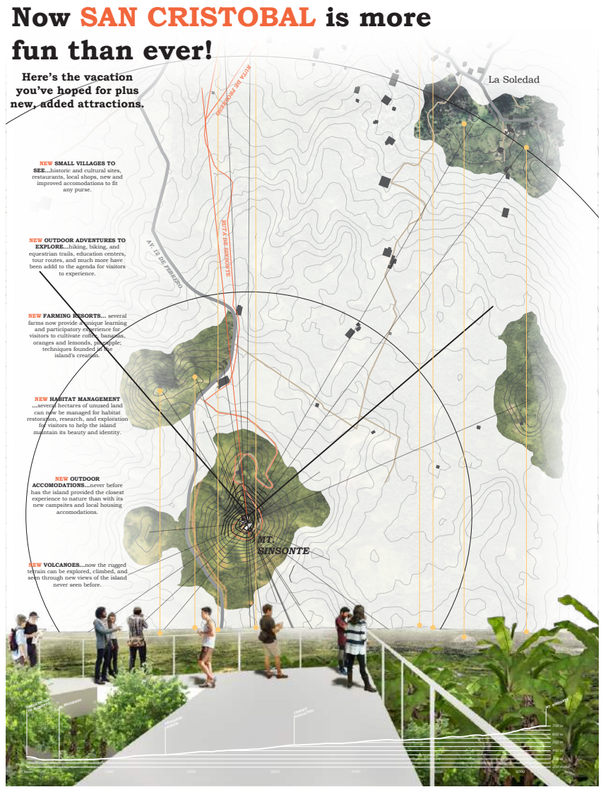
Natural Monument

Habitat Management Area

Protected Landscapes (Cultivation)

El Progreso

Paved Road



04

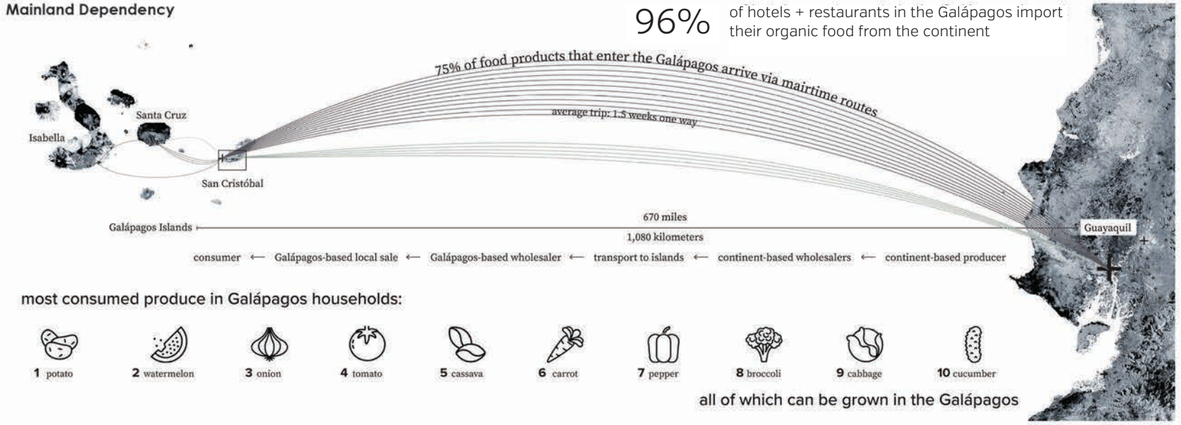
CULTIVATION ISLAND

Anna Darling

The native ecosystem of the Galápagos Islands is being threatened by the introduction of invasive species. Farmland on the island of San Cristóbal has been abandoned, primarily because farmers are seeking better wages in the tourist industry in Puerto Baquerizo Moreno. This has resulted in over half of the farmland being covered by invasive species such as blackberry. At the same time, the majority of the produce consumed on the island is brought in from the mainland, creating an avenue for invasive species, increasing food prices, and decreasing food quality. This project aims to bolster the food culture of San Cristóbal Island to increase its autonomy from mainland Ecuador. To do so, this project focused on shaping the food culture in Puerto Baquerizo Moreno at three scales: structuring new development, reworking the central park, and crafting deployable structures that can be used as shade and market stalls. Through these interventions, the project aims to shape the tourist-local interface, promote individual growing capacity, and create community food space. These design interventions capitalize on existing innovators, while promoting cooperation among the municipality, the National Park, the Ministry of Tourism, and the Ministry of Agriculture in order to stem the flow of invasive species to the islands and increase the availability of local quality produce for both locals and tourists.

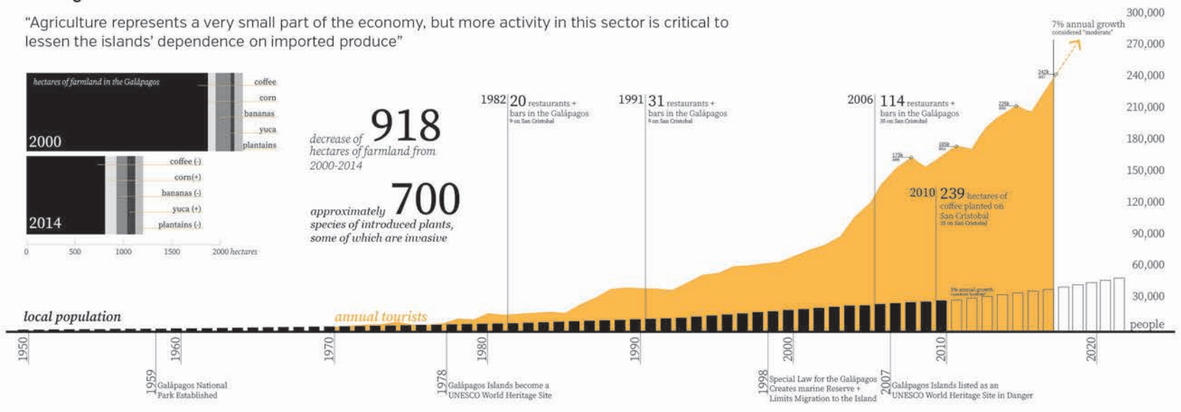
Resource Dependency In San Cristóbal

Mainland Dependency



Increasing Demand

"Agriculture represents a very small part of the economy, but more activity in this sector is critical to lessen the islands' dependence on imported produce"



Hectares of Farmland Source: Bulletin Integral Galápagos 2018. Ministerio de Agricultura y Ganaderia. http://sipa.agricultura.gob.ec/index.php/agricola-integral-territorial/boletin-integral-galapagos/2018

Economy and Population Source: Tourism, the Economy, Population Growth, and Conservation in the Galápagos. Charles Darwin Foundation. 2007. https://www.galapagos.org/wp-content/uploads/2012/01/TourismReport2.pdf

Drawings by Anna Darling

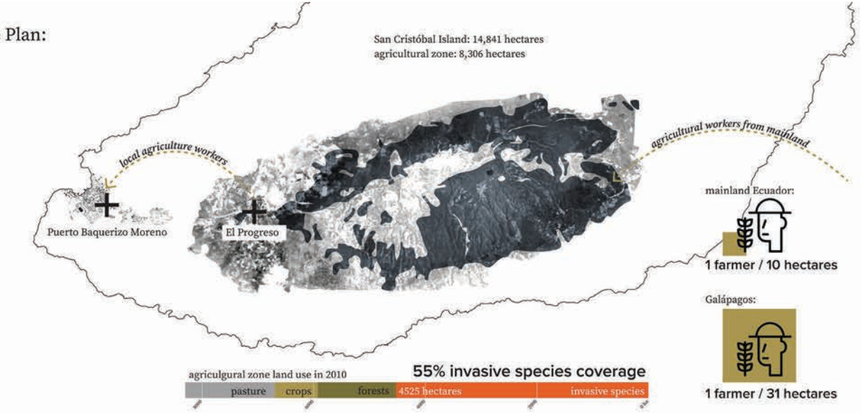
Farmland at Risk

Goals of Galápagos Bioagriculture Plan:

1 Transform agriculture into the primary human activity in Galápagos in such a way that it contributes to the conservation of the natural heritage of Galápagos, especially with regards to controlling invasive species, through the design and implementation of highly efficient agro-ecological production systems.

2 Contribute to economic sustainability in Galápagos through the *promotion of local markets* that function under the principles of a social and solidarity-based economy.

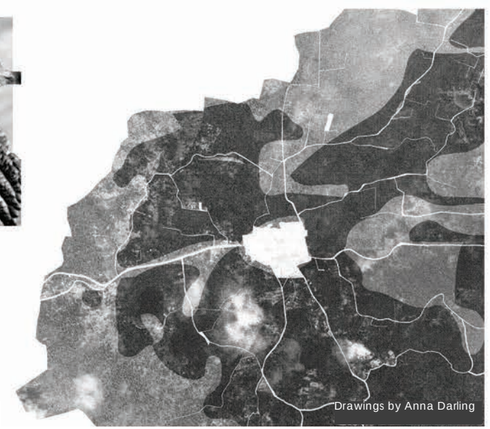
3 Consolidate a research system based on *dialogue, sharing knowledge, + expanding local capacity* to create and innovate.



Greatest Threat to the Galápagos

600 species of edible plants are grown on the Islands

tomato, coffee, otoy, papaya, guava, squash, banana, pineapple, corn, onion, lettuce, cucumber



Drawings by Anna Darling

Project Approach

Capitalize on Existing Innovators

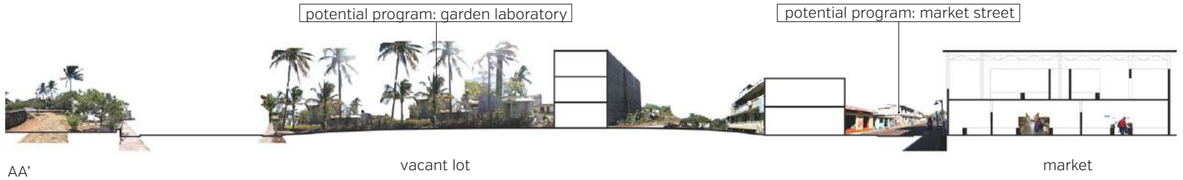
Urban Foraging + Private Gardens in Town

Muyu Restaurant

Otoy Farm + Restaurant

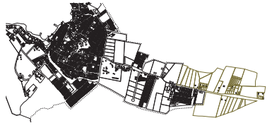
Coffee Farms

Transform the Existing Single Use + Conventional Public Space



Structuring New Development

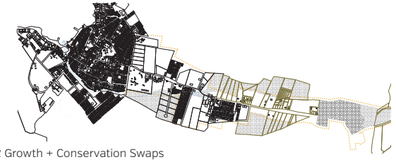
Existing Conditions



Strange Block Layout

Proposed Approach

1 Connecting Circulation



2 Growth + Conservation Swaps

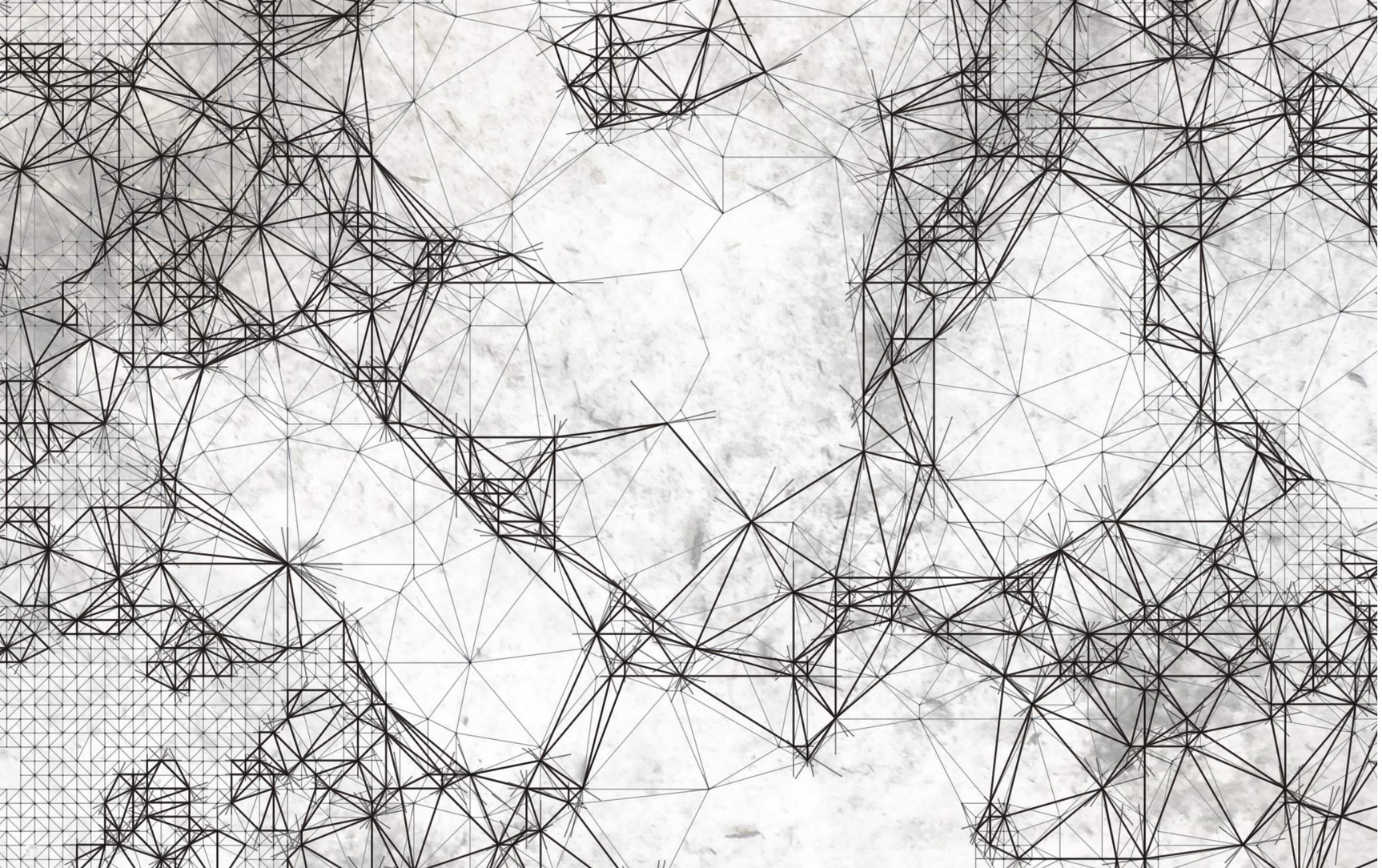
Central Park

Growing Conditions

Demonstration Garden + Park

Community Space

Tourist Interface



05

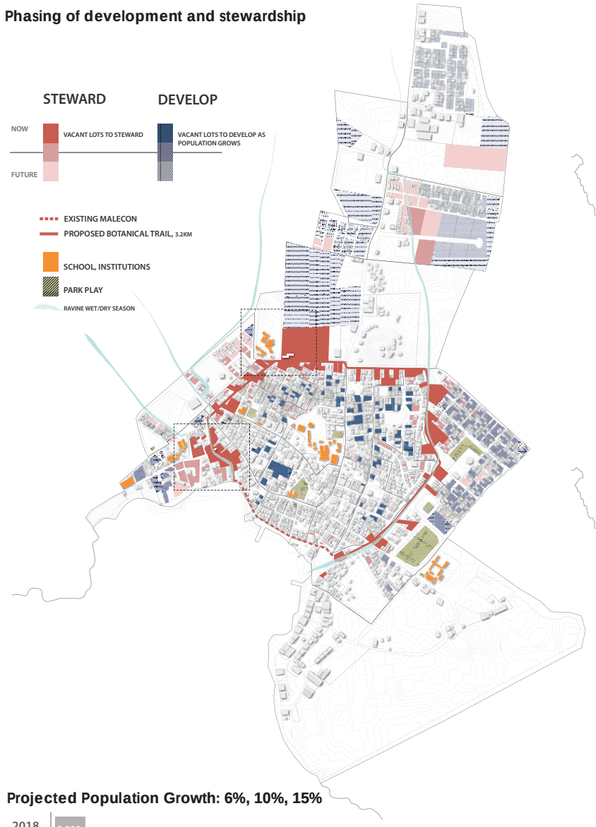
CITY TRAIL

Lucy Whitacre

How can a trail protect biodiversity, disperse education, and cultivate stewardship? This project aims to activate and restore underused land in Puerto Baquerizo Moreno to create an urban botanical trail that promotes native plants through nursery nodes, engages the community and schools, and protects the island's biodiversity. The Galápagos Islands' fragile ecosystem is threatened by introduced species as well as development with growing population. Eradication efforts in park areas exist, leaving the inhabited area unprotected. Often residents are blamed for the environmental degradation yet this problem isn't addressed with proper education. Throughout the city there are overgrown vacant lots filled with debris. A city ordinance states that if a site remains abandoned for 10 years, the city can take ownership. It is in the GNP's best interest to cultivate the urban environment. Involvement with schools is central to this project as it provides opportunity for the curriculum to be coordinated with nursery-based community centers, allowing relevant subjects to be taught within the context of local and global environmental issues. It also harnesses existing programs by partnering with groups like the LAVA Kids and Young Park Ranger's Club to facilitate stewardship from an early age.

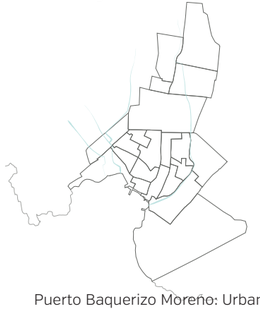
Site Strategy

Phasing of development and stewardship

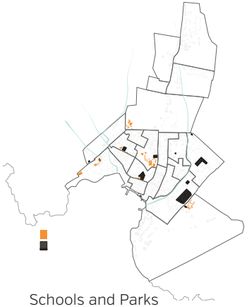


Projected Population Growth: 6%, 10%, 15%

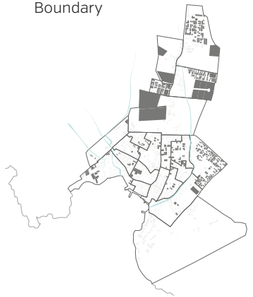
Site Analysis



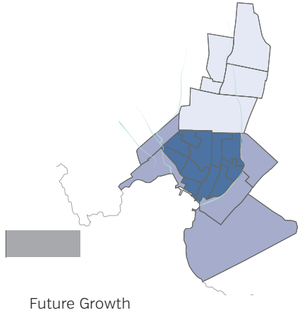
Puerto Baquerizo Moreno: Urban Boundary



Schools and Parks



Vacant lots: to develop



Future Growth

Botanical Trail Loop

Malecón

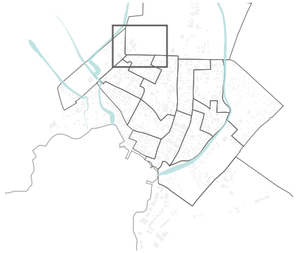
Ravines

Ravine: Adjacencies

Connection: Ave. Jaime Roldos

Future Development

Colegio Ignacio Hernandez Lava Field Park, Nursery



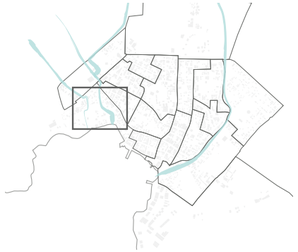
high school
vacant lots
GNP park boundary

Plan

Colegio Ignacio Hernandez Lava Field Park sits on the edge of the current urban fabric. The adjacent high school students can become stewards of this nursery and park space. This plan activates a large vacant lot previously filled with debris to create a park that offers shade and gathering space, highlighting the ever-present lava rock. Across the street is the hybrid nursery community center classroom. Native and endemic species are grown in the nursery from cuttings and propagation and then distributed along the botanical trail loop, growing the native network.

View From Lava Park into the nursery classroom

Barrio Bajo Nursery Park



primary school
vacant lots
ocean

Plan

Barrio Bajo Nursery Park is along one of the town's ravines and adjacent to the ocean and Malecón. This nursery community space similarly grows native species for community members, encouraging engagement and education. A terraced grading system of cuts and low walls opens up the narrow, channelized ravine. The neighboring elementary school will be able to coordinate their curriculum with this amenity. These nodes along the botanical trail loop facilitate the spread of native plant species while providing the community with shade and places to gather.

View from the terraced ravine into the community greenhouse

Vacant Lot Typology

Shade Relief

Seasonal Interest, Living Fence

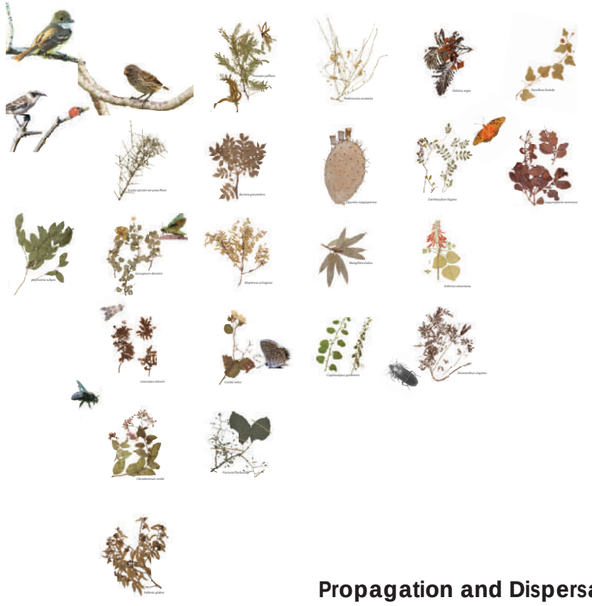
Ravine Stabilization

These vacant lot typologies demonstrate the potential for the native plant network in town to grow to other vacant lots along the botanical trail loop and beyond. They range in programming, quality, and planting depending on their area and context. This network of natives within the urban setting grows with local stewards and strengthened relationships between the city and the park.

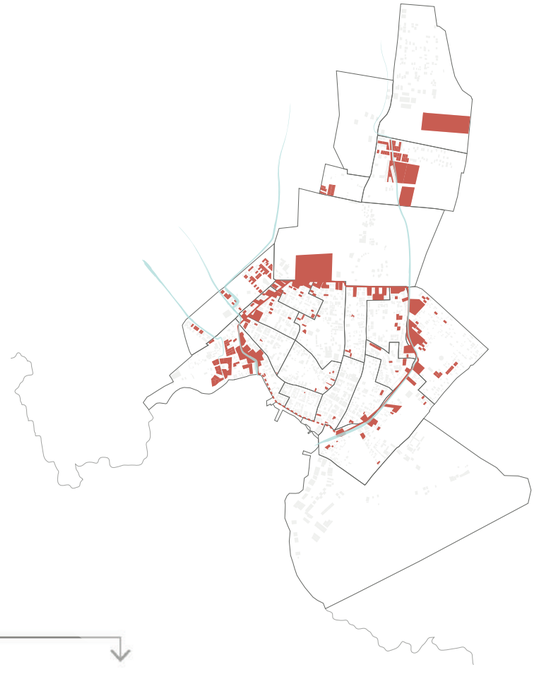
Cultural: Demonstration, Endemic

Bird Habitat

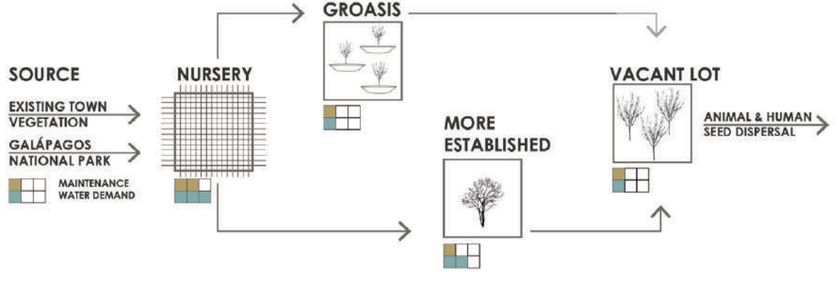
Material Palette

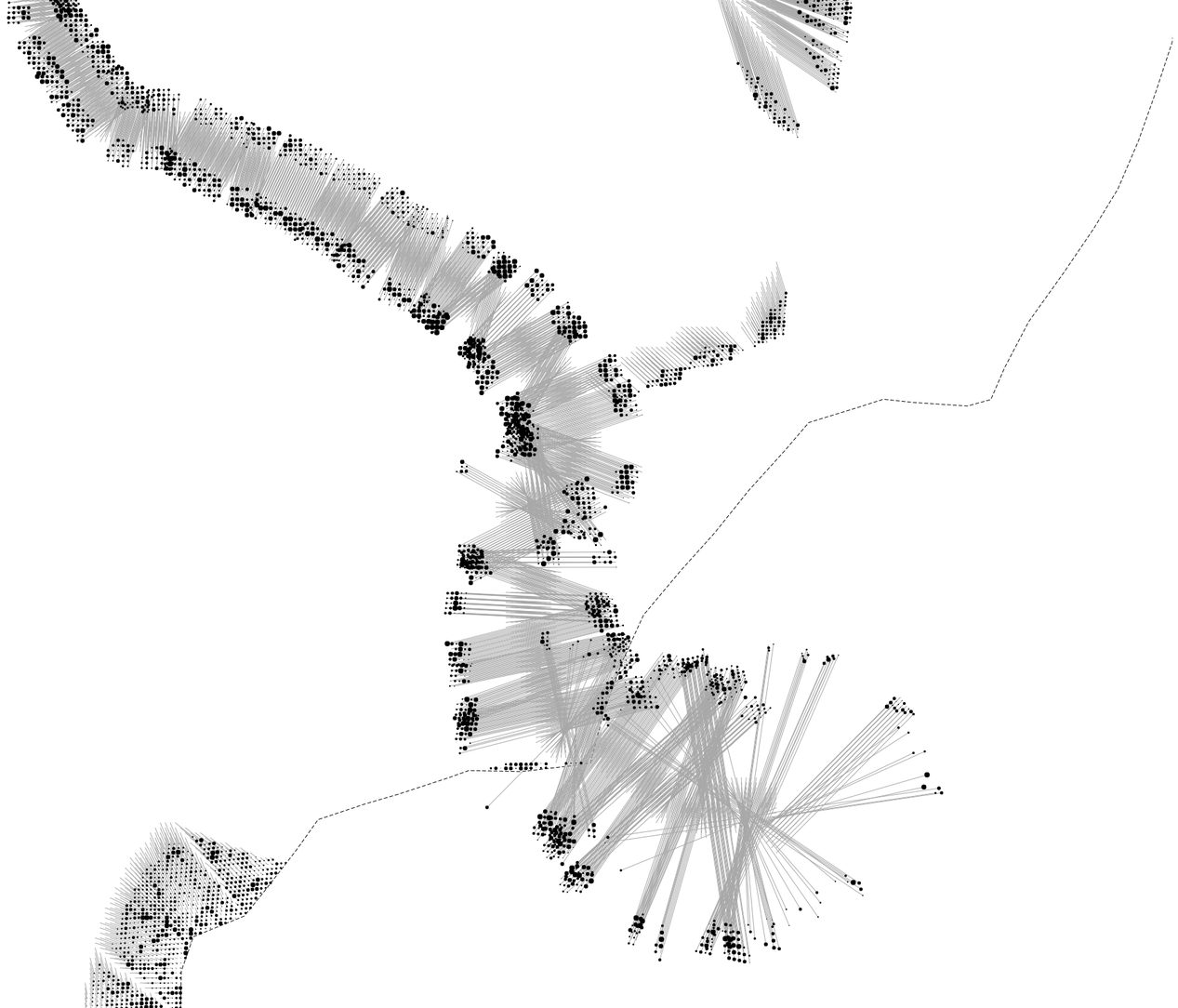


Phasing: Botanical Loop & Growing Native Network



Propagation and Dispersal





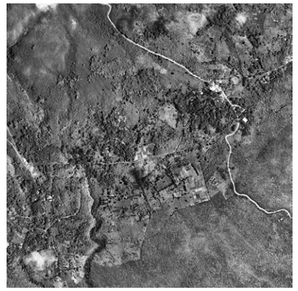
06

THE TORTOISE'S NECK

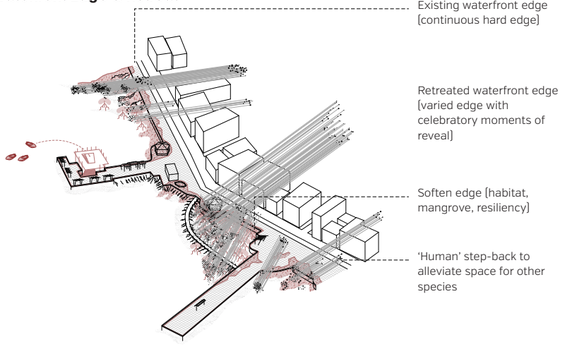
Luke van Tol

The Galápagos Islands are the first designated ecotourism destination, a strategy designed to protect nature by making a strict boundary between human inhabitation and wild conservation areas. Local human populations have little access to the National Park because visitation requires a hired guide. Consequently, the value of the park for residents is often limited to those involved in tourism. As tourism increases, so does the population needed to support it–Puerto Baquerizo Moreno could fully saturate its urban boundary in just twenty years. The ecological and economic values of Galápagos nature are increasingly at odds. Now is the time to contemplate extension or retreat at the town's edges. This project explores the creation of an experiential trail along the edge of the urban-park boundary. It is conceptually inspired by one of the island's most famous inhabitants: the Galápagos tortoise. The neck of this species is theorized to have evolved differently in accordance with the particularities of each island. On 'greener' islands, with an abundance of resources, tortoises have shorter necks whereas, in arid environments, the saddleback carapace structure is thought to be an adaption to increase vertical reach to browse taller vegetation. Examining the edge conditions between human-occupied zones and conservation areas on San Cristóbal Island, this project explores adaptions with different "reaches" into the park–a "New Malecón"–providing vantage points and platforms for residents to view the conservation zones.

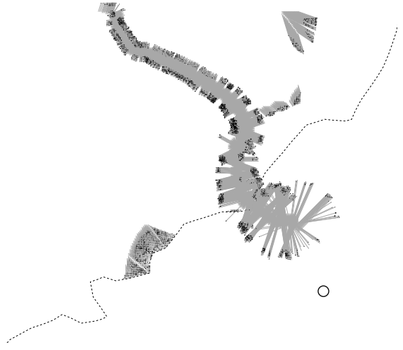
Extending or Retreating Island Life at the Edge



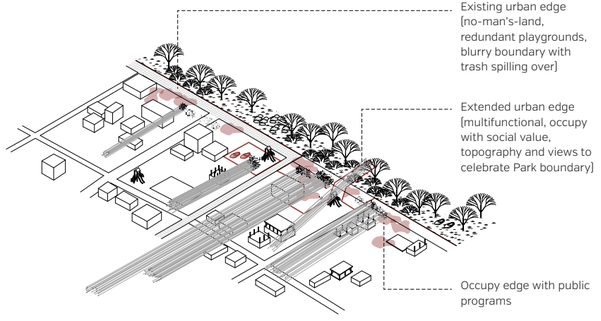
Waterfront Edge & Retreat



Conceptual Push and Pull



Urban Edge & Extension

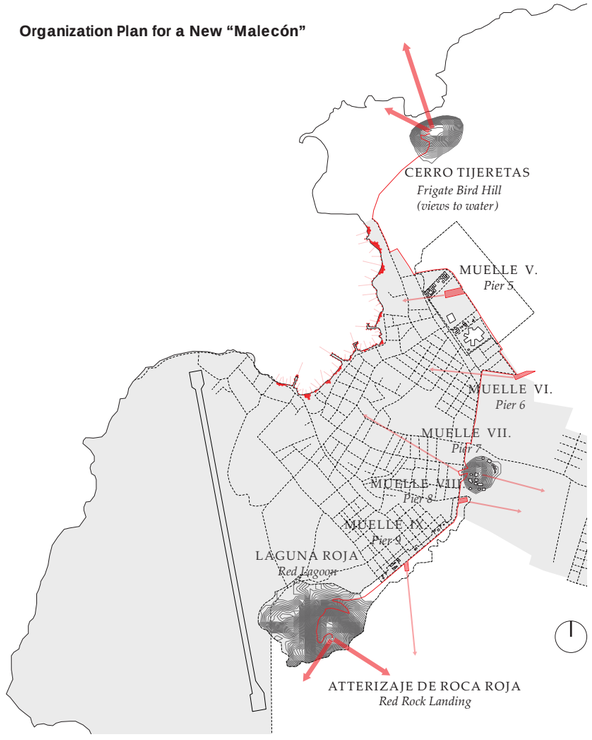


Diversity of Experiences

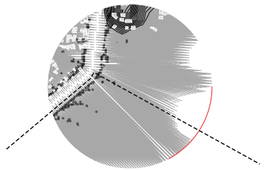
Diverse experiences at Cerro Brujo

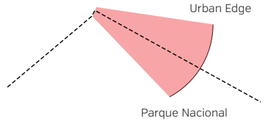
Potential diverse experience at urban edge

Organization Plan for a New "Malecón"

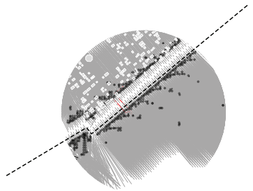


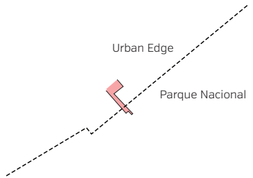
Identifying Intervention Locations



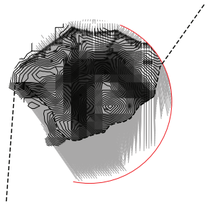


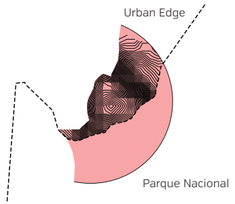
Disturbance Radius within Park





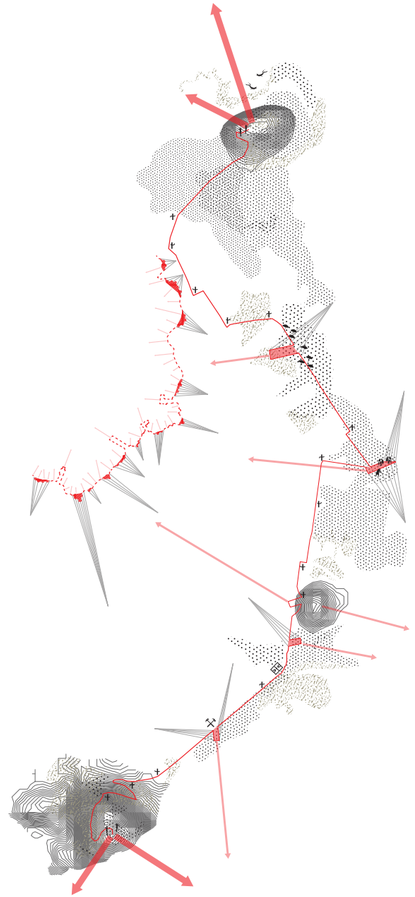
Introduce Highpoint within Vacant Land



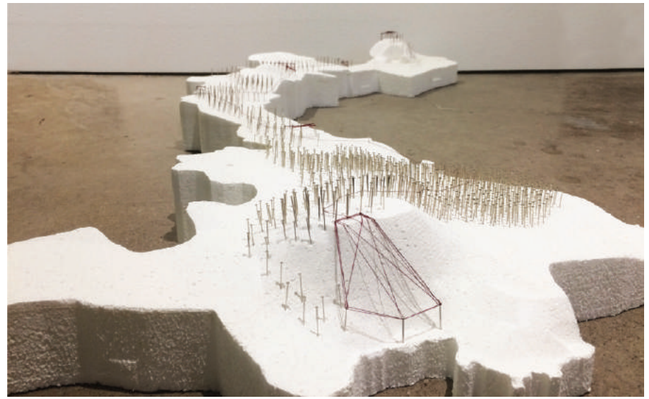


Existing Highpoint within Vacant / Mine Land

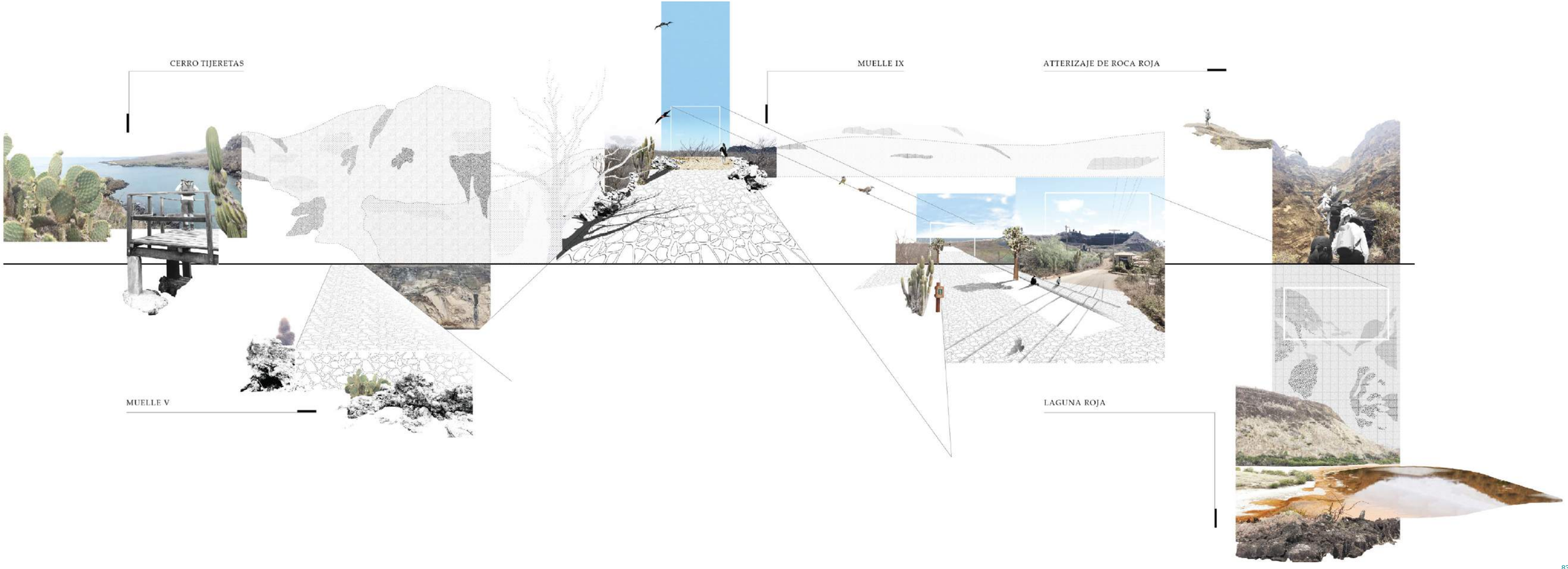
Identifying Intervention Locations



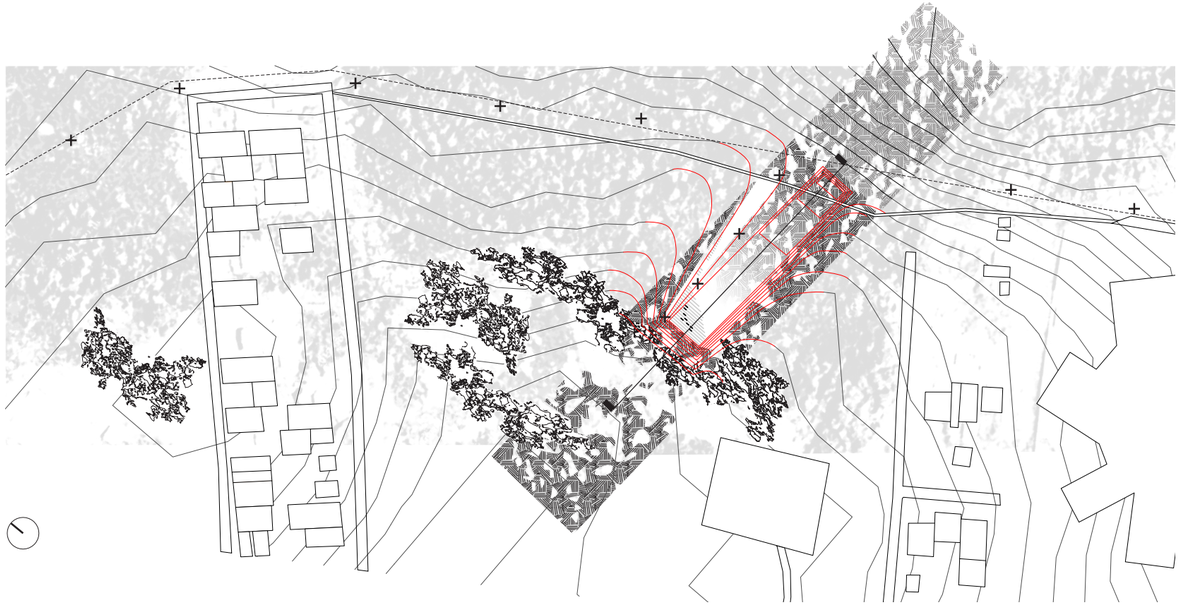
Indicator Cacti Species as Celebratory Markers

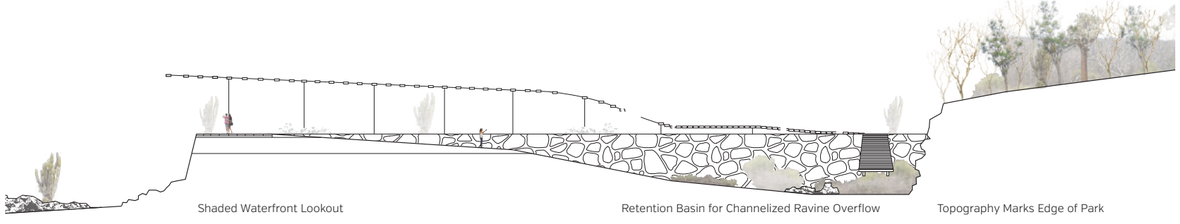


Views Along the Trail



Muelle V : Pulling to the Water



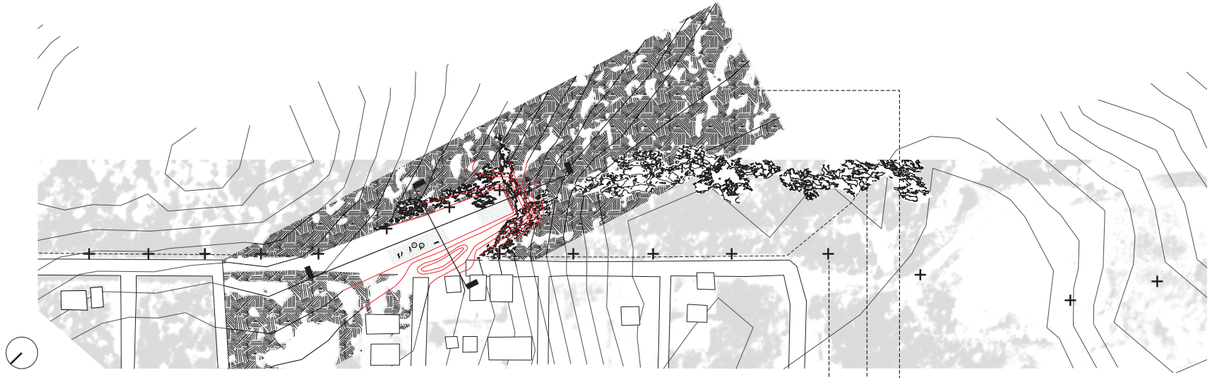


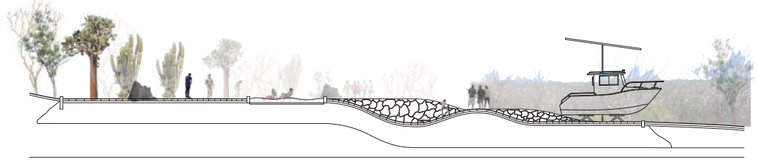
Shaded Waterfront Lookout

Retention Basin for Channelized Ravine Overflow

Topography Marks Edge of Park

Muelle IX : Pushing into the Park





Existing Vegetation

Lava Rock

Indicator Cacti

Sandy Beach

Paved Mounds

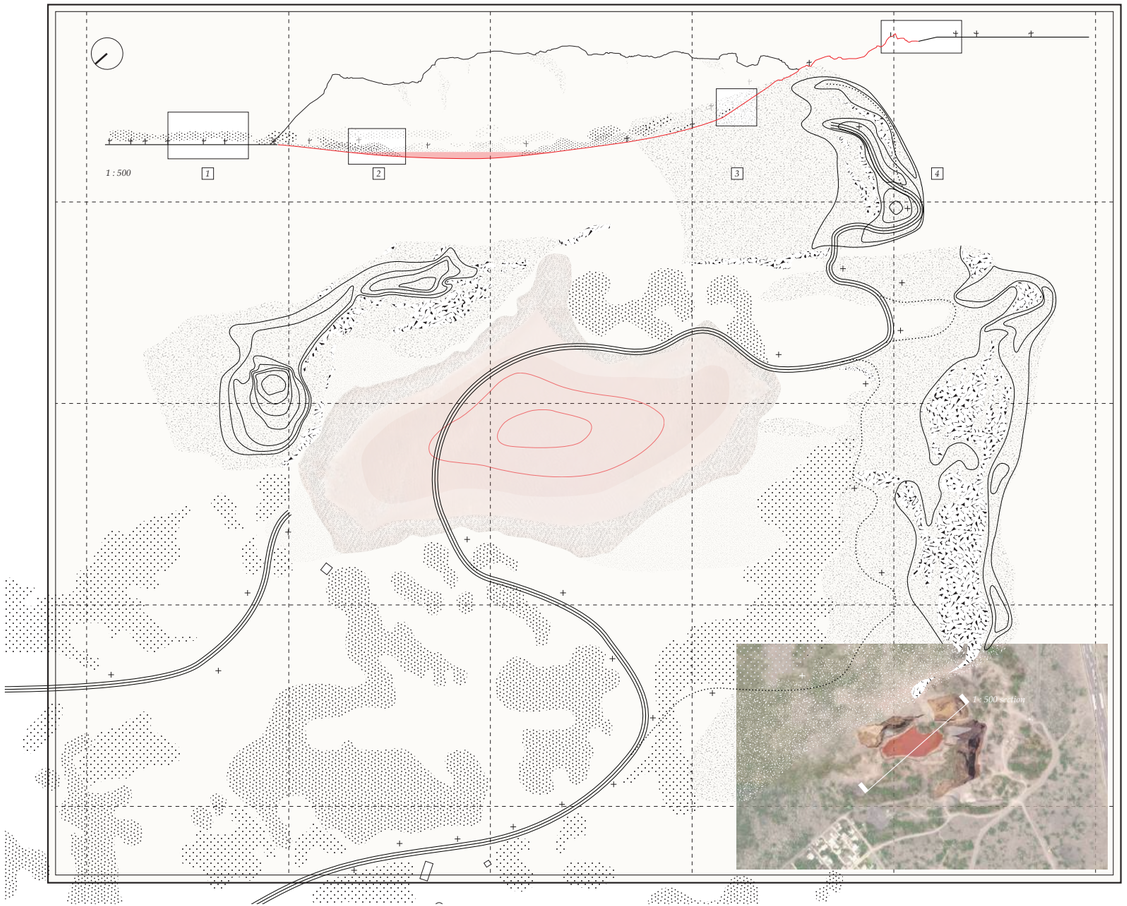
Boat-Building

Indicator Cacti

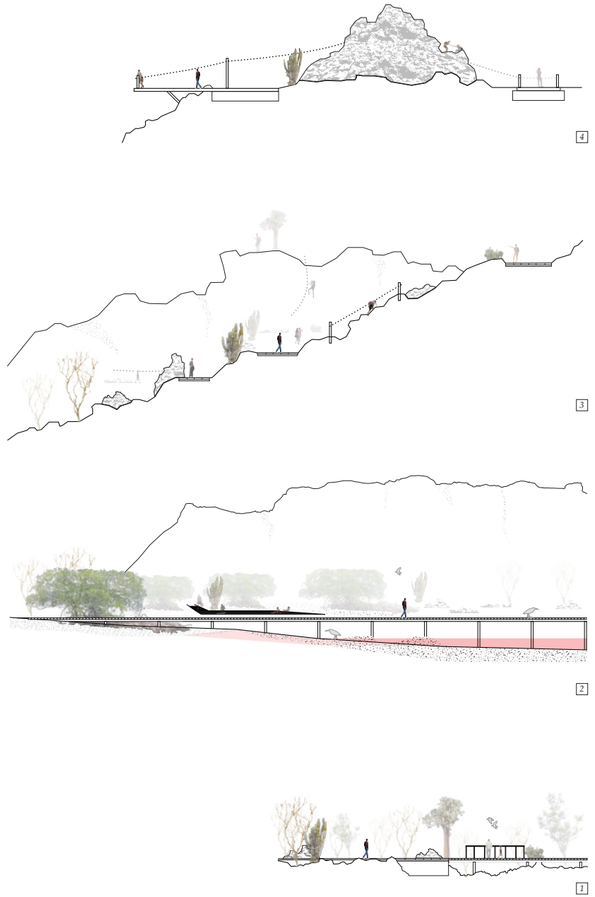
Sandy Beach

Infinite Sand Edge

Atterizaje de Roca Roja & Laguna Roja



Sequential Section



Study Models

I

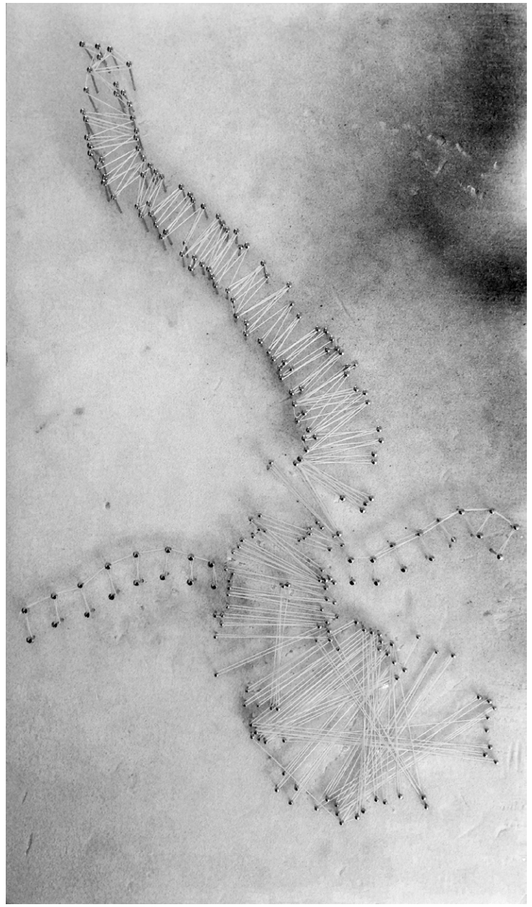
II

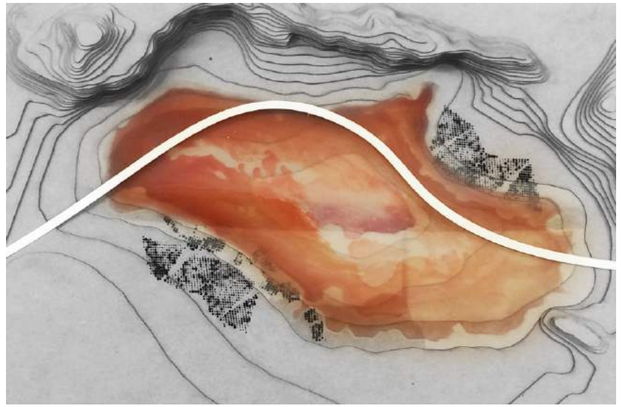
III

IV

V

VI



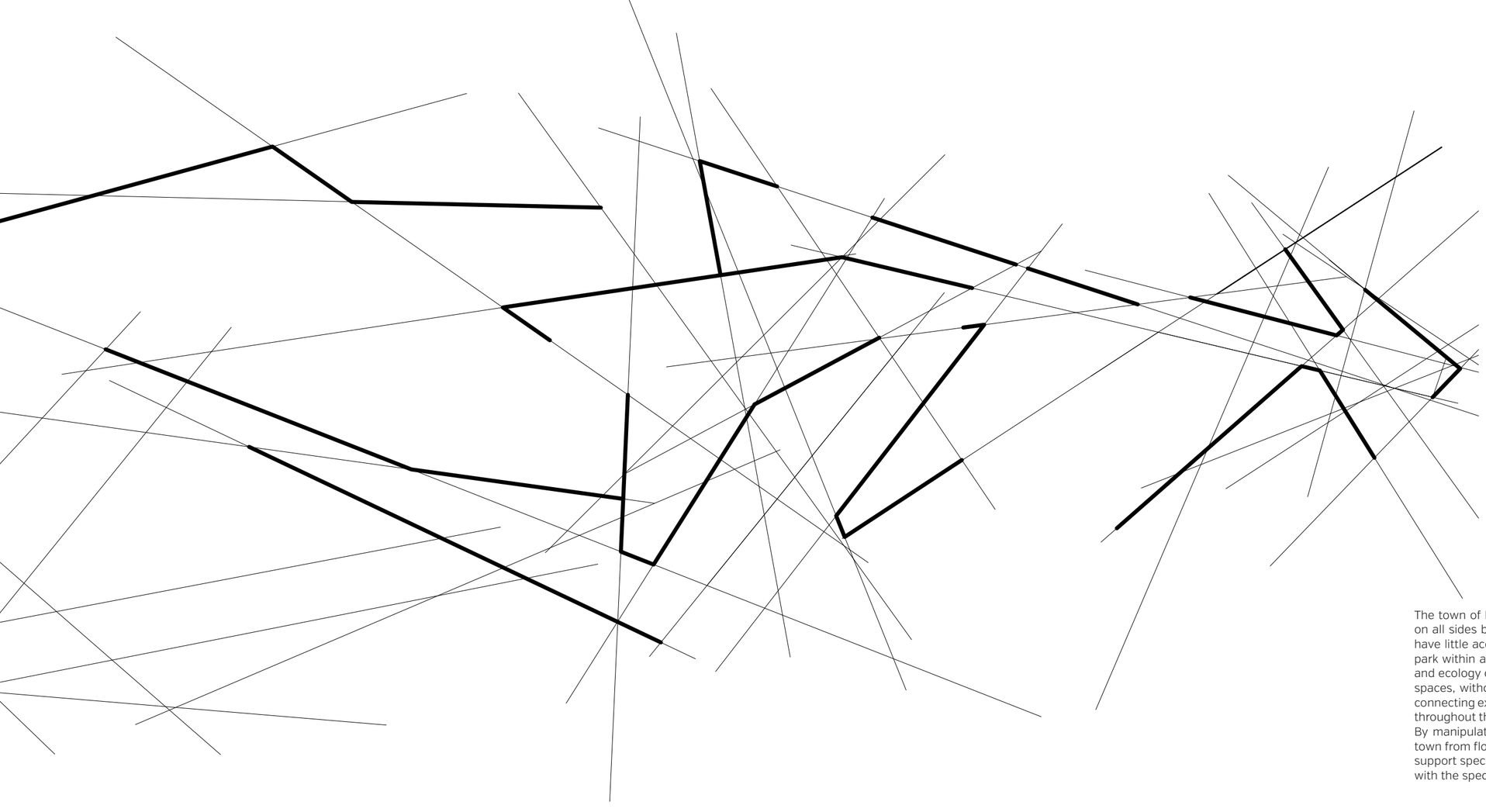


"[A]nimals on separate islands ought to become different if kept long enough apart with slightly differing circumstances."

C.R. Darwin [Notebook B: [Transmutation of Species], 1837-1838]

"A particular lifestyle that assumes that living in Galápagos is fundamentally different and accepts the limitations associated with the archipelago's fragile natural system [is] the best and only way to facilitate the transition toward a more sustainable future."

González et al. [Rethinking the Galápagos Islands, 2008]



07

PARK CITY PARK

Andrew Ward

The town of Puerto Baquerizo Moreno sits on the southwestern tip of San Cristóbal Island, bordered on all sides by the Galápagos National Park. Although it is a city surrounded by a park, the residents have little access to the park due to mandatory fees and limited access points. This project creates a park within and for the city, providing residents with opportunities to experience the unique geology and ecology of the island on their own terms. The new park also provides the town with needed urban spaces, without infringing on or being constrained by the rules of the GNP. The park takes form by connecting existing institutions and their under-utilized land throughout the town. A variety of programs throughout the park will relate the existing institutions to the needs of the surrounding neighborhoods. By manipulating the topography, places of water collection and re-direction will help to protect the town from flooding during heavy rains. The build-up of soil and walls will create microclimates that will support species from a variety of ecozones on the island, allowing residents to experience and engage with the specific environments that make their island so unique.

Site Analysis

ACCESS TO NATIONAL PARK

- Visitors must be accompanied by a Naturalist Guide authorized by the GNP.
- Many residents have never visited the GNP due to lack of access and cost.

LAND DESIGNATION ON SAN CRISTÓBAL

Galápagos National Park: **88%**

Urban Area: **1%**

Rural Area: **11%**

Connecting Institutions and Activating Underutilized Land

Charles Darwin Foundation
Current use by highschool programs, and student Ranger club. Some native species planting and education.

City Park
Basketball and Soccer Courts, Ping Pong Hall, Playground, Sunny garden Path, Restrooms

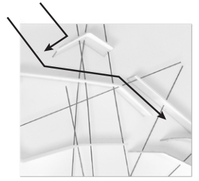
Tourist Pier
Used for transportation and inspection of tourists only between the hours of 7:00 - 7:30 am 3:00 - 3:45 pm

Government Hill
Provincial government offices and police station overlooking town. Limited pedestrian access.

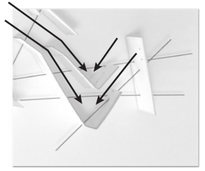
Alejandro Von Humboldt High School
Local high school with neglected unused land. Many existing mature plants on site including Palo Santo, Mesquite, and salt bush.

Waterfront
.5 mile continuous waterfront path with restaurants, shops, and hotels. Frequently used by residents and tourists alike.

Design Strategies



Divert



Collect

Spread

Parcels

Connected Parcels

Cross Stitching

Activated Edges

Water Flow

Areas of Holding

Edges of Interception

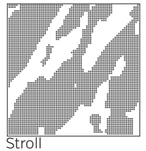
Framework

Park Design Elements

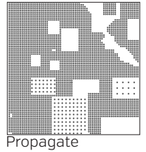
Framework Plan

Collecting Wetness

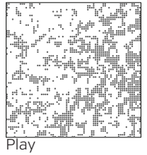
Spatial Strategies



Stroll

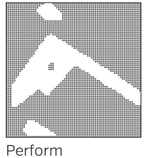


Propagate



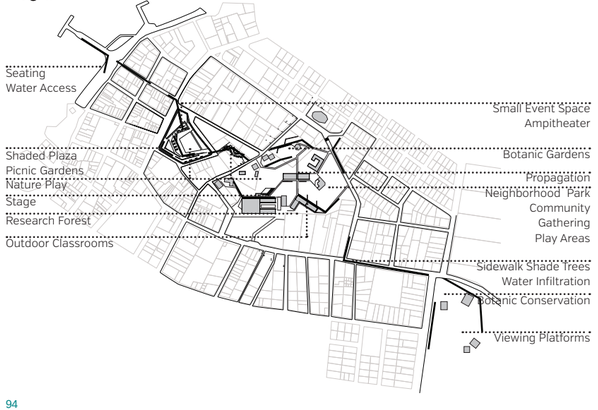
Play

Research



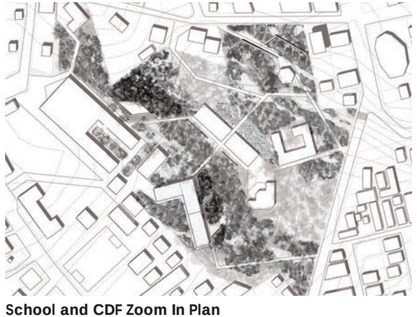
Perform

Program



Ecozones

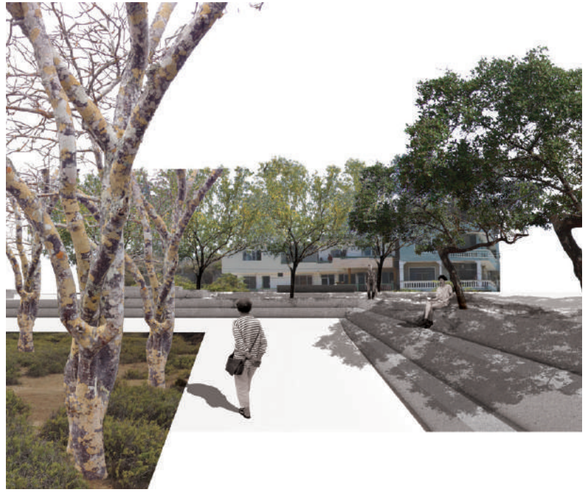
City Park Zoom In Plan



School and CDF Zoom In Plan

City Park Lot

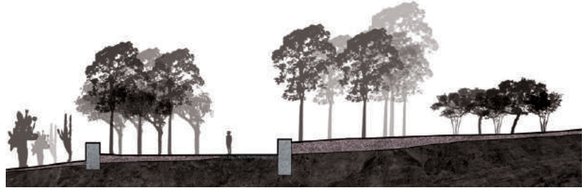
Central Gardens and Recreation Area



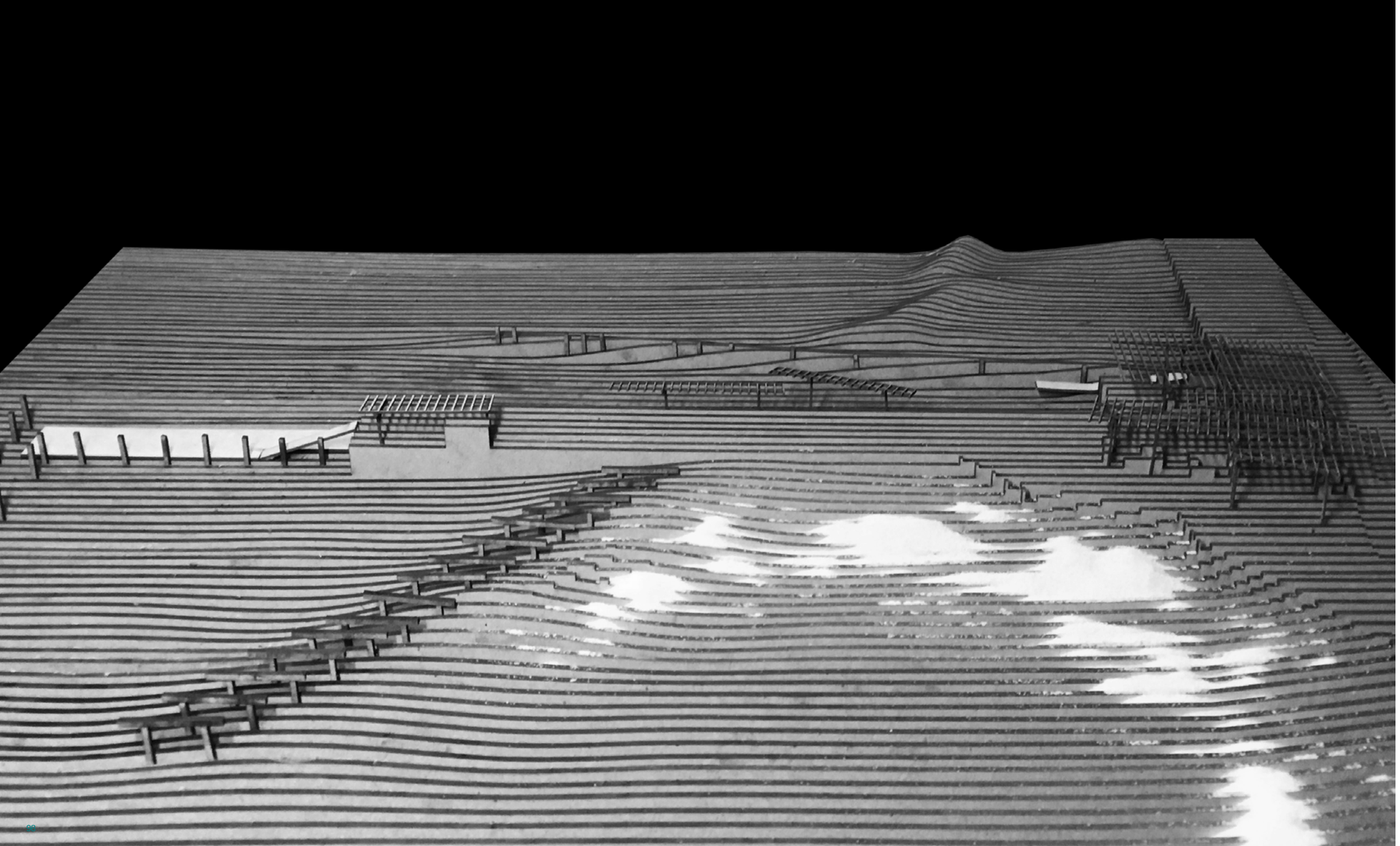
Plaza and Seating

Highschool and Charles Darwin Foundation lot

CDF Botanical Gardens



Scalasia Amphitheater



08

MULTI-FUNCTIONAL PIER

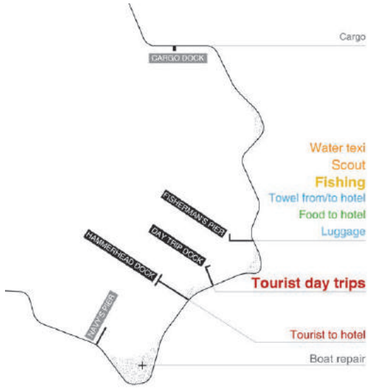
Yini Tang

The Galápagos Islands are famous for their endemic animals, yet much less is known about local people and their experiences with the ecology of the islands. On the flip side, the tourists, especially those who stay on 'boat-hotels,' have many interactions with wildlife but few with human residents. By analyzing the people and product flows through the existing piers at Puerto Baquerizo Moreno, I observed that tourists and locals are separated, and the tourists' piers are underutilized while the fisherman's pier is overcrowded. Furthermore, the current multitude of piers give too much area to boat traffic, thereby encroaching on much-needed sea-lion habitat.

By reorganizing and consolidating activities to the town's largest pier, which also leads to the town center, this project aims to create more encounters between tourists and locals, and give more visibility to the exchange of local products. This "mega-pier" includes transportation of fishes and highland produce, tourist embarking / disembarking, an outdoor market, and a new beach area. By consolidating activities to one pier, other areas can be designed for recreation and animal habitat.

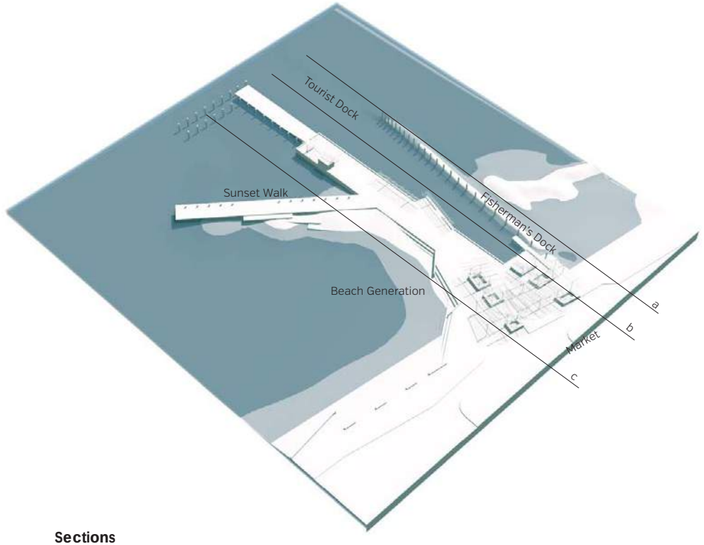
Site Analysis & Operations

Existing: Disordered Pier Activities



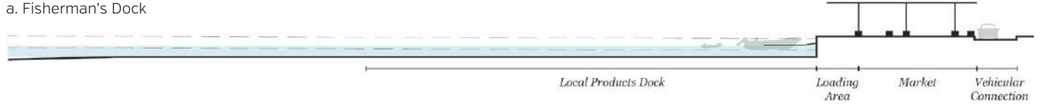
Proposed: Consolidation of Activities & Beach Generation

Multi-functional Pier Design



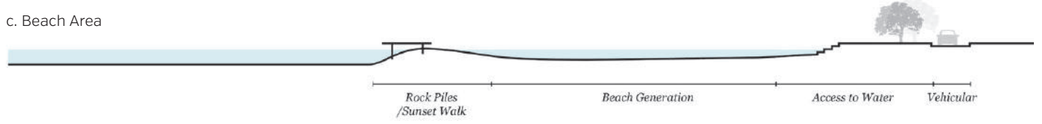
Sections

a. Fisherman's Dock



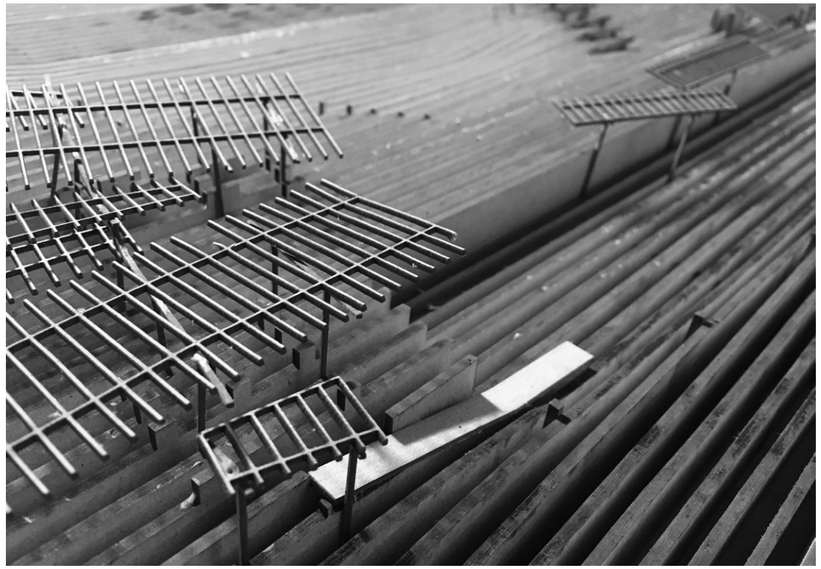
b. Tourist Dock

c. Beach Area



Model

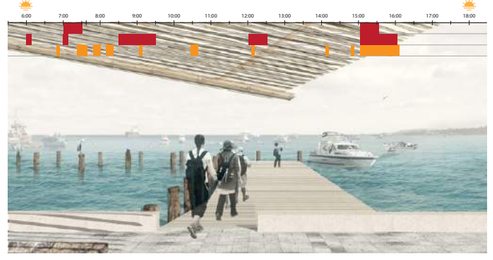
Fisherman's Dock (top) | Tourists' Dock (bottom left) | Beach & Market (bottom right)



Beach Generation over Time

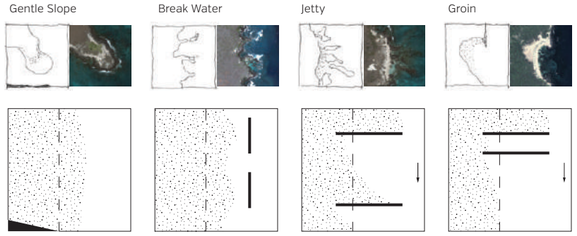
Performance

Fisherman's Dock (top) | Tourists' Dock (bottom left) | Beach (bottom right)

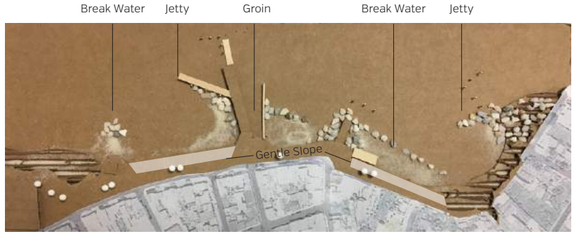


Beach Generation Concept Design

Beach Generation Principle

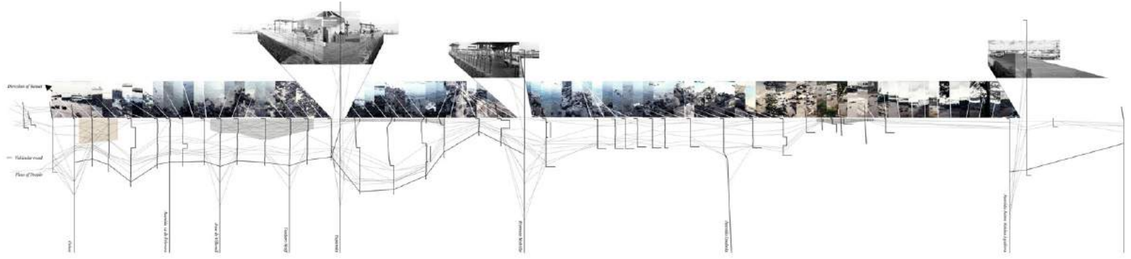


Study Model

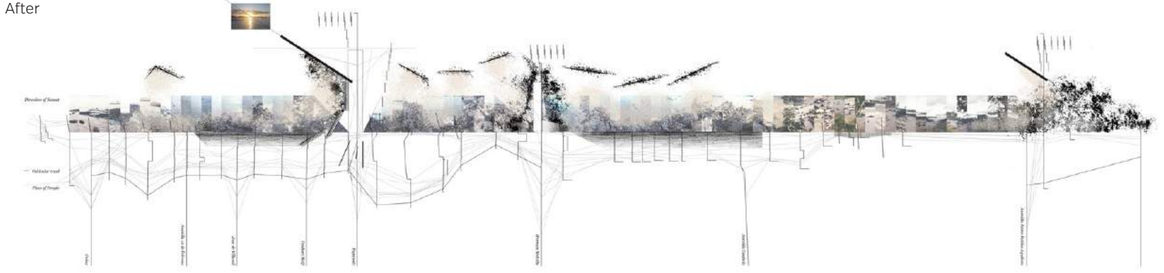


Shoreline Material Study

Before



After



Beach Generation Concept Design

Sequential plans show beach generation and tidal changes over time.

Existing Condition

Initial Operation

Beach Generation













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FANTASY ISLAND

This book is comprised of select projects that best represent the range of ideas explored in this studio at the University of Pennsylvania. The studio was guided by Karen M'Closkey and focused in and around Puerto Baquerizo Moreno on San Cristóbal Island, Galápagos Islands, Ecuador. I wish to thank all of my fabulous students who went on this journey with me. The students and I would like to thank Michael Weisberg, Ernesto Vaca, Penn's Program in Environment Humanities, the Stuart Weitzman School of Design at the University of Pennsylvania, and the many wonderful people we met along the way. Special thanks to Zhexuan Liao, Yang An, and Dorothy Jacobs for book design.