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IN
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SUBMITTAL FORM

The Vital River

by

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The Vital River: Damour River

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Landscape Capstone Project

American University of Beirut

Spring 2020



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01 STATEMENT

The Damour River is being misused by agricultural practices, there has been an excess intake of water for irrigation purposes, as well as, chemicals acting as a disturbance. Also, the risk of future urban expansion will impact the river in a negative manner. Thus, my intervention will be centered on the restoration and rehabilitation of the river through ecological practices, which will allow social activities to exist in the future.

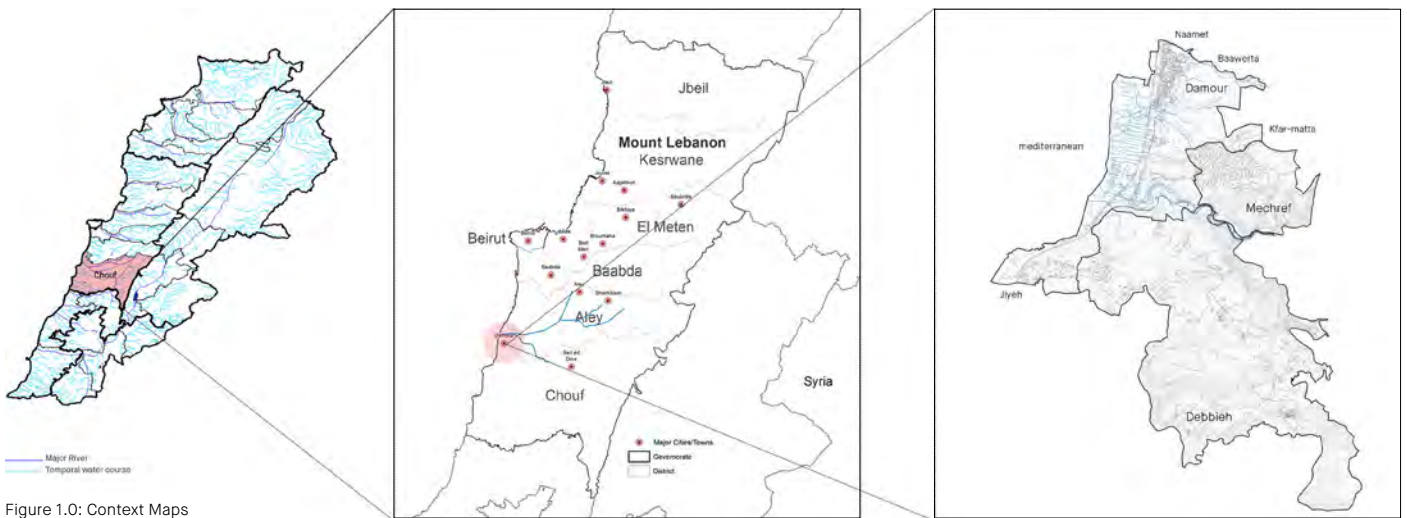


Figure 1.0: Context Maps

The part of the Damour River studied is the one located in damour and also runs in between the mountains of debbieh and mechref. Those areas are situated in the lower part of the chouf where chouf is an administrative district in Mount Lebanon.

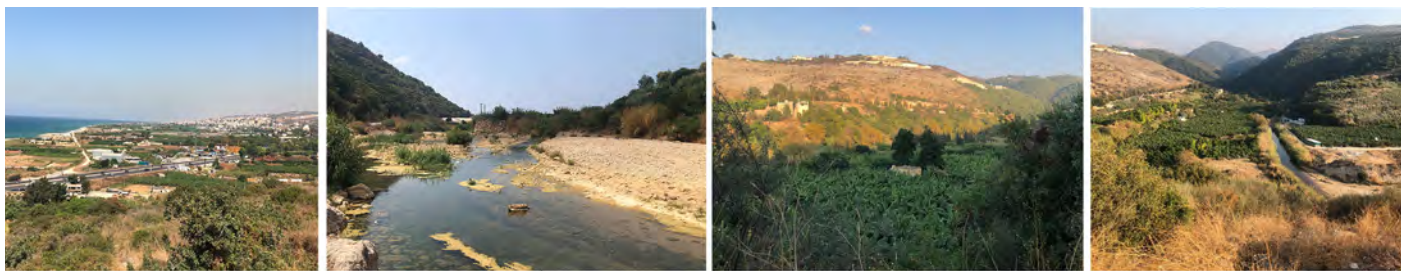
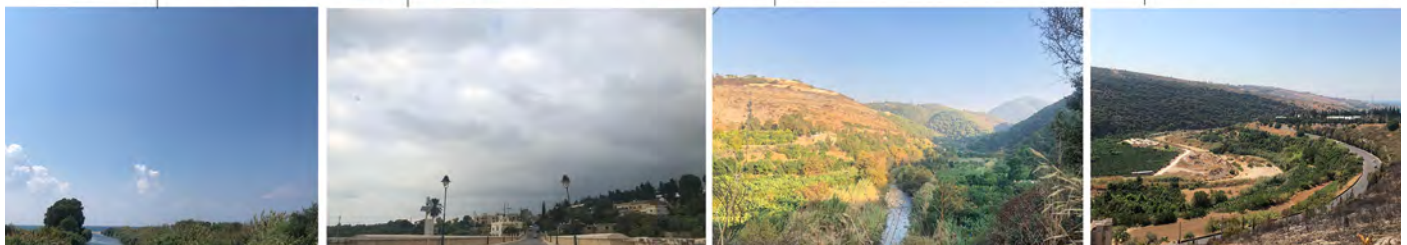


Figure 1.1: Aerial Image



03 CASE STUDIES

Case Study 1: Rio Seco Linear Resiliency Park

El Alto, Bolivia - along the El Alto River - SCAPE



Generated after extensive site analysis and series of community and stakeholder engagement sessions, **SCAPE's vision plan proposed the river as a form of urban infrastructure and civic space, honing in on nodes and connector areas to catalyze the long-term implementation of an overall linear resiliency park.**

Parque Urbano Central, connects the city's two primary rivers with the airport, **revamping the existing site into a central parkland replete with a botanical garden, greenhouses, playgrounds, and recreational spaces.**

Case Study 2: Nantong Eco-corridor 2017

Nantong, China - along the Nantong River - AECOM



Issue: The greenway lies in Yangtze River delta eco-region, due to the ruthless and rapid urbanization in the past few years, the harmony of Yangtze Delta **wetland ecosystem has been disrupted and has suffered from heavy metals, organic pollution, invasive species and acid rain.**

Solution: Nantong was the birthplace of modern textile industry, which is well-known for its blue printed fabric. Inspired by the art of fabric weaving, **a new ecosystem was named 'Landscape Ribbon' which plays a vital role in completing the urban Greenland system as well as in providing multi-functional spaces such as a recreational venue, a cultural journey, an ecological display and educational experience.**

Case Study 3: Ecosong Park 2013

Shanghai, China - along the Huangpu River - Meyer + Silberman



goals: optimize existing resources, clean water, promote organic farming, restore habitat, provide recreation and promote prosperity. The Master Plan builds upon the existing agrarian landscape and introduces systematic interventions that retain the character of the place and improves ecological and economic function. Currently, the site harbors a mix of farmland, canals, tree plantations, orchards, and villages.



Source: Public Works Studio
Figure 2.0: Damour Urban Expansion Through Time

The municipality zoning shows that they are planning on expanding the urbanization zones (H) towards the river. if so, then this shows that there will be many negative affects on the biodiversity of the river.

Tourism



Source: Public Works Studio
Figure 2.1: Tourism Map

Zoning

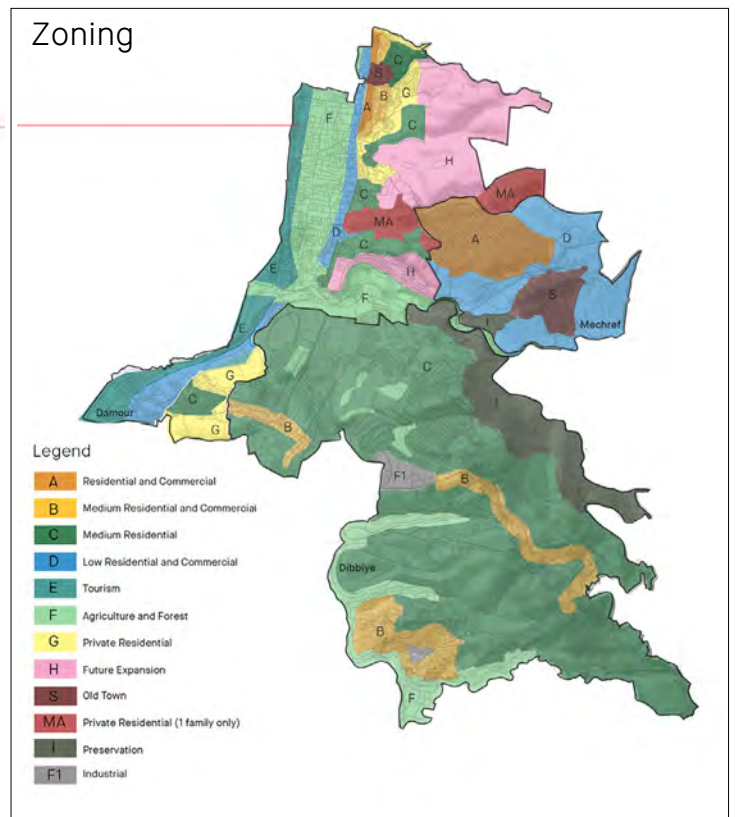
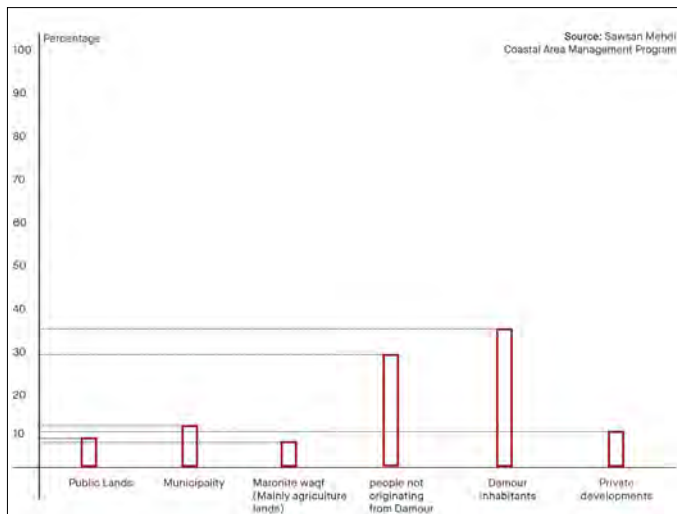


Figure 2.3: Zoning Map

Ownership



The following graph shows the percentages of the land ownership. A lot of the lands are owned by people who are not from damour for real estate purposes to widen the tourism sector, thus we can conclude that tourism is a main entity that impacts the damour river and is considered to be of great importance (which is also shown in the future zoning done by the municipality).

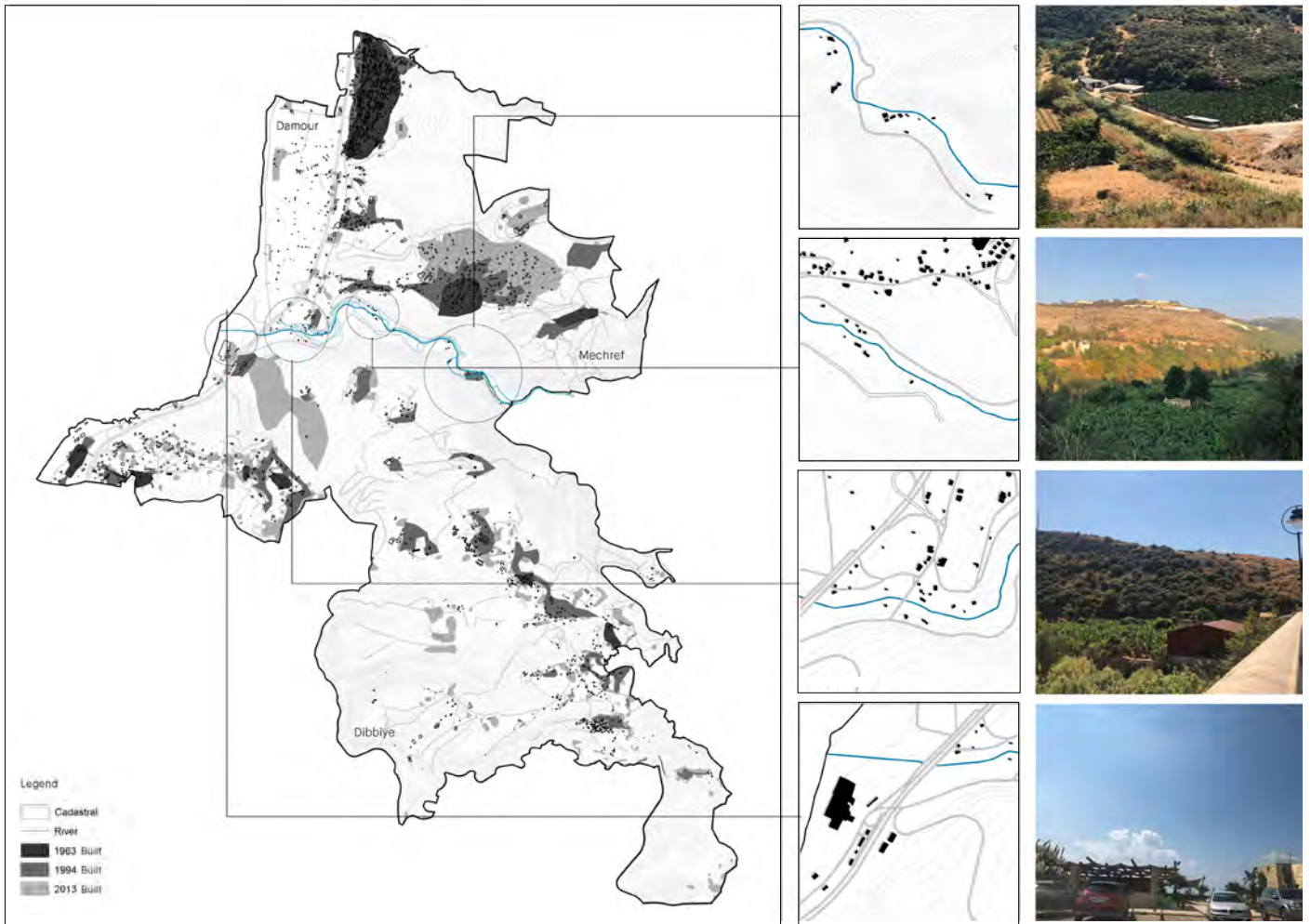


Figure 2.4: Damour, Debbieh and Mechref Urban Expansion Map

The Urban expansion has been a major issue because the built zones are spreading and have been reaching a close proximity to the river. This shows that the spread will affect the riparian ecosystem negatively.



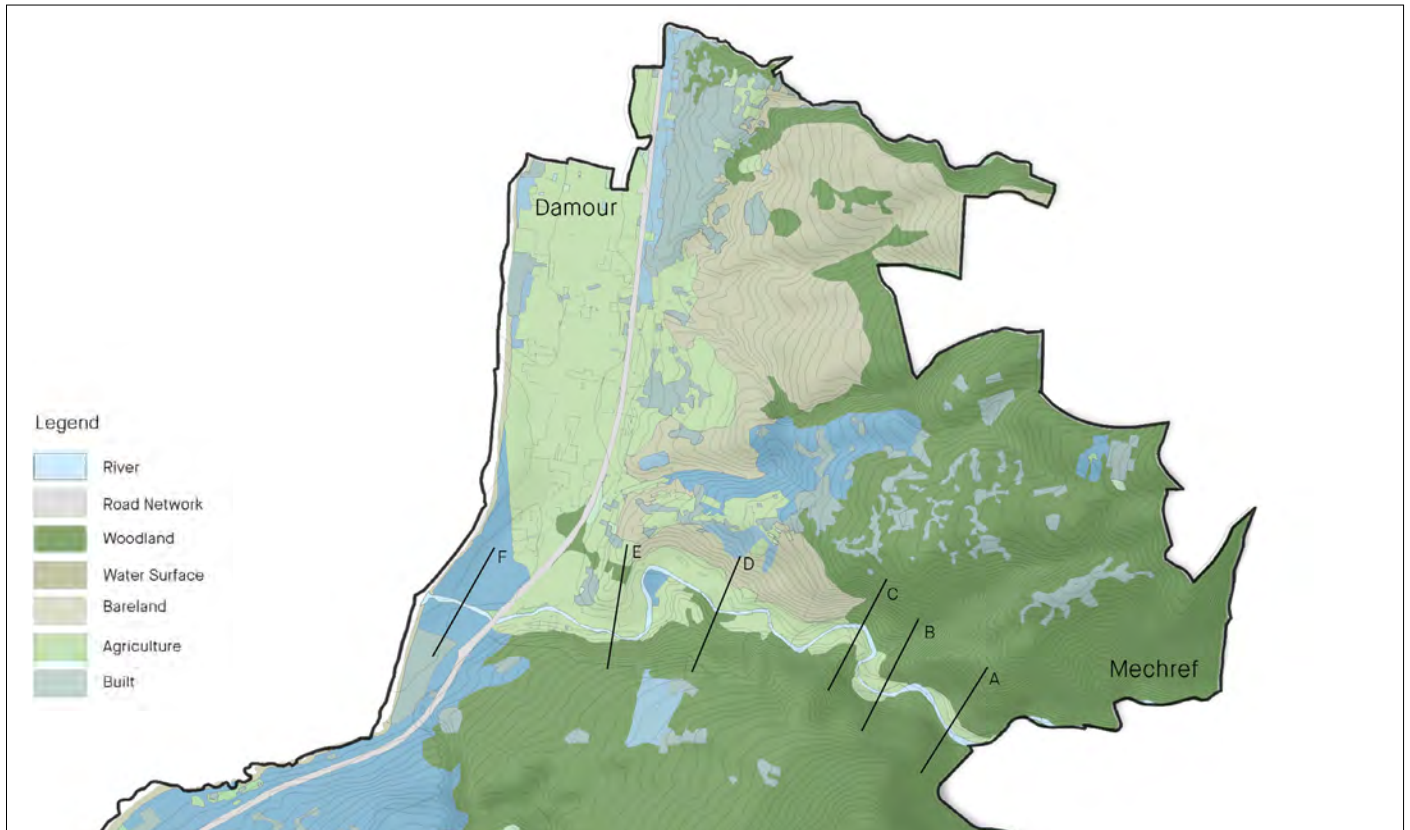
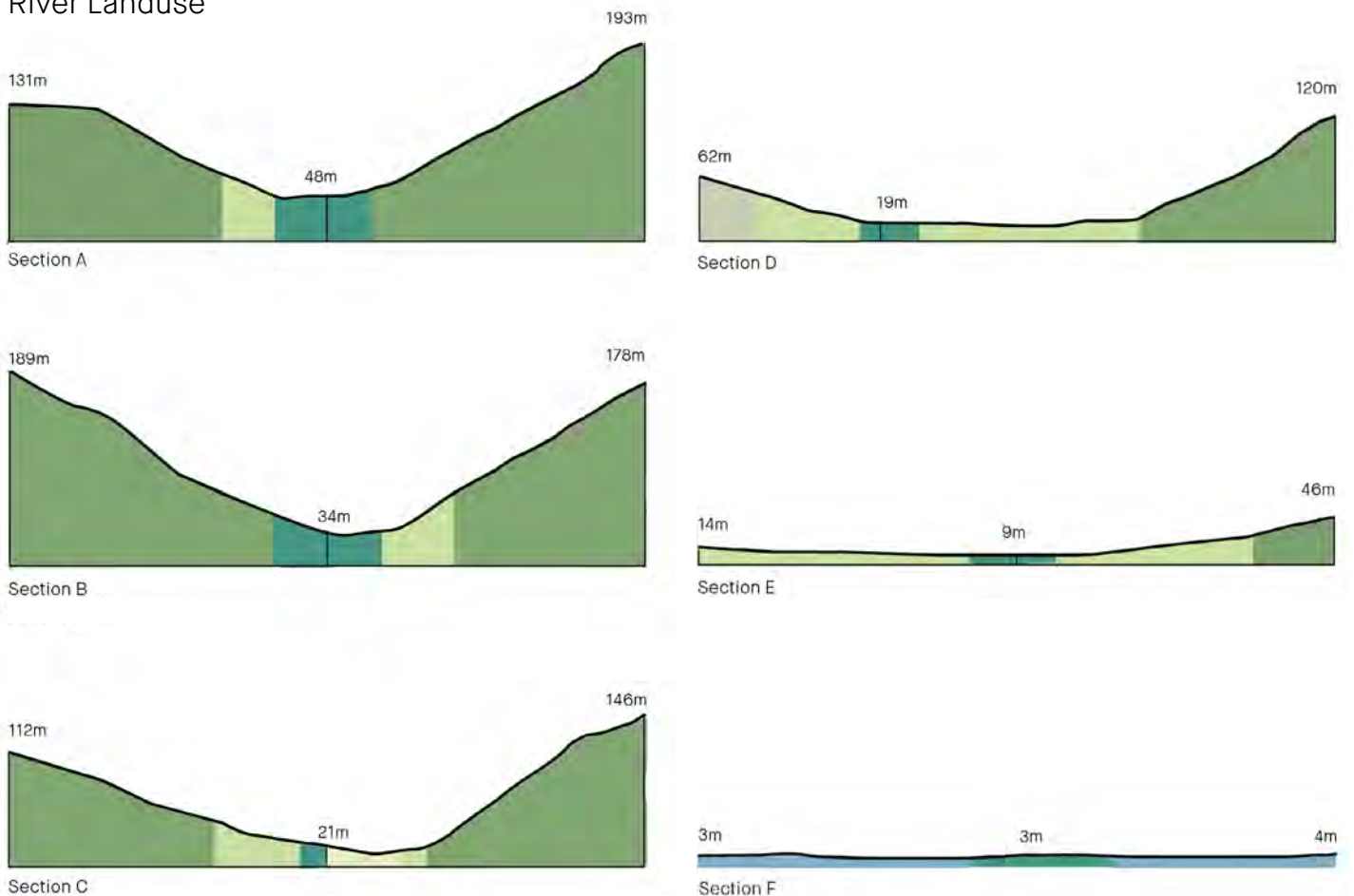


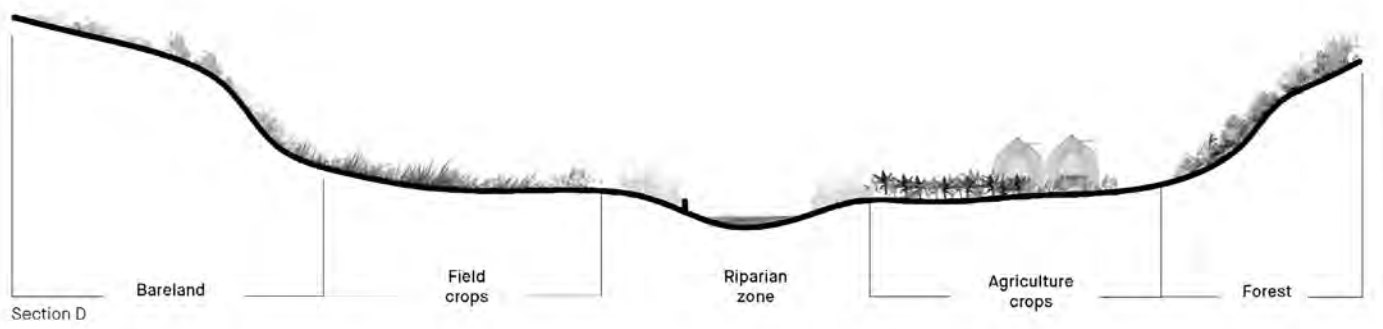
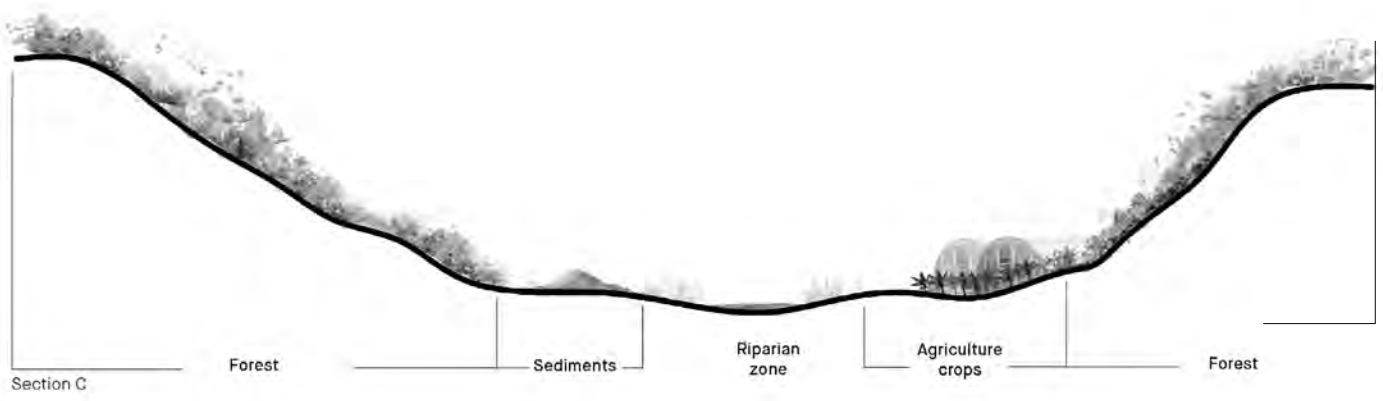
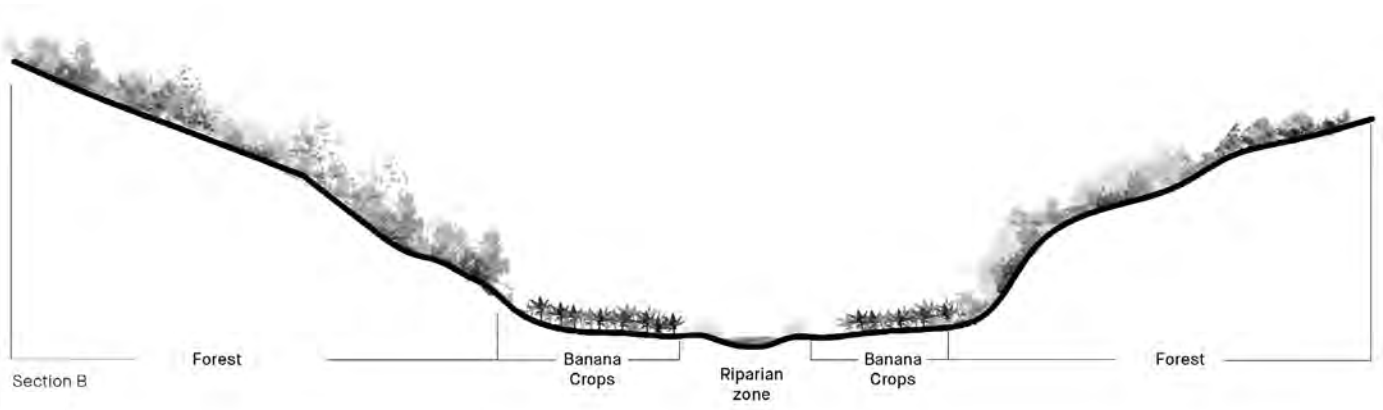
Figure 3.0: Landcover Map

The Damour River has been known for years for its Valley that can be seen from highway. It has distinct levels of topography starting with steep mountains from the top of the village and ending with the shallow estuary in the coastal area.

River Landuse



River Character





burnt zone near river

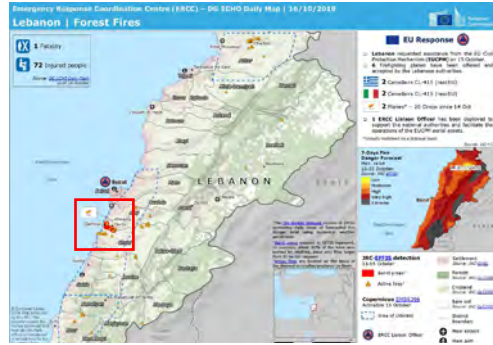
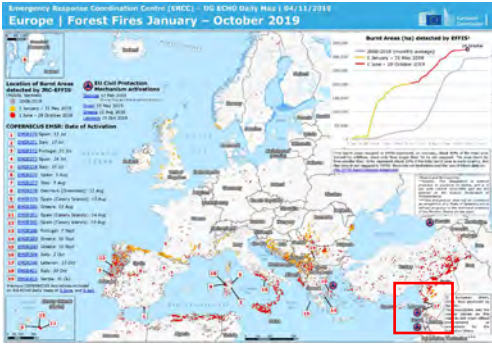


Figure 4.0: Forest Fires Maps

Landuse Through Time

2004

2010

2019

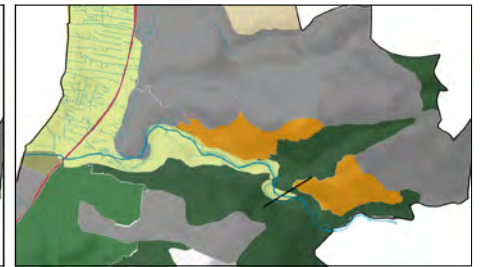
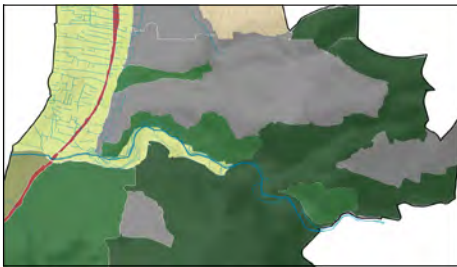


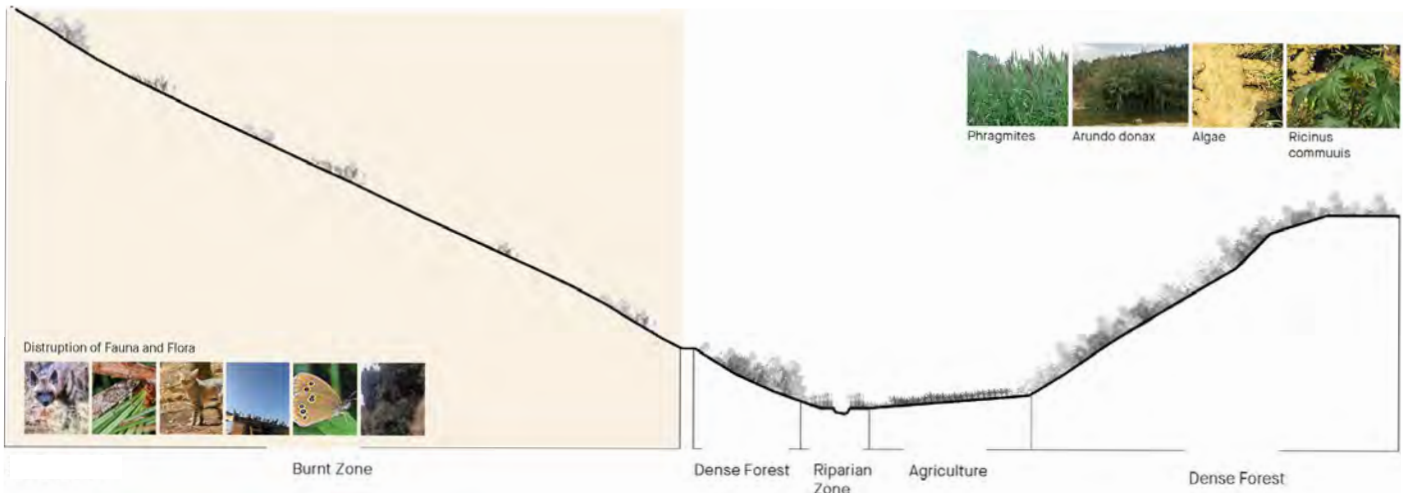
Figure 4.1: Landuse Through Time Map

Legend

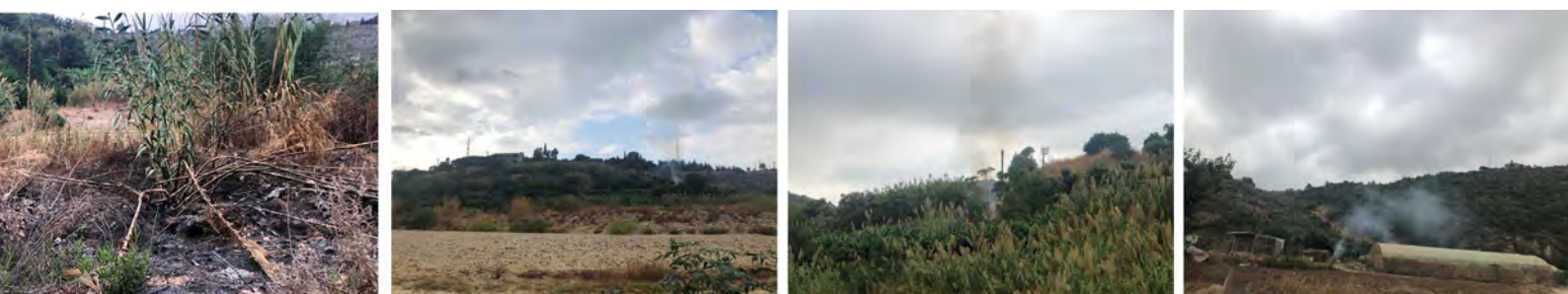
- Urban Fabric
- Sparsed Forest
- Dense Forest
- Highway
- Herbaceous Veg.
- Forest Fire Zones

Lebanon struggled this week to fight its worst wildfires in decades after a heatwave and strong winds caused fires in the pine tree-dense western mountains to spread to towns south of Beirut. The forest fires started in mechref and then spread towards most of chouf. The fires in mechref reached at a very close proximity to the river affecting its fauna and flora.

Fauna & Flora affected by fires



Fire Activities before the wildfires



Agriculture Shift

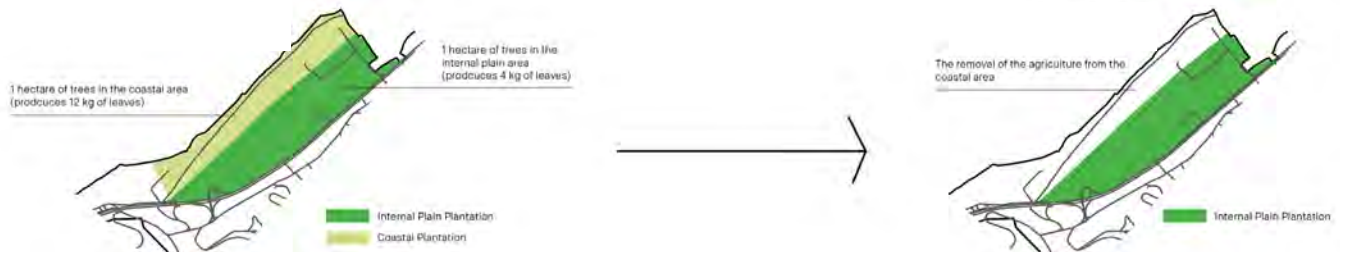


Figure 4.2: Agriculture Shift Maps

Source: Municipality/LDEM 204

Before 1915, mulberry plantations happened in both the plain area as well as the coast. The leaves that were produced from the mulberry trees in the coastal area were almost triple the amount produced from that in the plain area. This shows how significant it is to plant in the coastal areas. Also the importance of tourism has disrupted that agriculture production due to the replacement of the mulberry plantations to resorts.

Agriculture Typologies



Figure 4.3: Agriculture Typologies Map

- Legend
- Banana
 - Field Crops in Medium to Large Terrace
 - Field Crops in Small Fields/Terrace
 - Fruit Trees
 - Olives
 - Protected Agriculture
 - River
 - Sandy Beaches
 - Citrus Fruit Trees

Irrigation Typologies

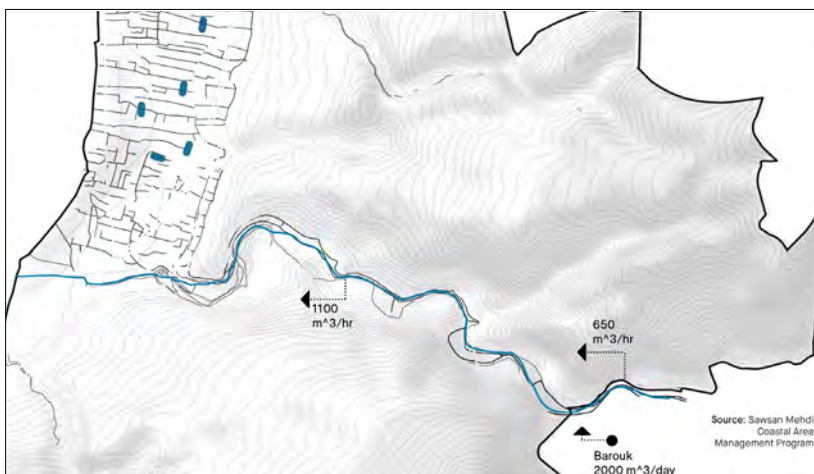


Figure 4.4: Irrigation Typologies Map

- Legend
- Irrigation water channel from Damour river going to the Damour plain
 - Irrigation Canal
 - Public Well

There is an excess intake of water from the river for irrigation purposes, and also the chemicals coming from agri practices has had a negative impact. Where the irrigation channels stem from the river into the agri fields



Rainfall

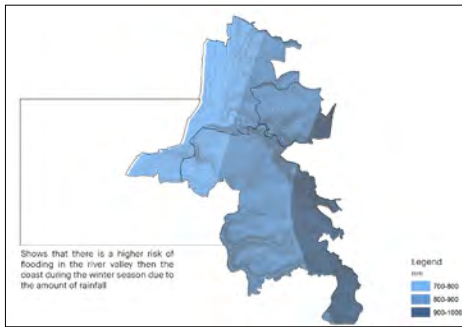


Figure 5.0: Rainfall Map

Soil

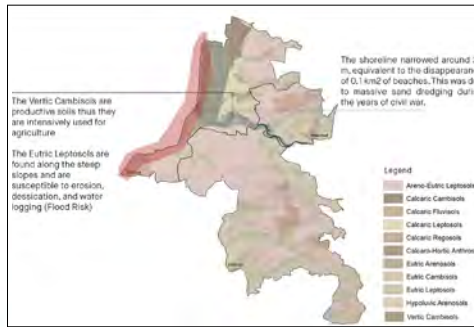


Figure 5.1: Soil Map

Slope

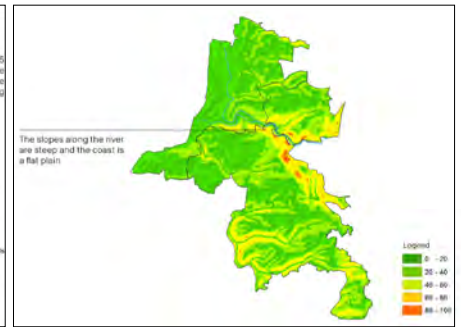


Figure 5.2: Slope Map

Seasonal Change in Water Flow

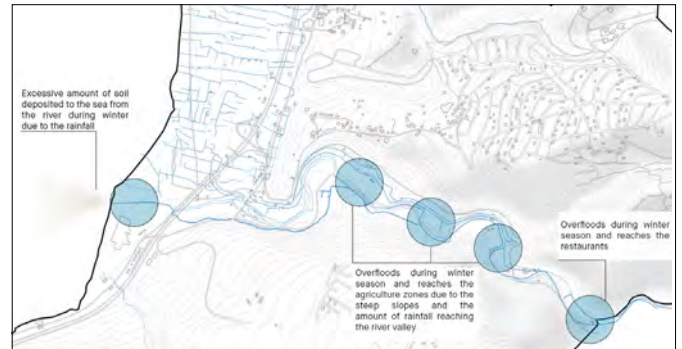
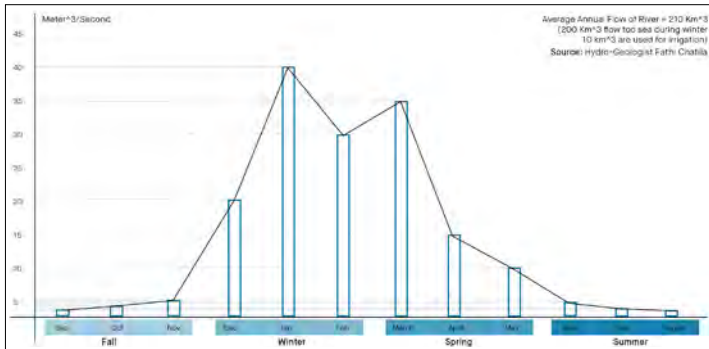
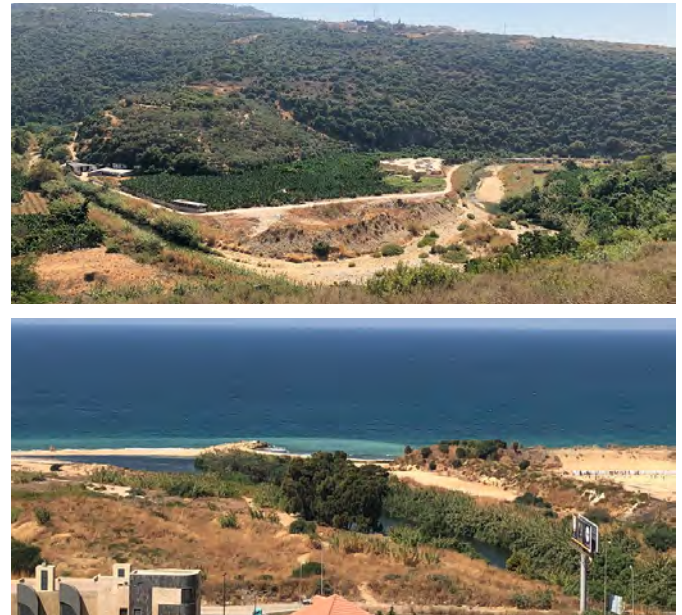
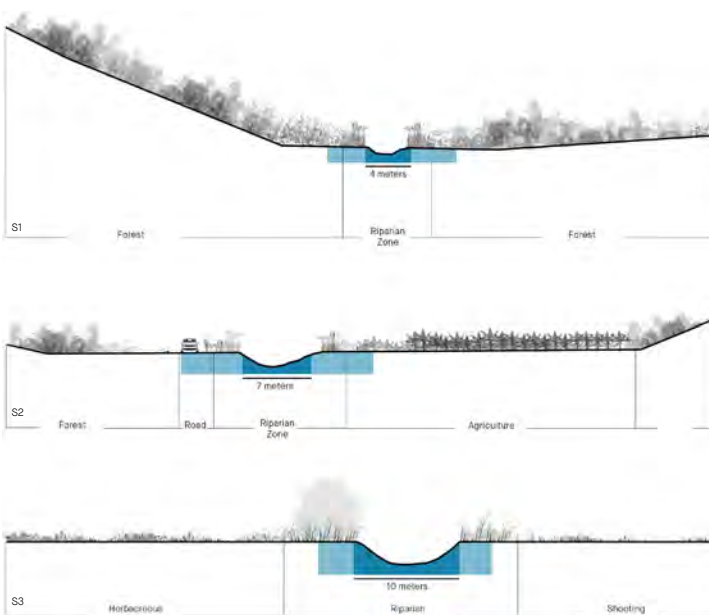
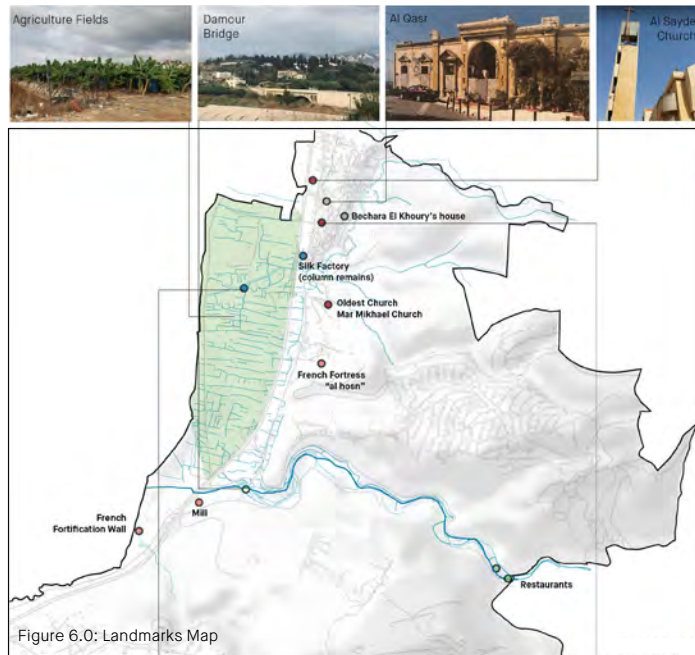


Figure 5.3: Seasonal Change in Water Flow Maps

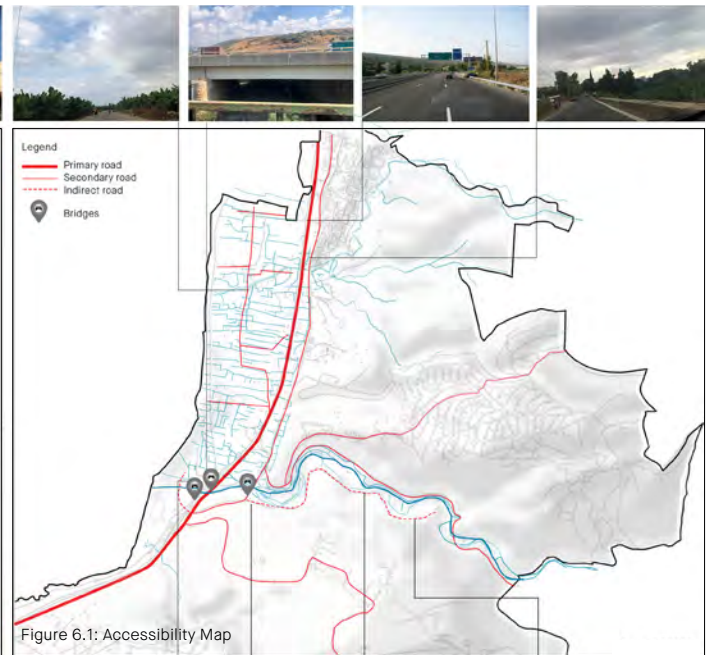
Riverbed limit



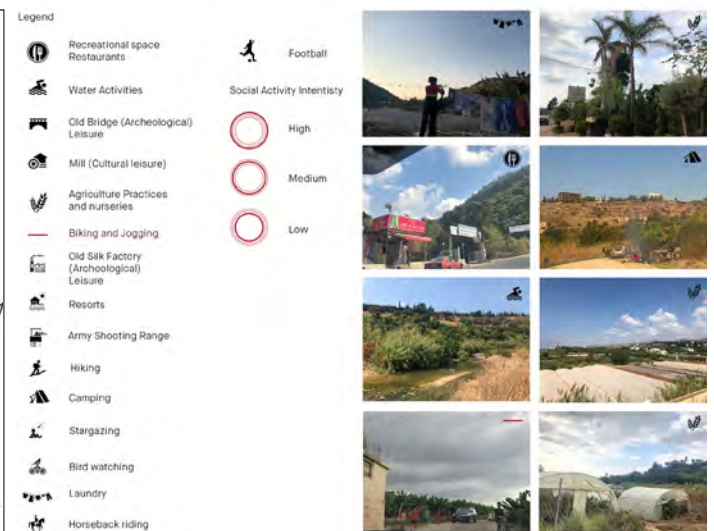
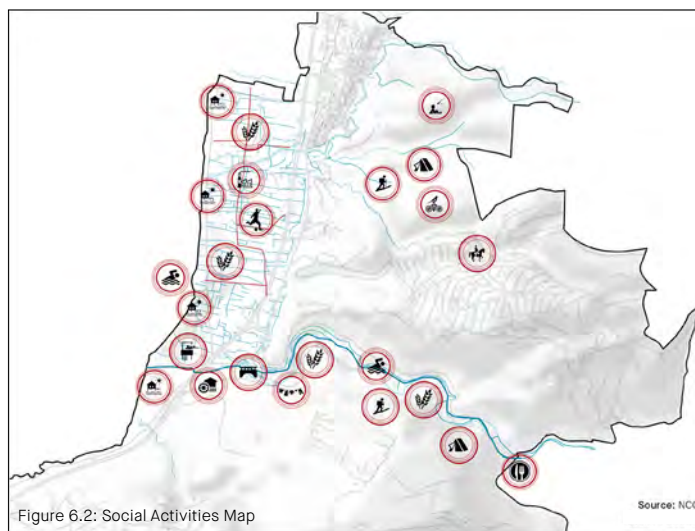
Landmarks



Accessibility



Social Activities



Seasonal Changes of Activities



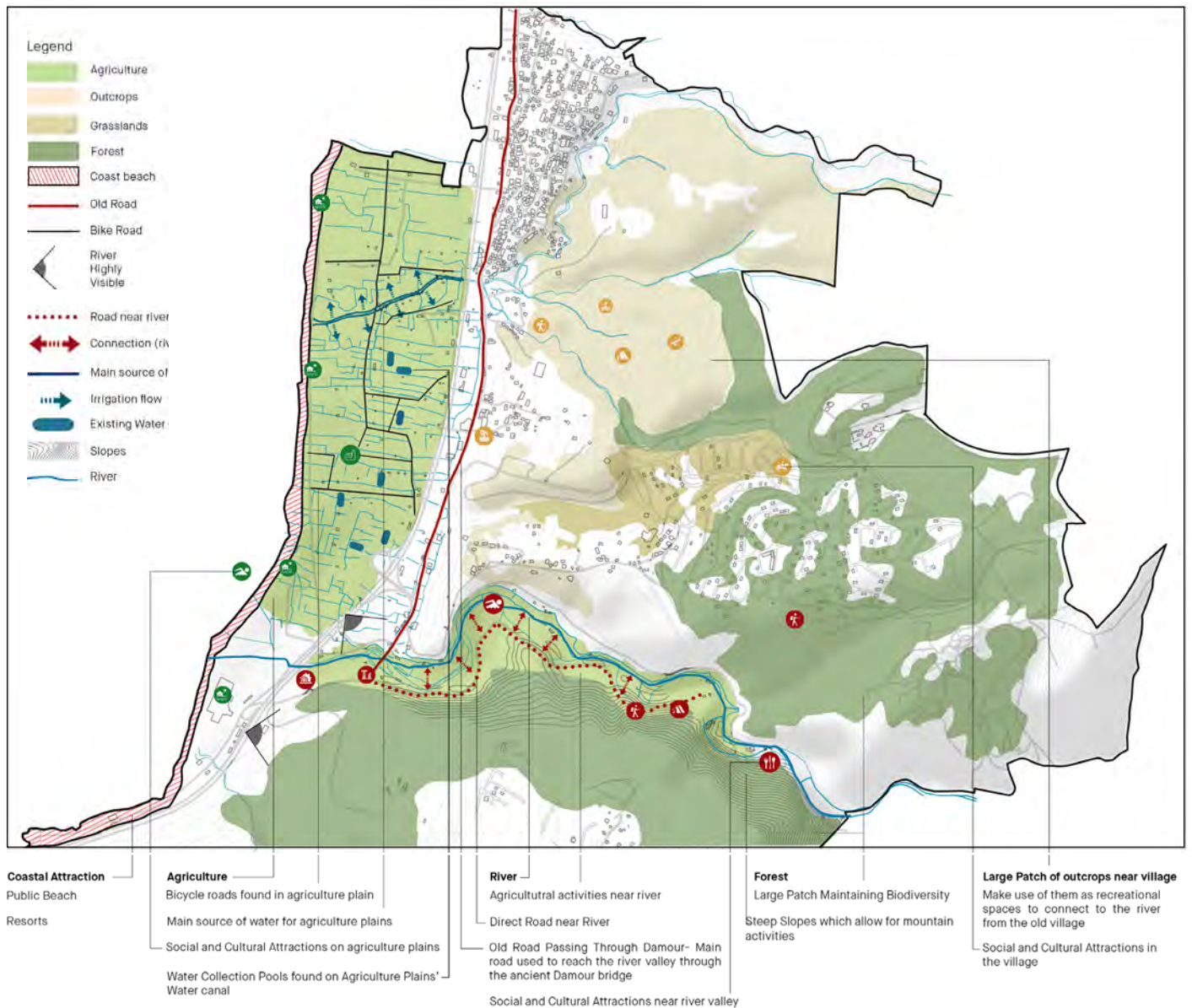


Figure 7.0: Opportunities Map

Social and Cultural Attractions

Sediment Islands

- River**
- Restaurants
 - Water Activities
 - Hiking
 - Old Bridge (Archeological)
 - Mill (Cultural)
 - Camping
- Landcover**
- Horseback riding
 - Hiking
 - Stargazing
 - Bird watching
 - Camping
- Agriculture Plain**
- Resorts
 - Water Activities
 - Old Silk Factory (Archeological)



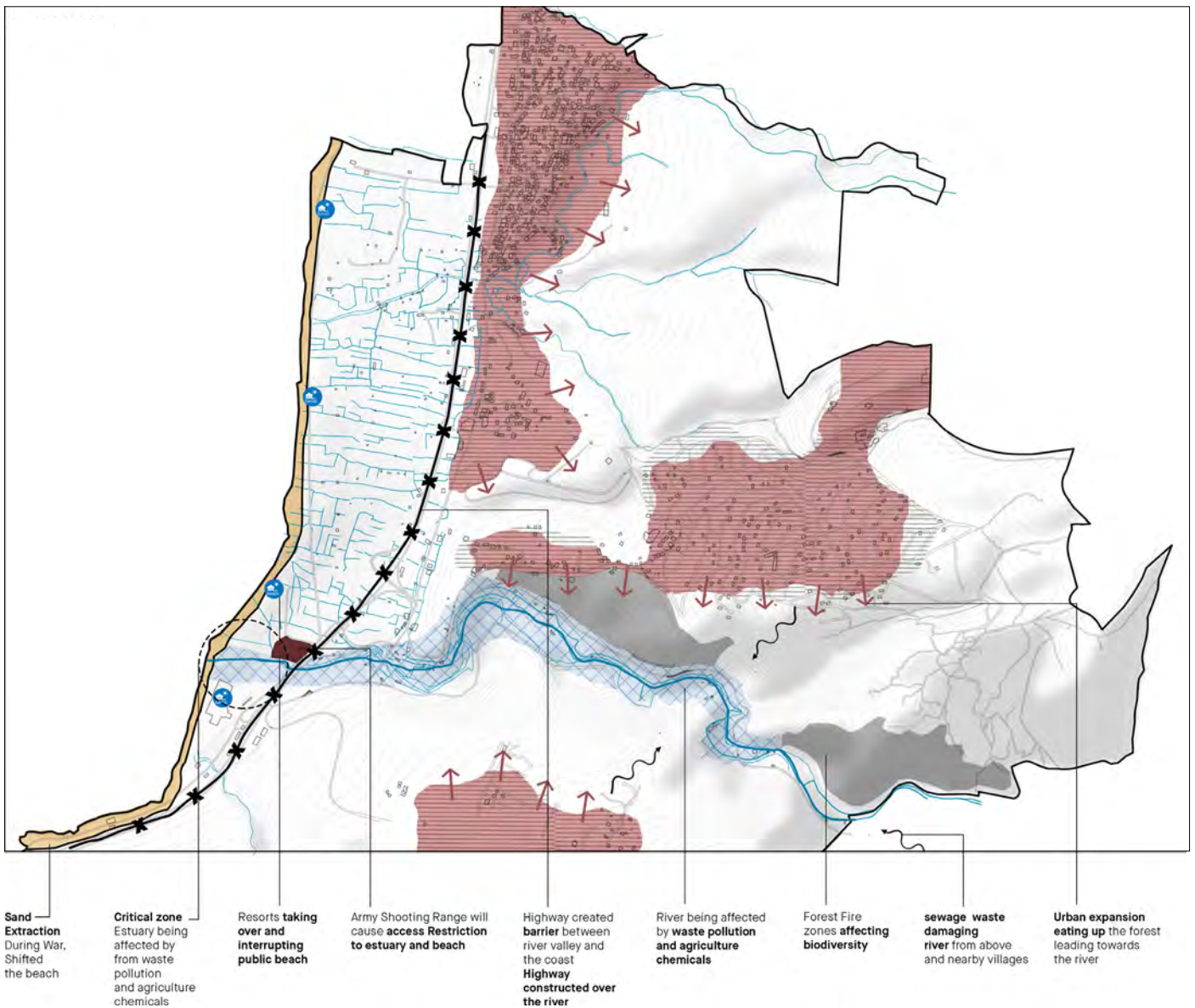
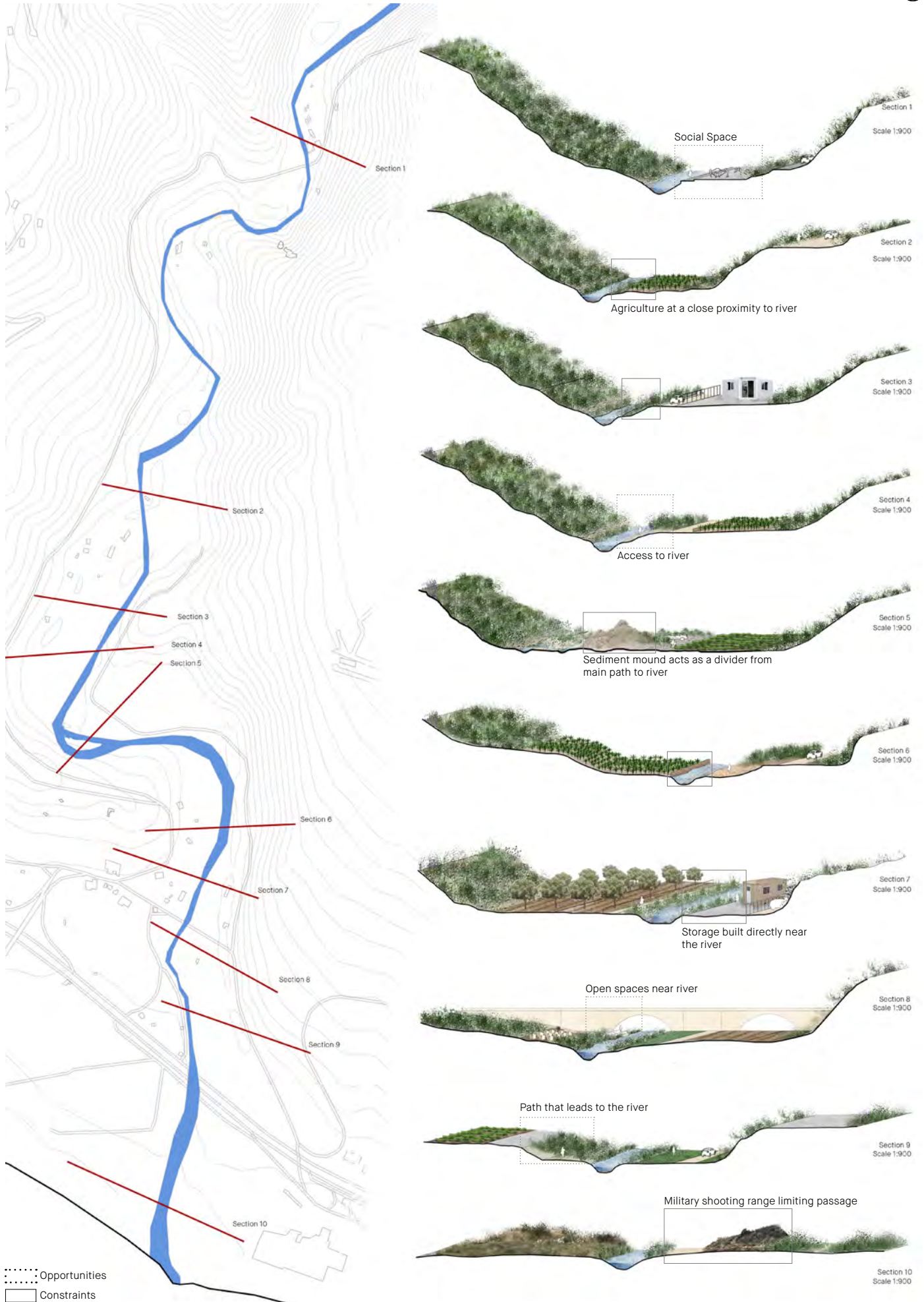


Figure 8.0: Constraints Map

Social Activities



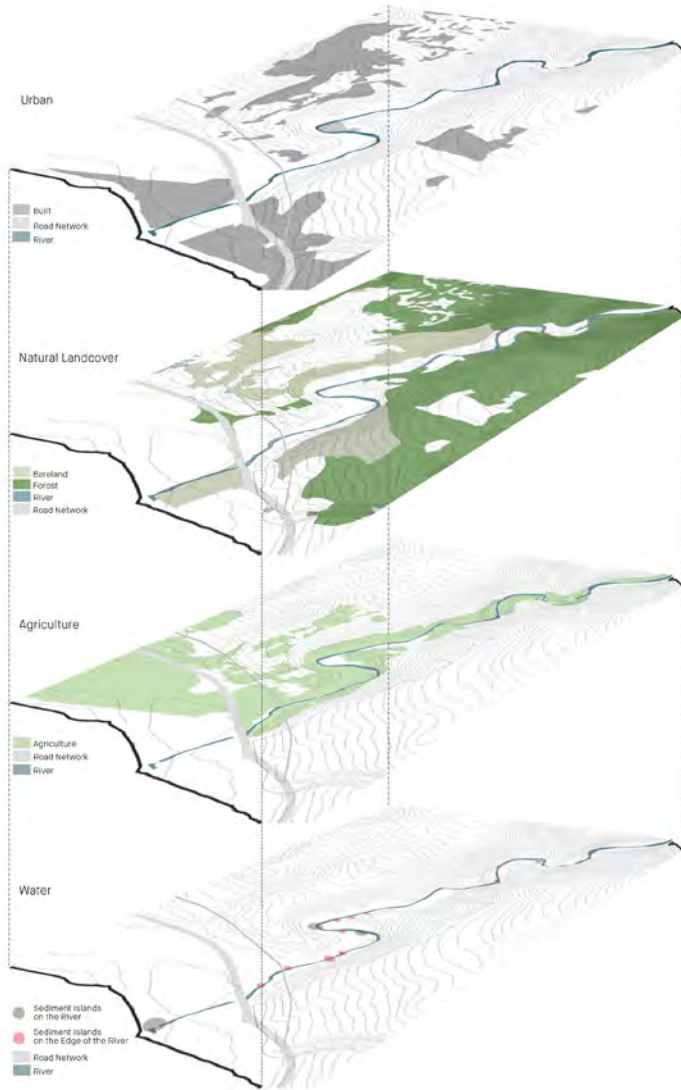
River Character Showing the Opportunities and Constraints



11 STRATEGY & CONCEPT



Concept



Vision Collages

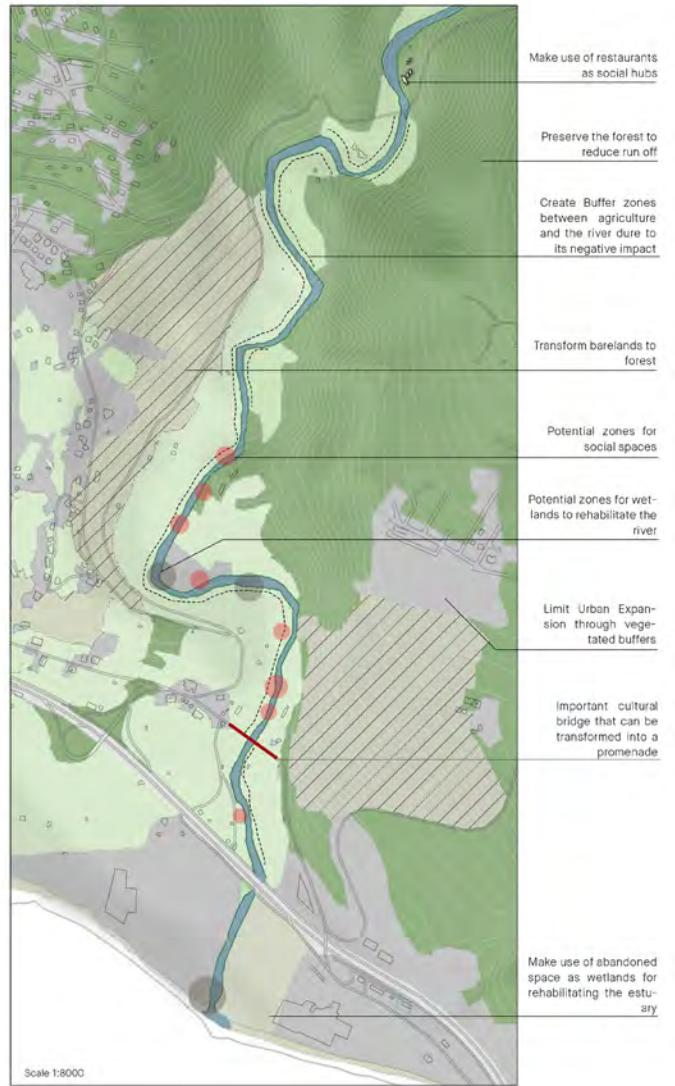
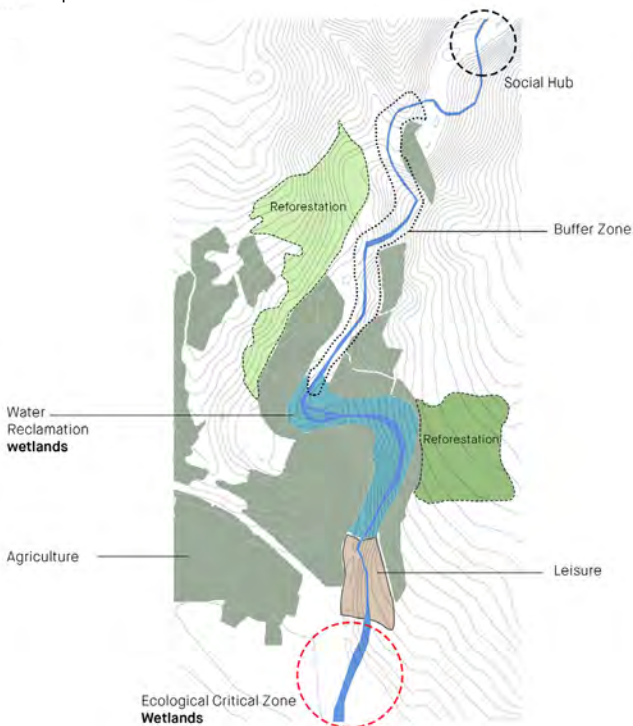


Figure 9.0: Strategy Map

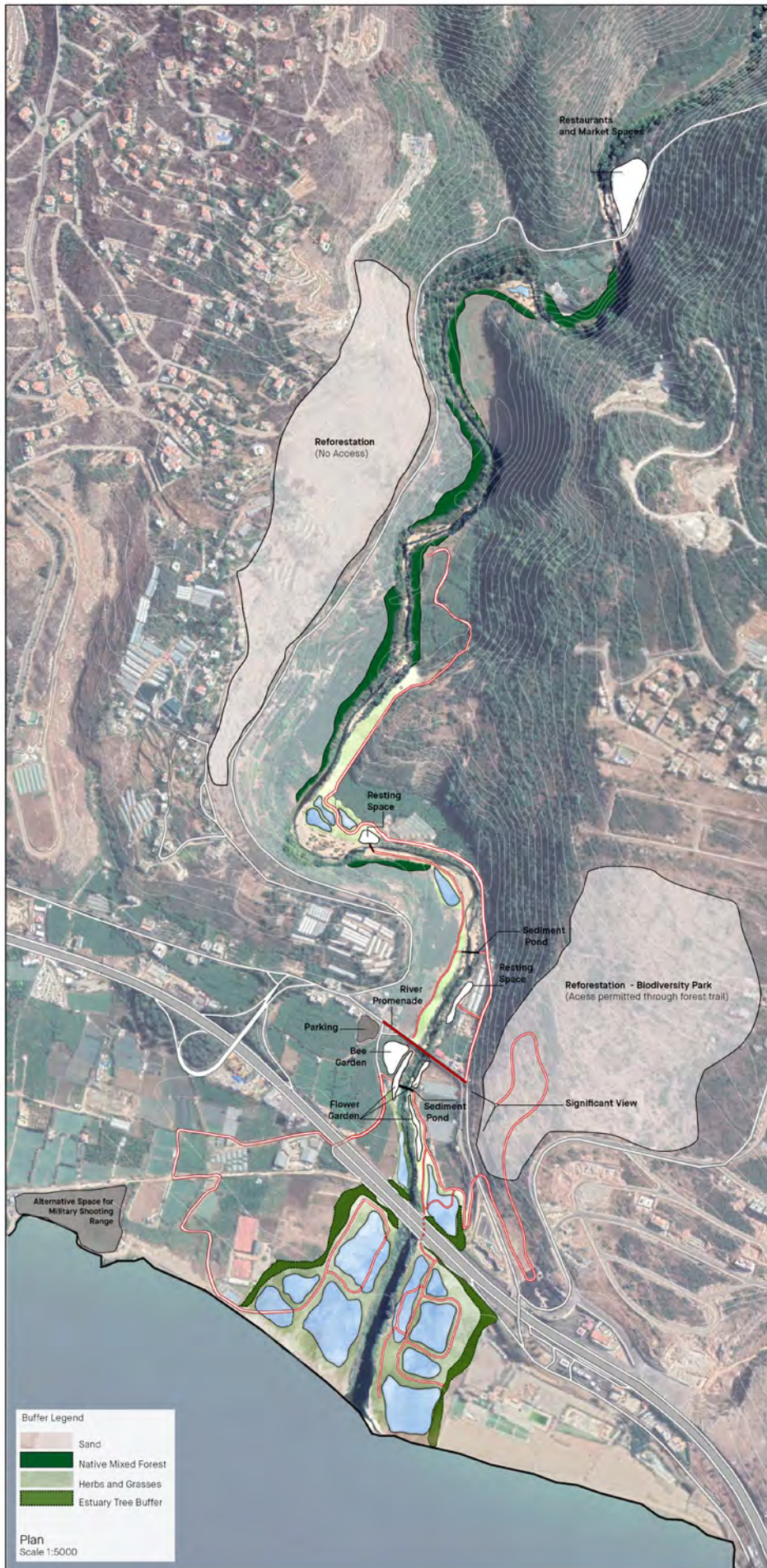
Concept



Vision Collages



Figure 9.1: Concept Diagram



Water System Treatments



Figure 10.1: Water Treatment Systems

- 1 Subsurface Flow Constructed Wetlands:** (horizontal flow) - used for treatment of wastewater
- 2 Sediment Ponds:** temporary pond built to capture eroded or disturbed soil that is washed off during rain storms, and protect the water quality of the river.
- 3 Salt Marsh Constructed Wetlands:** water quality improvement and allow for habitats for fish and wildlife

Programs

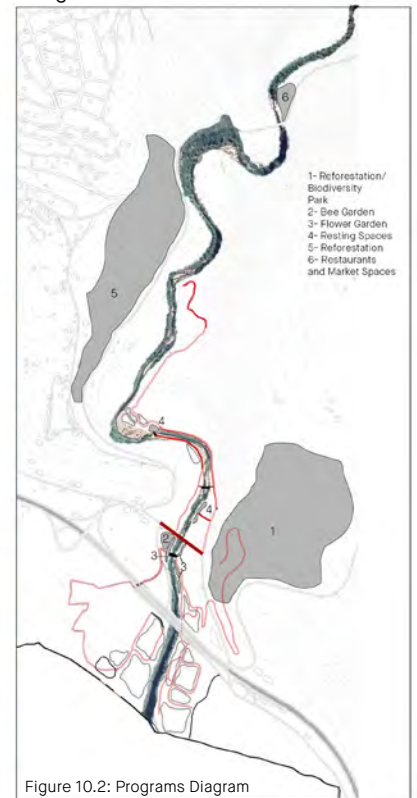


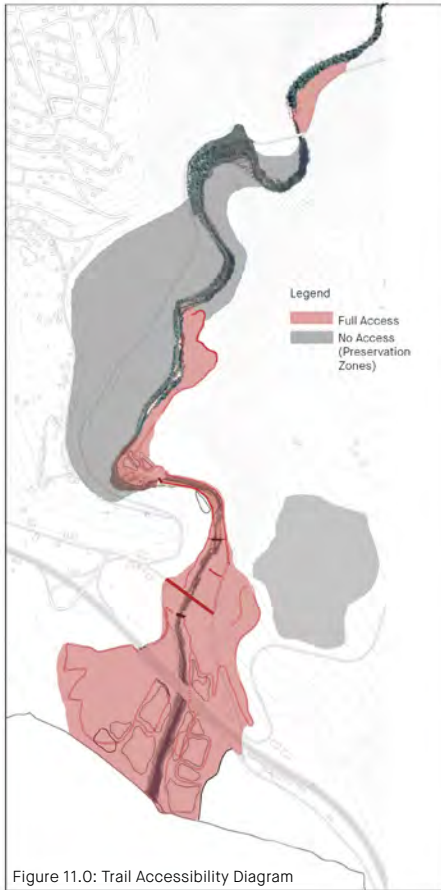
Figure 10.2: Programs Diagram

Figure 10.0: Plan

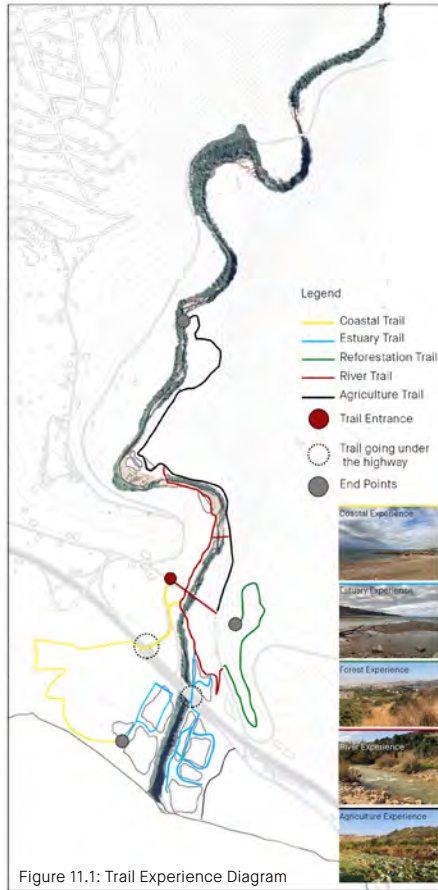
13 TRAIL DIAGRAMS



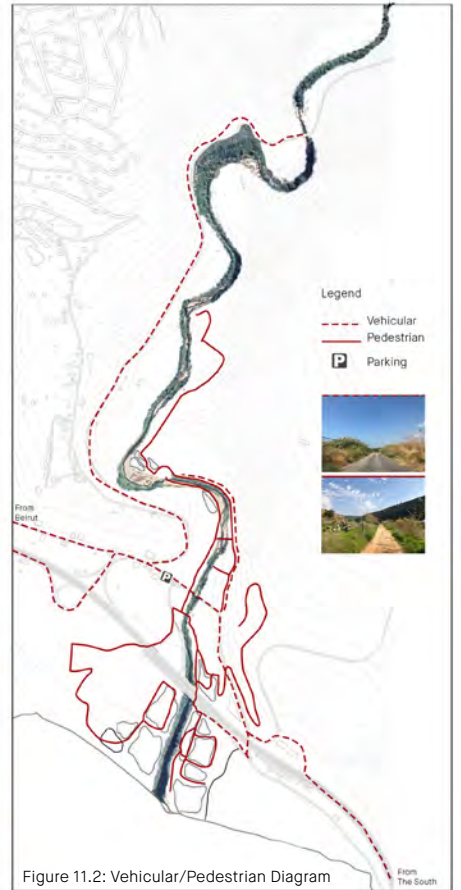
Accessibility



Trail Experience



Vehicular/Pedestrian



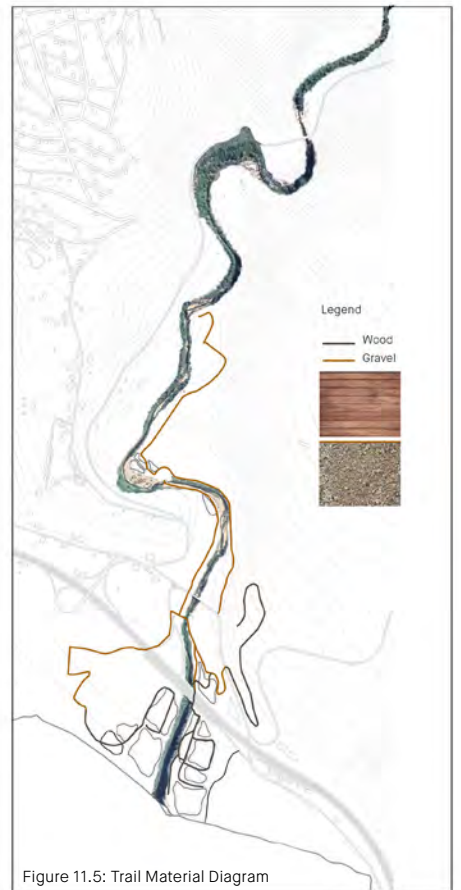
Trail Strategic Measures



Trail Widths



Trail Material



14 ESTUARY WETLANDS



Estuary Wetlands Phasing

Phase 1: 0-3 Years



- Soil Preparation
- Wetland Construction
- Buffer Placement - Long Grasses, Shrubs, Trees (Visual and Physical Buffer)
- Planting the wetland vegetation seedlings



Phase 2: 3-7 Years



- The wetland ecosystem starts to develop
- The grasses will develop at its fullest
- The shrubs will start spreading towards the wetlands from the edges
- buffer continues its growth till it reaches maturity



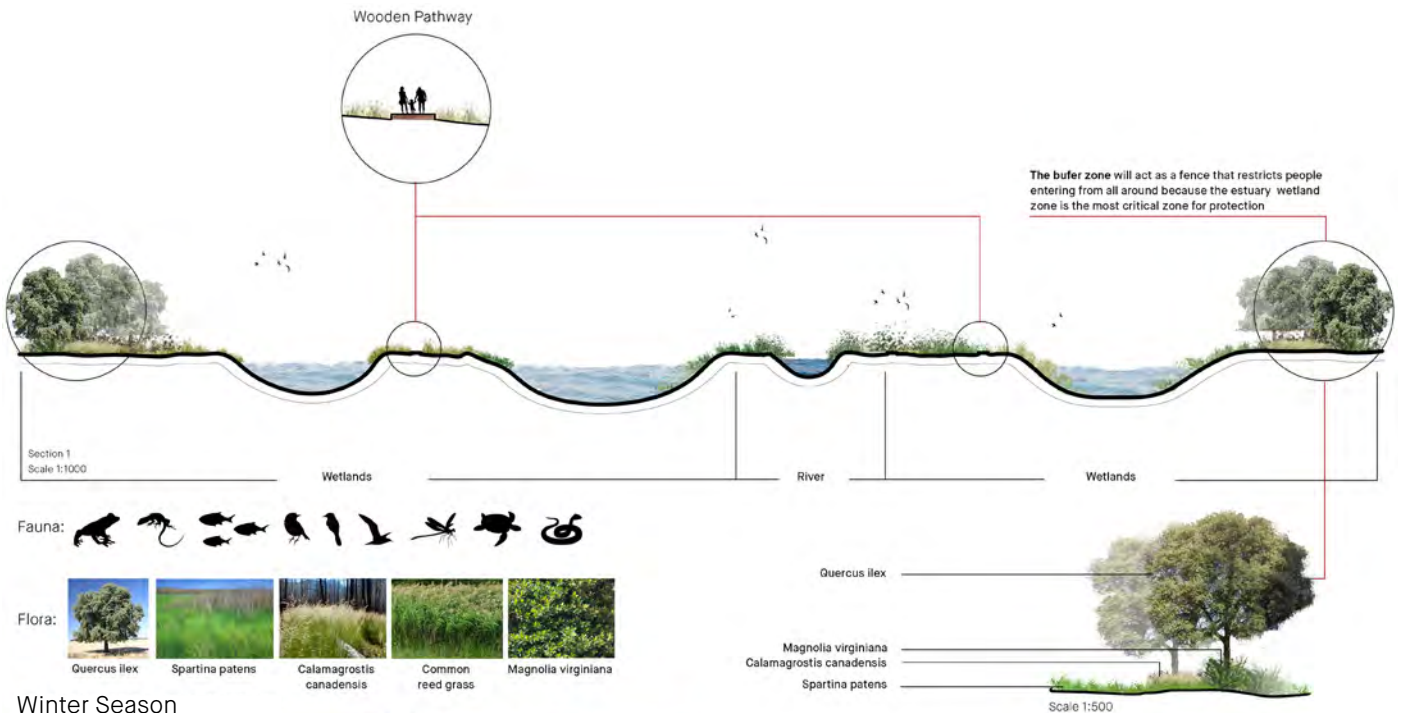
Phase 3: 7-12 Years



- The wetland ecosystem will introduce new species due to its development
- The grasses will begin to grow within the wetlands
- The shrubs located near edges will develop fully



Figure 12.0: Estuary Wetland Phasing Zoom Ins



Winter Season



During winter the beach pushes inwards restricting access zones.



Figure 12.1: Estuary Wetland Winter Season Zoom In

The before and after section perspectives were produced to capture the mood of the space

Before



After



Section 2

- Water purification.
- Shoreline Stabilization
- Groundwater recharge and stream flow maintenance
- Flood protection
- Fish and wildlife habitat

Perspective A



Figure 12.2: Estuary Wetland Trail on Water Perspective

Perspective B



Figure 12.3: Estuary Wetland Trail Between Estuaries Perspective

Perspective C



Figure 12.4: Estuary Wetland Buffer Perspective

Perspective D



Figure 12.5: Estuary Wetland Trail on Water Perspective

15 COASTAL TRAIL

Beach Coastal Trail



Agriculture Coastal Trail



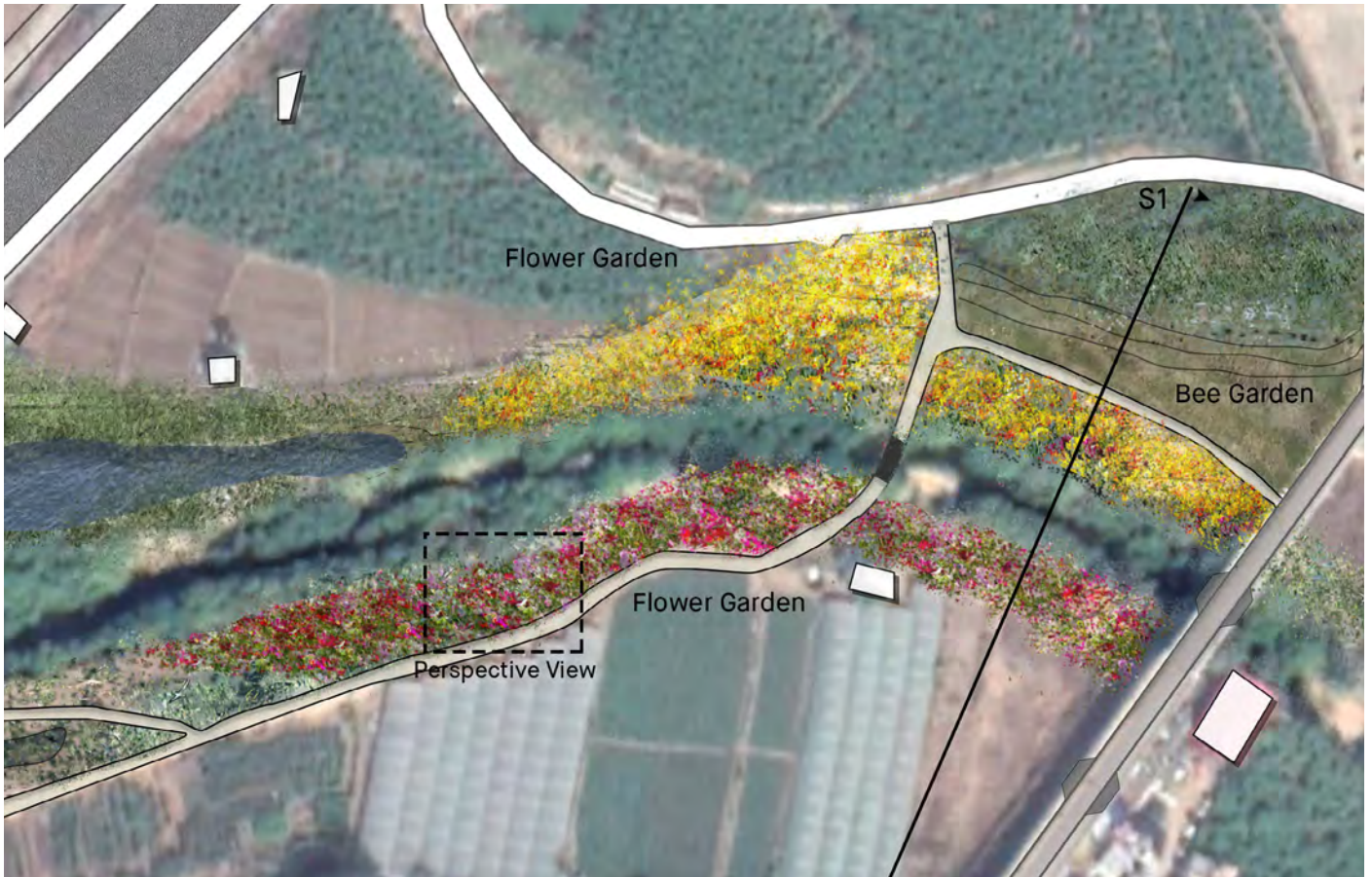


Figure 14.0: Leisure Gardens Zoom in

Summer/Fall

Winter/Spring



Figure 14.1: Leisure Gardens Seasonality

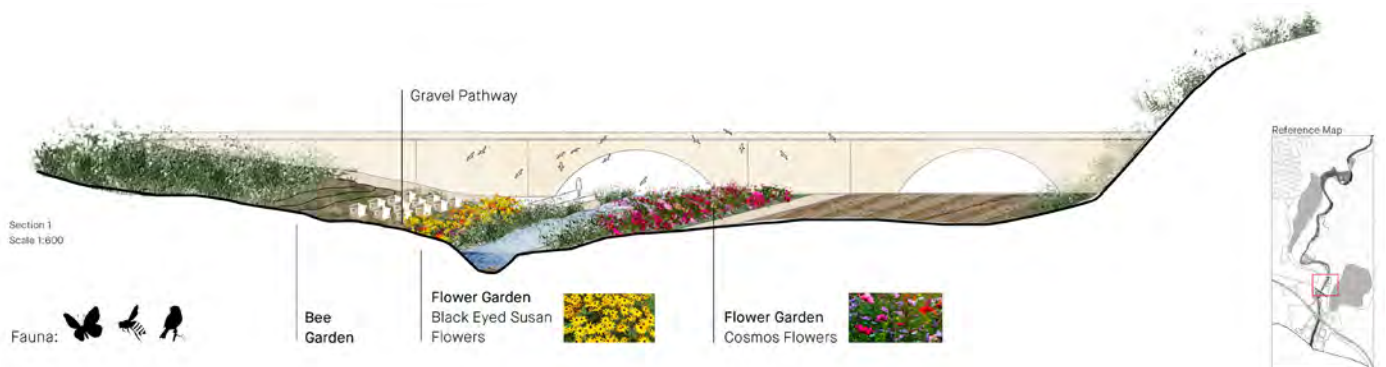




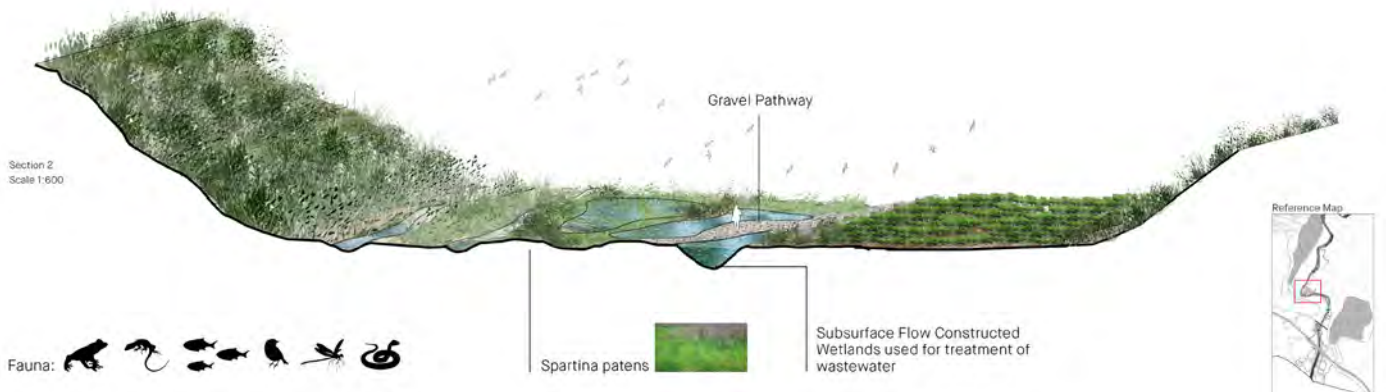
Figure 15.0: River Wetlands Zoom In

Summer/Fall

Winter/Spring

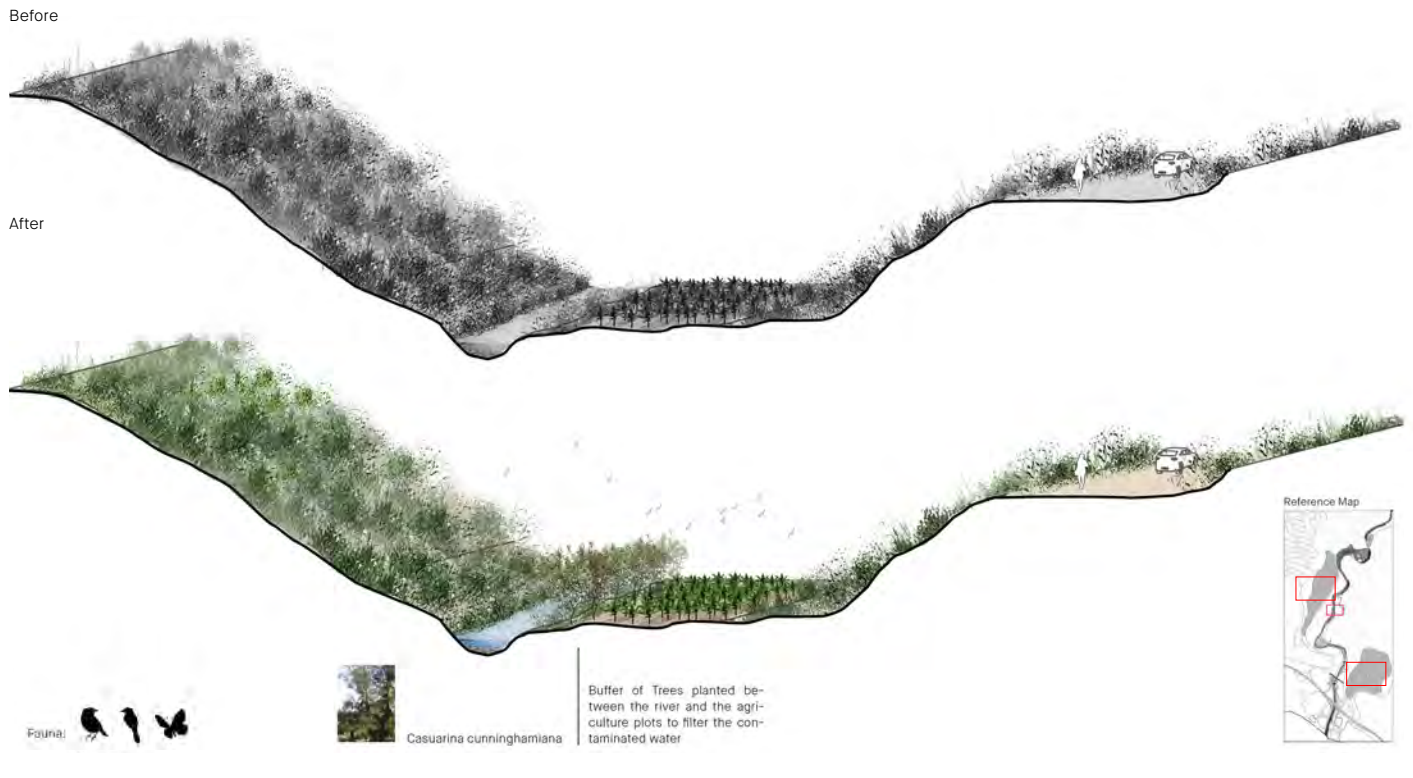


Figure 15.1: River Wetlands Seasonality



18 BUFFER & REFORESTATION

River Forest Buffer



Reforestation of Burnt Zone (No Access)



Figure 16.0: Reforestation of Burnt Zone

Reforestation of Bareland (Accessible)

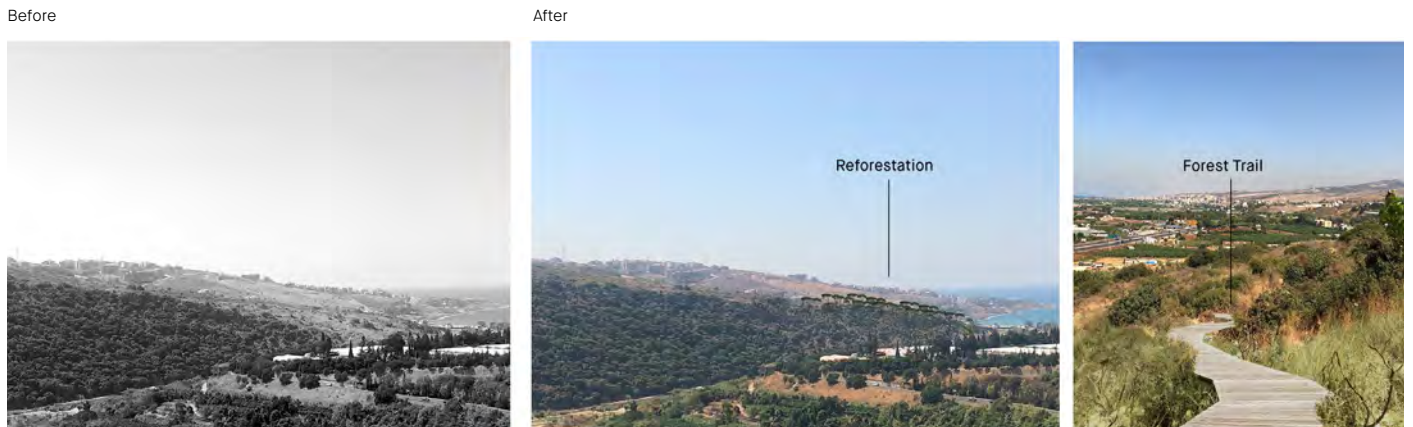


Figure 16.1: Reforestation of Bareland

19 RIVER PROMENADE

Before



After

Viewing Platforms



Figure 17.0: River Promenade

Flora: *Eriobotrya deflexa* Material: Porous Pave



Fauna: 

Four viewing platforms (two on each side) will be placed along the promenade to show different moments of the river and its programs.



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