A Design Process for Smith and Bybee Wetland in Portland, OR

JIALING NI - Master's Project (MLA) University of Idaho - 2021
Major Professor: DANIEL CRONAN

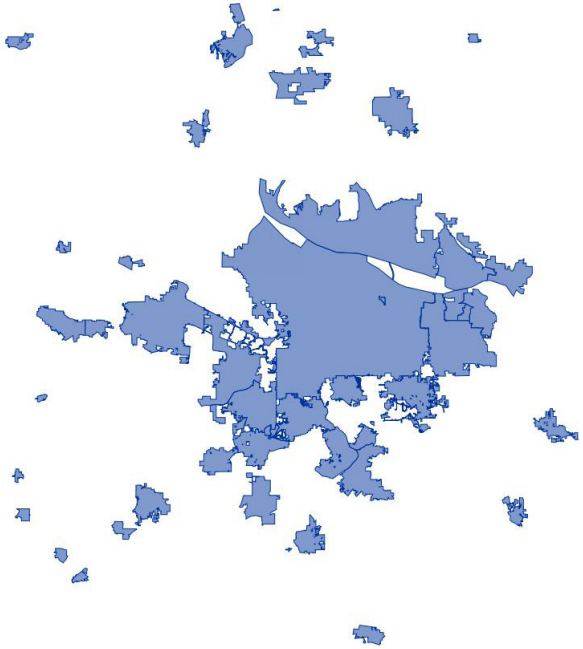
CONTENT

1/ INTRODUCTION

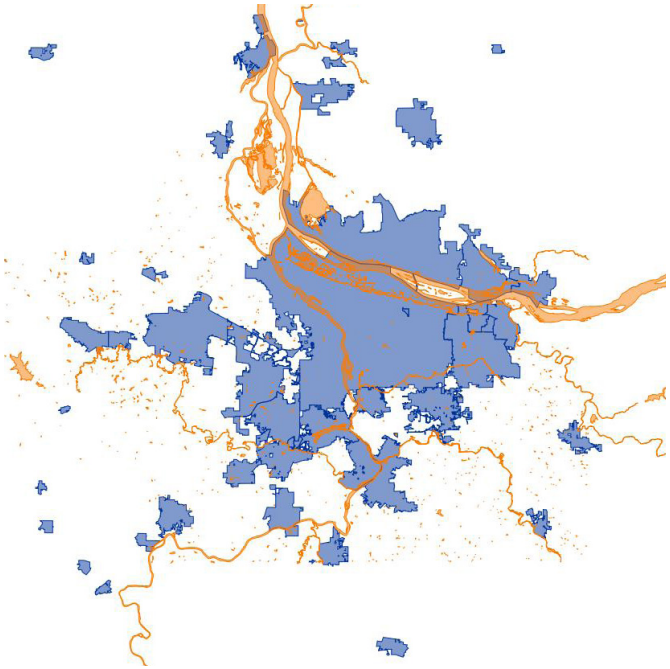
Project significance

Mainly around the future development of urban wetlands. Portland is rich in wetland resources, but with the rapid development of the city, many wetlands are at risk of pollution and disappearance. Resource protection and sustainable development are the core of the project. Smith and Bybee wetland is one of the largest wetlands in the Columbia Basin. It is an urban wetland reserved by the city of Portland, which provides a green barrier for the city. The sustainable design of the site can protect the habitat of wild animals and plants, while encouraging local residents to get close to the wetlands and nature.

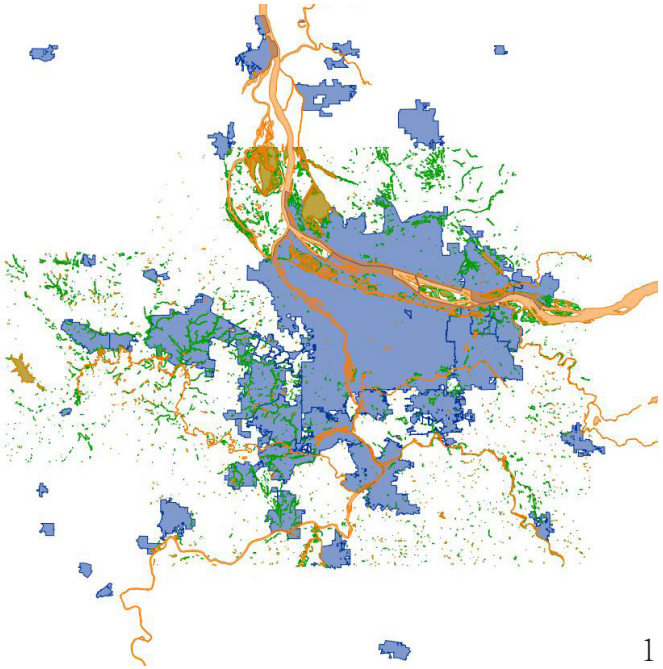
Portland city



Portland River Distribution

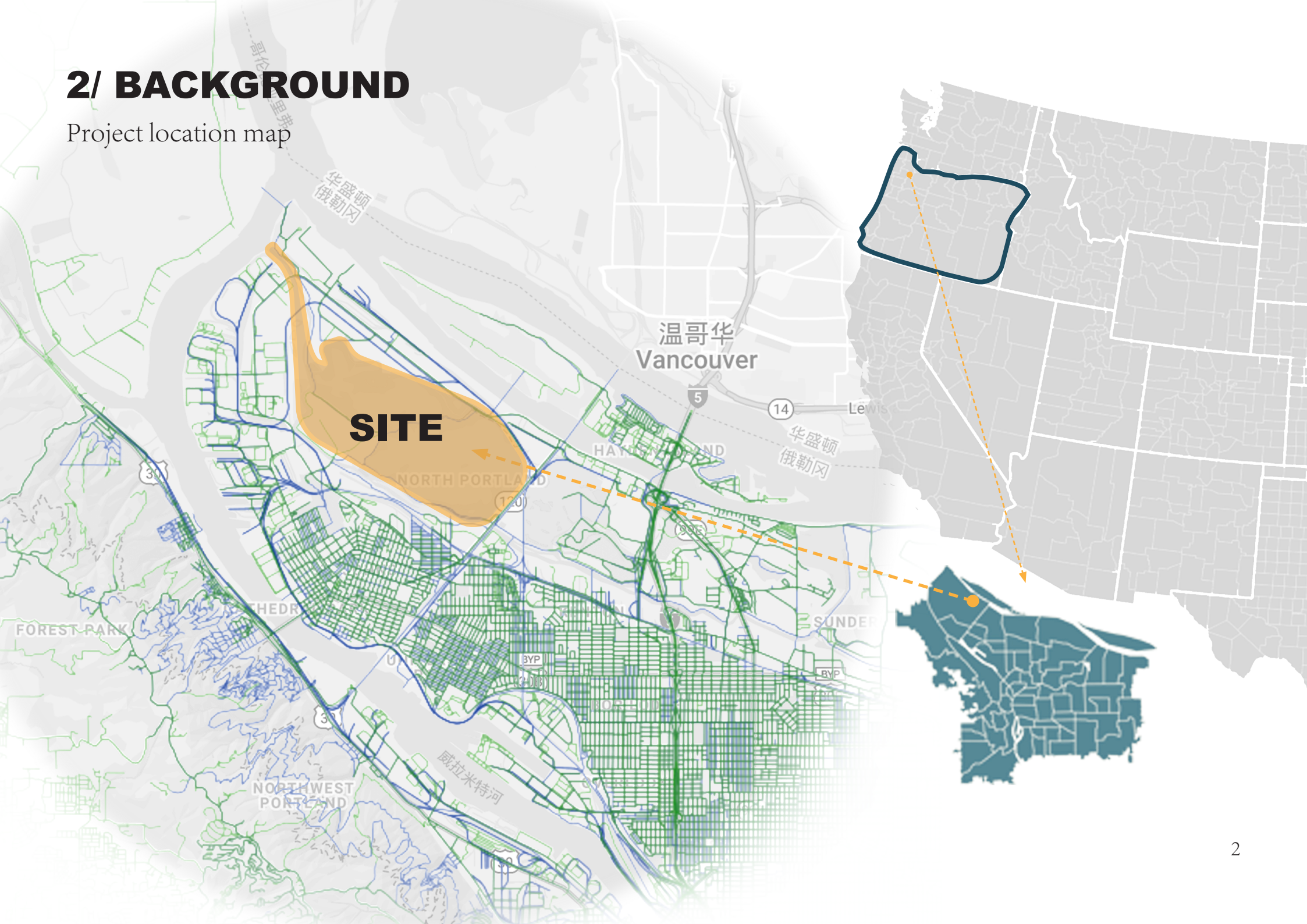


Portland wetland distribution



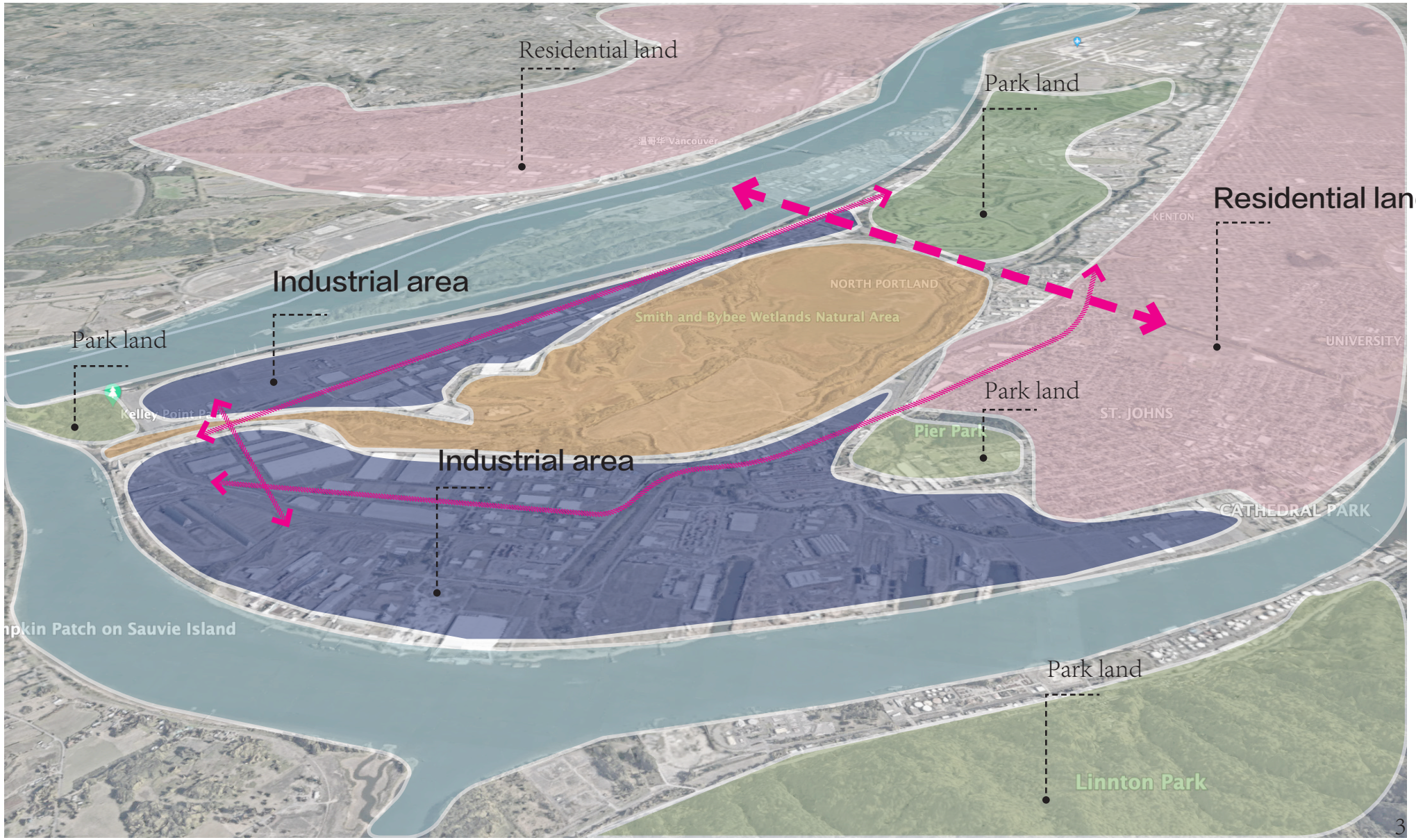
2/ BACKGROUND

Project location map



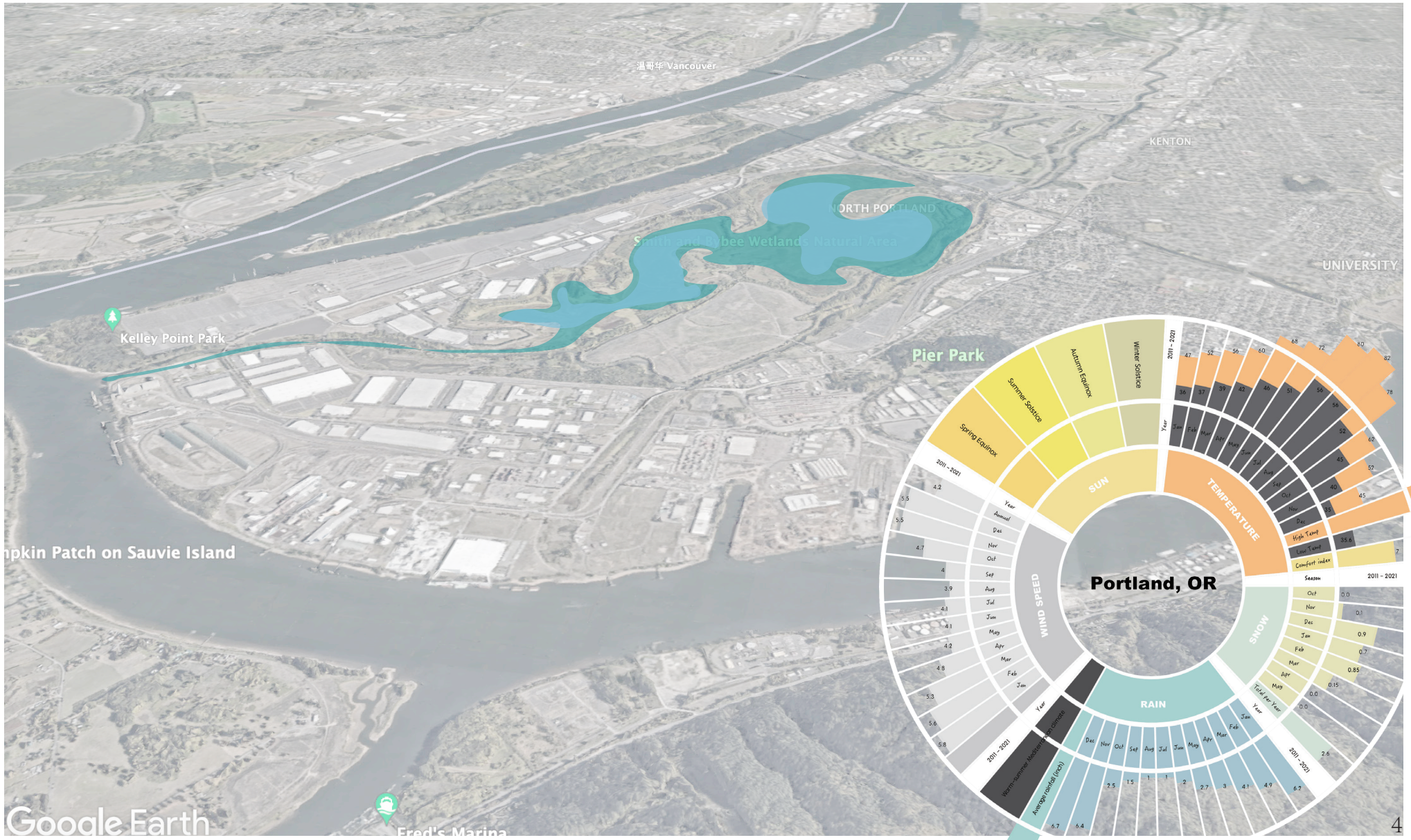
2/ BACKGROUND

Surrounding traffic/zoning



2/ BACKGROUND

Portland Climate & Flooding



2/ BACKGROUND

Smith and Bybee Wetland - Historical story

1930 to 1970: Urban garbage, leisure and natural disasters

For more than half a century, the Smith and Bibi Wetland Natural Area has been used as a landfill. Next to the landfill, Lake Smith and Lake Bibby are popular hunting, fishing and camping areas.

1980s and 1990s: transition and regulations

The landfill was closed, and the lake will be preserved as a historical relic along the Columbia River and the wetland system. They will be maintained and enhanced in a manner that is faithful to their original natural conditions and encourage recreational uses that meet environmental goals.

1990 to 2010: ecology and education

The original landfill has become a plateau grassland. Days of hunting, garbage disposal and water skiing are forbidden. Participants in the feasibility study cancelled the planned trail along the eastern edge of Lake Smith and discussed a route connecting the east-west trail.

2011 to 2021: planning and protection

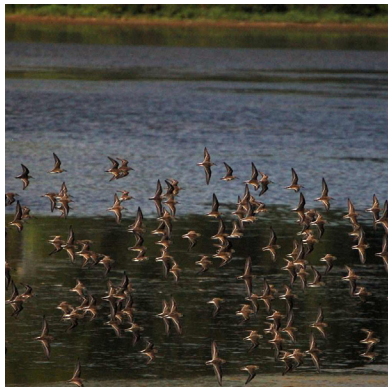
74.1% of people want habitat restoration and protection; 40.7% of people pay attention to footprints; 40.7% of people want more wildlife viewing stations; 37% of people want more educational programs.

2/ BACKGROUND

Current situation

NATURAL HABITAT






Yes!

HUMAN ACTIVITIES

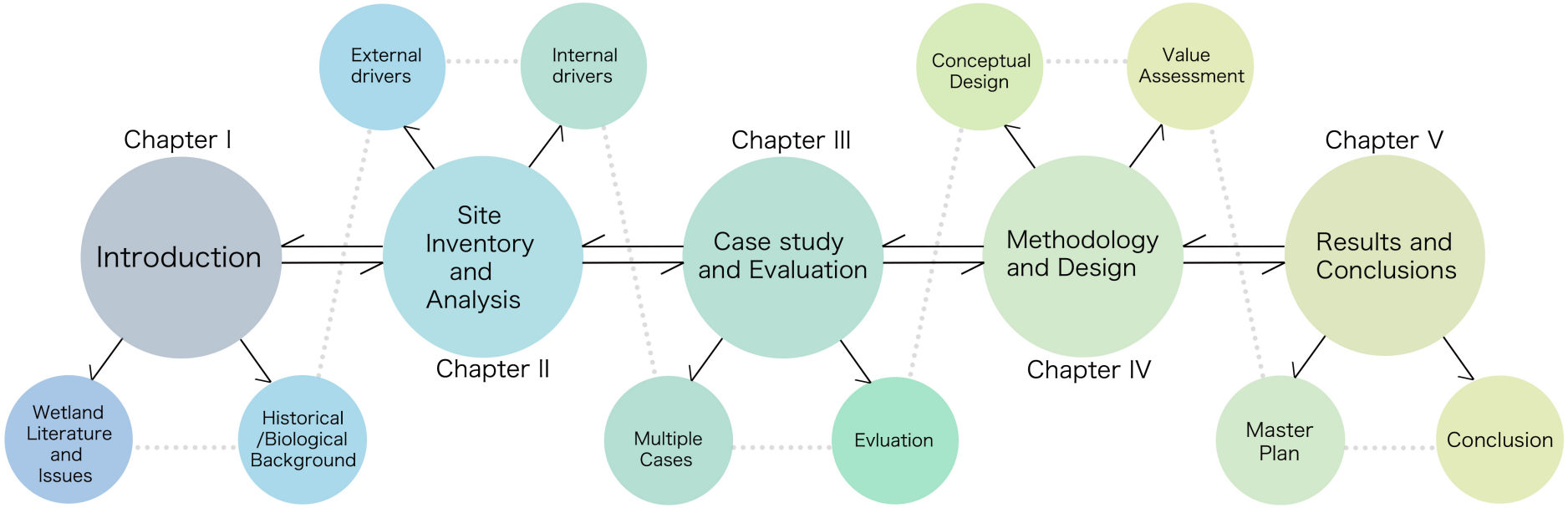



No?

3/ RESEARCH QUESTION

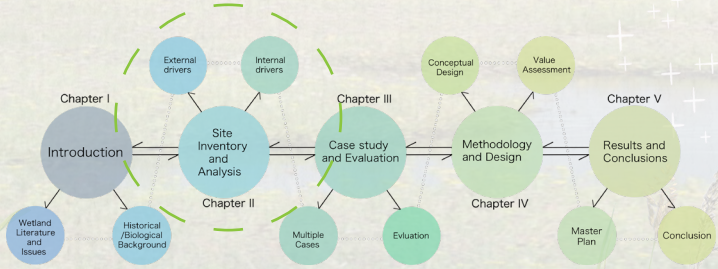
Which effective design decisions can promote the sustainable use of the Smith and Bybee Wetland Natural Area in Portland, Oregon?

4/ OVERVIEW


External drivers
Internal drivers
Conceptual Design
Value Assessment
Chapter I
Chapter III
Chapter V
Introduction
Site Inventory and Analysis
Case study and Evaluation
Methodology and Design
Results and Conclusions
Chapter II
Chapter IV
Wetland Literature and Issues
Historical /Biological Background
Multiple Cases
Evluation
Master Plan
Conclusion

SECTION 1

: INVENTORY & ANALYSIS



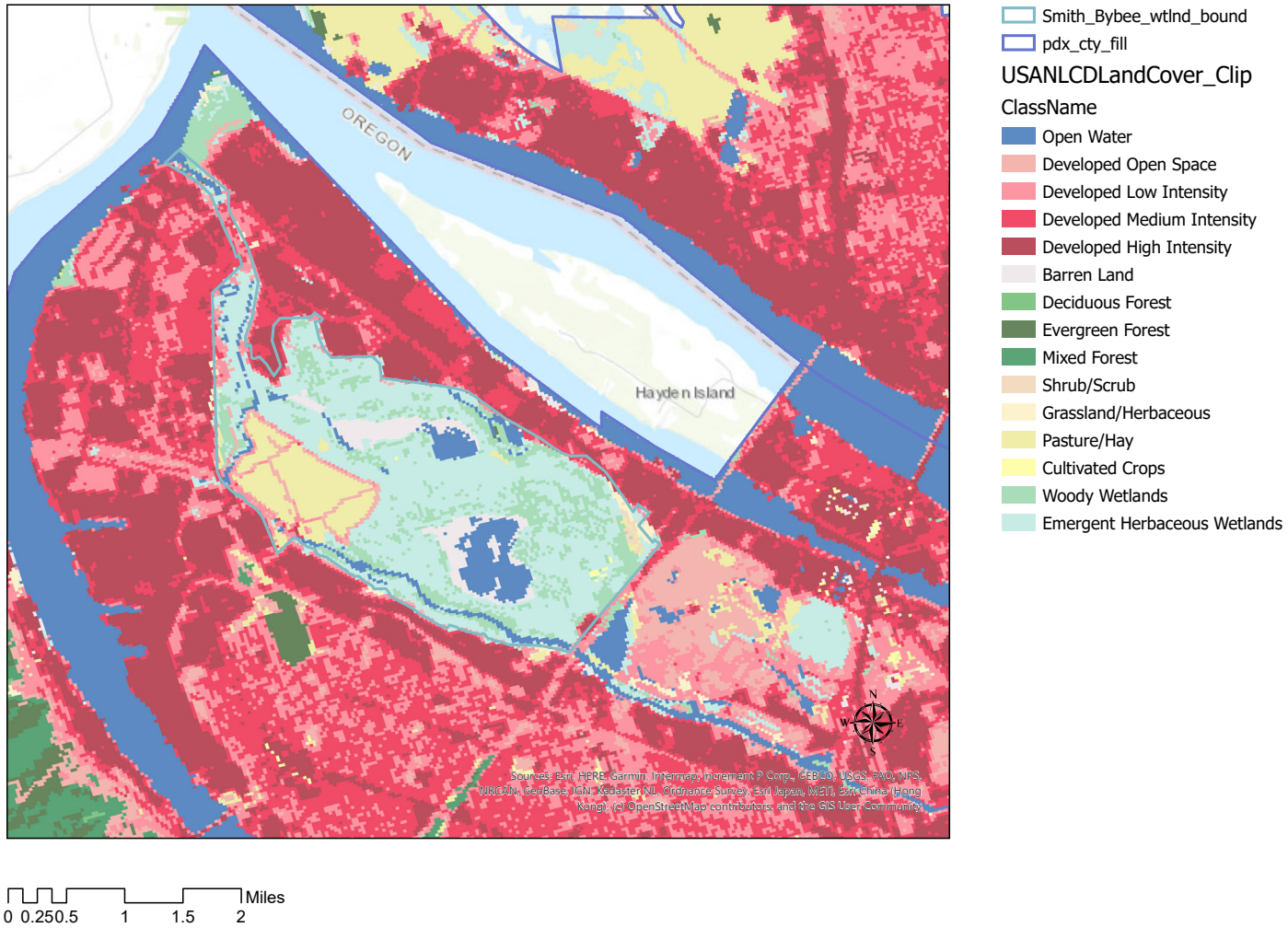
/ Inventory & Analysis

Habitat classification

Smith and Bybee Wetland is an excellent habitat. Different types of ecological environment can meet the needs of different species. S&B Wetland includes two shallow lakes, they are Smith Lake and Bybee Lake. The abundance of waters includes permanent open waters, emerging wetlands, weeds and willow trees. Part of the land outside the waters is distributed with forest wetlands. The main ones are willow, Oregon ash and black poplar. In addition to Siberian wetlands, there are sedge meadow wetlands, seasonal ponds, highland grasslands, riparian forests and woodlands. In such a beautiful habitat, there are 17 species of fish, more than 150 species of birds and some reptiles, amphibians and insects.

/ Inventory & Analysis

Zone classification



/ Inventory & Analysis

Habitat classification

Highland grassland

Highland grassland comes from the change of St. John’ s landfill. Many similarities in the Willamette Valley can be seen on this 250-acre grassland.

Open water and emerging wetlands

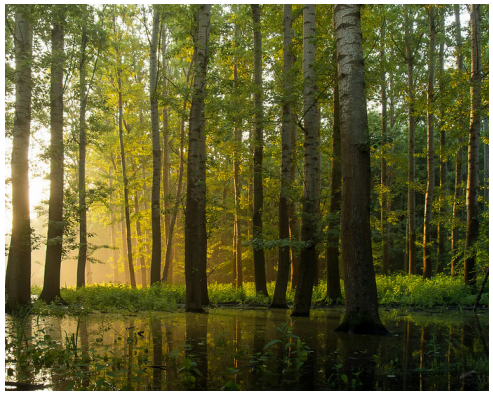
The emerging wetlands covers approximately 825 acres. Among them, Smith Lake and Bybee Lake with about 300 acres are two permanent shallow lakes that maintain the living environment of aquatic plants and animals.

Shrub wetland

The shrub wetland is a special area connecting land and water, covering an area of about 360 acres. As a succession stage of the forest wetland, it is a stable community in the entire wetland. Among them, woody plants within 6m are mainly woody plants, including shrubs, trees and riverside plants.

Bottomland hardwood forests

The Bottomland broad-leaved forest in the wetland covers approximately 260 acres. It is one of the important riparian ecosystems in the United States. During the growing season, the area is often flooded or saturated by surface water or groundwater.



Riparian forest

The riparian forest covers an area of 175 acres and is dominated by black poplar trees. The riparian forest is basically in the floodplain of the entire wetland. The grassy riverbank buffer zone can effectively capture sediment.

/ Inventory & Analysis

Keystone species

Avian - Streaked Horned Lark

Aquatic - Chinook salmon

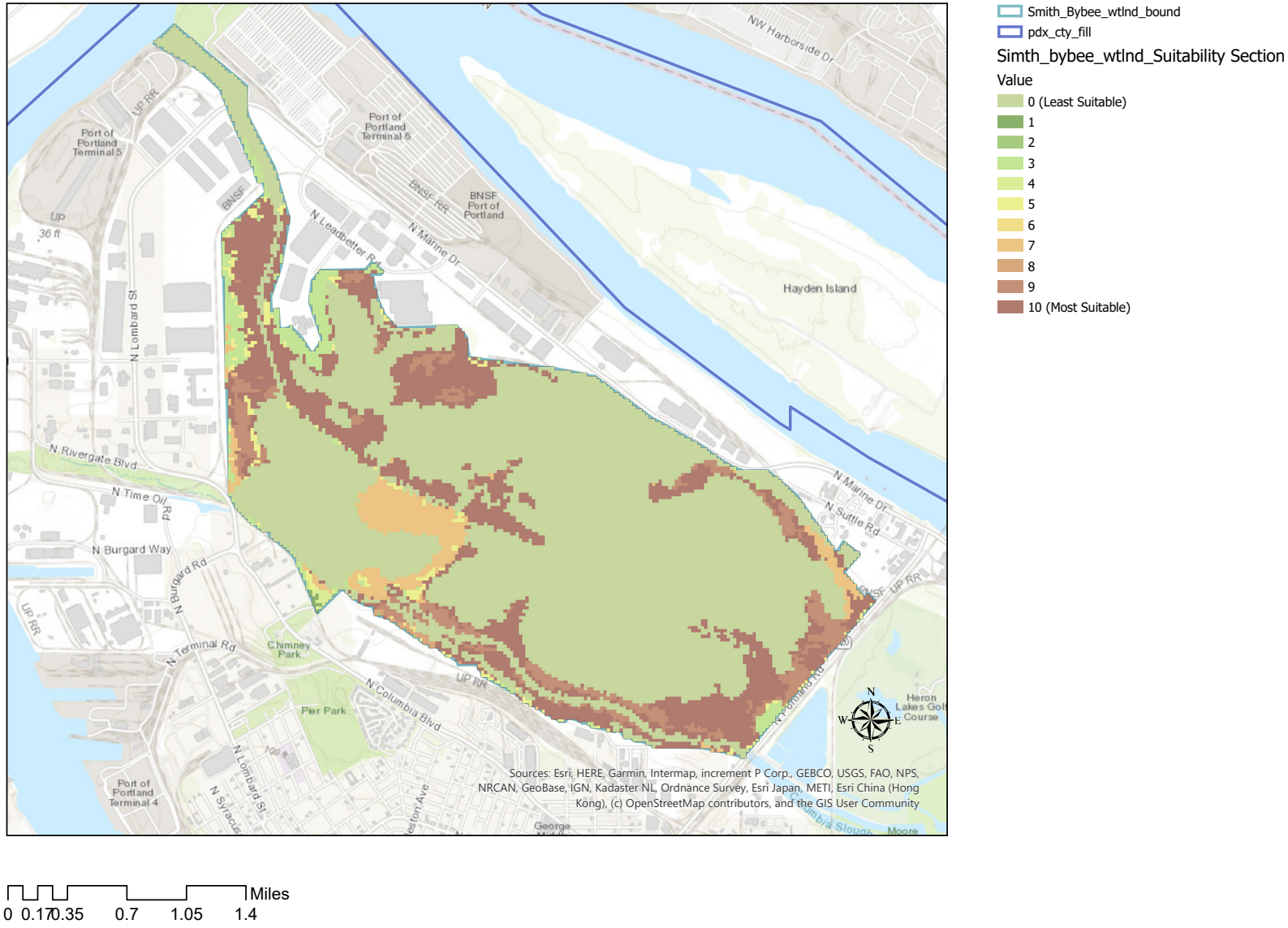
Amphibian - Western Painted Turtles

Insects - Fender's Blue Butterfly

Plants - Kincaid's lupine

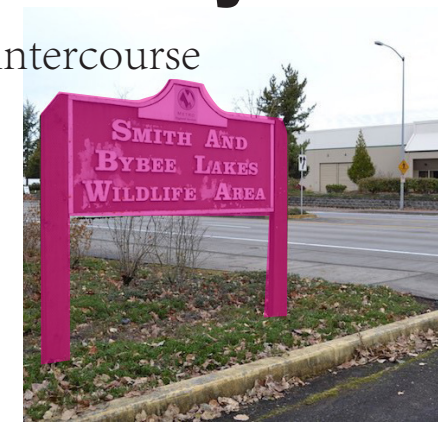
/ Inventory & Analysis

Keystone species



/ Inventory & Analysis

social intercourse











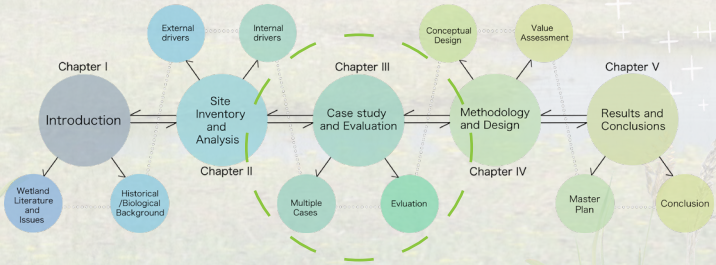
/ Inventory & Analysis : ISSUES

Conflict

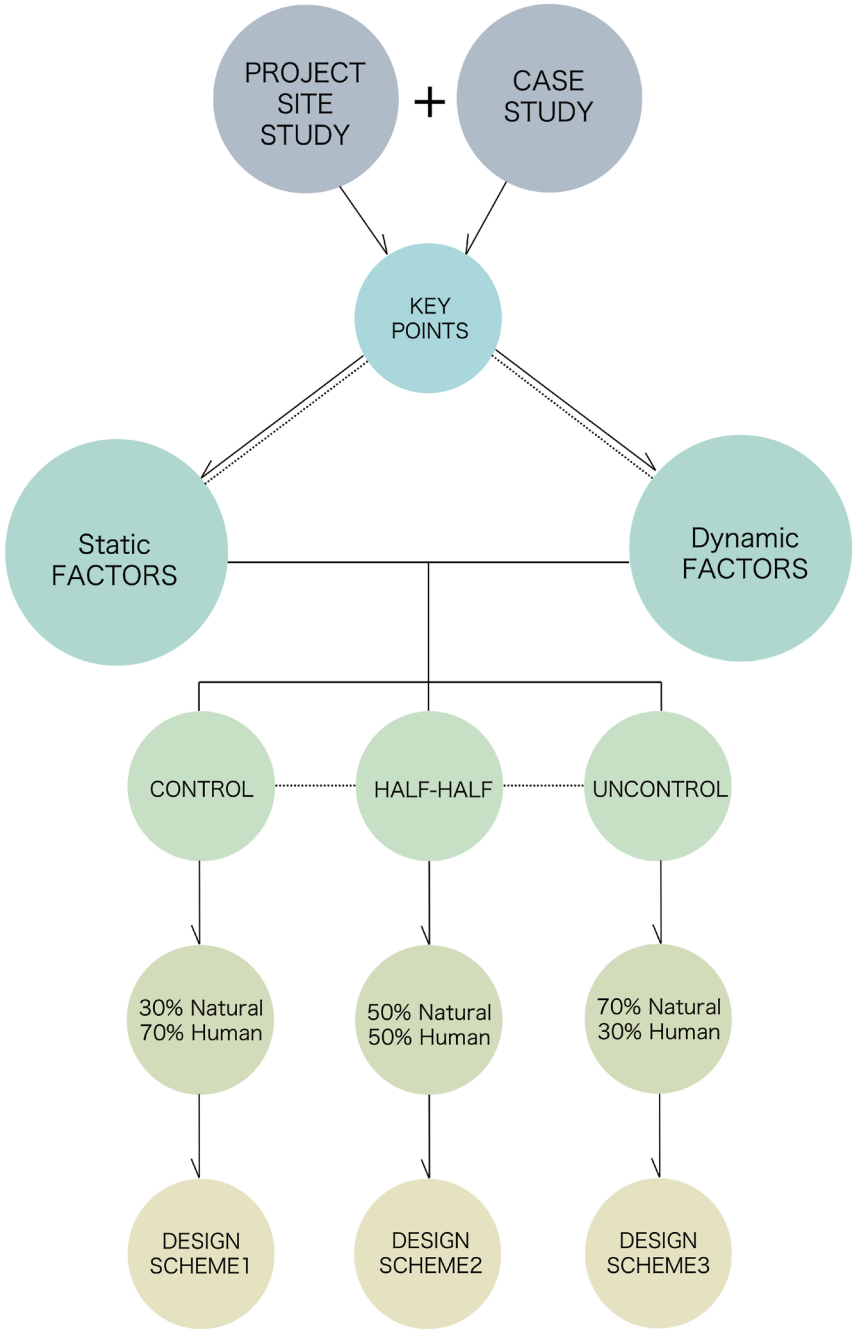
1. Wetlands and forests are disturbed by invasive plant species.
2. The only accessible trails concentrated in the northeastern part
3. Only three designated wildlife viewpoints
4. Metal grille without edge protection, bumpy road
5. The start of the trail borders a very busy four-lane road with a lot of car noise
6. 40 miles of loops and dead ends
7. The canoe entrance is at the deepest point of the wetland entrance, and the path to the water's edge is usually muddy

SECTION

2 : Methodology



4/ Method OVERVIEW



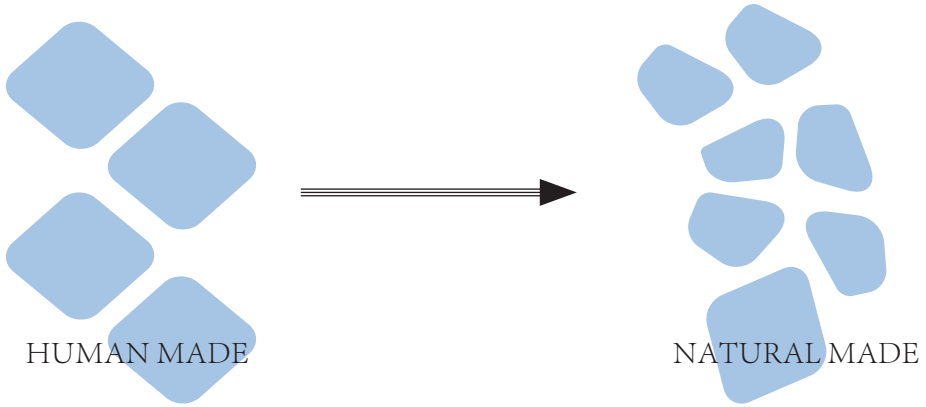
This section describes design strategies which emerged from descriptive case studies. This mixed-method approached utilized both Descriptive Case Studies with Projective Design to provide various design alternatives.

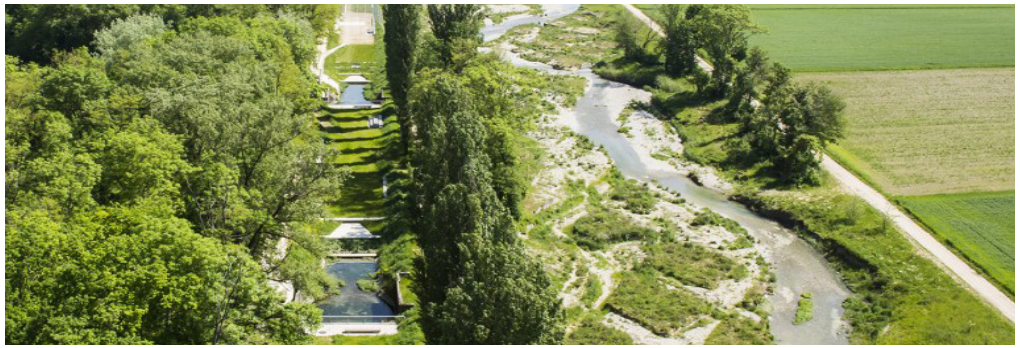
/ RESEARCH

CASE STUDY 1

Restoration: Aire Riverside Gardens and original river restoration, Geneva

It is futile to propose a fixed riverbed design. In order to learn more about the characteristics of independently designed rivers, they risked adopting the "initial model" or "initial process". The direction of the river and the preparation of the terrain. "". This diamond-shaped site creates a complex network of uncertain river channels in the form of dissipative force based on the principle of infiltration. These river channels cover the entire new riverbed. After removing the humus layer, the design team excavated the entire site under the precise control of the longitudinally distributed river. The size of the diamond-shaped protrusion is shaped according to the amplitude of the original meander shape that can be "accepted". One year after the water flow entered this new river area, the river displayed various materials such as sediment, gravel, sand and the birth of the original rhomboid geometry, forming an extremely rich river landform.

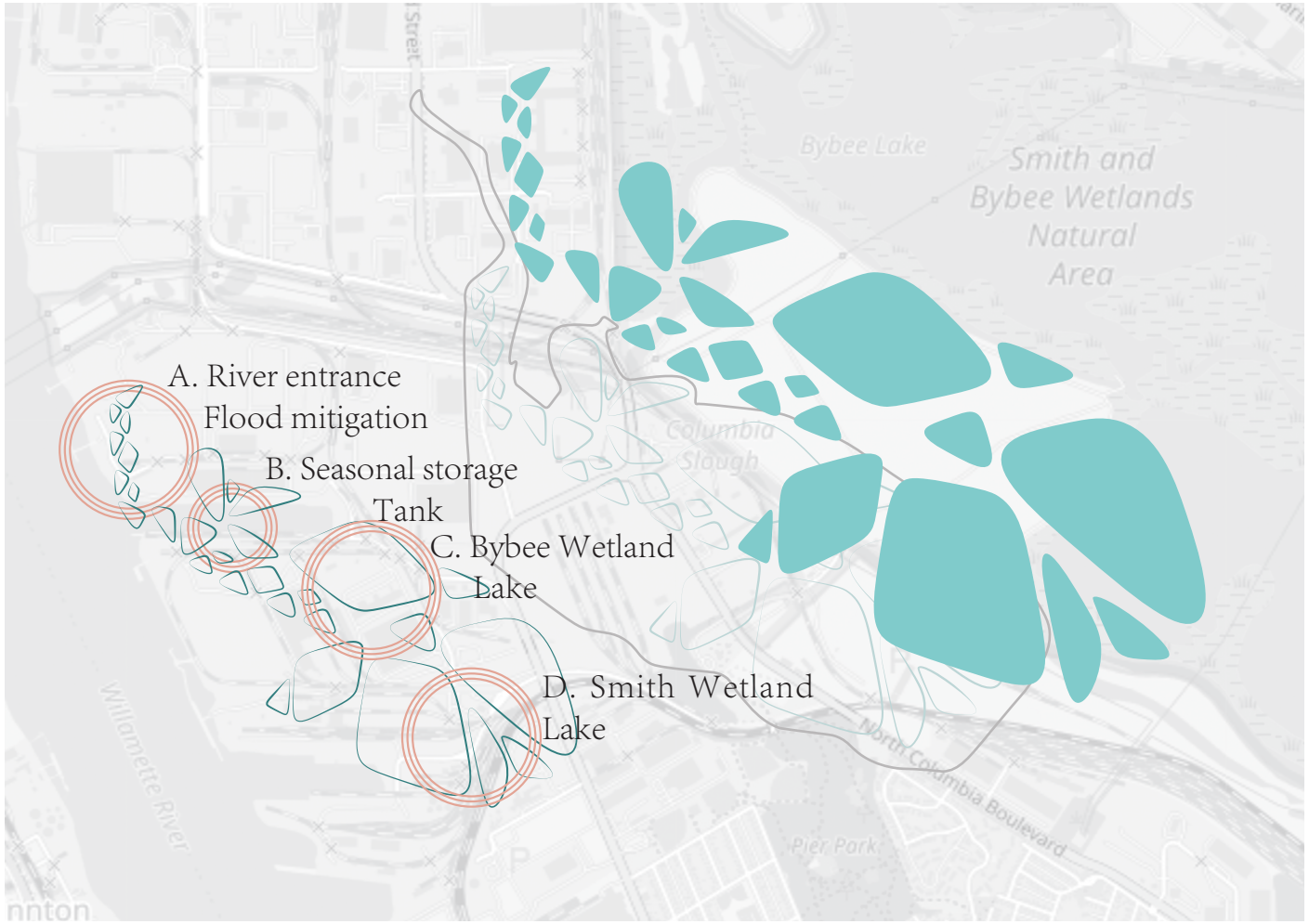




/ Design strategy 1: Vernal Pools

Vernal Pools

The first design strategy revolved around the fragmentation of the pond shoal. In this design plan, we will try to abandon the original lake form, and divide the lake into diamond-shaped blocks of different sizes and shapes through artificial excavation. In the following time, the lake water and seasonal floods will continue to scour and erode the shoreline, creating the most suitable form. The plan draws on a design case in Geneva called Aires Riverside Garden and the original river restoration.

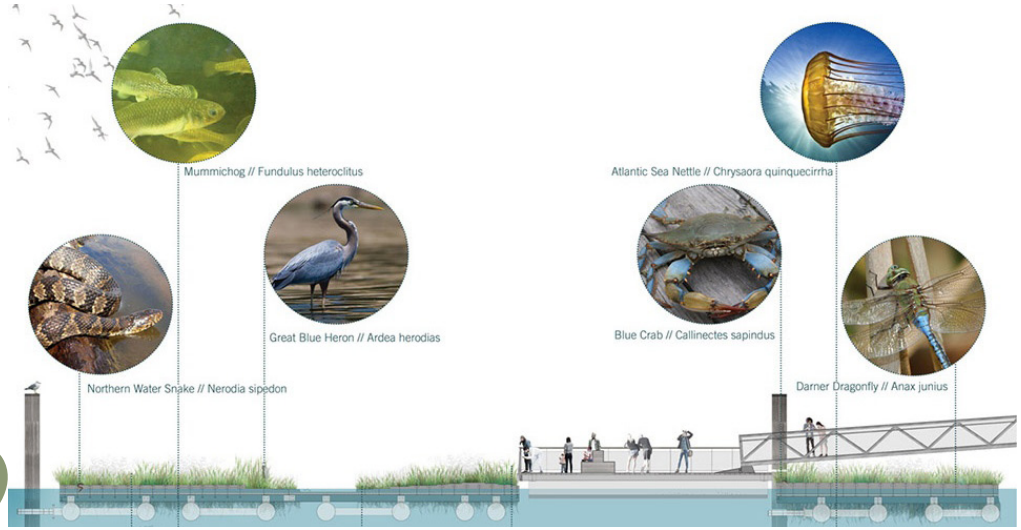


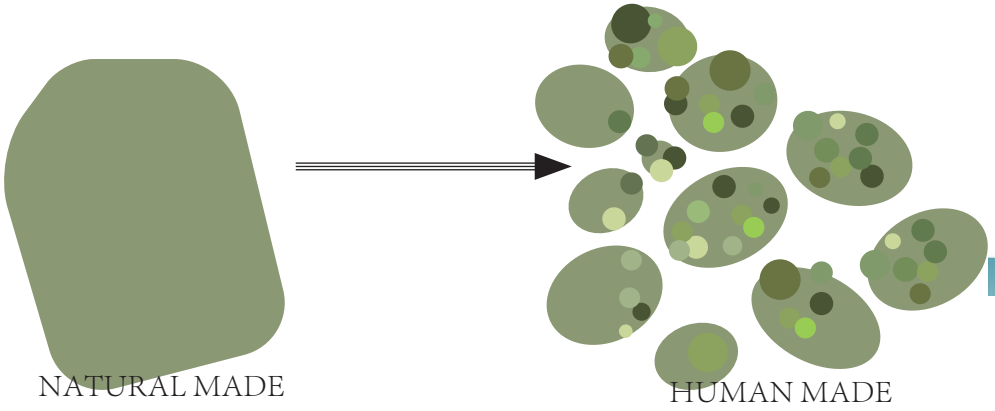
/ RESEARCH

CASE STUDY 2

Urban Water Health： Integrating new technologies and flexible facilities into floating wetlands, Maryland, USA

1. Create a more sustainable and high-performance floating wetland
2. Establish a sustainable microhabitat
3. Conserve biodiversity through artificially aggregated habitat elements
4. Each wetland is set at a predetermined depth to support different habitat conditions above and below the water

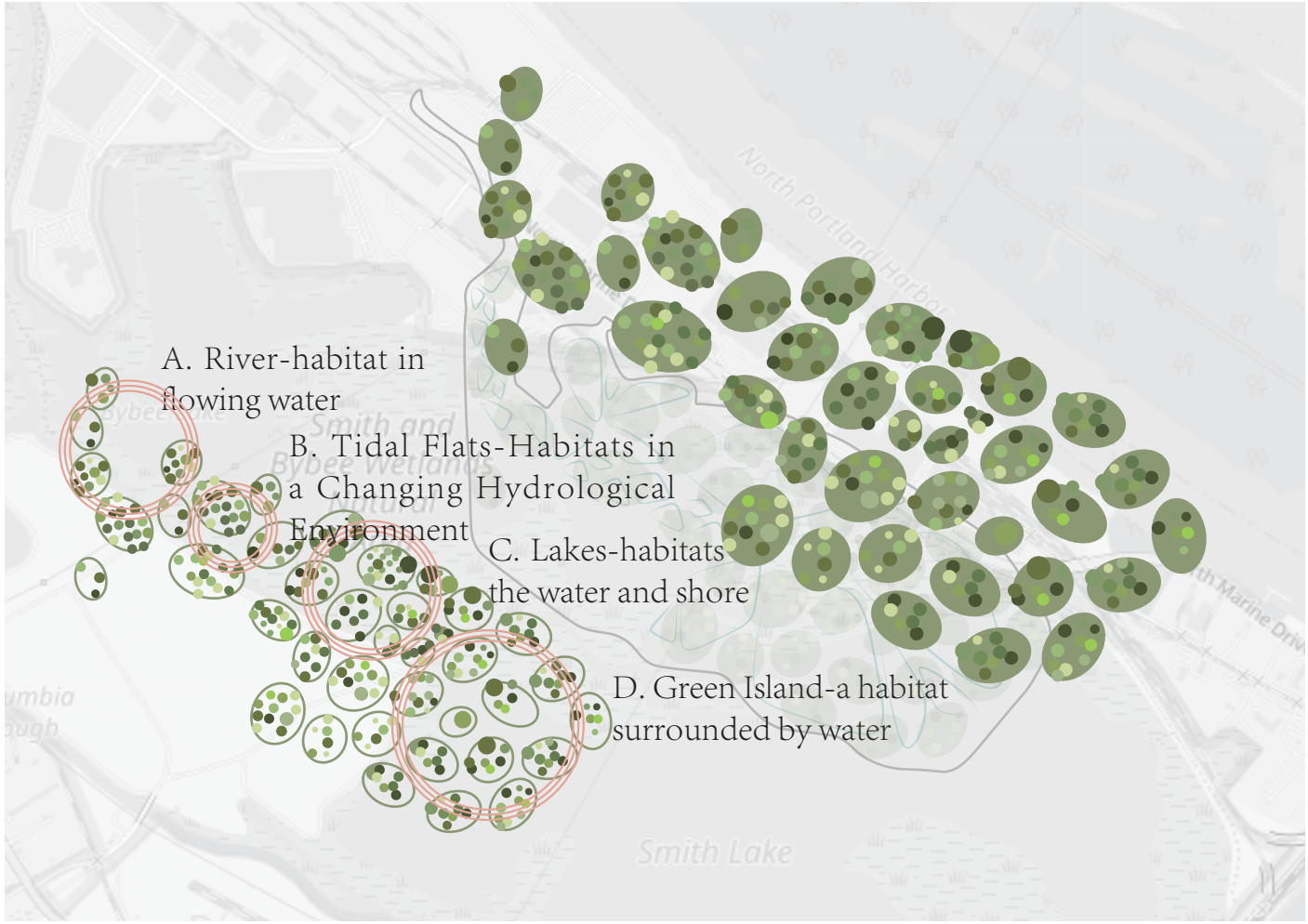




/ Design strategy 2: Habitat Patches

Habitat Patches

The second design strategy comes from the concept of landscape fragmentation, which is a guessing strategy for wild animal habitat design. After analyzing the habitats of local key species through GIS, it is concluded that most of the most suitable habitats are mainly on the coastlines of two large ponds. Most other places and lakes are not suitable for the colonization of multiple species at the same time. The design strategy of dividing the land in the wetland mainly attempts to increase the shoreline of the habitat and better develop the biodiversity.



/ RESEARCH

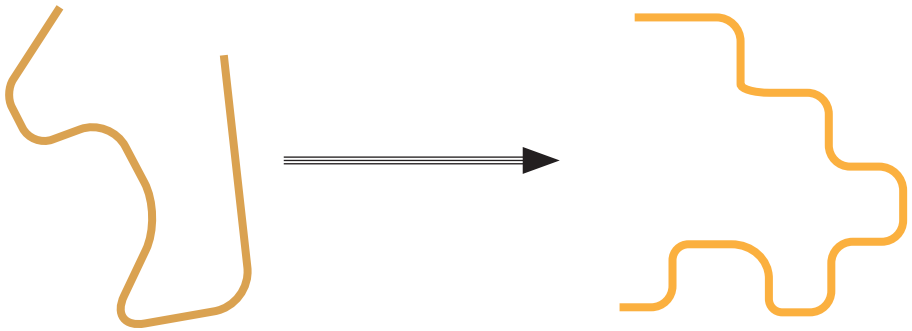
CASE STUDY 3

Floating Connection: Harbin Cultural Center Wetland Park, Harbin, China

City park close to nature

- Use trails to solve site water level changes
- The elevated formwork road bridge is separated from the water bank
- Build an offshore boardwalk to separate the pedestrian space from the ground and the edge of the wetland
- Permeable volcanic sand is used to pave environmentally friendly sidewalks on high ground

Greatly enrich the experience of tourists



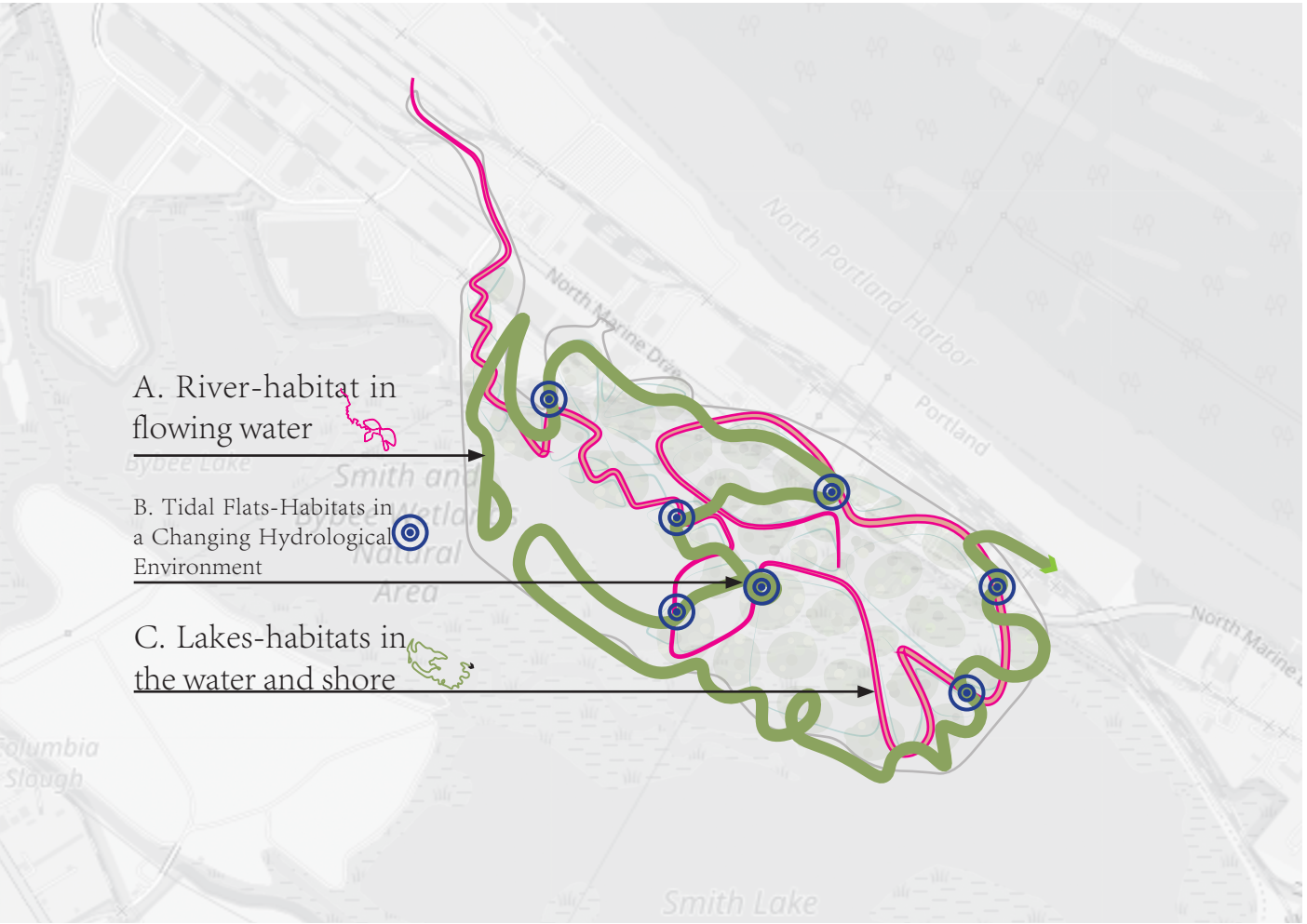
NATURAL MADE

HUMAN MADE

/ Design Strategy 3: The Social + Ecological Approach

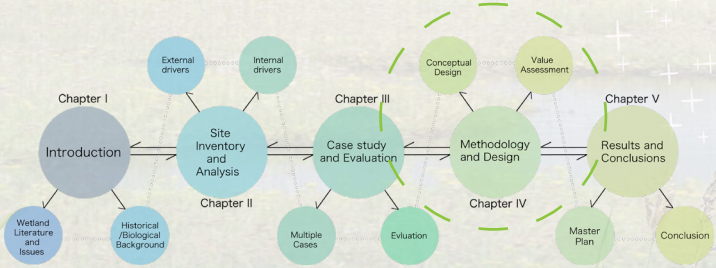
The Social + Ecological Approach

The third design strategy comes from the accessibility of wetlands. Exploring wetlands requires crossing water bodies and tidal flats, and there are many obstacles. On the other hand, wetlands are located in floodplains with abundant seasonal hydrological changes. As the water level rises, roads will disappear. The multi-segment path design strategy can solve this problem more effectively. According to the different soil and hydrological environment of each region, different trails can be customized. Entering the wetland, you can enjoy the scenery from different angles.

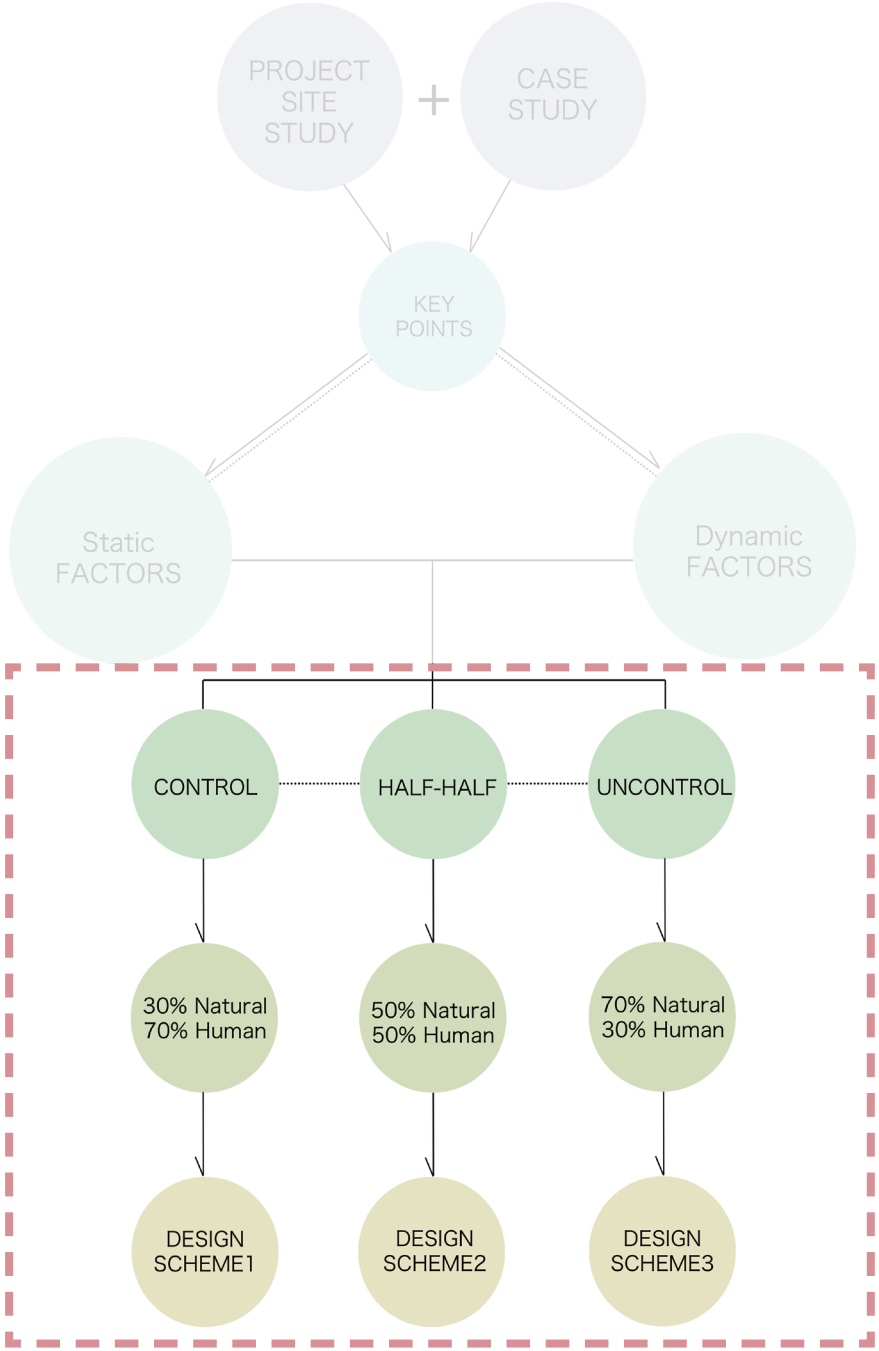


SECTION

3 : Results, Design Alternatives



4/ Method OVERVIEW

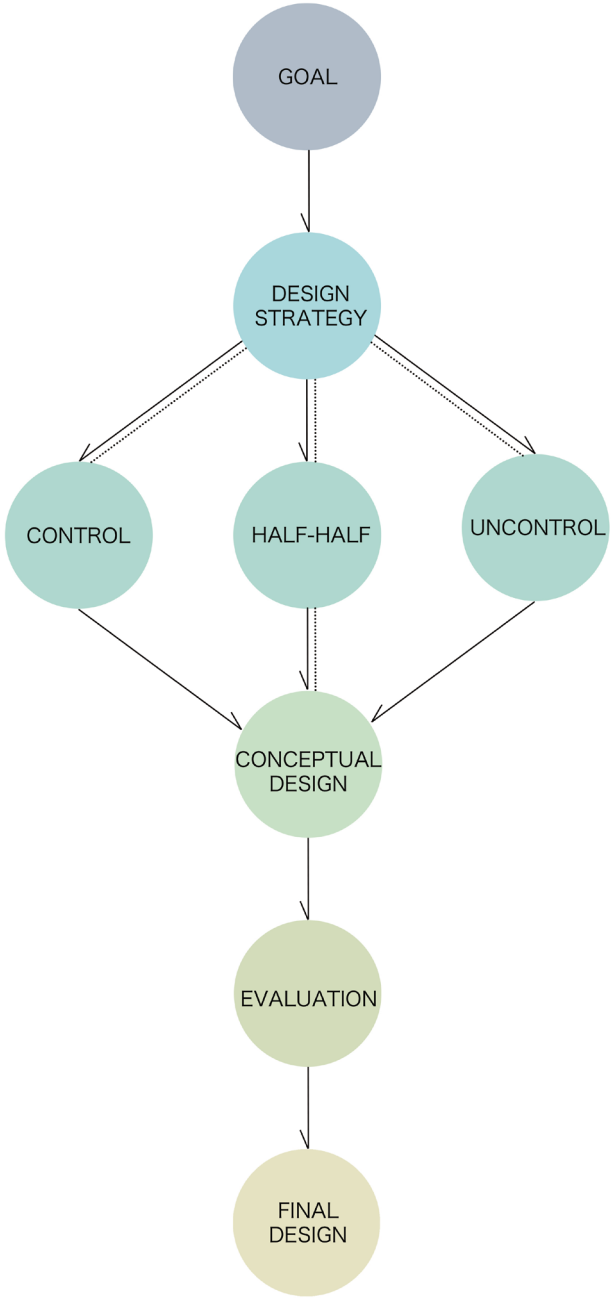


/ Design Alternatives concepts

Ecological perspective
Provide better protection for the existing wetland resources and ecosystems in the Smith and Bibi Wetland Natural Area.

Social perspective
Improve the accessibility of wetlands. Allow city residents to have in-depth understanding, active participation and interaction.

Economic perspective
The daily maintenance and management of wetlands require a lot of money, a large part of which comes from the government. Reasonably open to the public to obtain more support, use the wetland for future planning and development, and realize the sustainable development of the wetland.



/ Results, Design Alternatives

Three Conceptual design

Uncontrolled-original wetland -"untouched"

- The conceptual design advocates maintaining the original wetland appearance.
- The goal is to preserve the original wetland features and biological species to the greatest extent.
- Another purpose of this design is to reduce excessive human intervention to help wetland restoration and ecological sustainable development.

50% controlled-"GIVE HALF BACK" wetland park

-The conceptual design aims to protect the wetland and develop it appropriately.
-Wetland design based on E.O Wilson's "half feedback" theory.
-Half of the land and waters are reserved for wetlands, and the other half is used for conservative excavation and development.

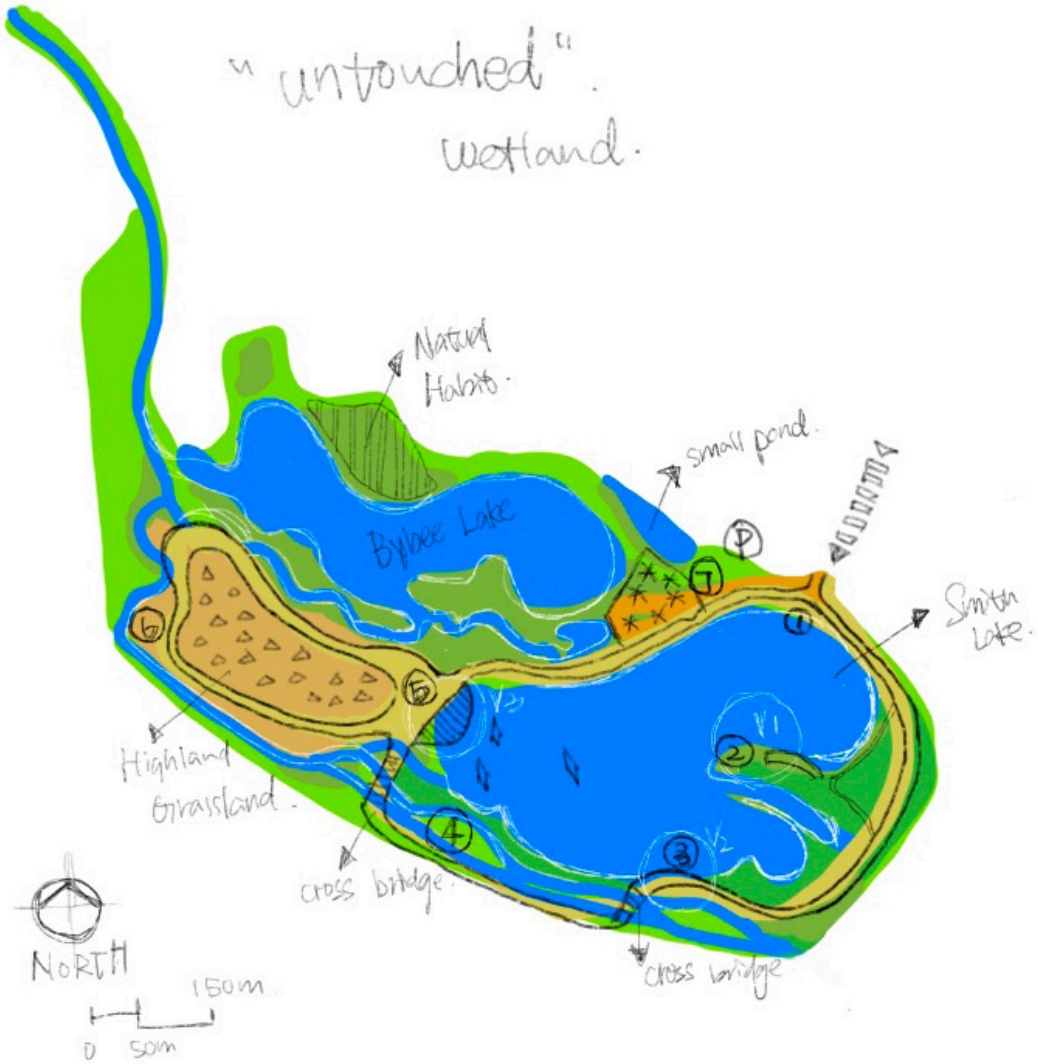
100% Wetland Park -"Immersive Wetland"

- The main purpose of this concept is to change the state of wetlands.
- Focus on convenient accessibility for Portland residents.
- The entire wetland has been rezoned.
Seasonal green island.

/ Results, Design Alternatives

Uncontrolled-original wetland-"untouched"
- Design Detail

1 Entrance gate
2 Hydrophilic floating platform
3 Wooden footbridge
4 Elevated footbridge
5 Inlet of rubber dinghy
6 Viewing platform
7 Camping ground
Waterfront habitat
Vegetation cover habitat
Trail / Path
Pond / lake
Flat ground
8
9



/ Results, Design Alternatives

50% natural wetland and 50% human activities – ‘GIVE HALF BACK’ wetland park

1 Entrance gate
2 Independent camping ground
3 Hydrophilic floating platform
4 Access to the island
5 Crossing a pontoon
6 Water trail
7 Bird watching tower
8 Highland grassland
9 Waterfall Observation Deck
10 River crossing
11 Recreation area
12 Rubber boat inlet
13 Meandering river bank
14 Seasonal trail

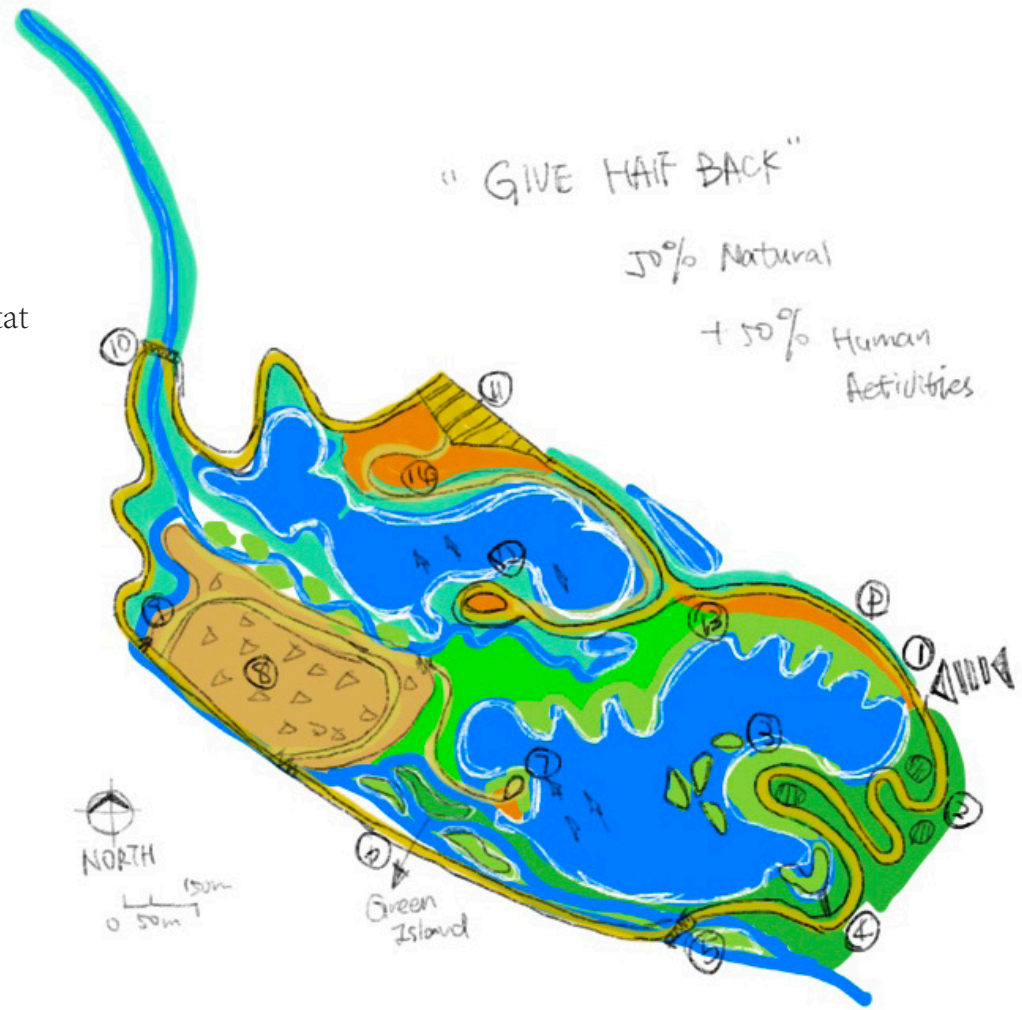
Waterfront habitat

Vegetation cover habitat

Trail / Path

Pond / lake

Flat ground

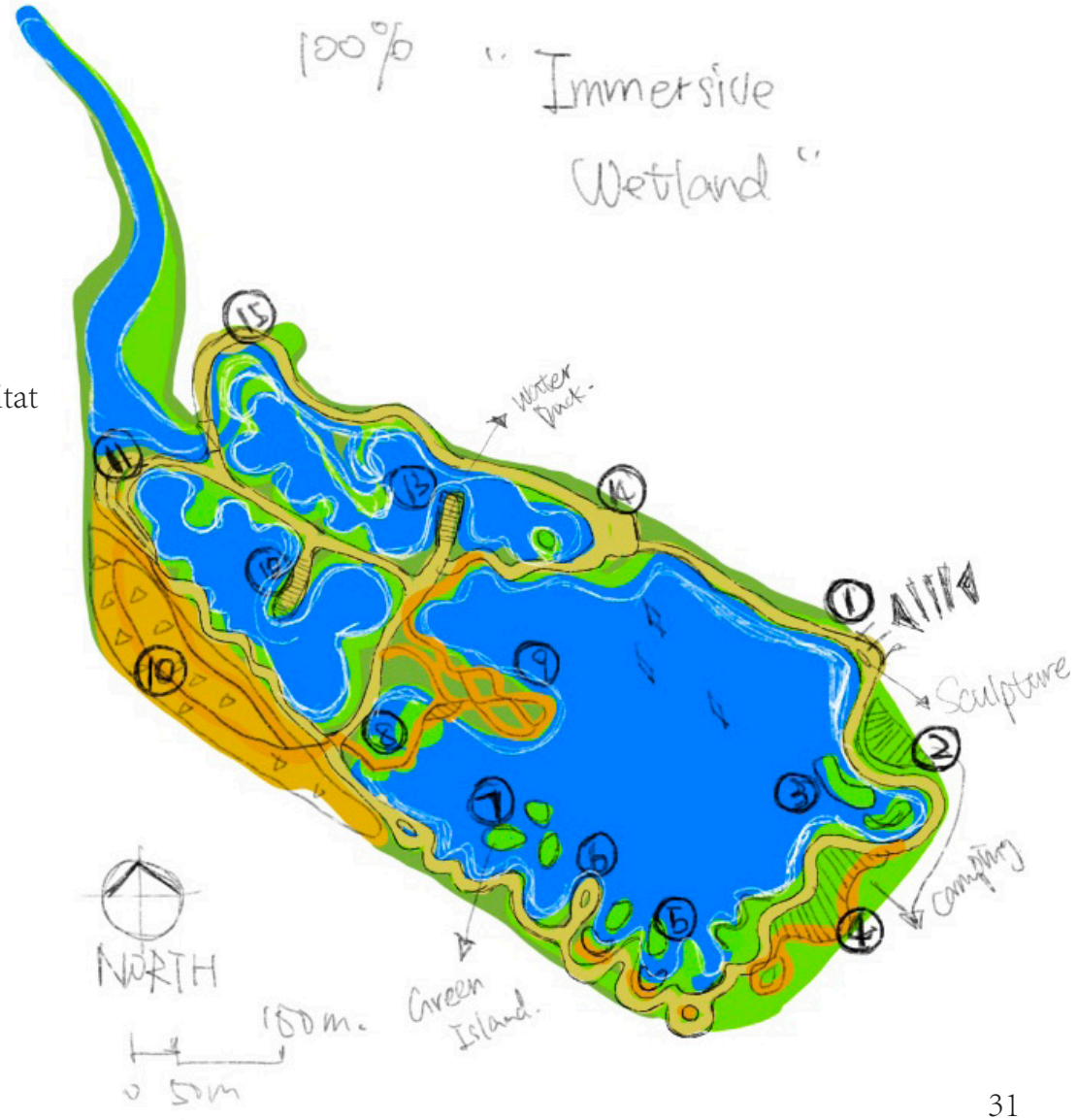


/ Results, Design Alternatives

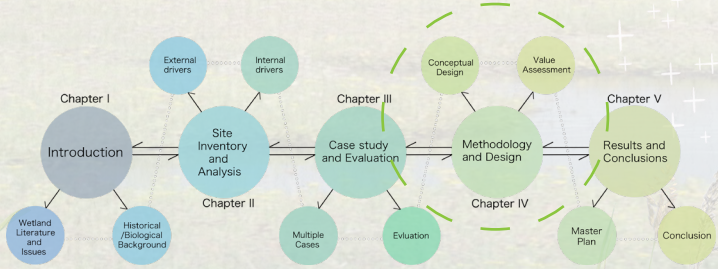
100% Wetland Park -"Immersive Wetland"

1 Entrance gate/sculpture
2 Popular Science Area
3 Green Island Habitat
4 Camping ground
5 Seasonal greenway
6 Hydrophilic floating platform
7 Water trail
8 Access to the island
9 Hidden Garden
10 Highland grassland
11 Waterfall viewing platform
12 Floating platform
13 Bird watching tower
14 Recreation area
15 Access to tidal flats

Waterfront habitat
Vegetation cover habitat
Trail / Path
Pond / lake
Flat ground



SECTION 4 : Evaluation



/ Evaluation, Sustainable SITES Initiative

D1	D2	D3	1: SITE CONTEXT		Possible Points:	13
Y	Y	Y	CONTEXT P1.1	Limit development on farmland		
Y	Y	Y	CONTEXT P1.2	Protect floodplain functions		
Y	Y	Y	CONTEXT P1.3	Conserve aquatic ecosystems		
Y	Y	Y	CONTEXT P1.4	Conserve habitats for threatened and endangered species		
3	3	3	CONTEXT C1.5	Redevelop degraded sites		3 to 6
4	4	4	CONTEXT C1.6	Locate projects within existing developed areas		4
2	2	2	CONTEXT C1.7	Connect to multi-modal transit networks		2 to 3

D1	D2	D3	2: PRE-DESIGN ASSESSMENT + PLANNING		Possible Points:	3
Y	Y	Y	PRE-DESIGN P2.1	Use an integrative design process		
Y	Y	Y	PRE-DESIGN P2.2	Conduct a pre-design site assessment		
Y	N	N	PRE-DESIGN P2.3	Designate and communicate VSPZs		
3	3	3	PRE-DESIGN C2.4	Engage users and stakeholders		3

D1	D2	D3	3: SITE DESIGN - WATER		Possible Points:	23
Y	Y	Y	WATER P3.1	Manage precipitation on site		
Y	Y	Y	WATER P3.2	Reduce water use for landscape irrigation		
4	5	6	WATER C3.3	Manage precipitation beyond baseline		4 to 6
6	6	4	WATER C3.4	Reduce outdoor water use		4 to 6
4	5	5	WATER C3.5	Design functional stormwater features as amenities		4 to 5
6	5	4	WATER C3.6	Restore aquatic ecosystems		4 to 6

D1	D2	D3	4: SITE DESIGN - SOIL + VEGETATION		Possible Points:	40
Y	Y	Y	SOIL+VEG P4.1	Create and communicate a soil management plan		
Y	Y	Y	SOIL+VEG P4.2	Control and manage invasive plants		
Y	Y	Y	SOIL+VEG P4.3	Use appropriate plants		
4	5	6	SOIL+VEG C4.4	Conserve healthy soils and appropriate vegetation		4 to 6
0	4	6	SOIL+VEG C4.5	Conserve special status vegetation		4
0	4	5	SOIL+VEG C4.6	Conserve and use native plants		3 to 6
0	4	5	SOIL+VEG C4.7	Conserve and restore native plant communities		4 to 6
1	1	1	SOIL+VEG C4.8	Optimize biomass		1 to 6
4	4	0	SOIL+VEG C4.9	Reduce urban heat island effects		4
3	3	4	SOIL+VEG C4.10	Use vegetation to minimize building energy use		1 to 4
4	4	0	SOIL+VEG C4.11	Reduce the risk of catastrophic wildfire		4

D1	D2	D3	9. EDUCATION + PERFORMANCE MONITORING		Possible Points:	11
0	3	4	EDUCATION C9.1	Promote sustainability awareness and education		3 to 4
3	3	3	EDUCATION C9.2	Develop and communicate a case study		3
0	4	4	EDUCATION C9.3	Plan to monitor and report site performance		4

D1	D2	D3	5: SITE DESIGN - MATERIALS SELECTION		Possible Points:	41
Y	Y	Y	MATERIALS P5.1	Eliminate the use of wood from threatened tree species		
4	3	0	MATERIALS C5.2	Maintain on-site structures and paving		2 to 4
3	3	4	MATERIALS C5.3	Design for adaptability and disassembly		3 to 4
4	4	4	MATERIALS C5.4	Use salvaged materials and plants		3 to 4
0	3	0	MATERIALS C5.5	Use recycled content materials		3 to 4
3	3	4	MATERIALS C5.6	Use regional materials		3 to 5
4	3	0	MATERIALS C5.7	Support responsible extraction of raw materials		1 to 5
5	3	4	MATERIALS C5.8	Support transparency and safer chemistry		1 to 5
5	0	0	MATERIALS C5.9	Support sustainability in materials manufacturing		5
5	5	5	MATERIALS C5.10	Support sustainability in plant production		1 to 5

D1	D2	D3	6: SITE DESIGN - HUMAN HEALTH + WELL-BEING		Possible Points:	30
2	2	2	HHWB C6.1	Protect and maintain cultural and historic places		2 to 3
0	2	2	HHWB C6.2	Provide optimum site accessibility, safety, and wayfinding		2
0	2	2	HHWB C6.3	Promote equitable site use		2
2	2	2	HHWB C6.4	Support mental restoration		2
0	2	2	HHWB C6.5	Support physical activity		2
0	2	2	HHWB C6.6	Support social connection		2
0	3	3	HHWB C6.7	Provide on-site food production		3 to 4
4	4	4	HHWB C6.8	Reduce light pollution		4
4	4	4	HHWB C6.9	Encourage fuel efficient and multi-modal transportation		4
1	2	2	HHWB C6.10	Minimize exposure to environmental tobacco smoke		1 to 2
0	3	3	HHWB C6.11	Support local economy		3

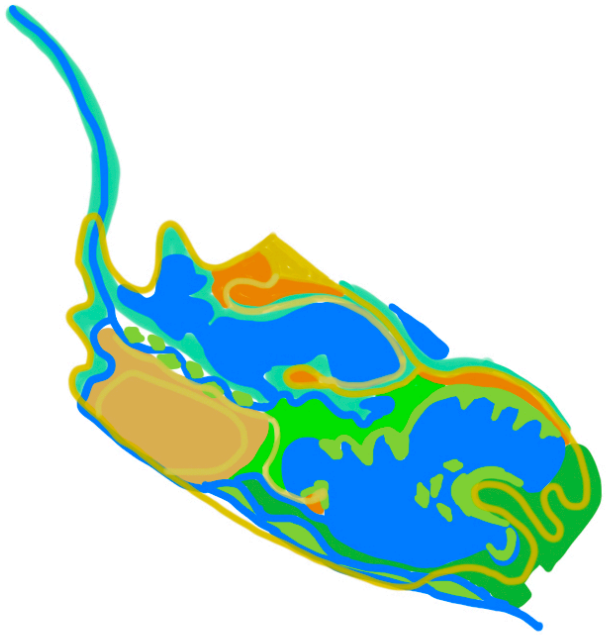
D1	D2	D3	7: CONSTRUCTION		Possible Points:	17
Y	Y	Y	CONSTRUCTION P7.1	Communicate and verify sustainable construction practices		
Y	Y	Y	CONSTRUCTION P7.2	Control and retain construction pollutants		
Y	Y	Y	CONSTRUCTION P7.3	Restore soils disturbed during construction		
0	3	5	CONSTRUCTION C7.4	Restore soils disturbed by previous development		3 to 5
0	0	3	CONSTRUCTION C7.5	Divert construction and demolition materials from disposal		3 to 4
0	0	3	CONSTRUCTION C7.6	Divert reusable vegetation, rocks, and soil from disposal		3 to 4
4	2	2	CONSTRUCTION C7.7	Protect air quality during construction		2 to 4

D1	D2	D3	8. OPERATIONS + MAINTENANCE		Possible Points:	22
Y	Y	Y	O+M P8.1	Plan for sustainable site maintenance		
Y	Y	Y	O+M P8.2	Provide for storage and collection of recyclables		
3	4	5	O+M C8.3	Recycle organic matter		3 to 5
5	4	4	O+M C8.4	Minimize pesticide and fertilizer use		4 to 5
4	4	4	O+M C8.5	Reduce outdoor energy consumption		2 to 4
4	4	4	O+M C8.6	Use renewable sources for landscape electricity needs		3 to 4
4	4	2	O+M C8.7	Protect air quality during landscape maintenance		2 to 4

D1	D2	D3	10. INNOVATION OR EXEMPLARY PERFORMANCE		Bonus Points:	9
3	5	9	INNOVATION C10.1	Innovation or exemplary performance		3 to 9

/ Evaluation, Sustainable SITES Initiative

	SITE CONTEXT	PRE-DESIGN ASSESSMENT + PLANNING	SITE DESIGN - WATER	SITE DESIGN - SOIL + VEGETATION	SITE DESIGN - MATERIALS SELECTION	SITE DESIGN - HUMAN HEALTH + WELL-BEING	CONSTRUCTION	OPERATIONS + MAINTENANCE	EDUCATION + PERFORMANCE MONITORING	INNOVATION OR EXEMPLARY PERFORMANCE	Final Score
DESIGN 1	0	3	20	16	33	15	4	20	3	3	117
DESIGN 2	10	0	21	29	27	28	5	20	10	5	155
DESIGN 3	13	0	19	27	37	28	13	19	11	9	166



Final evaluation result:
After passing the complete "site" evaluation, Design 2 and Design 3 scored 155 and 166 points, respectively. Among them, design two has gained greater advantages in "water" and "soil and vegetation"; at the same time, it is better than design one in other projects. Design 3 has received more points in "Human Health and Wellbeing" and "Education and Innovation" through extensive redesign and overall opening. In terms of the scores of design two and design three, design three is better than design two, but the overall promotion of design two is more environmentally friendly and sustainable. The original intention and purpose of the design of the site is to better protect the natural wetlands in the city, balance the ecological system and the living environment, and create an accessible site in the city. So design two is the most suitable final choice for this project.

/ Results, Final Design

Which parts are urgently needed?

/ Results, Design DETAIL 1

The most important design in the entire site: **The trail**

A. Trail

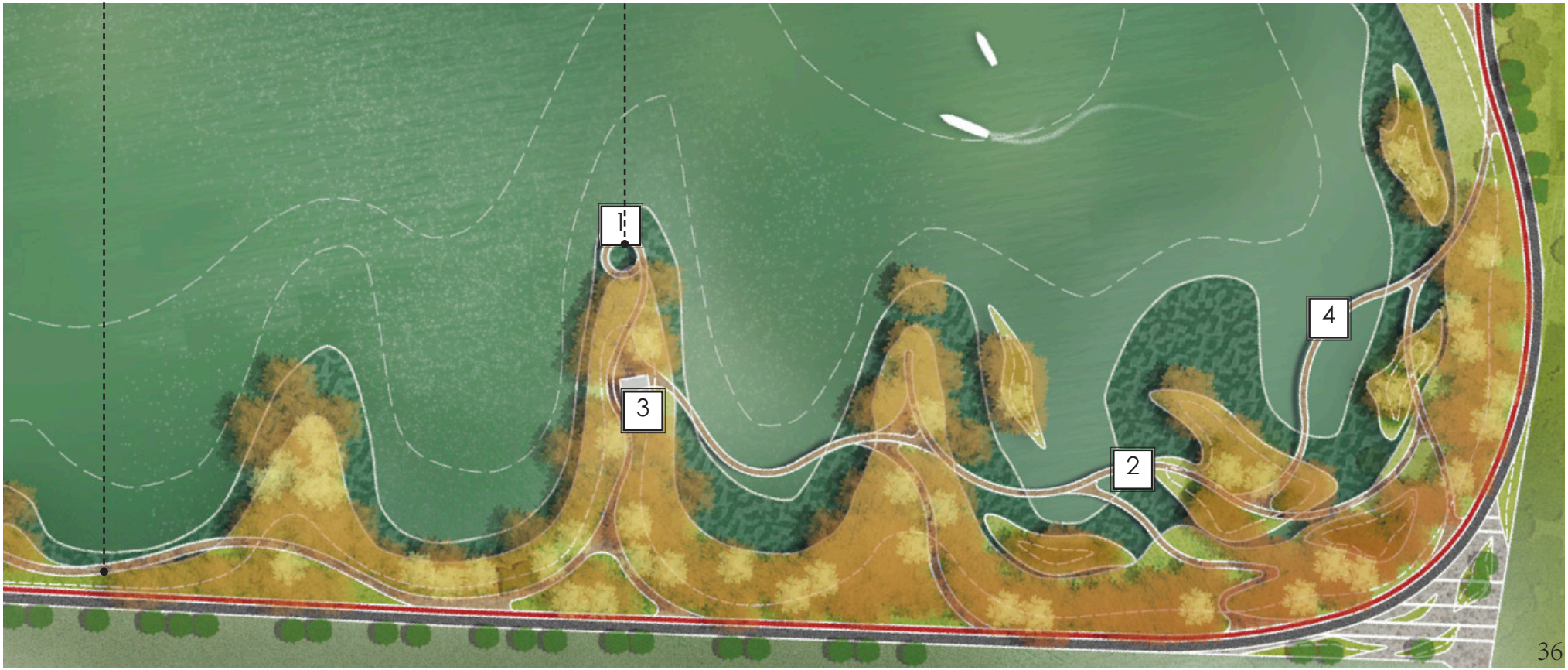
1 Bird watching tower

2 Waterfront trail

B.Riverside Terrace

3 Observation Deck

4 Elevated footbridge



/ Results, Design DETAIL 1-1

The most important design in the entire site: **The trail**
- Compared with the current trail, the new trail is closer to the water and has a better view.

/ Results, Design DETAIL 1-2

The most important design in the entire site: **The trail**
- Compared with the current trails, people have more opportunities to approach the water's edge.

/ Results, Design DETAIL 2

The most important design in the entire site: **The Seasonal trail / Green island**

/ Results, Design DETAIL 2-1

The most important design in the entire site: **Bird watching tower**
- Compared with the current viewing pavilion, people have a better view of bird watching.

/ Results, Design DETAIL 2-2

The most important design in the entire site: **Popular Science Area**
- Compared with the current trails, people have more opportunities to approach the water's edge.

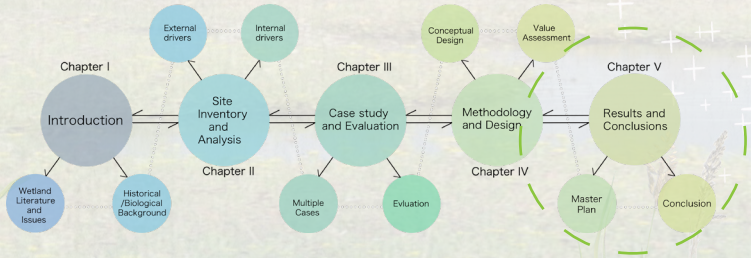
/ Results, Design DETAIL

Other facilities (may be added in the future)

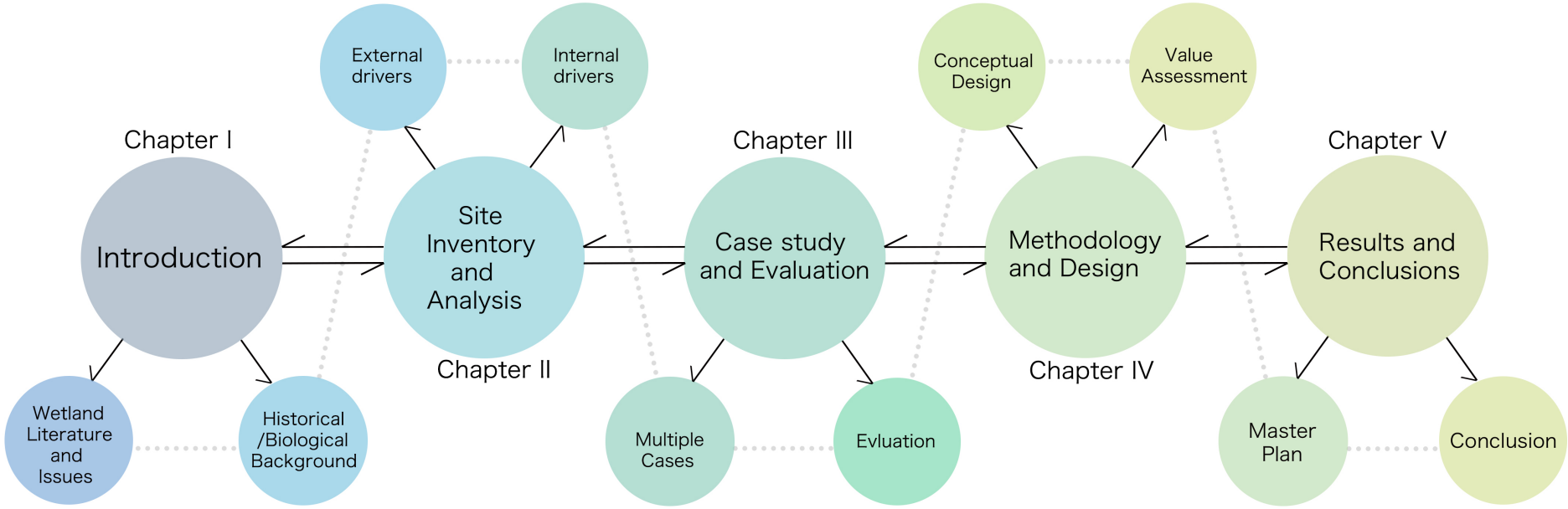
- Nature rides
- Sculpture/Public Art
- Outdoor teaching classroom
- Portal, signage, brand
- Educational place for children
- Community Wetland Garden
- Campground
- Seating/picnicareas
- Wildlifeblinds
- Unstructured play opportunities

Users
- National and international tourists;
- Local visitors;
- Resort staff and laborers;
- Students and researchers.

SECTION 5 : DISCUSSION



4/ OVERVIEW


External drivers
Internal drivers
Conceptual Design
Value Assessment
Chapter I
Chapter III
Chapter V
Introduction
Site Inventory and Analysis
Case study and Evaluation
Methodology and Design
Results and Conclusions
Chapter II
Chapter IV
Wetland Literature and Issues
Historical /Biological Background
Multiple Cases
Evluation
Master Plan
Conclusion

/ REFERENCE

Take Aways

Transferable design process
Reasonable design plan

Limitations

(1) Due to time constraints, there are still many details in the final design that have not been dealt with.
(2) The species, habitat range and activity range within the site have not been fully collected and analyzed.
(3) No stakeholder involvement

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THANK YOU !