Under the Weather

Rewriting Hydro-Social Narratives in the Thames Basin

P5 Presentation - 23.06.2023

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Research Studio: Transitional Territories
Inland-Seaward: The trans-coastal project

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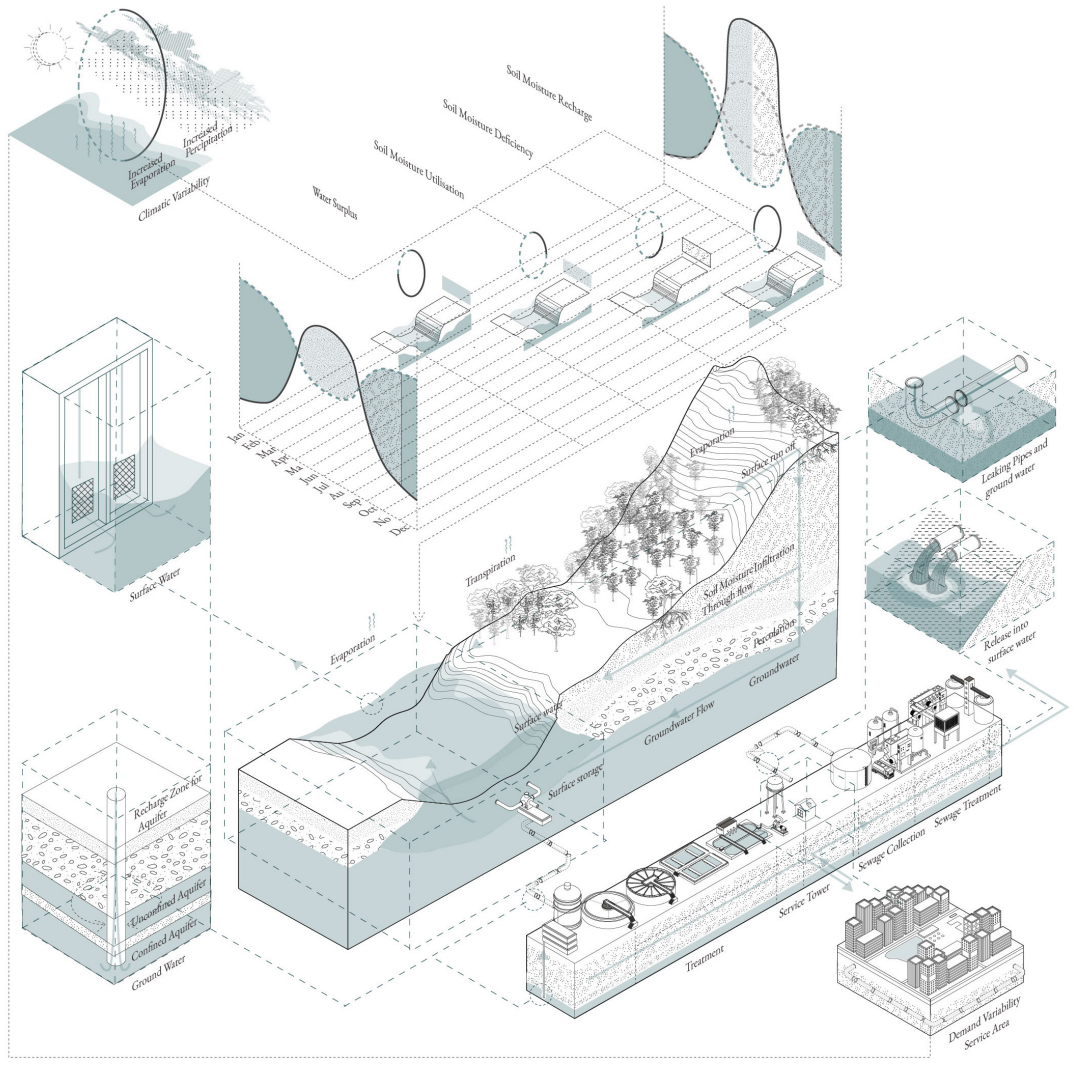
Introduction

Problem Field
Context

"The long-term impact of our technologically driven, consumer culture necessitates a critical reconsideration of the failings of this modern apparatus as a precondition for design."

(Burns et al., 2005)



Infrastructure Replacing Temporal Processes : Synthetic Diagram that shows weather and social variables within the hydro-social cycle

Narratives about Water : Public Discontent

It's time to WAKE up! Furious campaigners launch bombshell appeal to sue water regulator

Untreated sewage was released into the seas and rivers around the UK more than 770,000 times over the course of 2020 and 2021.

UK Utility Probes Data Centers' Water Usage During Drought

- Data centers compete with consumers for drinking water
- UK is in a drought, recording its driest July in 90 years

Thames Water criticised over lack of investment in sewage treatment works

Campaigners say most sites cannot cope with amount of wastewater, raising risk of raw discharges into rivers

Analysis suggested three-quarters of facilities in the upper Thames area lacked capacity to deal with the amount of wastewater from the population. Photograph: Cultura Creative Ltd/Alamy

Thames Water hosepipe ban to start on 24 August

Thames Water has announced a hosepipe ban for 10 million customers across the south of England.

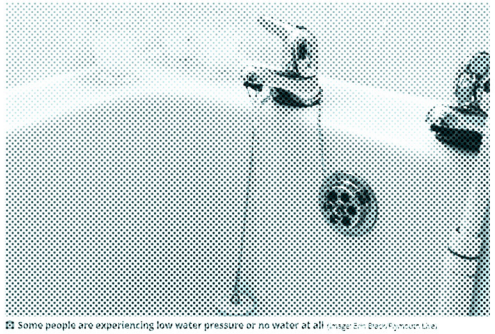
Thames Water: Protestors demand halt to sewage spills

Banner-wielding protestors banging drums, pots and pans have demanded Thames Water clean up its act and stop spilling sewage into rivers.

Source of River Thames dries out 'for first time' during drought

Head of the Thames is now more than 5 miles downstream as forecasters warn of further high temperatures to come

Burst Thames Water pipe at Crookham Common Reservoir sees homes left with supply issues



Some people are experiencing low water pressure or no water at all

11 water companies - including Thames Water - must return almost £150 million to customers for failing on targets

Protest against Thames Water in Port Meadow

News paper headlines from 2022: Accounts of hose pipe bans, end of fracking ban, and protests against sewage discharge and water loss

Source | Express, The Guardian, BBC News

Narratives about Water : Historic Parallel

Public Discourse

Depictions of the Thames River at the Intersection

The Personal Sphere and its connection with the Water Technology

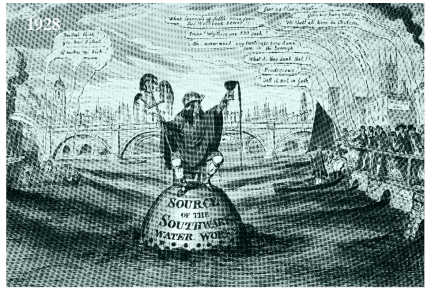


Fig: Criticism against South Water works in the 19th Century (Source Crikshank, G. (1832). Source of the Southwark Water Works. cartoon)

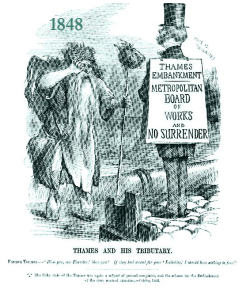


Fig: The Metropolitan Water Board meeting Father Thames

Fig: Criticism of UK's Flood Defense Expenditure (Source: Yorkshire Enterprise Network)

Fig: Criticism of the Hosepipe Bans amid news of leaking pipes (Source: Telegraph)

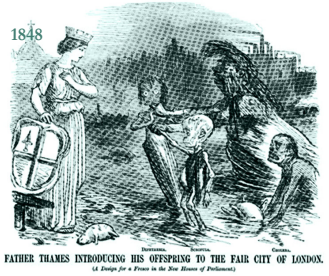


Fig: Father Thames introducing his offsprings (Source: British Library)

Fig: The River Thames a Highway Man - 'your money or your life'

Fig:Accounts of the Great Flood of 1928 (Source: Illustrated Police News)

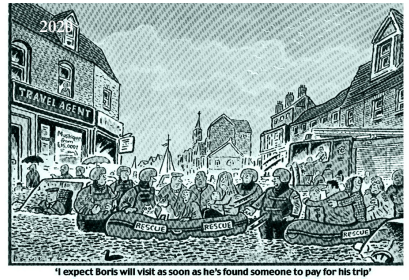


Fig: Accounts of Political Indifference to Londons Flooding (Source: Political Cartoon Society)

Fig: A water carrier from the 1700's (Source:

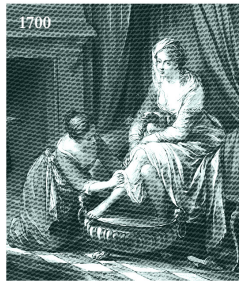


Fig: Dry Washing instead of Baths in Georgian England

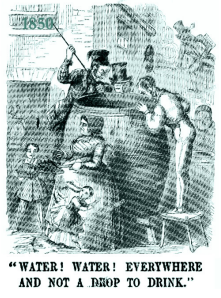


Fig: (Source: World History Archive)

Fig: The Advent of private bath tubs

Fig: Diktats of the drought police (Source: Daily Mail)

The Thames River Basin : London and its Ecological Hinterland

1400

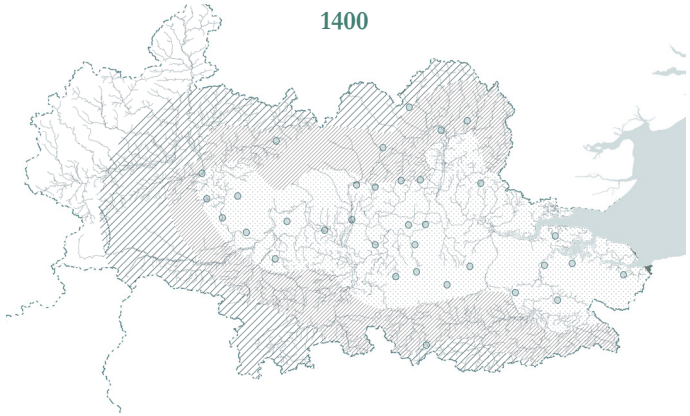


Fig : London's relationship with its hinterlands in the medieval period as defined by travel distances from various trading ports through waterways.

1940

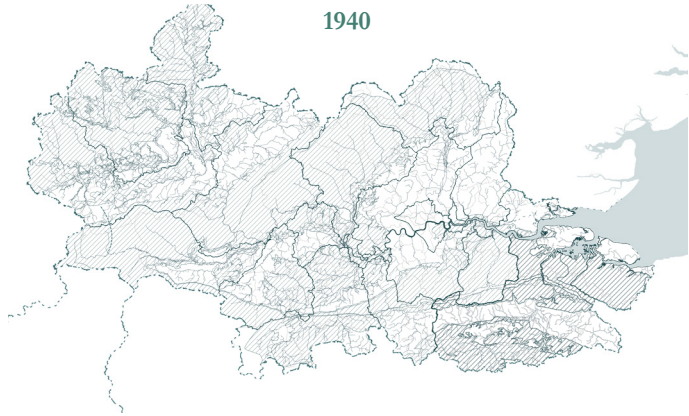


Fig: Debates since the 19th century drove the recognition of a catchment board to manage the distribution of local reserves of ground and surface water to service Londons Growing Demand

2022

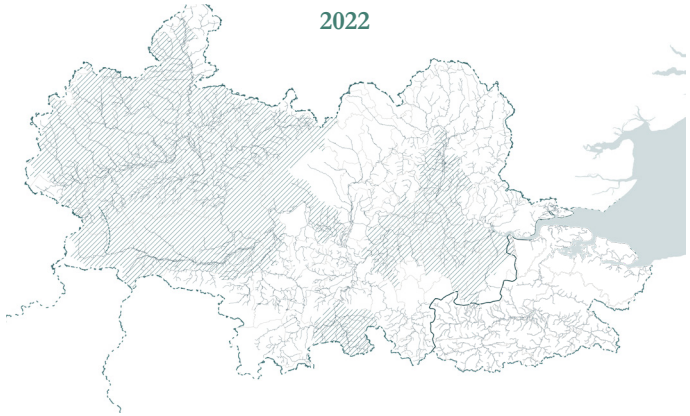
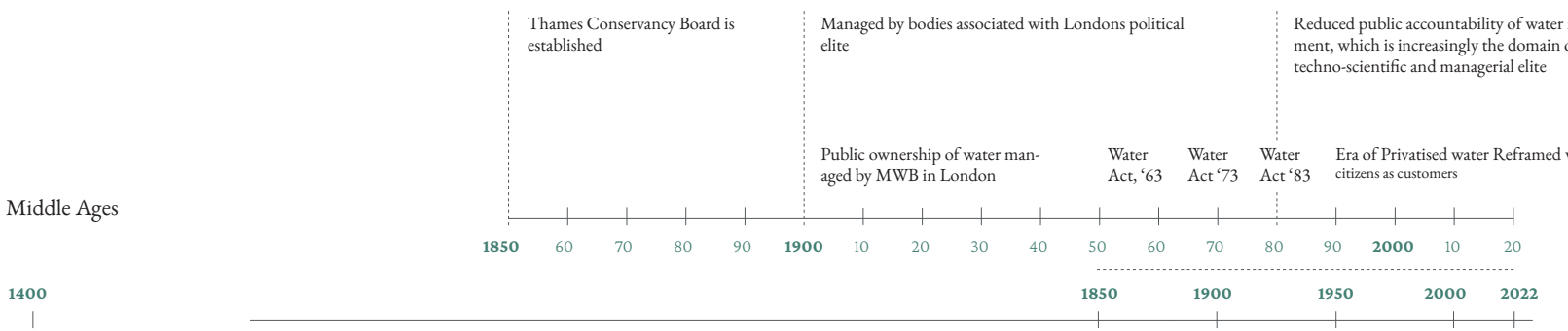


Fig: The division of the basin today, marked by the water companies domains of responsibility.



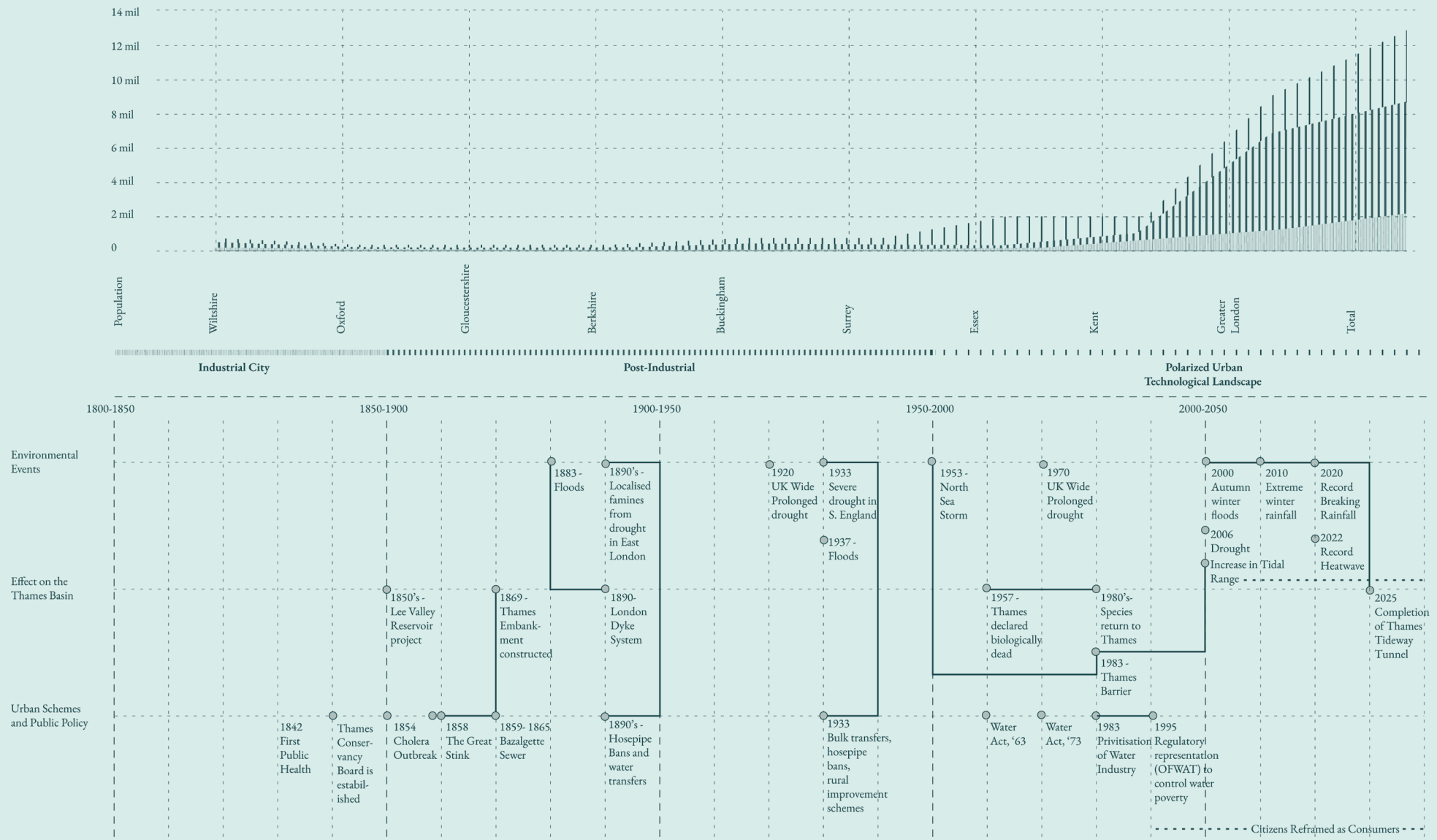


Fig: Time line of environmental events and urban schemes that have shaped the Thames Basin

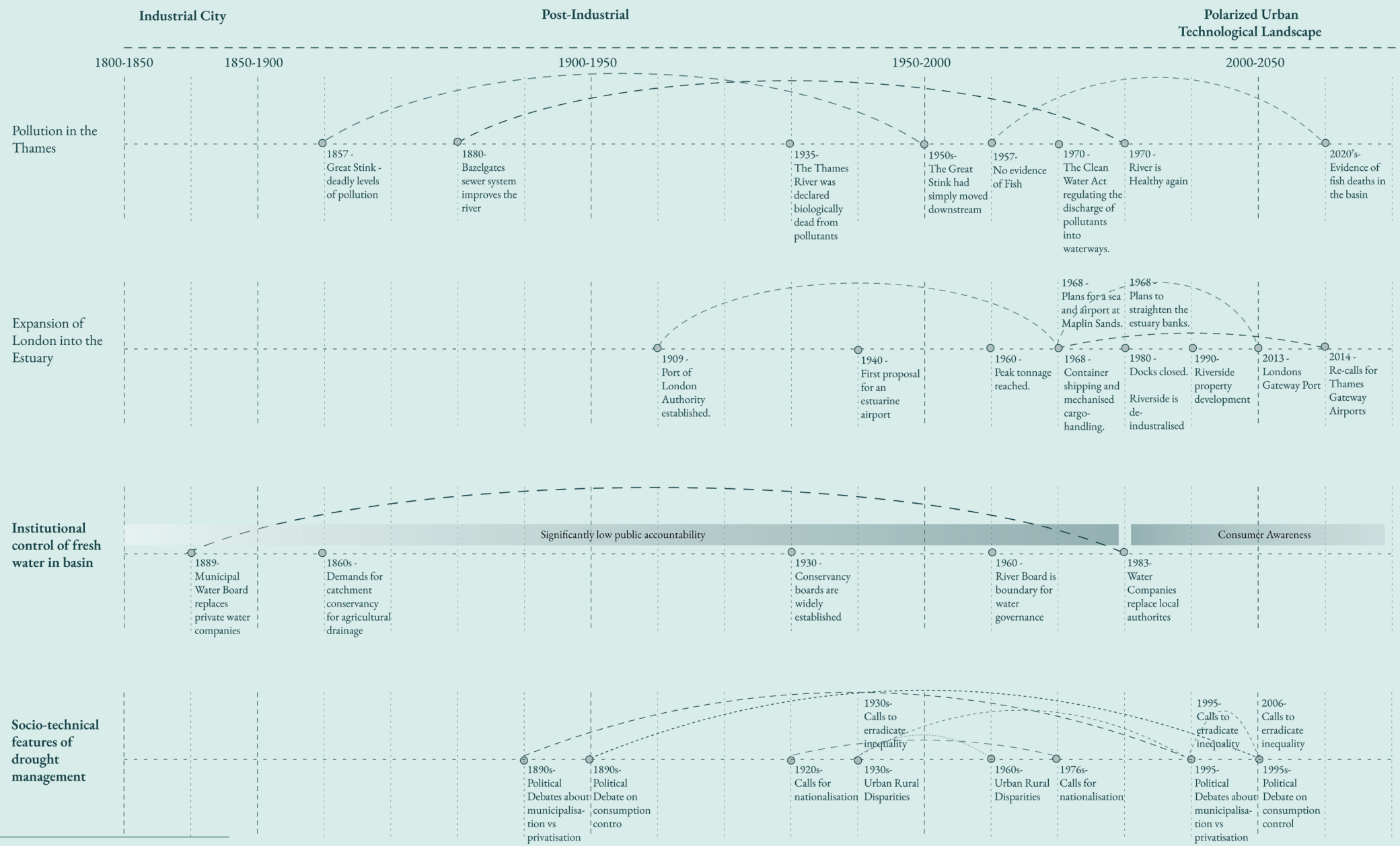
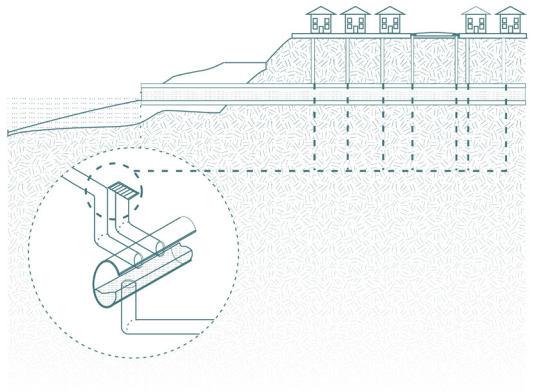
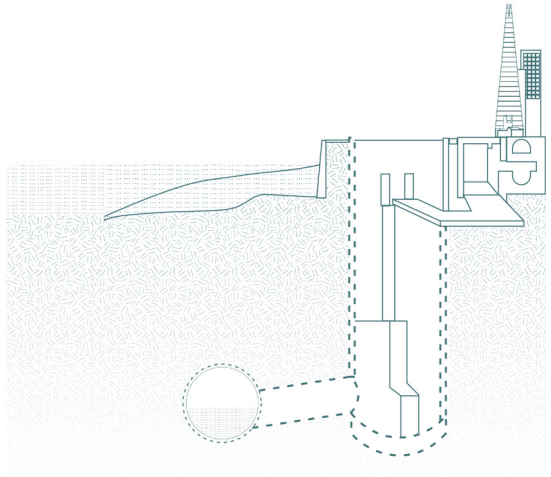
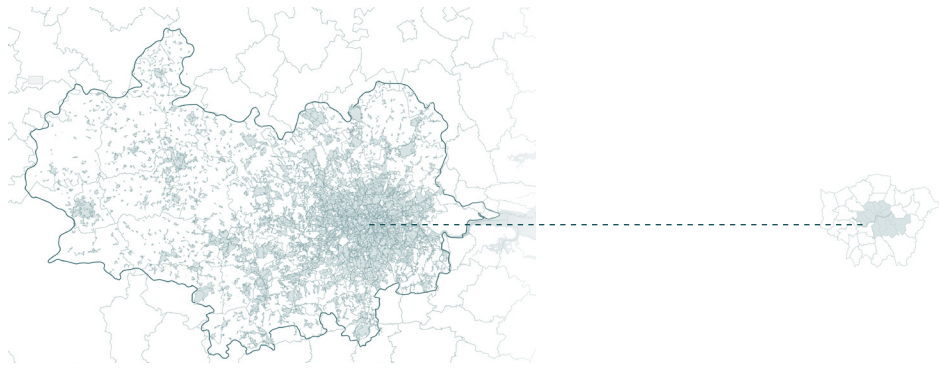


Fig: Historical Parallels in the Thames Basins Management

Historical Precedents Resurfacing : Thames Tideway Tunnel







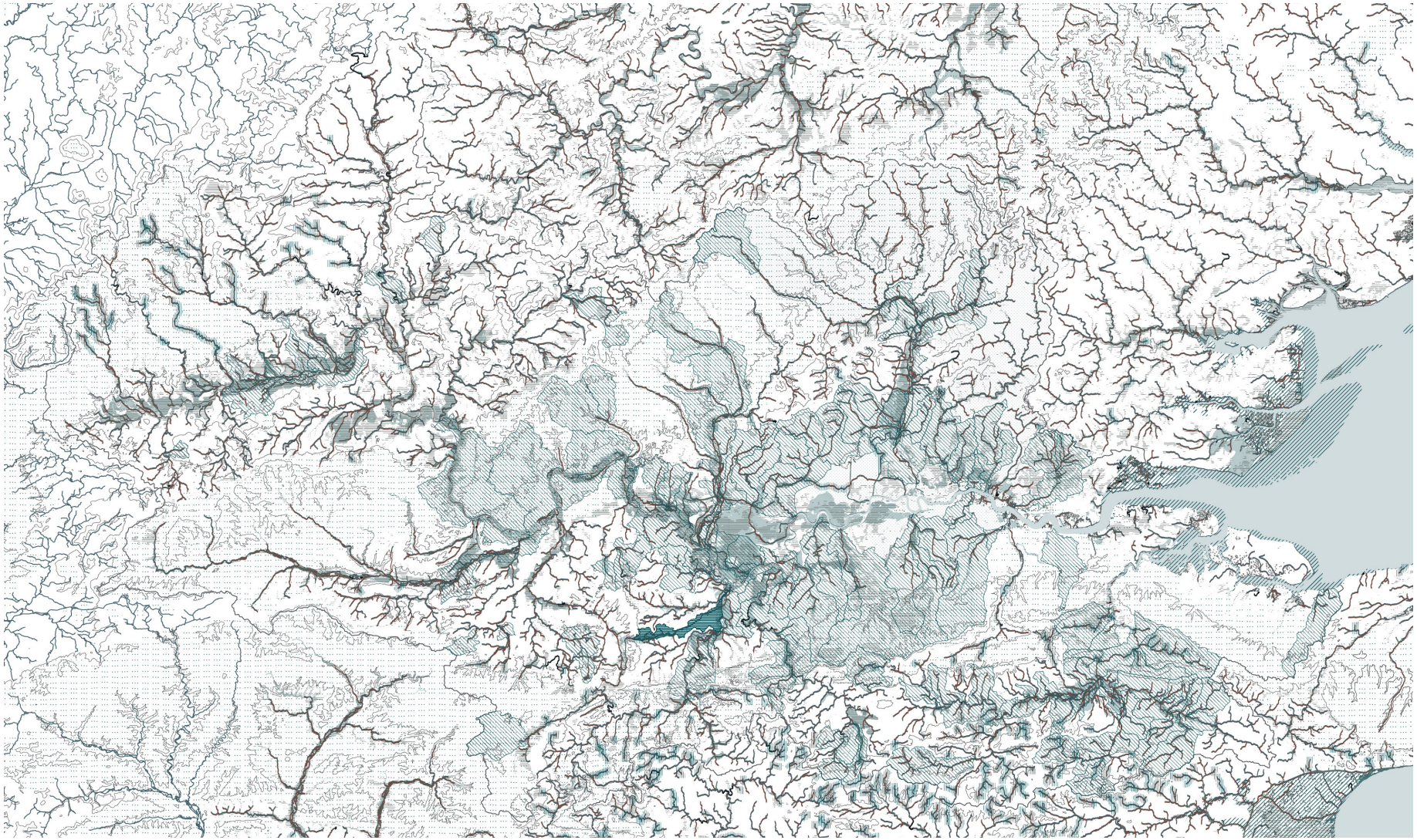
Disparities in the Infrastructural Paradigm:

Section of combined Sewers carrying sewage and storm water across the basin

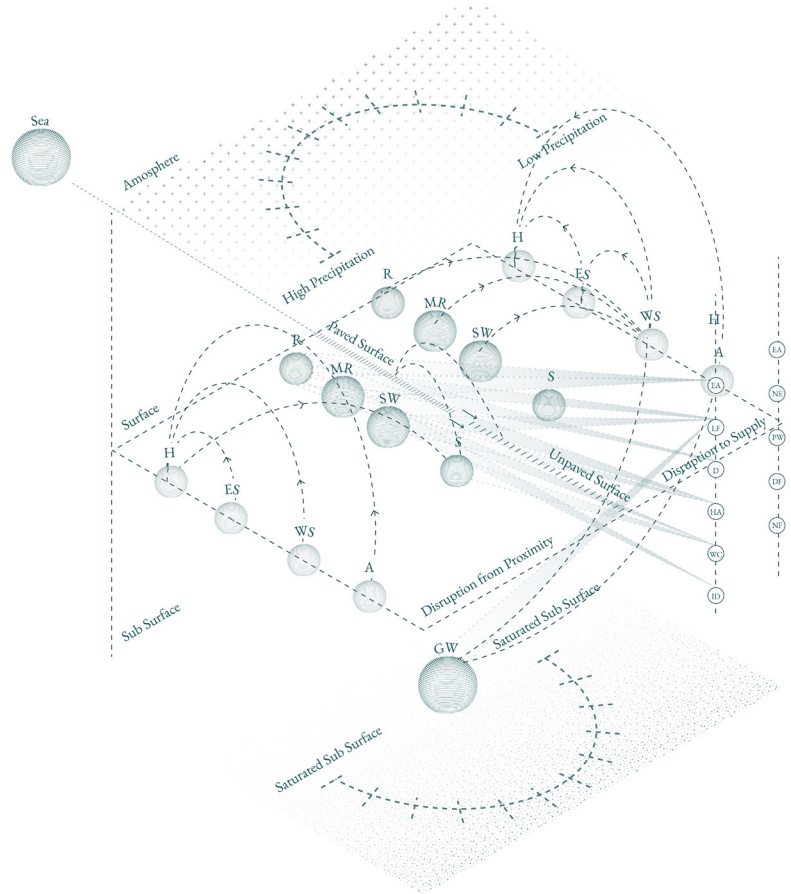
Section of the Thames Tideway Tunnel which serves Inner London alone

Dichotomies in the Hydro-Social Narrative

Research Question



Composition of Topos: Flood Risks in the Basin



R Reservoir
MR Main River
SW Surface Water
S Sewer
GW Ground Water

H Household
ES Electric Supply
WS Water Supply
A Agriculture

EA Environmental Agency
LF Lead Local Flood Authority
D District / Borough Council
HA Highway Authority
WC Water Company
ID Internal Drainage Board

NE Natural England
PW Private Water Supply
DF DEFRA
NF Natural Farmers Union

Alterations of Geopolitics: Domains of responsibility

	Impacts of Flood Control Measure on Drought			Impacts of Drought Reduction Measure on Flooding		
	Hazard	**Exposure**	**Vulnerability**	**Hazard**	**Exposure**	**Vulnerability**
Reservoir	(+) Can be used for water supply during drought (-) Lowering reservoir levels can lead to lower water availability downstream (-) Water loss due to evaporation	(-) Increased development downstream can lead to increased exposure	(-) Supply-demand cycles and reservoir effects (i.e. higher extraction and overreliance on reservoir)	(-) High reservoir levels can lead to susceptibility to overtopping and dam failure in event of high discharge	(-) Increased development downstream of dams can lead to increased exposure	(-) Supply-demand cycles and reservoir effects (i.e. higher extraction and over-reliance on reservoir)
Storm water control and upstream measures	(+) Storage of water for evaporative cooling and water source during drought (+) Upstream contour bunds and gully plugs to reduce runoff (and soil erosion) increase groundwater recharge			(-) Increased infiltration leading to flooding because of substantial Groundwater recharge (+) Area downstream can experience reduced flood hazard as more water captured/ delayed upstream		
Subsurface storage	(+) Managed aquifer recharge to reduce peak flows can increase water availability during drought		(+) Underground Taming of Floods for Irrigation (UTFI) to mitigate floods are effective in enhancing groundwater availability making irrigated agriculture less vulnerable to droughts than conventional rainfed agriculture	(-) Continued pumping of groundwater during dry periods can lead to land subsidence and permanent reduction in storage space (-) Area downstream can experience reduced flood hazard as more water captured/ delayed upstream		
Agricultural practices and land use changes	(+) Reservoirs & land use management can reduce both drought and flood risk (-) Reforestation can lead to decreased dry season flows (+) Reforestation can reduce irrigation water extraction on irrigated land	(-) Reforested land may be needed for food productionv (+) Establishment of plantations can increase economic return of degraded land	(-) Wrong flood forecasts can lead to b higher drought vulnerability (-+) Competition between agriculture and forest socio-economic gains	(-) Overdraft of groundwater leads to lowering of water table, resulting in subsidence and lower water storage (-) Enhanced rainfall infiltration in dry areas can lead to waterlogging during heavy rains (+) Successive dams for soil and water conservation can be favorable for flood hazard (-) Changing to high water-use efficiency crops could increase flood risk due to low evaporative losses (+) Reforestation can lead to increased dry season flows if soil infiltration capacity improves Wrongly implemented water harvesting interventions may result in increased topsoil erosion and gully formation	(-) Cultivating floodplains increases flood exposure (+) Reduces exposure to floods and shortens flood periods	(+) Better early-warning can lead to decreased drought and flood vulnerability (-) Reforested areas susceptible to tree mortality (which can increase peak flows) in response to fires, pest and diseases

Table 1: Overview of how flood and drought management efforts disproportionately effect one another (Adapted from Ward et al, 2020))

Dichotomy under Investigation	Problem Focus
The City and the Countryside	The need to re frame the area lying outside greater London from an ecological hinterland to a part of a watershed democracy. The need to reduce the imposition of negative externalities of improper urban water management on these spaces
Seasonal Flooding and Drought Challenges	The need to reduce socio-economic losses due to the inability of the current urban water system to cope with extreme weather events.
Upstream and Downstream Catchment Dynamics	The need to ed-engineer the upstream catchments to manage both its own and the flooding risks of the highly engineered catchments downstream.

Research Question

As the Thames Basin is subjected to increasing instances of **extreme weather events,** what is a **new form of urban design** that can sustain **water security and agricultural productivity** while **regulating imbalances in the hydrosocial cycle?**

Research Question

As the Thames Basin is subjected to increasing instances of **extreme weather events,** what is a **new form of urban design** that can sustain **water security and agricultural productivity** while **regulating imbalances in the hydrosocial cycle?**

1

1.1 How can a form of planning that is responsive to the temporality of natures processes, adapt to uncertain intensities and frequencies of seasonal droughts and floods?

Problem Focus Seasonal Flooding and Drought Challenges; Upstream and Downstream Catchment Dynamics

2

2.1 What are the historical precedents that need to be examined and redefined in rewriting the water paradigm of the basin?

Problem Focus The City and the Countryside

3

3.1 What is the new role of the countryside in working towards securing food and water self sufficiency?

Problem Focus The City and the Countryside

4

4.1 What are the context responsive ways in which different forms of flooding events in the basin can be reframed from a risk to an opportunity?

Problem Focus The City and the Countryside; Upstream and Downstream Catchment Dynamics

4.2 What are the actions that can be taken upstream, to relieve the extremes of climate change related risks across the basin?

Problem Focus Upstream and Downstream Catchment Dynamics

De-constructing the Countryside

Many Meanings of the Countryside
Design Hypothesis
Framework for Hydrological Relevance of Countryside

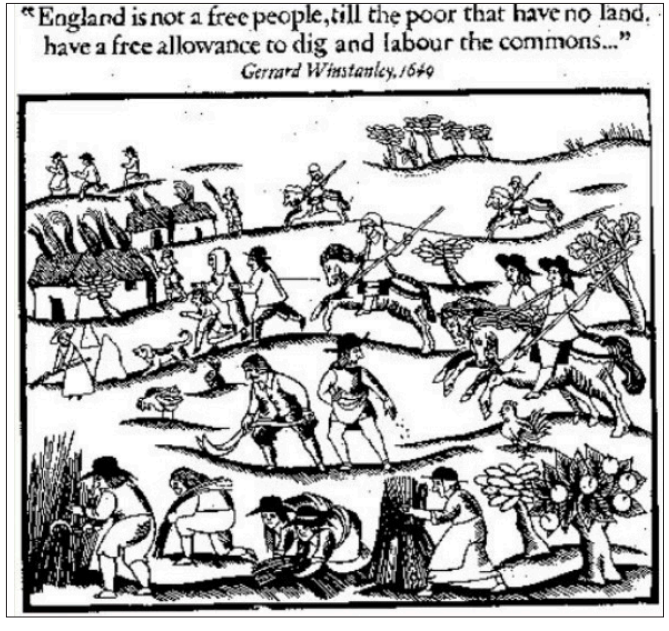
Many Meanings of the Countryside : The Pastoral and Counter Pastoral

"'Thus at once, for me, before the argument starts, country life has many meanings"

(Williams, 1973)

Pastoral Narrative: John Constable, British, 1776 - 1837, Wivenhoe Park, Essex, 1816, oil on canvas,

Source | Widener Collection



Counter Pastoral Narrative: The Diggers rebellion in England, 1649

Source | Libcom.org Online Archive

Many Meanings of the Countryside : The Dying Countryside

"It is a prose style of very little action. In large part, it is a language of powerlessness"

(Cocker, 2018)

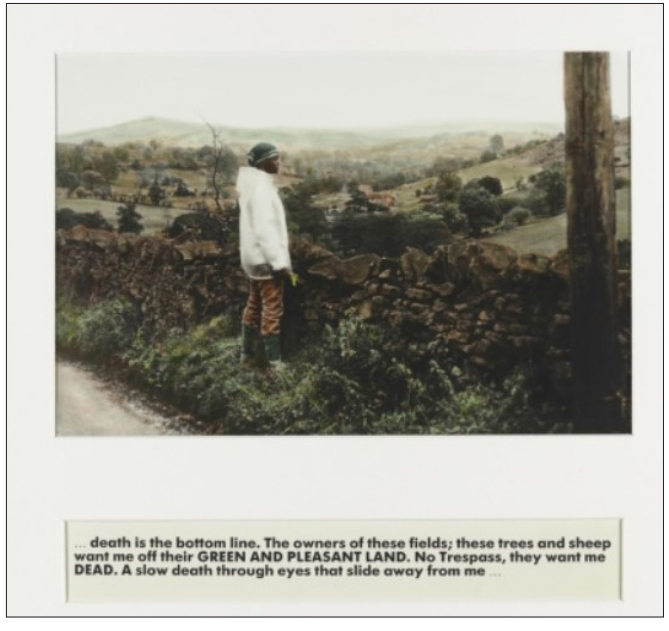
UK is 30-40 years away from 'eradication of soil fertility', warns Gove

Farmers must be incentivised to tackle decline in biodiversity, says environment secretary at launch of parliamentary soil body

'If you drench soil in chemicals that improves yields ... but ultimately you are cutting the ground away from beneath your own feet. Farmers know that," said Gove. Photograph: Alamy Stock Photo

Dying Countryside: Critique of unsustainable farming that has killed the countryside

Source | Guardian



... death is the bottom line. The owners of these fields; these trees and sheep want me off their GREEN AND PLEASANT LAND. No Trespass, they want me DEAD. A slow death through eyes that slide away from me ...

Dying Countryside: Exclusion of minority communities
Ingrid Pollard, Pastoral Interlude, No.4 1988, 1988

Source | Arts Council Collection

Alternative Narratives about the Countryside : Addressing Climate Anxieties

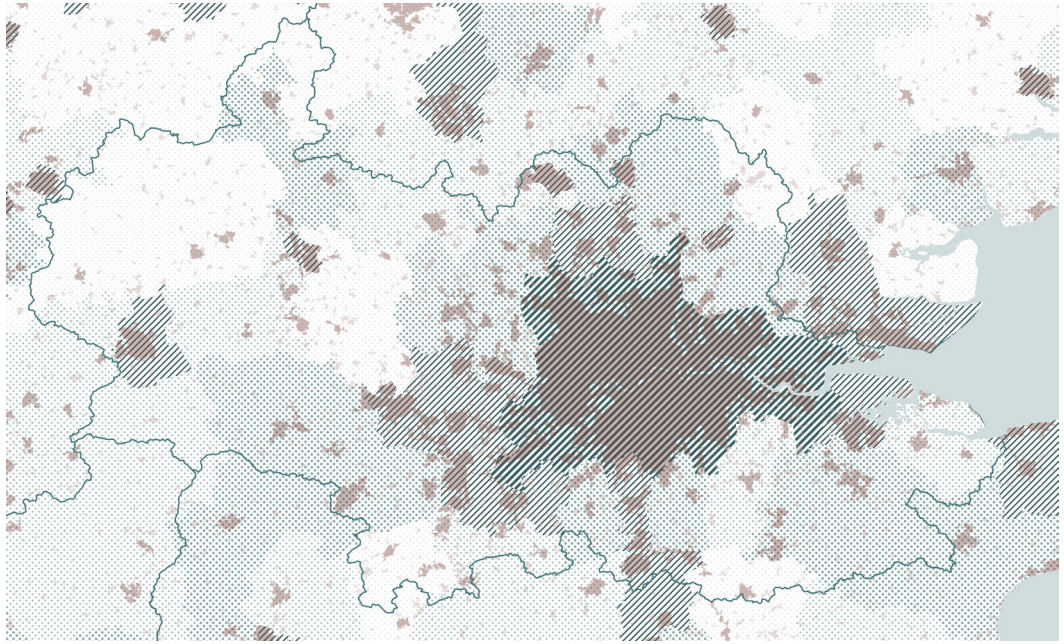
Parliament Square Paddy Fields: London Adapting to rising water tables through managed flooding to maintain food sufficiency

Source | Postcards From The Future

Deconstructing the Countryside

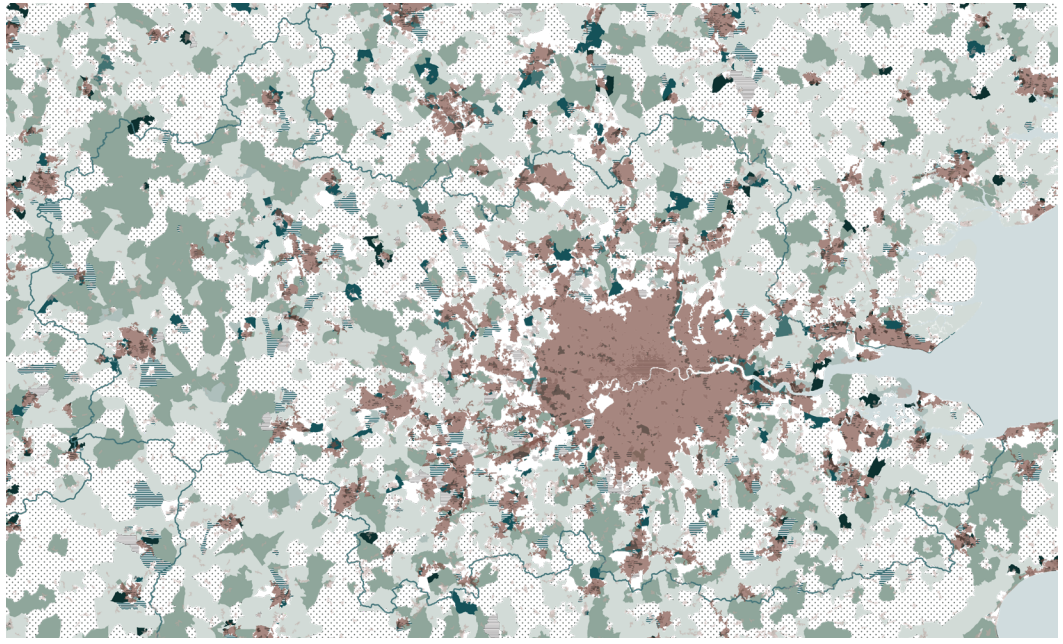
			Understanding the Limits to how Urbanity and Rurality is framed	Potential for Design
Spatial elements that culturally allude to the countryside	Land Use	Charting and Mapping its distribution within existing defintions of Urbanity and Rurality (population distribution within Local Authority Districts)	Infering whether a pattern exists that correlates the occurrence of land uses specifically associated with the countryside within administrative boundaries classified as rural.	Infering whether a pattern exists that correlates the occurrence of land uses specifically associated with the countryside within subcatchments.
	Infrastructure	Charting and Mapping its distribution within existing defintions of Urbanity and Rurality (population distribution within Local Authority Districts)	Infering whether a pattern exists that correlates the occurrence of water infrastructure specifically associated with the countryside within administrative boundaries classified as rural.	Infering whether a pattern exists that correlates the occurrence of water infrastructure specifically associated with the countryside within subcatchments.

Perspective that Frames the Countryside : Perspective into Land Management that Frames the Countryside



Urbanity and Rurality of the Administrative Divisions in the Thames Basin

- Mainly Rural
- Largely Rural
- Urban with significant rural
- Predominantly urban
- Urban with minor conurbation
- Urban with major conurbation

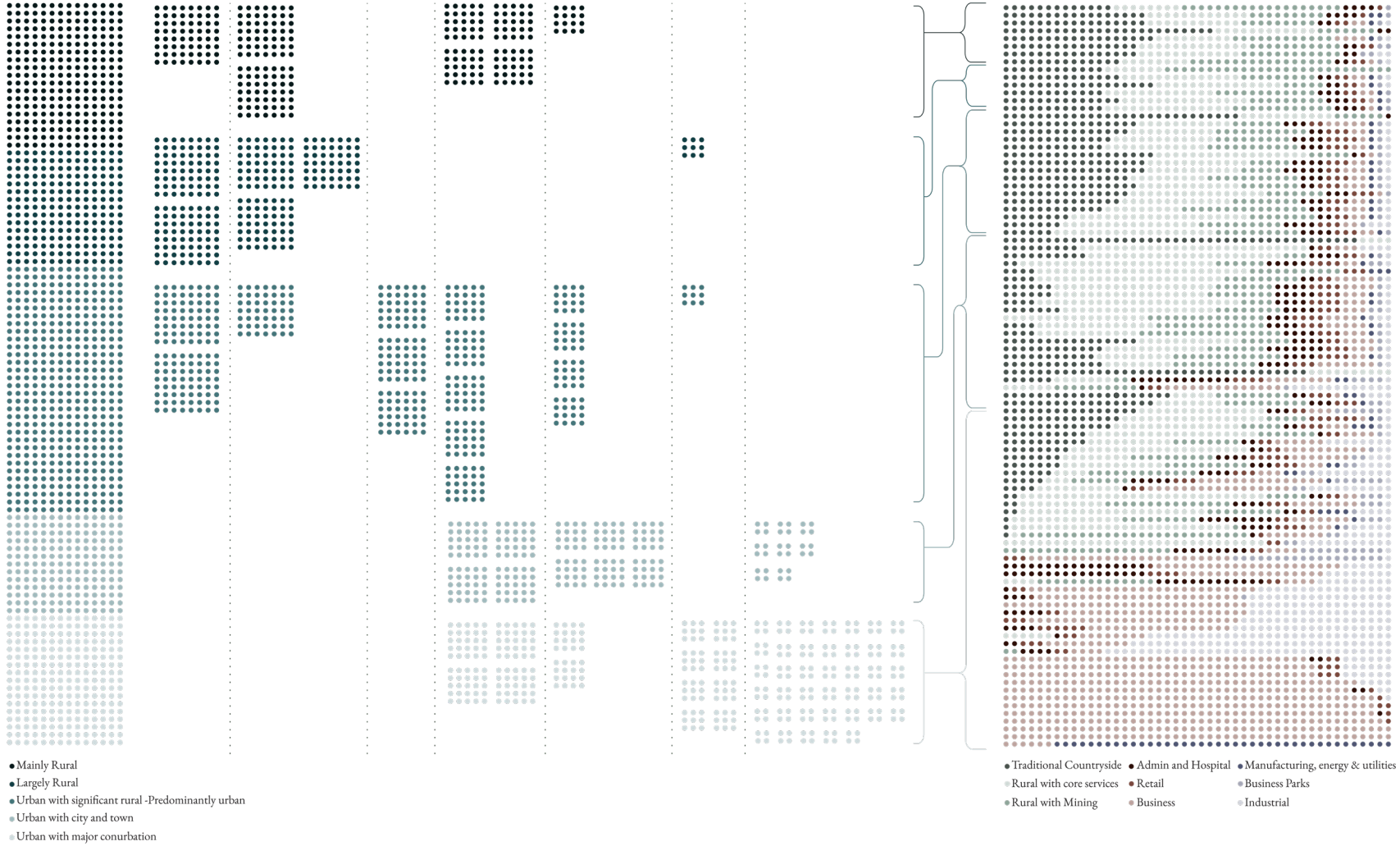


Land Use Distribution in the Thames Basin

Legend

- Residential
- Administration and Services
- Commercial and Retail
- Mining and Quarrying facilities
- Industrial Unit
- Built Up Area
- Business Parks
- Manufacturing Energy and Utilities
- Rural with core services and non-local workers
- Rural with mining or quarrying
- Traditional Countryside

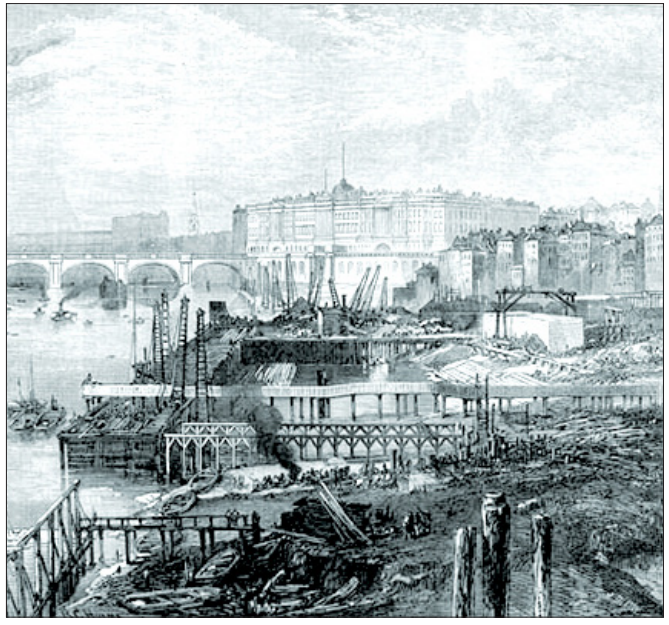
Perspective that Frames the Countryside : Perspective into Land Management that Frames the Countryside



Perspective that Frames the Countryside : Perspective into River Management that Frames the Countryside

Upper Thames: Hart's Weir, 1859.

Source | The Book of the Thames from its Rise to its Fall, Halls

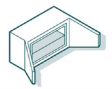


Lower Thames: Victoria Embankment under construction in 1865.

Source | : The Illustrated London News [London, England] 4 February 1865

Infrastructure that frames the river as a Chanel

Culvert

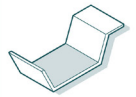


A covered channel or pipe which conveys a watercourse through an obstacle.

Natural Springs

A point at which groundwater flows from an aquifer at the Earth's surface.

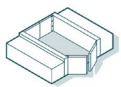
Open Channel



A conduit in which water flows with a free surface, i.e. not culverted.

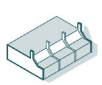
Infrastructure that frames the river as an Inland Waterway

Lock



A group of associated assets which form a complex of locks

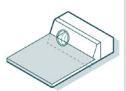
Wier



A low barrier that is built across the width of a watercourse to control the flow or upstream water level.

Infrastructure that frames the river as a Drain

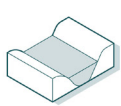
Outfall



The structure at the point where surface water drains discharge into a watercourse or the sea.

Infrastructure that frames the river as an Ecosystem

Natural High Ground

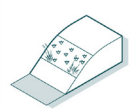


Any extent along a watercourse or coastline which completes the line of continuous defense, but has not been modified in any way, so does not qualify as any of the other defense asset types.

Salt - Marshes

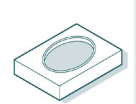
Mudflats that have built up to a higher elevation so that vegetation is able to thrive

Mudflats



Coastal wetlands that form in inter-tidal areas where sediments have been deposited by tides or rivers.

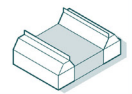
Water Storage



An area of land that is deliberately engineered to hold water where it wouldn't naturally accumulate.

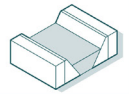
Infrastructure that frames the river as a Threat to Loss of Property

Embankment



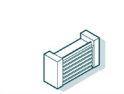
An artificially raised, earthen ridge used in the fluvial, tidal and coastal environments for flood defense, erosion protection, or channel containment.

Engineered High Ground



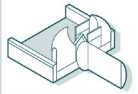
Retained, engineered or otherwise modified ground along watercourses or the coastline, that is not covered by one of the other defence asset types.

In Channel Stoplogs



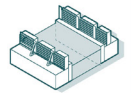
An adjustable structure used to control water levels and flow in watercourses, for water flow management, flood control, and navigation.

Tidal Barrier



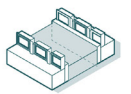
A defense structure against high tidal flows.

Demountable Defence



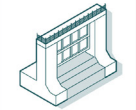
Sections of flood defense that are removable (e.g. for visual amenity or access reasons).

Wall



A wall which is raised above the surrounding land and acts as a barrier against flooding from rivers or the sea.

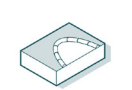
Flood Gate



A gate providing access for pedestrians or vehicles through a flood defense, while maintaining flood protection when closed.

Infrastructure that frames the river as a Source of Pollution

Debris Boom



A floating barrier across a watercourse designed to catch debris which could interfere with the operation of an asset.

Debris Screen

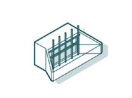
A screen that reduces the amount of trash and debris entering culverts, outfalls or channels (where it could cause a blockage).

Inspection Chamber

An opening to a confined space such as a culverted watercourse or underground services, providing access for testing, inspecting, maintaining and clearing blockages.

Infrastructure that frames the river as a Habitat

Fish or Eel Barrier



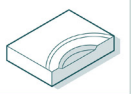
A barrier that prevents the movement of aquatic life into areas that may jeopardize their survival.

Infrastructure that frames the river as a Water Source

Borehole

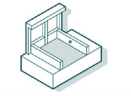
A shaft bored into the ground that is used to extract groundwater via a pump, or to monitor and/or measure water quality and/or quantity.

Spillway



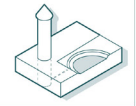
A slope or ramp leading down into water (channel or sea) used for launching/landing boats.

Stilling Basin



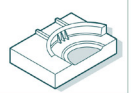
A depressed area in a channel or reservoir that is deep enough to reduce the velocity of the water before it passes further downstream.

Stilling Well



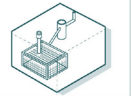
A chamber that is connected to a water body by one or more inlets. The water level in the stilling well will not be subject to the turbulence that may be present in the water body, allowing for more accurate level measurement.

Reservoir



. A reservoir is a large area for storing water which is created or enlarged by artificial means, and the associated impounding and control structures and assets.

Sand Trap



A structure for aerating groundwater and filter sand and soil particles.

Pumping Station

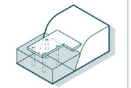
A group of assets which abstracts water from the ground and surface water a

Vortex Flow Control

A flow control structure

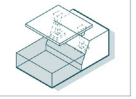
Infrastructure that frames the river as a Public Space

Quay



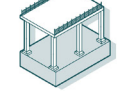
A structure adjacent to or protruding into watercourse or the sea to load or unload boats.

Bridge Abutment



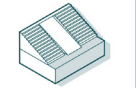
A supporting structure at the end of a bridge span that also acts as a flood defence. It ties into other flood defences and completes the line of defence against high river levels.

Pier



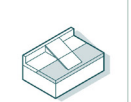
A significant supporting structure built in a channel.

Ramp



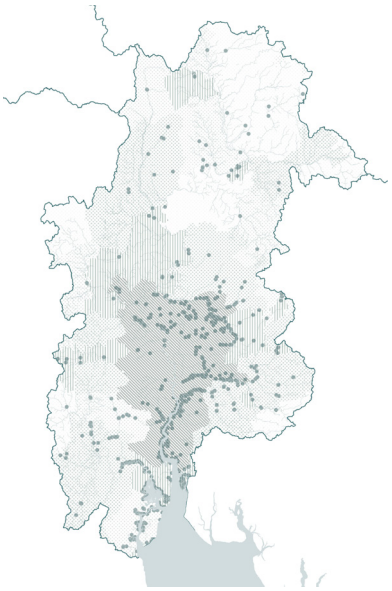
A sloped access route between two different levels.

Slipway

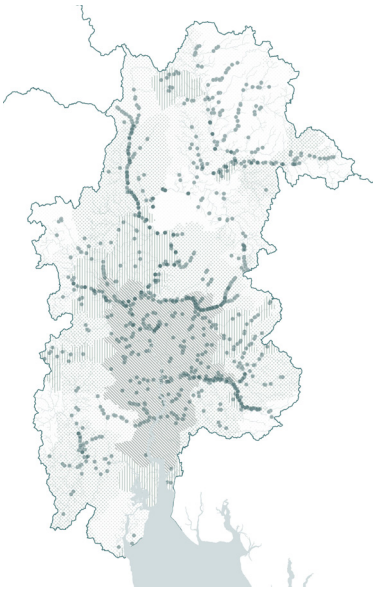


A slope or ramp leading down into water (channel or sea) used for launching/landing boats.

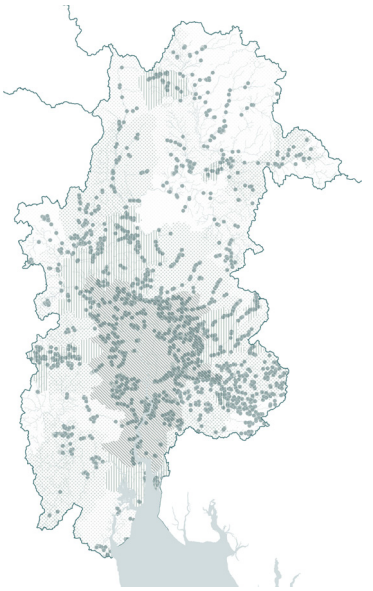
Infrastructure that frames the river as a
Drain



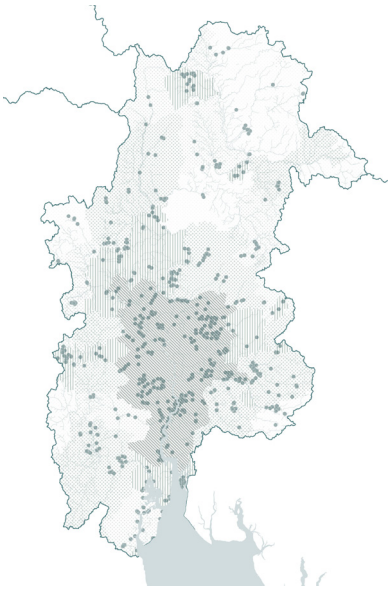
Infrastructure that frames the river as an
Inland Waterway



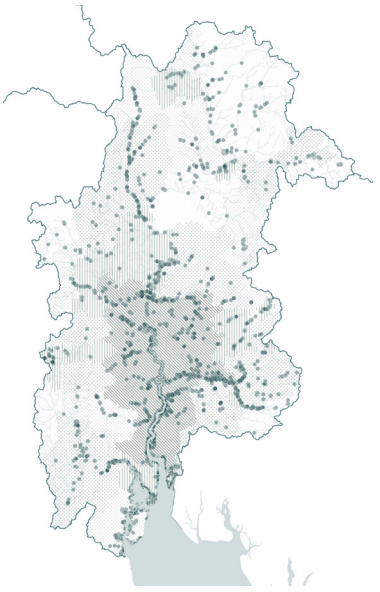
Infrastructure that frames the river as a
Chanel



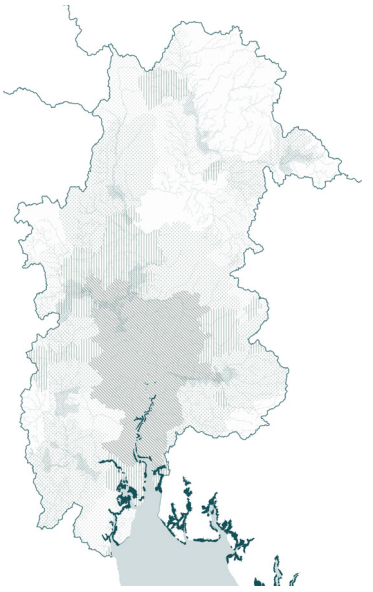
Infrastructure that frames the river as a
Source of Pollution



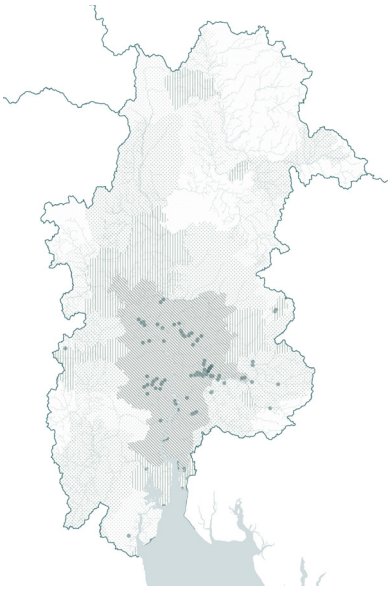
Infrastructure that frames the river as a
Threat to Loss of Property



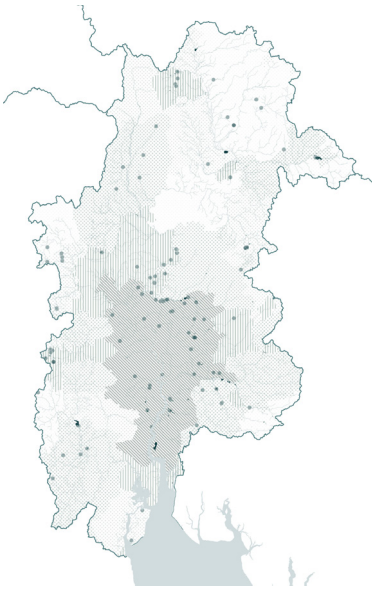
Infrastructure that frames the river as an
Ecosystem



Infrastructure that frames the river as a
Public Space



Infrastructure that frames the river as a
Water Source



Infrastructure that frames the river as a
Habitat

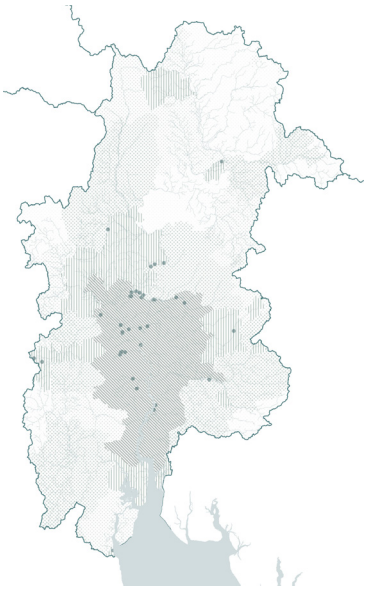
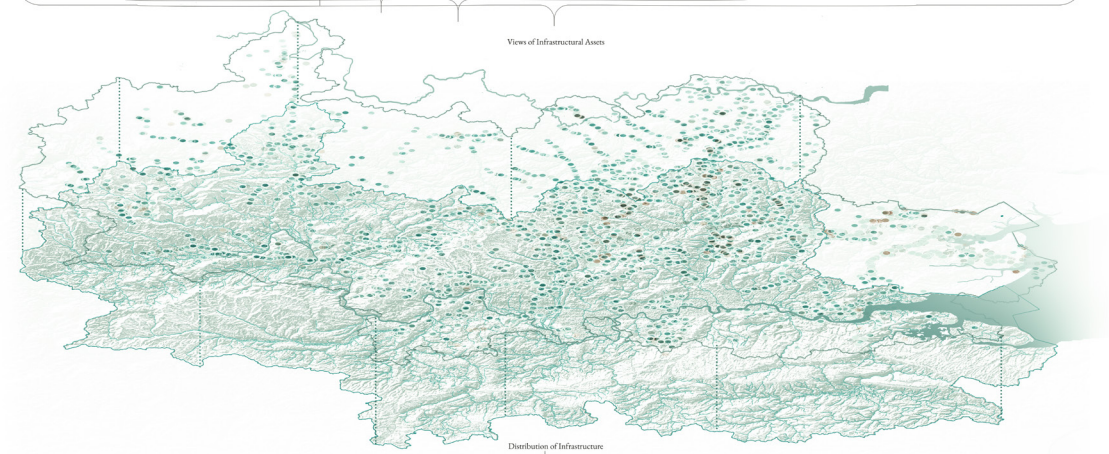


Photo Montage : Life Along the Thames

Life by the River

Views of Infrastructural Assets



Distribution of Infrastructure



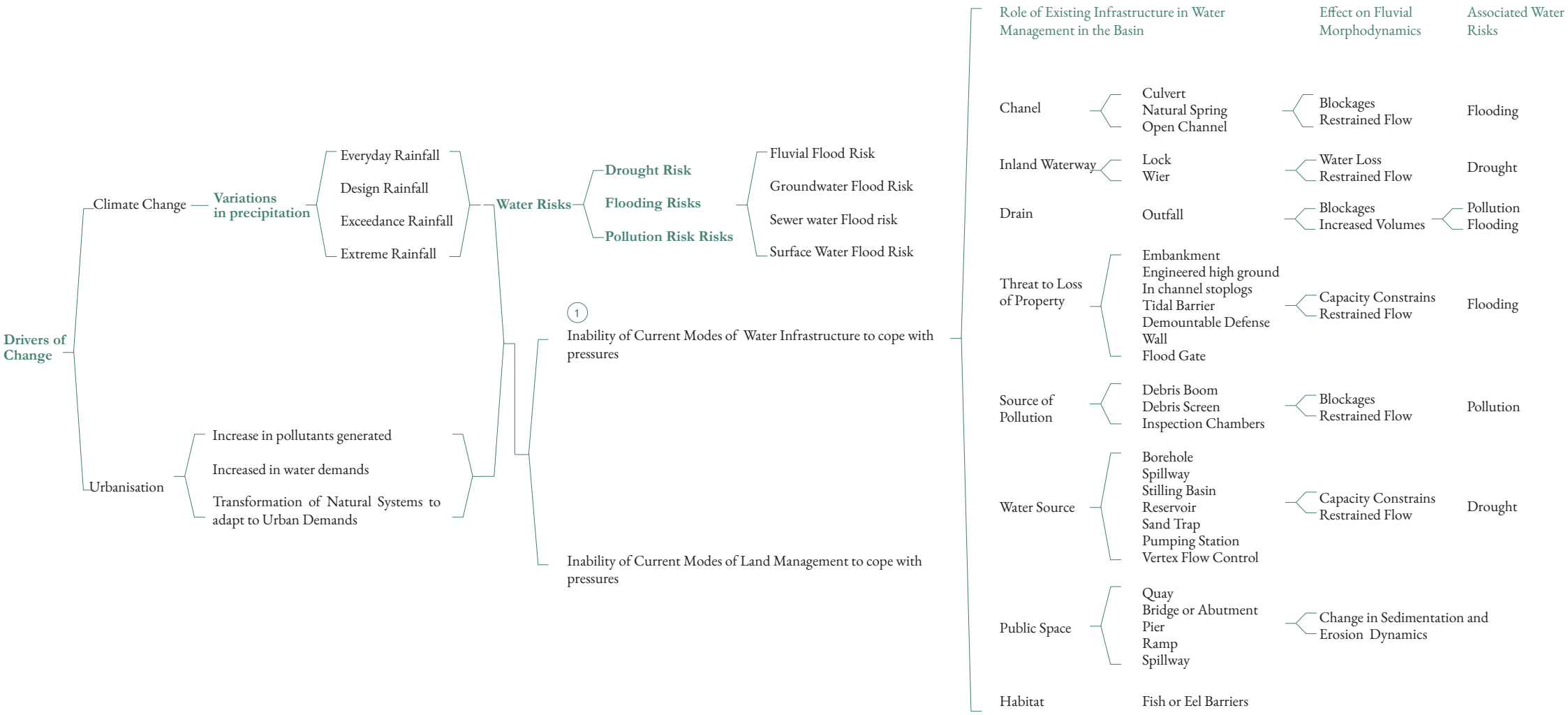




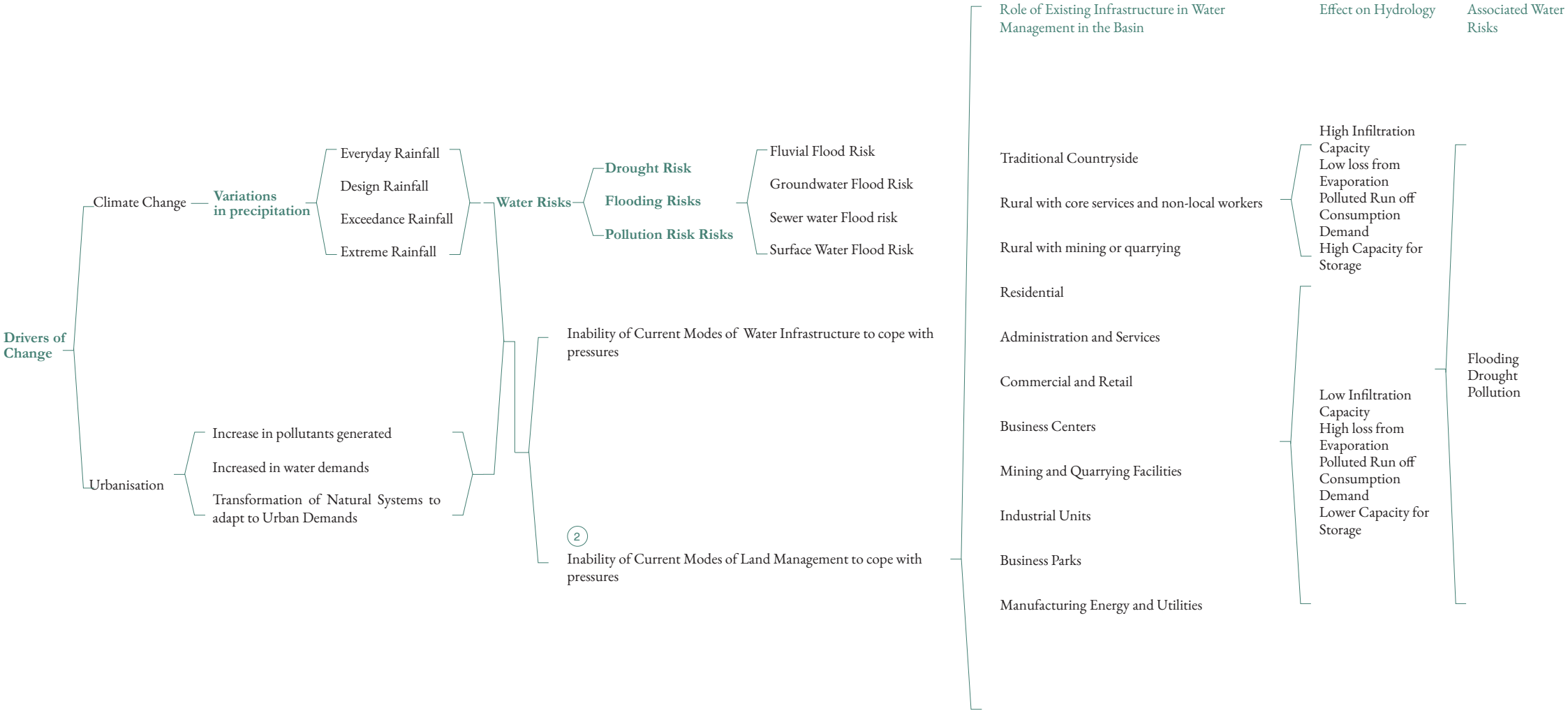
Photo-montage: Life along the Thames

Source | Alex Starkey

The Hydrological Relevance of the Countryside : Infrastructure Management



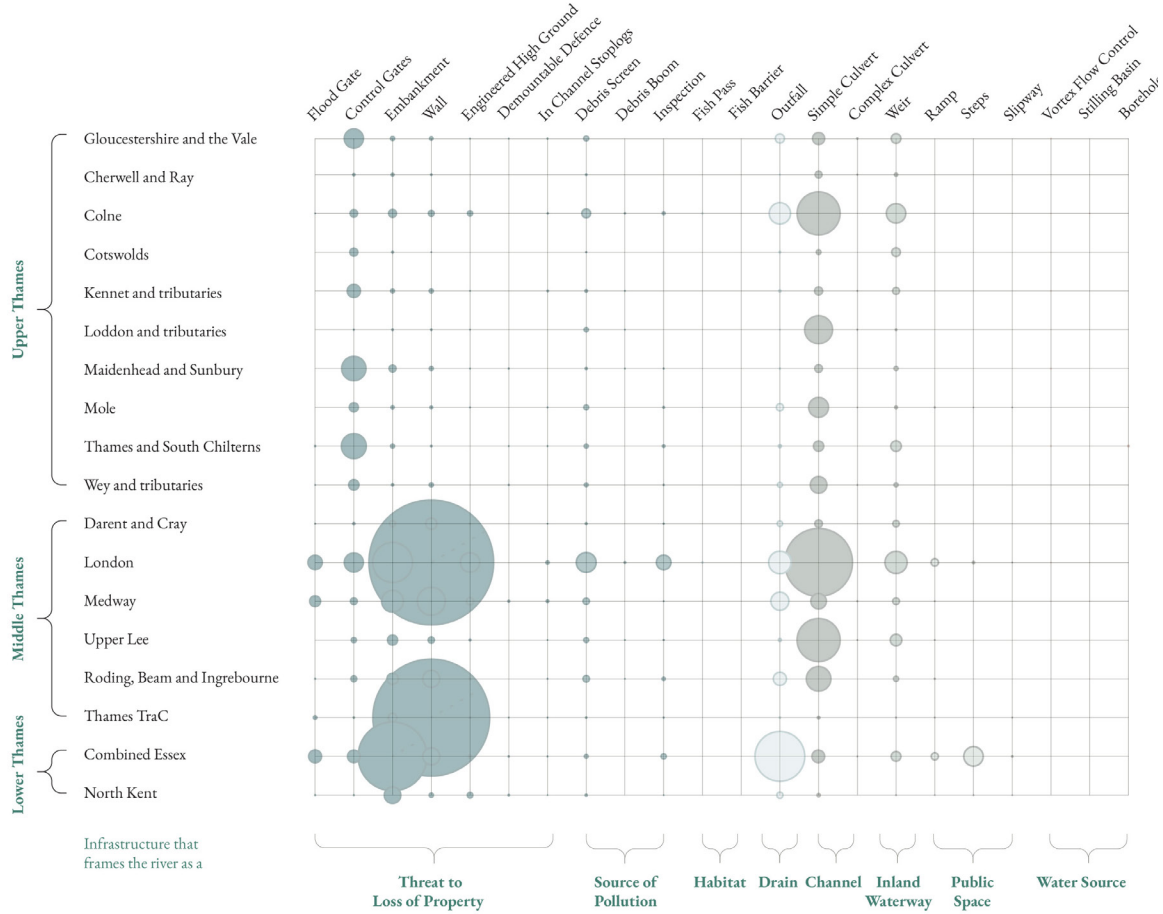
The Hydrological Relevance of the Countryside : Land Management



Perspective that Frames the Countryside : Conclusion

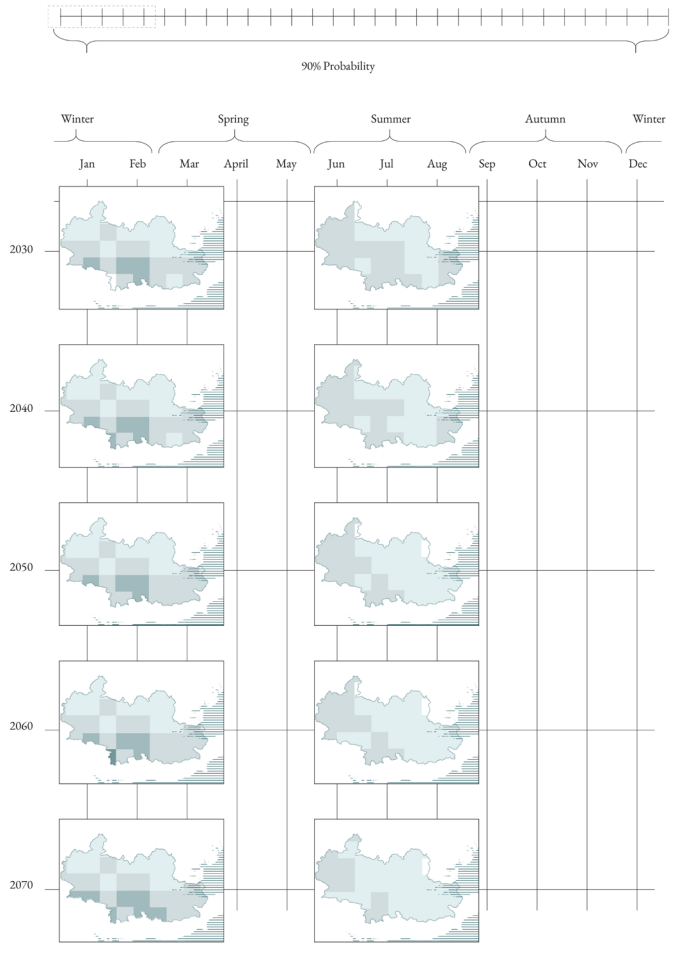
Perspective into Land Management that Frames the Countryside

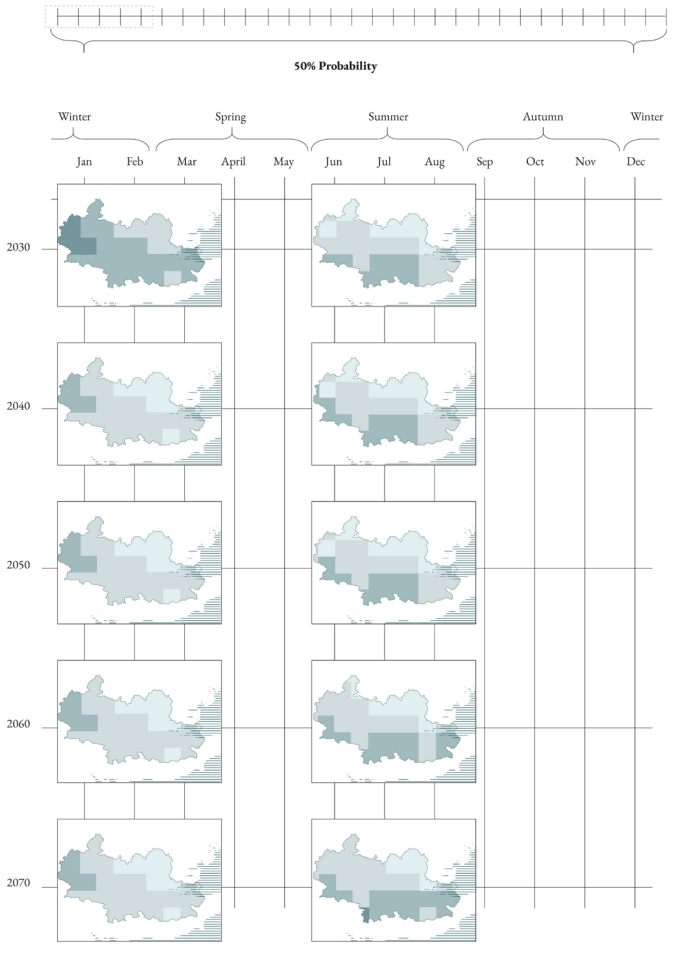
Perspective into River Management that Frames the Countryside

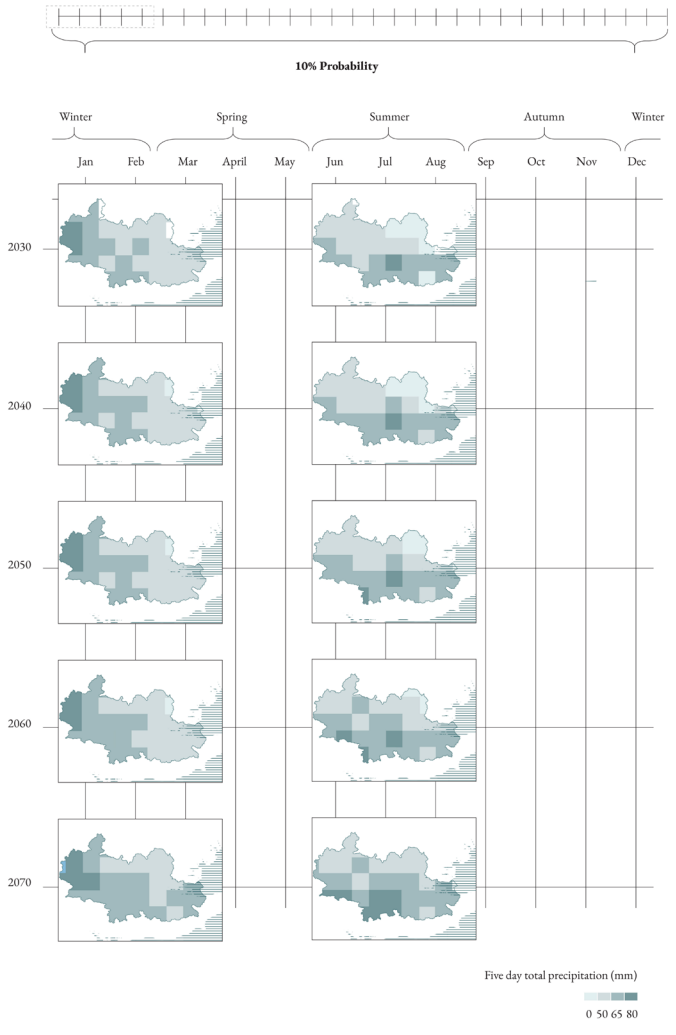


The Design

Design Scenario : RCP 6







Design Framework

Problem Today

Coping with Extreme Weather Events

① Inability of Current Modes of Water Infrastructure to cope with pressures

② Inability of Current Modes of Land Management to cope with pressures

Anamnesis in Design

Re-constructing Narratives *Political Anamnesis*

Anamnesis in using being mindful of the power disparities in how the basin was engineered and its water redirected

Acknowledging precedents of modern infrastructural efforts that needs to be countered with locally managed approaches

Re-programming the Countryside *Geological Anamnesis*

Compositions of the	Interventions of	Management through
Surface	Vegetation	Anamnesis in drawing inspiration from practices that predated the modern project since they didnt over ride natural processes
Subsurface Capacity	Soil	Maintenance focused on seasonal changes
	Water	Conjunctive Management : Focus on sub-surface infiltration ensure the water systems are replenished to sustain abstractions

Decentralized systems of management through partnerships between neighbors and species

Future Challenge

Fields in Flux

① Flexible forms of infrastructure that respond to weather extremes

② Management of soil, water and vegetation as the commons

Position: In Favor of Situated Knowledges

"The 'god trick' is a conquering gaze from nowhere'. This gaze is claimed to be immaterial while materializing what it embraces
(Particularly how bodies matter: which bodies have which meanings, which bodies are deprived of meaning, and how bodies (and meanings) materialize),
It is claimed to have the capacity to see, but is itself unseen."

.....

"Situated knowledges work like an apparatus of producing a more adequate, richer, better account of a world, in order to live in it well and in critical, reflexive relation to our own as well as others."

(Harraway,1988)

Composition of the Thames Basin

Terrain Classification	Topographic Wetness Index	Geology	Height above Sea Level
Mountain Tops, High Ridges	Dryer Regions	Chalk landscapes	Between 180-300m
Upper Slopes		Jurassic limestone landscapes	Between 180-300m
Local Ridges		Sandstone and sandy lands	Below 210m
Mid Slope Ridges		Sandy lands with some clays and gravels	Below 210m
Small Hills		Chalky drift veneered plateaux	Below 210m
Canyons, Deeply incised Stream	Increased Accumulated Run-off	Outwash sands and gravels	Below 210m
U shaped Valleys		Clay or marl lowlands	Below 210m
Plains		Alluvial plains and river terraces	Below 210m

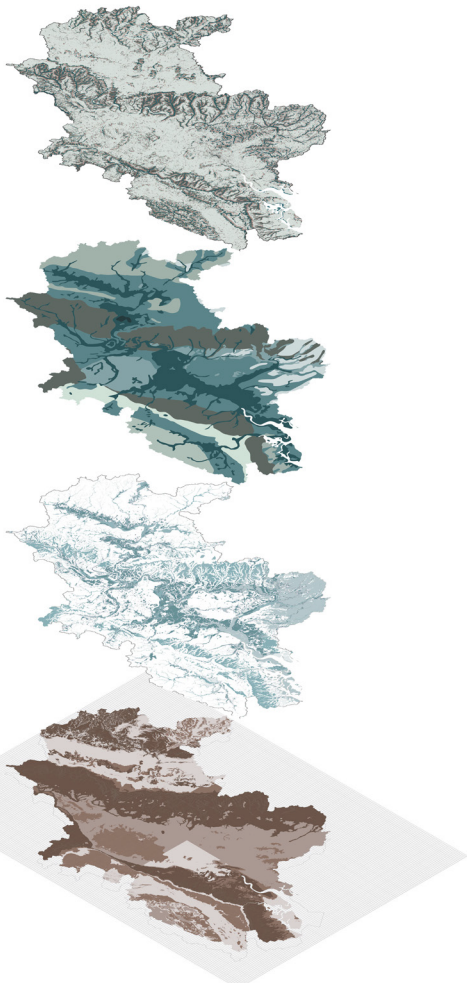
Surface

Geology	Possible Composition of Geology by Permeability							
	Composition of Geology and Superficial Permeability				Composition of Geology and Bedrock Permeability			
	Very High	High	Moderate	Low	Very High	High	Moderate	Low
Chalk landscapes								
Jurassic limestone landscapes								
Sandstone and sandy lands								
Sandy lands with clays and gravels								
Chalky drift veneered plateaux								
Outwash sands and gravels								
Clay or marl lowlands								
Alluvial plains and river terraces								

Key

0-12.5 % of total | 12.5-25 % of total | 25-37.5 % of total | 37.5-50 % of total | 50-62.5 % of total | 62.5-75 % of total | 75-87.5 % of total | 87.5-100 % of total

Sub-Surface



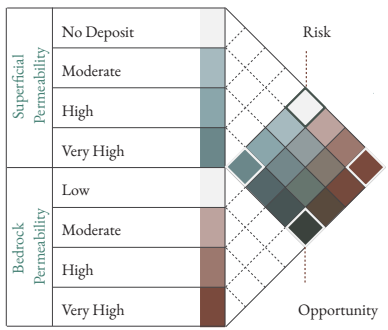
Terrain Position Index Classification
- Mountain Tops, High Ridges
- Mid Slope Ridges
- Local Ridges
- Upper Slopes
- Midslope Drainages, Shallow Valley
- Canyons, Deeply incised Stream
- U shaped Valleys
- Plains

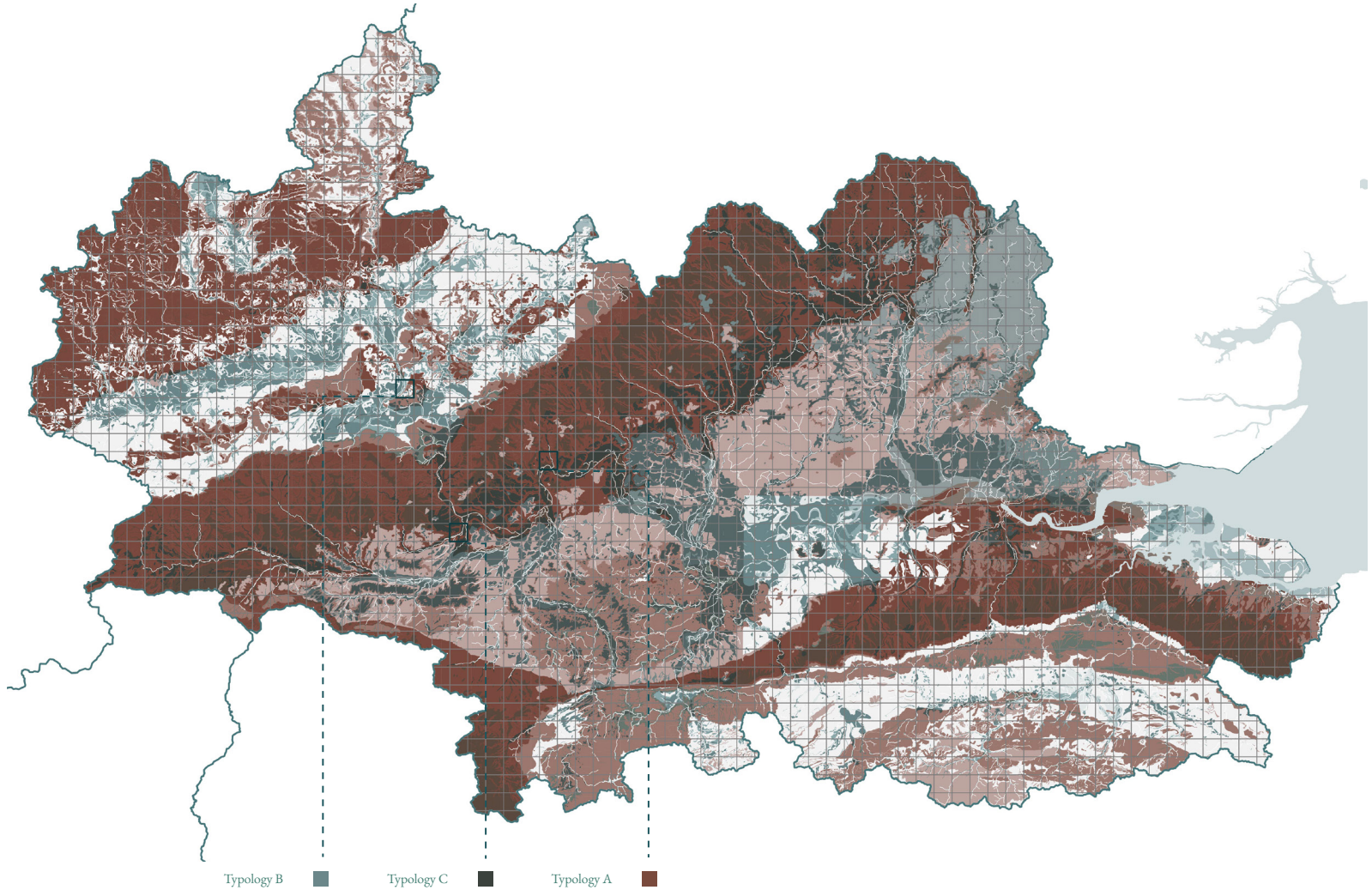
Geology
- Chalk landscapes
- Jurassic limestone landscapes
- Sandstone and sandy lands
- Sandy lands with some clays and gravels
- Chalky drift veneered plateaux
- Outwash sands and gravels
- Clay or marl lowlands
- Alluvial plains and river terraces

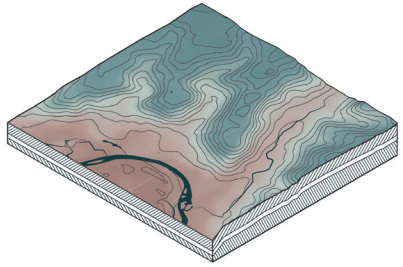
Superficial Permeability
- Very High
- High
- Medium
- None

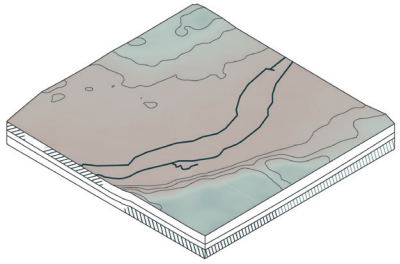
Bedrock Permeability
- Very High
- High
- Medium
- Low

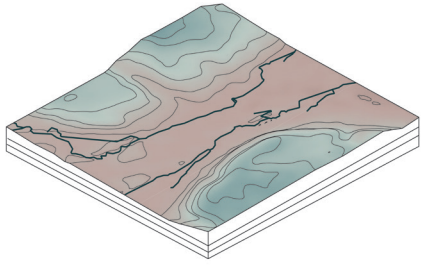
Typologies from the Composition











Typology A

Superficial Permeability	No Deposit
Bedrock Permeability	Very High

Geological Classification

Chalk Landscapes
Alluvial Terrace

Primary Terrain Category

Canyons
Upper Slopes
Local Ridges
Shallow Drainages
U Shaped Valleys

Proximity to River Body

Low

Infiltration Capacity

High

Potential

Productive Aquifer System

Design Goal in Typology

Infrastructure to Increase Sub Surface Infiltration
Reduce Erosion
Reduce Loss of water to run-off

Typology B

Superficial Permeability	Very High
Bedrock Permeability	Low

Geological Classification

Alluvial Terrace
Clay or Marl Lowlands

Primary Terrain Category

Plains
U Shaped Valleys
Upper Slopes

Proximity to River Body

Near

Infiltration Capacity

Low

Potential

Renaturalising the river to harvest flood water and establish water meadows

Design Goal in Typology

Improving Biodiversity
Reducing Silt being carried to the lower catchments
- Improves local soil fertility
- Reducing sediment deposition in lower catchments

Reduces volume of water being carried downstream

Typology C

Superficial Permeability	Very High
Bedrock Permeability	Very High

Geological Classification

Alluvial Terrace
Clay or Marl Lowlands

Primary Terrain Category

Plains
U Shaped Valleys
Upper Slopes

Proximity to River Body

Near

Infiltration Capacity

High

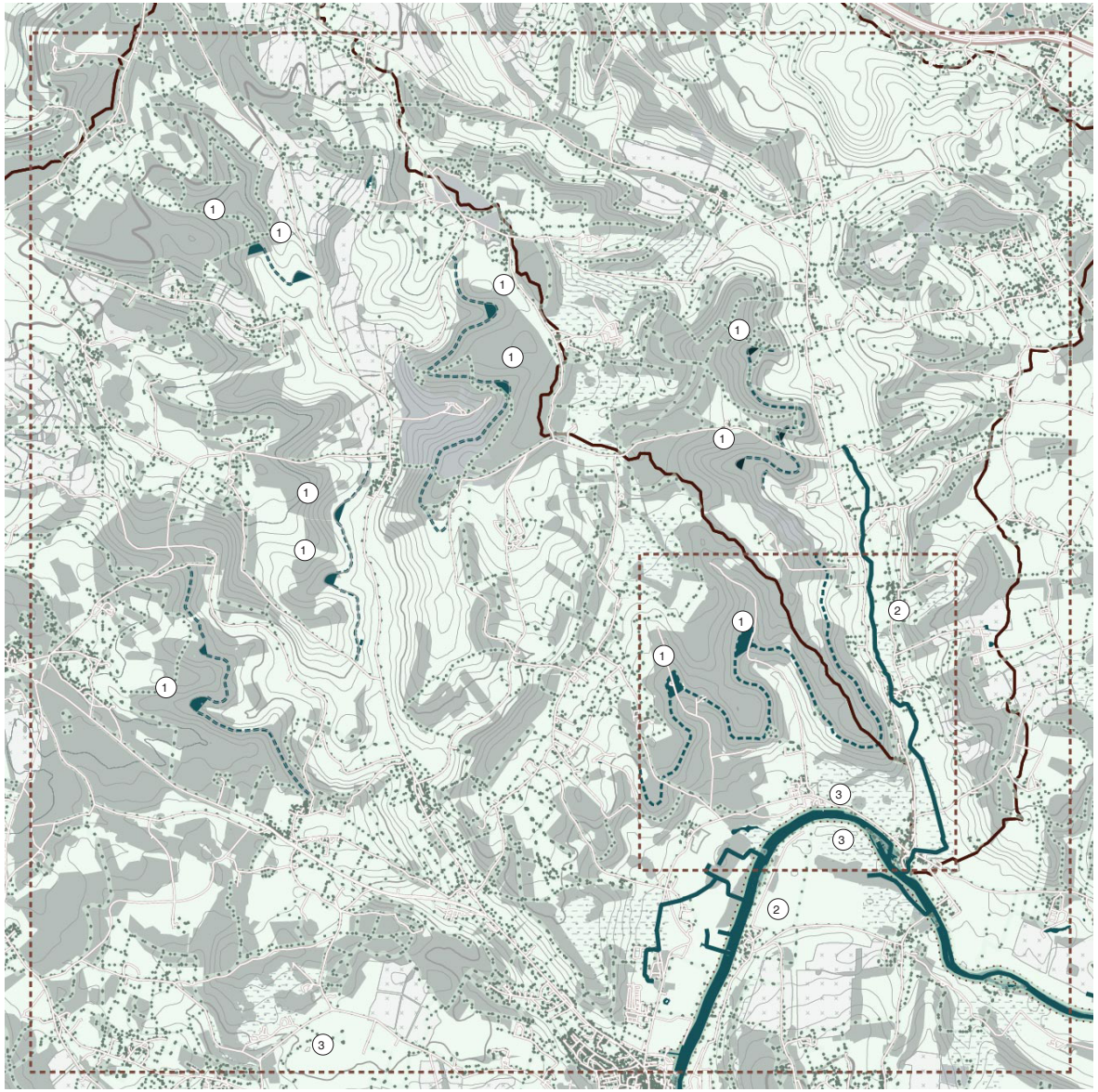
Potential

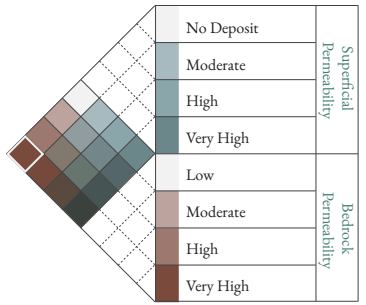
Creating a Wetland Food Forest

Design Goal in Typology

Improving Biodiversity
Restoring Dynamic flooding-disturbance-succession systems
Infrastructure to Increase Sub Surface Infiltration
Reduces volume of water being carried downstream

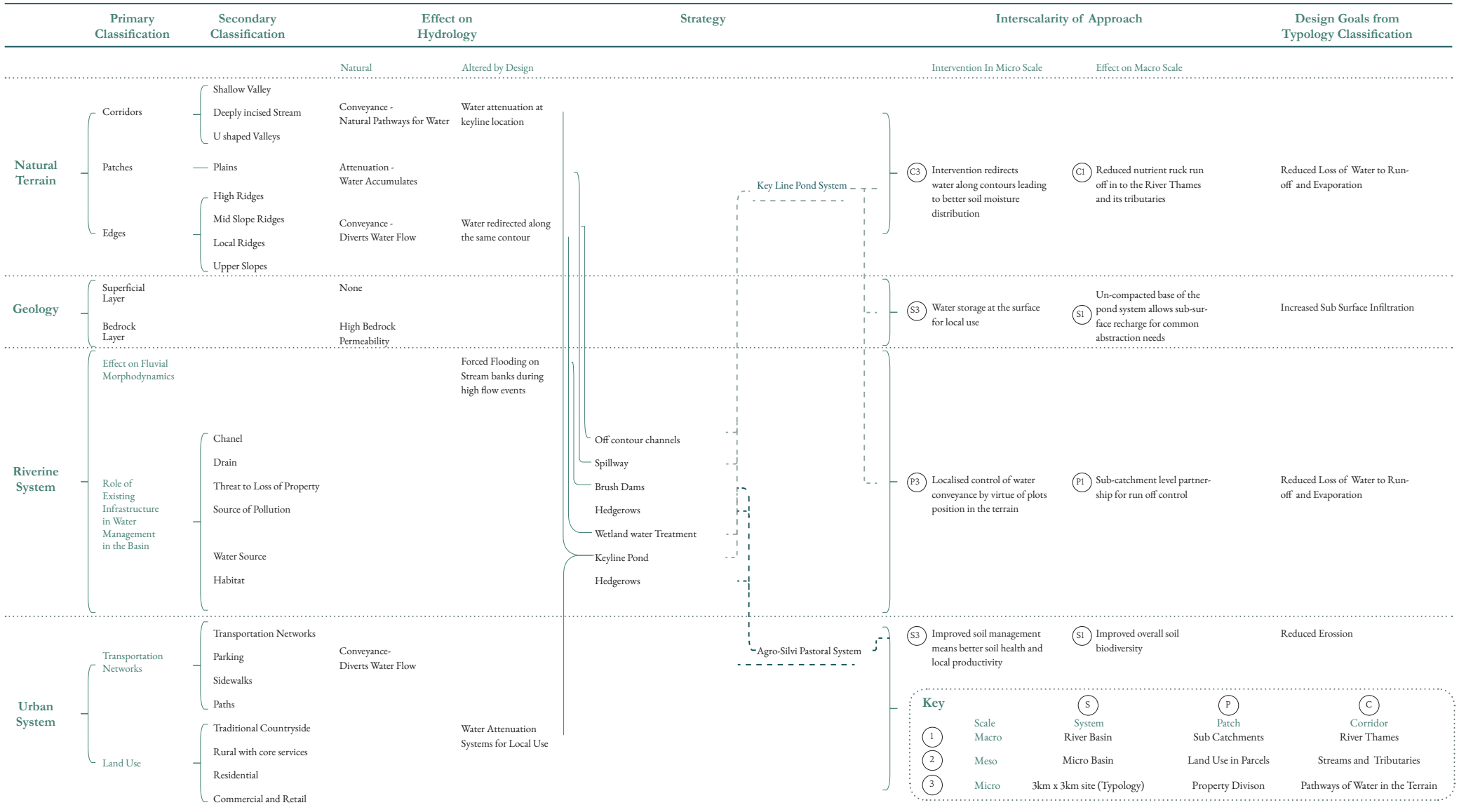
Typology A



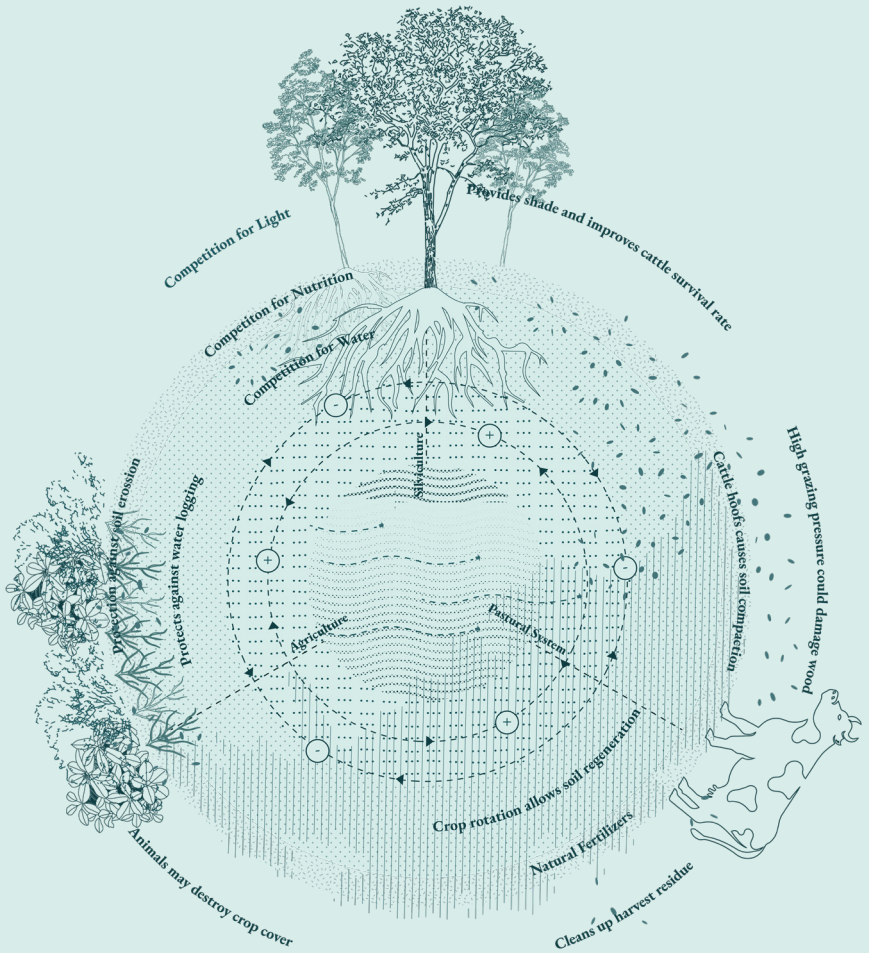


Recreational
Farmland
Meadow
Natural Grassland
Woodland
Keyline Storage Ponds (A) (1)
Keyline Contour in Plot (A) 1.1
Riparian Woodland (C) (2)
Storm Water Bio filtration throught floating wetlands (C) (3)
Replant fragmented Hedge Networks as biodiverse corridors and to control run off (B) (4)

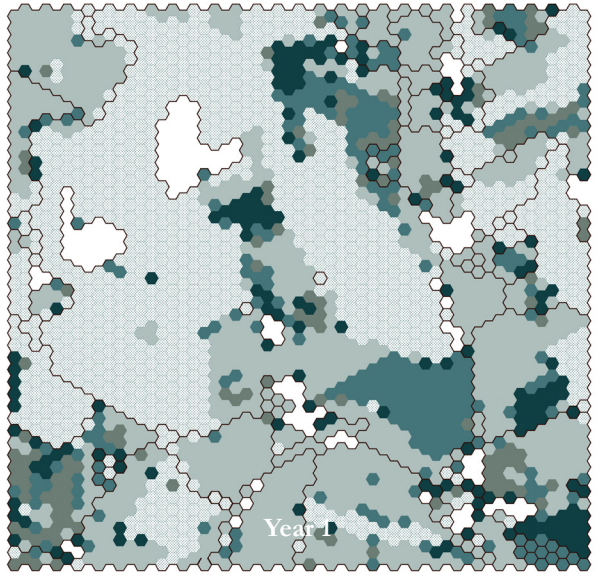
Fig: Positioning Typology A
within the larger context, and connecting strategies to larger network

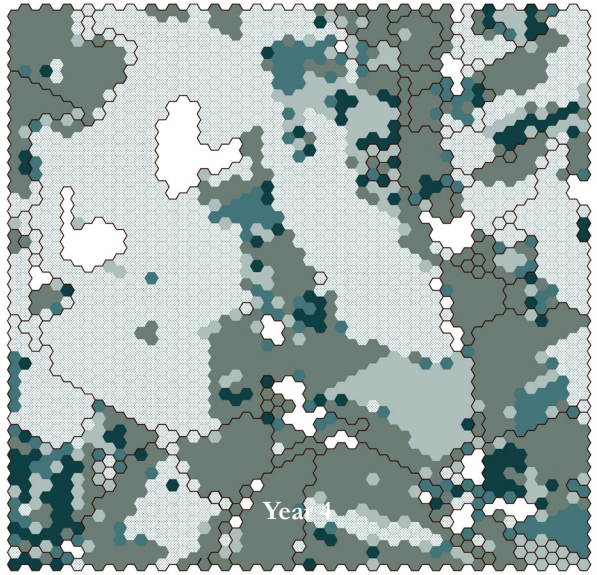

Primary Classification
Secondary Classification
Effect on Hydrology
Natural
Altered by Design
Strategy
Interscalarity of Approach
Intervention In Micro Scale
Effect on Macro Scale
Design Goals from Typology Classification
Natural Terrain
Corridors
Shallow Valley
Deeply incised Stream
U shaped Valleys
Conveyance - Natural Pathways for Water
Water attenuation at keyline location
Patches
Plains
Attenuation - Water Accumulates
Edges
High Ridges
Mid Slope Ridges
Local Ridges
Upper Slopes
Conveyance - Diverts Water Flow
Water redirected along the same contour
Key Line Pond System
C3 Intervention redirects water along contours leading to better soil moisture distribution
C1 Reduced nutrient ruck run off in to the River Thames and its tributaries
Reduced Loss of Water to Run-off and Evaporation
Geology
Superficial Layer
Bedrock Layer
None
High Bedrock Permeability
S3 Water storage at the surface for local use
S1 Un-compacted base of the pond system allows sub-surface recharge for common abstraction needs
Increased Sub Surface Infiltration
Riverine System
Effect on Fluvial Morphodynamics
Forced Flooding on Stream banks during high flow events
Role of Existing Infrastructure in Water Management in the Basin
Chanel
Drain
Threat to Loss of Property
Source of Pollution
Water Source
Habitat
Off contour channels
Spillway
Brush Dams
Hedgerows
Wetland water Treatment
Keyline Pond
Hedgerows
P3 Localised control of water conveyance by virtue of plots position in the terrain
P1 Sub-catchment level partnership for run off control
Reduced Loss of Water to Run-off and Evaporation
Urban System
Transportation Networks
Transportation Networks
Parking
Sidewalks
Paths
Conveyance- Diverts Water Flow
Agro-Silvi Pastoral System
S3 Improved soil management means better soil health and local productivity
S1 Improved overall soil biodiversity
Reduced Erossion
Land Use
Traditional Countryside
Rural with core services
Residential
Commercial and Retail
Water Attenuation Systems for Local Use
Key
Scale
S System
P Patch
C Corridor
1 Macro
River Basin
Sub Catchments
River Thames
2 Meso
Micro Basin
Land Use in Parcels
Streams and Tributaries
3 Micro
3km x 3km site (Typology)
Property Divison
Pathways of Water in the Terrain

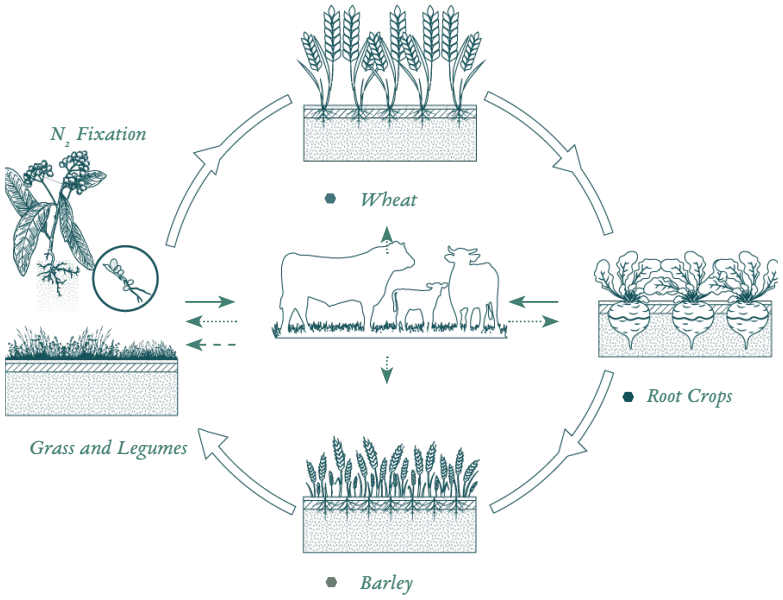
Strategy : Regenerative Agricultural Practices



Agro-Silvi-Pastoral system: Interdependencies and competing demands between practices





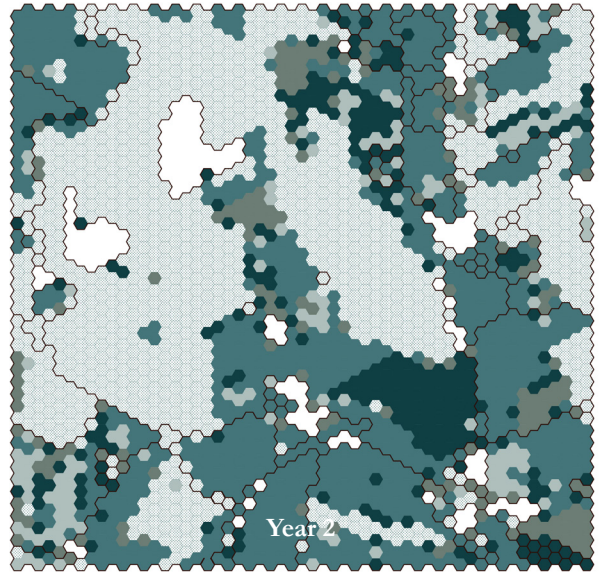


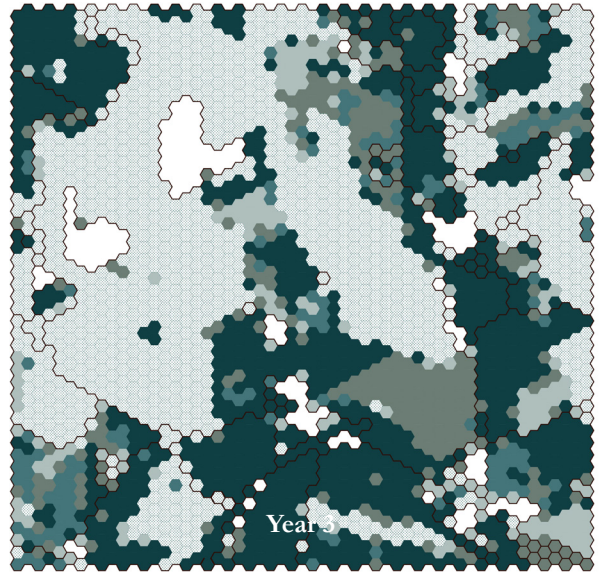
Legend

Tree · Wheat · Root Crops · Barley · Clove and Grass ○ Property Division

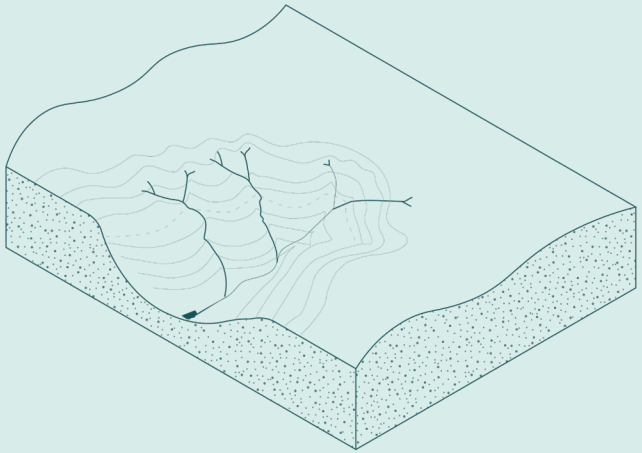
Manure from animals → Crops harvested for animal feed - - → Direct grazing of animals on fields

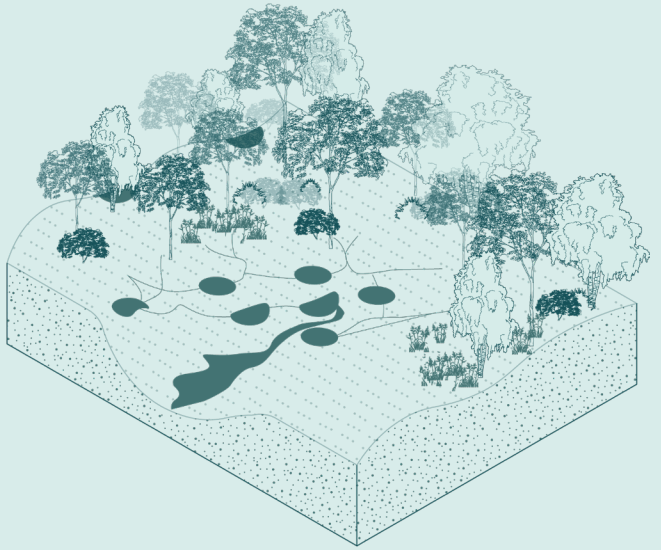
Norfolk Four-Course System : To cycle nutrient without the use of organic fertilizers



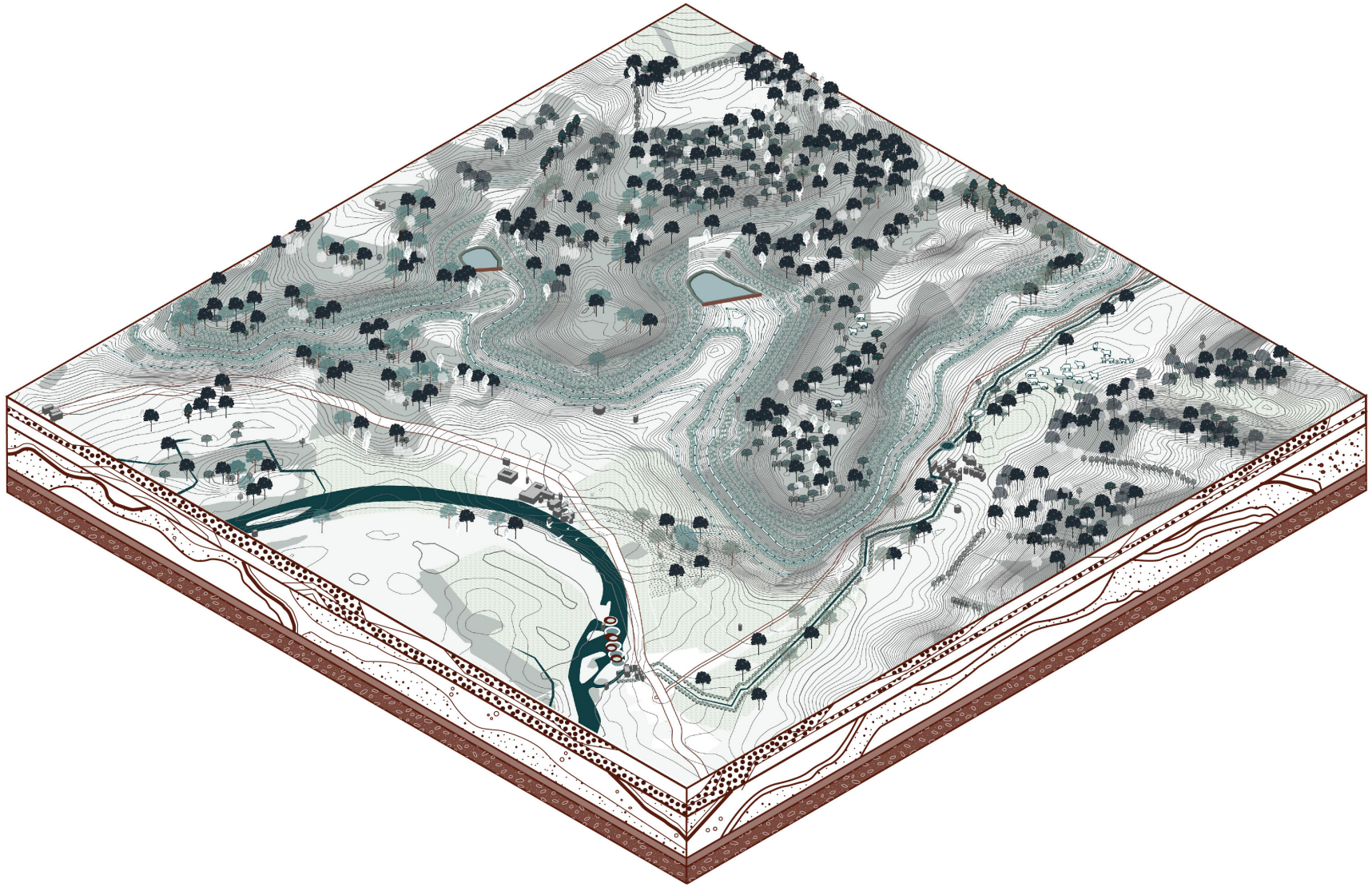


Strategy : Keyline System of Ponds



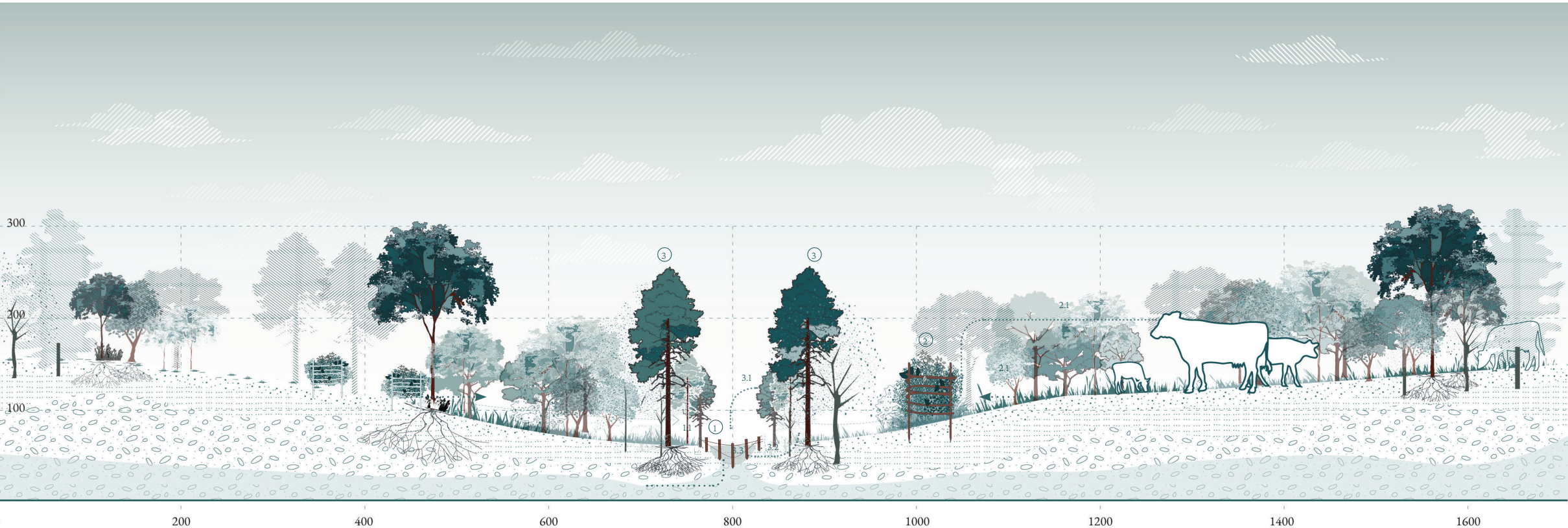


Without Intervention	Through Intervention
High Run off and erosion	Low Run Off
Uneven distribution	Even Distribution of Soil Moisture
High Evaporation	Low Evaporation
Low Infiltration and Groundwater Recharge	High Infiltration and Groundwater Recharge
	Soil Conservation



Legends

- Recreational
- Farmland
- Wetland
- Natural Grassland
- Woodland
- Willow Woodlands
- Wet Grasslands
- River
- Storage Pond
- Hedgerow System
- Contour Cropping



Legend

① Brush Dam

1.1 Avoids excessive erossion, and allows soil to accumulate to support vegetative growth

② Hedgerow system

2.1 Aborbs run off and reduces standing water which affects animal health

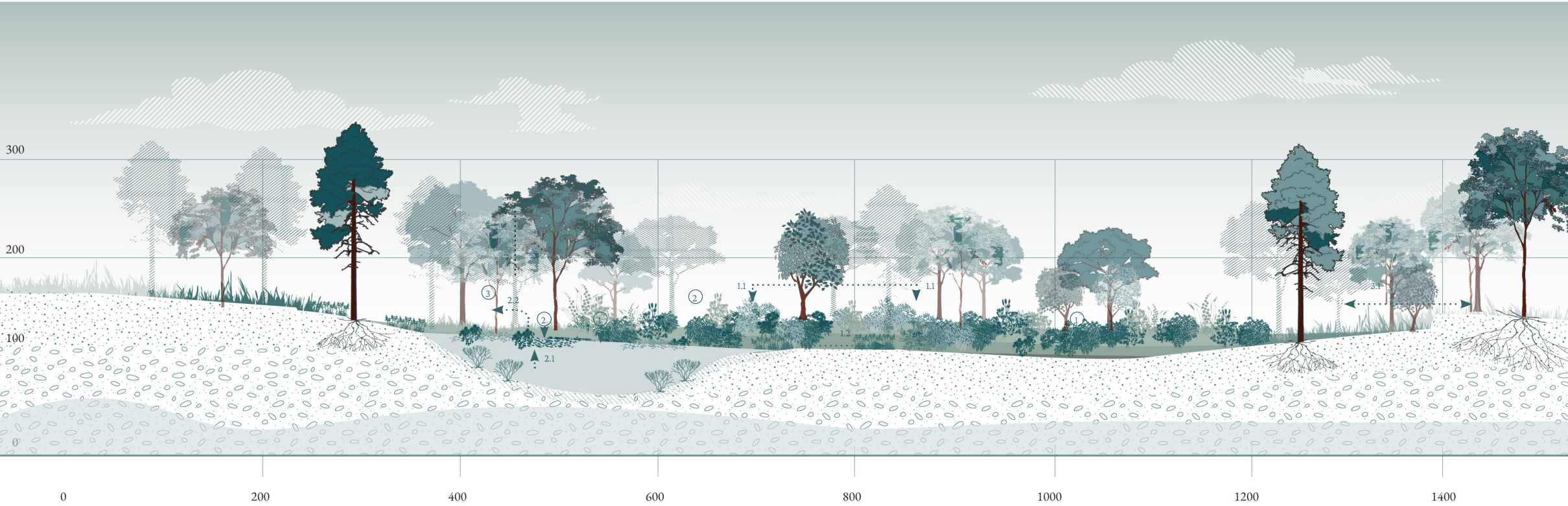
2.2 Reduced Silt reaching the River

③ Riparian Woodlands

3.1 prevent the banks from eroding away

3.2 trees will naturally alter the chemical balance of the water by taking up minerals from the soil and releasing them into the water.

3.2 Enhances biological value of the aquatic habitat

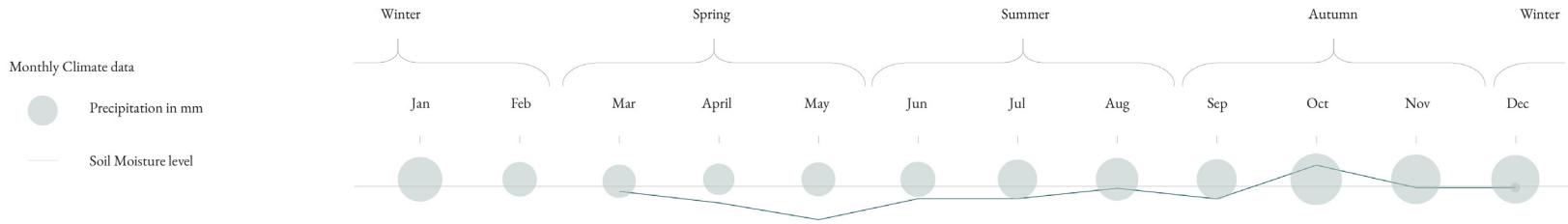


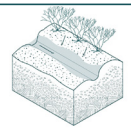
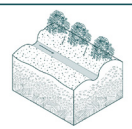
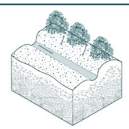
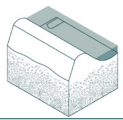
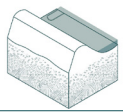
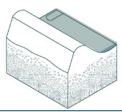
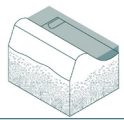
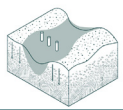
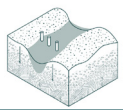
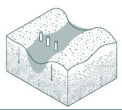
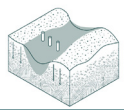
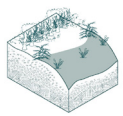
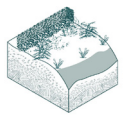
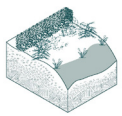
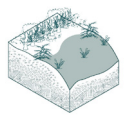
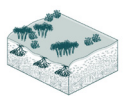
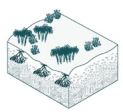
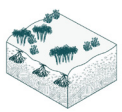
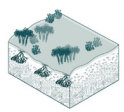
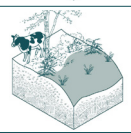
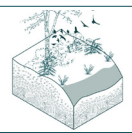
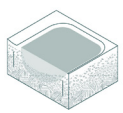
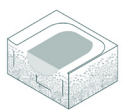
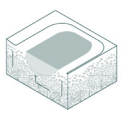
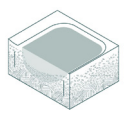
Legend

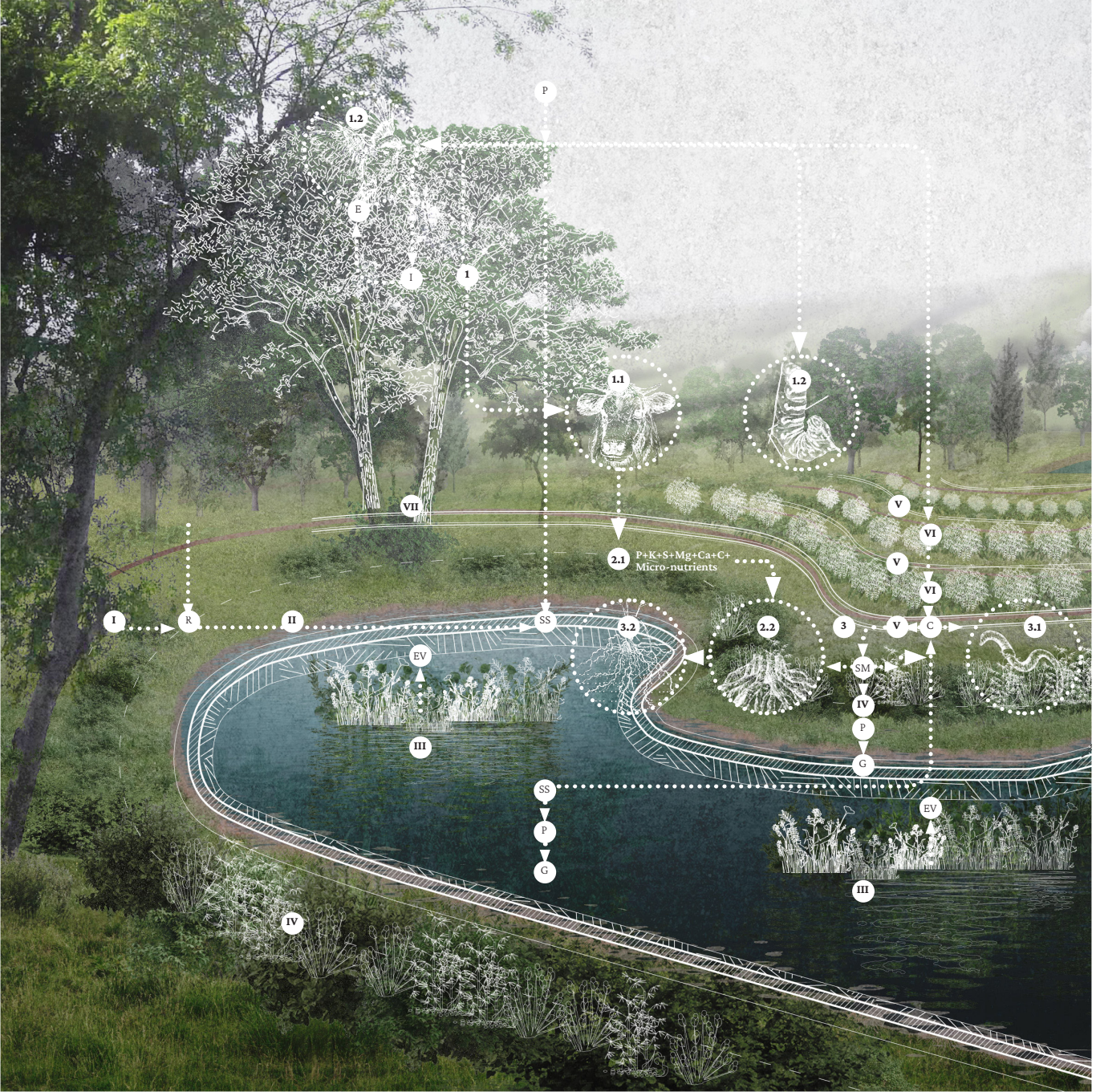
① Key Line Dam
- 1.1 Store greater sums of water for little earth moved
- 1.2 off contour Cropping
- 1.3 Incision channels to irrigate crops

② Water Ferns
- 2.1 to reduce loss of water by evaporation can be used as fodder
- 2.2 Can be used to feed grazing animals

③ Silvicultural Practices
- 3.1 Improved micro-climate for grazing animals and better animal health



Landscape as Infrastructure	Winter	Spring	Summer	Autumn
Chanel Off Contour Channels				
Drain Spillway				
Threat to Loss of Property Lock and Floodable Landscape				
Source of Pollution Hedgerows				
Source of Pollution Wetland water treatment at level sill				
Habitat Hedgerows for cattle				
Water Source Keyline Ponds				



Engineered Elements in the Landscape

Key-line Pond	I
Embankments to contain run off and precipitation	II
Floaters	III
Marginal Planting	IV
Off Contour Channels	V
Contour Cropping	VI
Silviculture	VI

Altered Hydrology

Interception	I
Conveyance	C
Surface Run off	R
Soil Moisture	SM
Percolation	P
Ground Water Storage	G
Surface Storage	SS
Stream Flow	SF
Evapotranspiration	E
Precipitation	PR
Evaporation	EV

Altered Ecology

Effect of Silviculture	1
Micro-climate modification for cattle health	1.1
Attracts birds who aid in biological pest control	1.2
Effect of Pastoral Activity	2
Cattle activity increases soil nutrients and organic content	2.1
Increased nutrient uptake by crop roots	2.2
Uninterrupted corridors for pollinators	3
Rhizodegradation : contaminant breakdown by soil organisms	3.1
Rhizofiltration : filtering contaminated groundwater, surface water, and wastewater through a mass of roots to remove toxic substances or excess nutrients	3.2

Engineered Elements in the Landscape

Piles	I
Brush Dam	II
Marginal Planting	III
Stabilized Slope	IV
Hedgerow System	V
Riparian Landscape	VI

Altered Hydrology

Interception	I
Conveyance	C
Surface Run off	R
Soil Moisture	SM
Percolation	P
Ground Water Storage	G
Surface Storage	SS
Stream Flow	SF
Evapotranspiration	E
Precipitation	PR
Evaporation	EV

Altered Ecology

Effect of Hedgerow Restoration	1
Promotion of Plant Diversity	1.1
Provides warmth to cattle in the winters	1.2
Movement corridors for mammals	1.3
Pest Control by attracting insects away from crops cover	1.4
Perennial home for hundreds of species animals, birds and fungi	1.5
Uninterrupted corridors for pollinators	1.7
Spatial cue for bats and Moths to navigate the landscape	1.8
Effect of Norfolk Four Crop Rotation	2
Wheat Plantation	2.1
Root crop like turnip as a cleansing crop	2.2
Barley Plantation	2.3
Nitrogen fixation by legume plants like clover	2.4

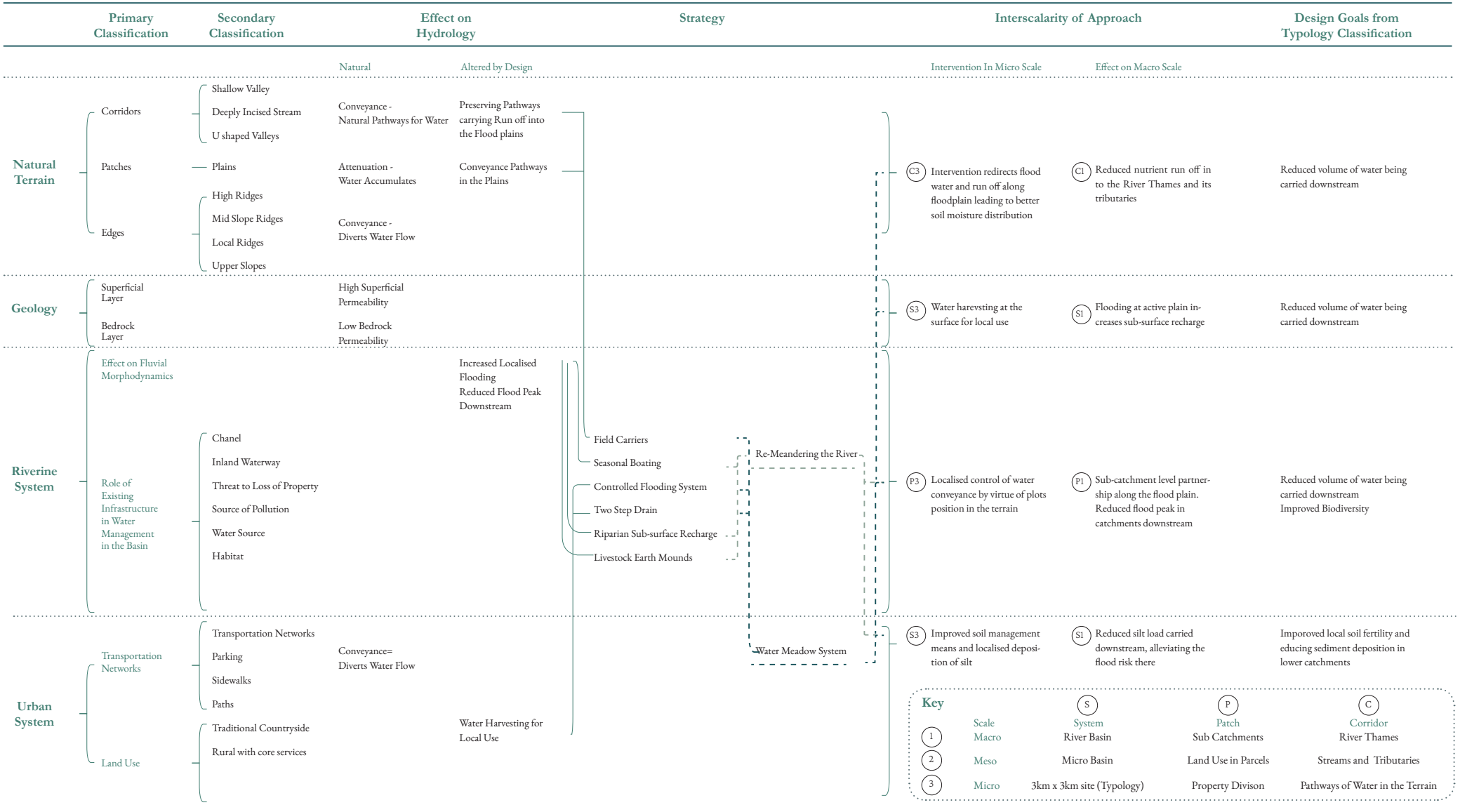
Typology B

Recreational
Farmland
Meadow
Natural Grassland
Woodland
Active Floodplain
Renaturalised Floodplain to Harvest Flood Water
Water Meadow to Harvest Flood Water
Main Carriers
Two Step Ditch
Blue Network
Green Network
Retrofitting Road Network for Green Infrastructure
Retrofitting Road Network for Blue Infrastructure

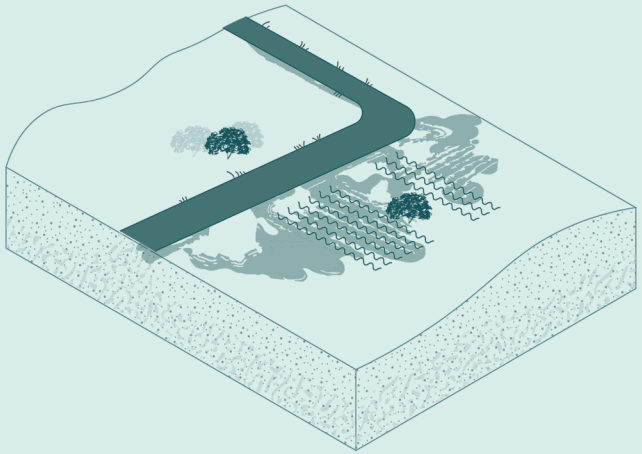
Fig: Positioning Typology B
within the larger context, and connecting strategies to larger network

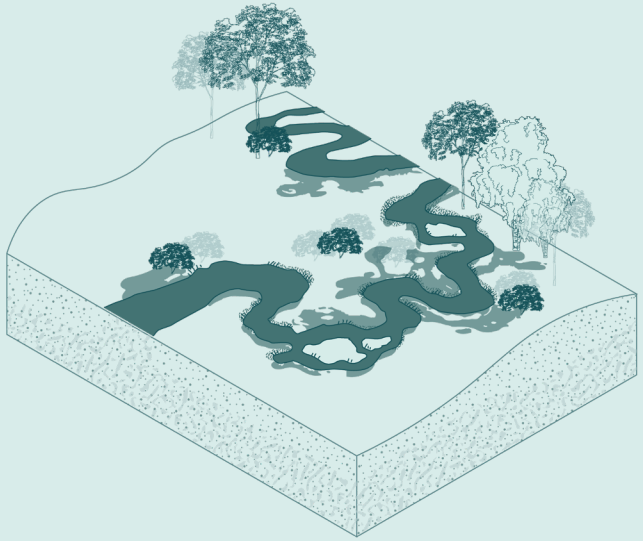
Criteria for Transferability of the Project into other parts of the Site

Enhancing the Larger Basin System: The Replenishing Effects of Design Application



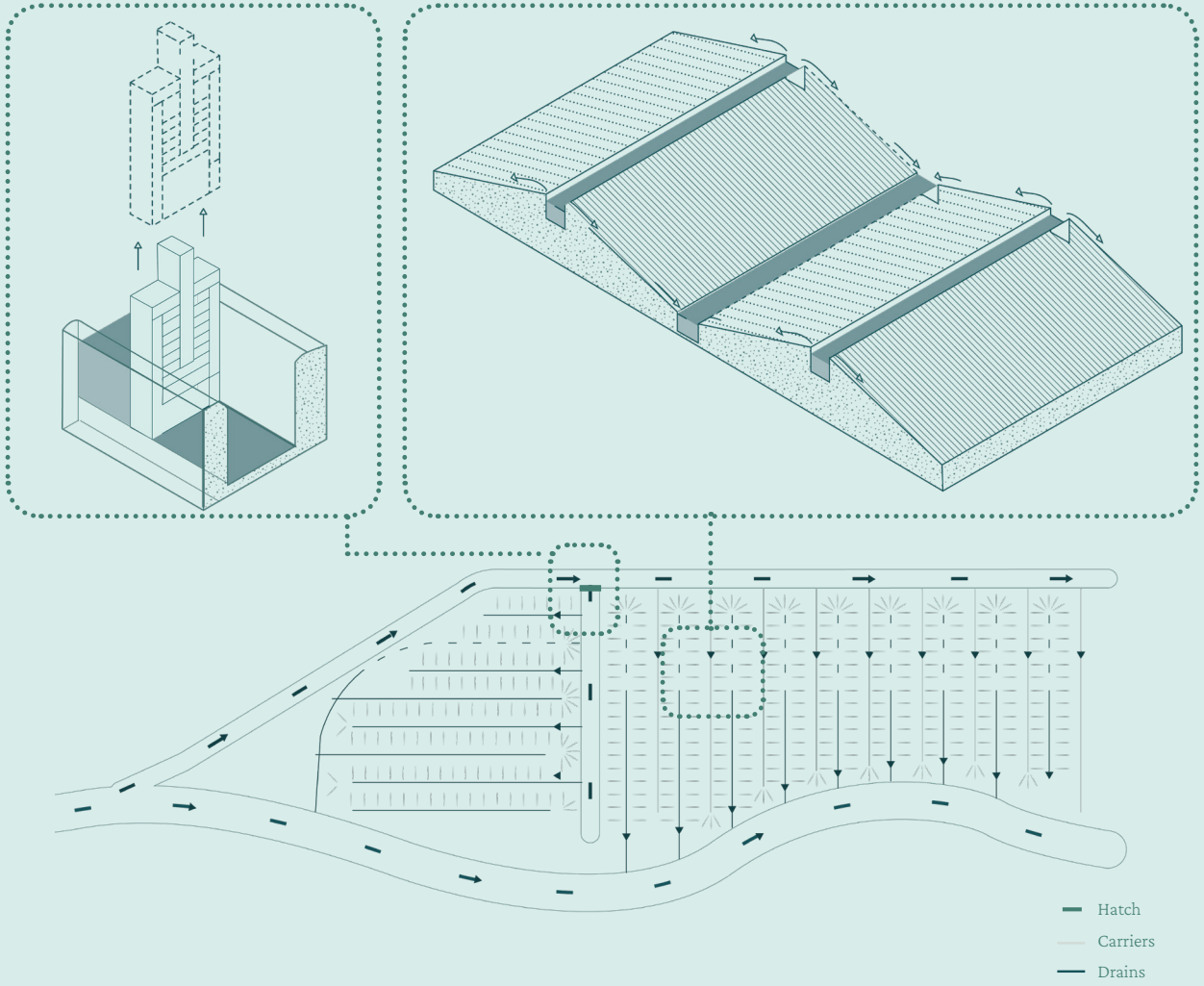
Strategy : Restoring Meanders

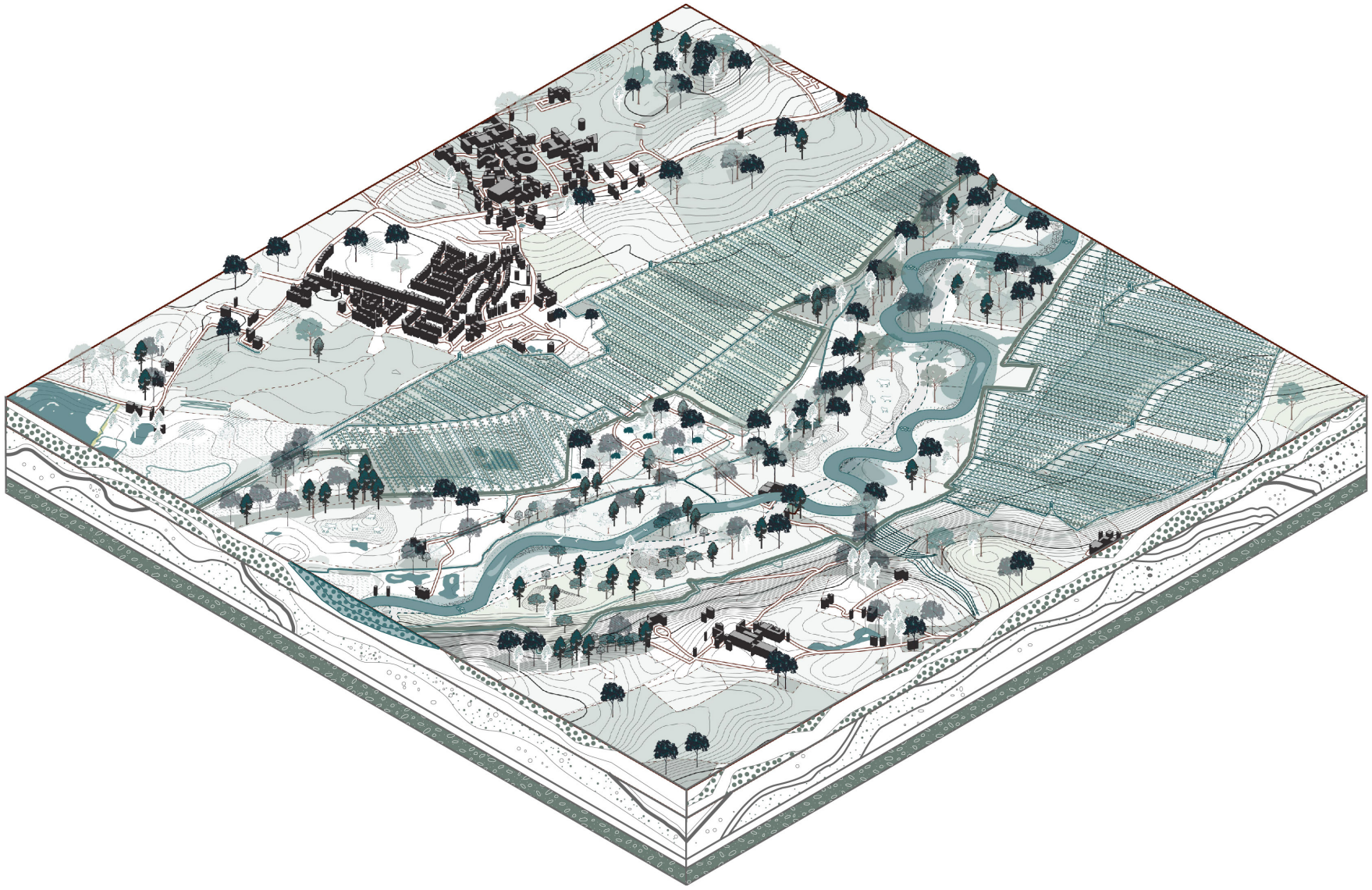




Without Intervention	Through Intervention
Accelerated flow	Meandering flow with delayed flood peak
Increased fragility of the river banks and riparian vegetation cannot survive	Improved biodiversity along river banks and dynamic river bank
Carries high volumes of water downstream to add to flood risk there	Increase in localised flooding reduces flood risk dowstream
River bed requires constant maintenance	Rivers natural dynamic allows better exchange with ground water

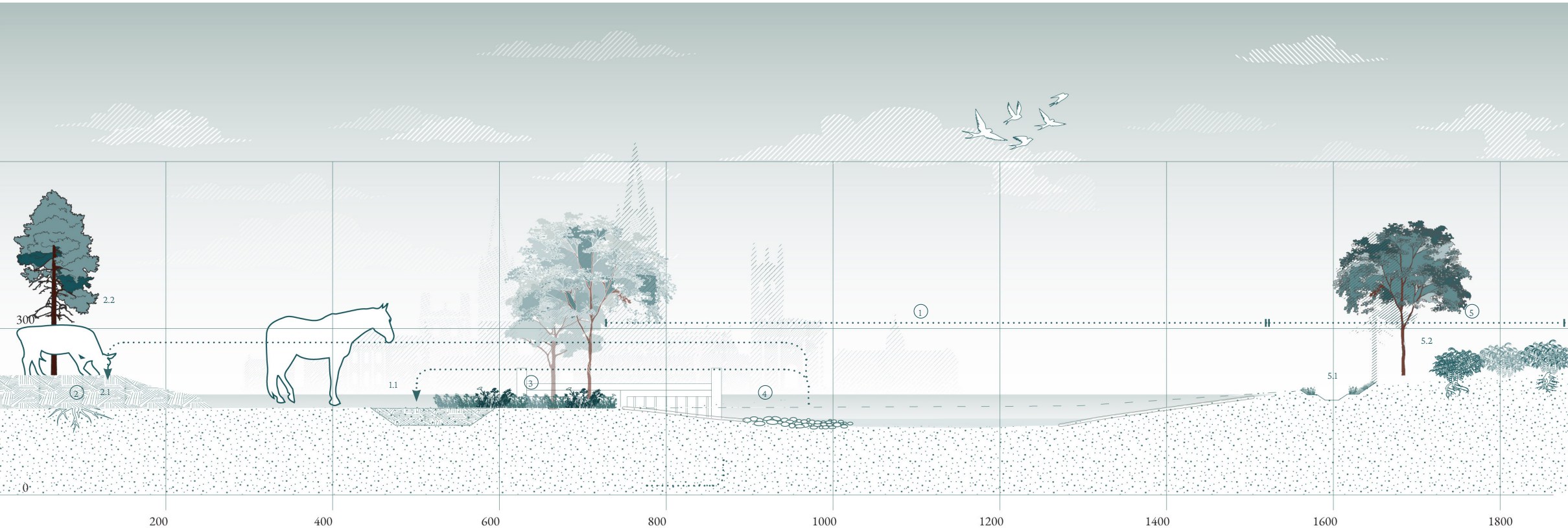
Strategy : Water Meadows





Legends

- Recreational
- Farmland
- Meadow
- Natural Grassland
- Woodland
- Low mounds for livestock refuge
- Field Gutter
- Drains
- Carriers
- Main Carriers
- Two stage ditch
- Pools
- Hatch
- Riffles



Legend

1 Reprofiled Banks
- 1.1 Filled in Channel
- 1.2 Graded Bank with wider channel capacity
- 1.3 Incision channels to irrigate crops

2 Earth mounds for livestock
- 2.1 From reprofiling excavation
- 2.2 Vegetation on earth mounds for grazing

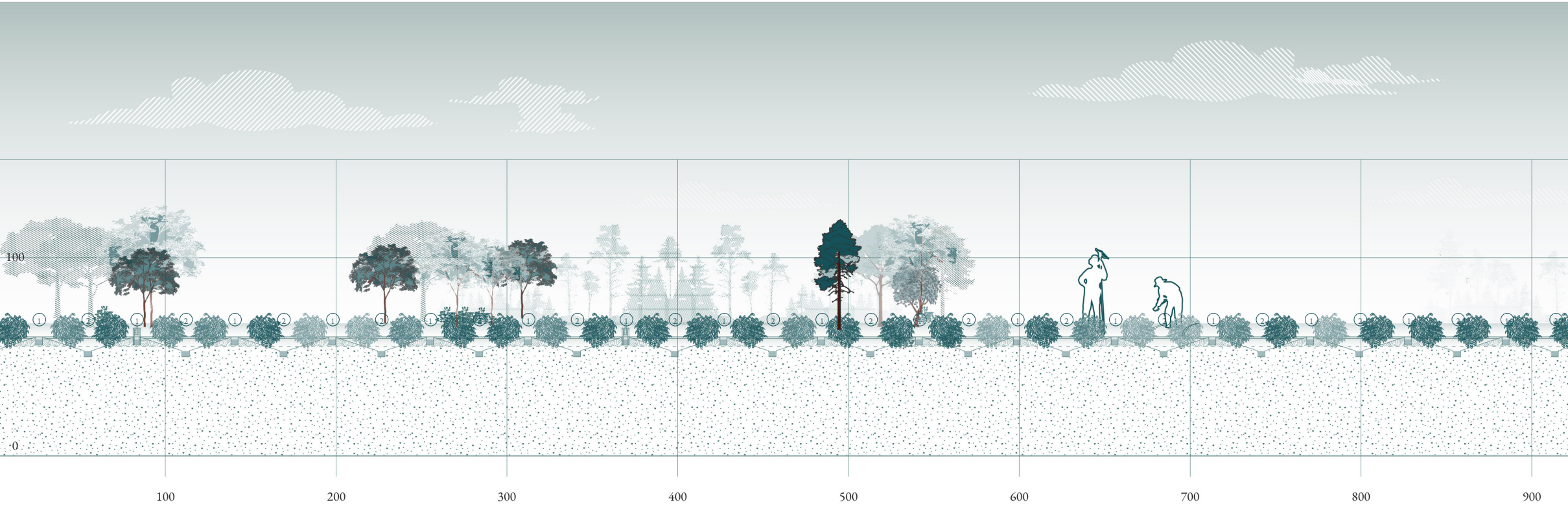
3 Reed Beds

4 Gravel Shoals

5 Cultivation
- 5.1 Two step ditch to collect run off
- 5.2 Bed work for water meadow system

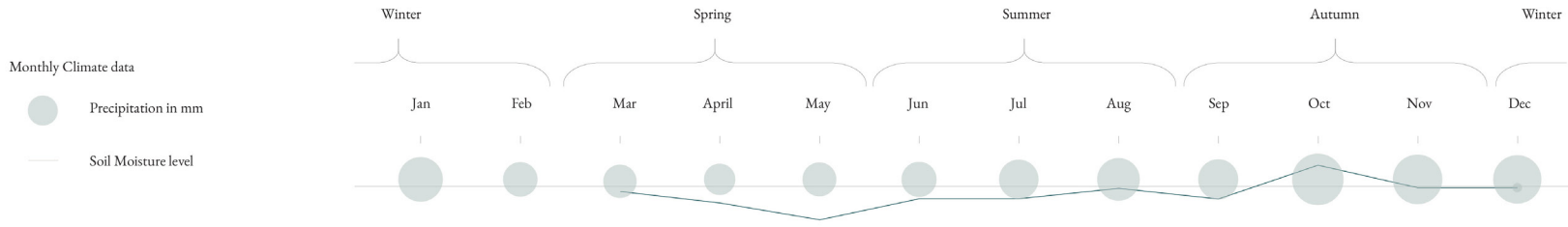
Low Flow Level

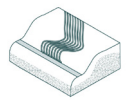
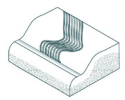
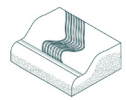
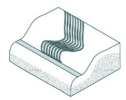
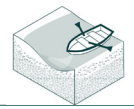
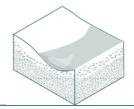
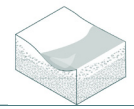
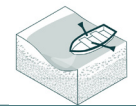
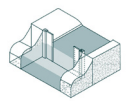
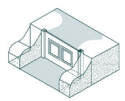
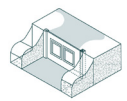
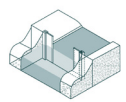
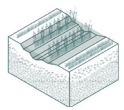
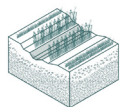
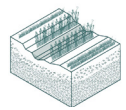
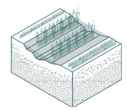
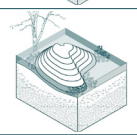
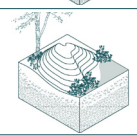
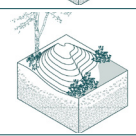
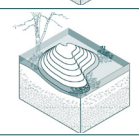
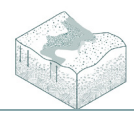
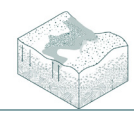
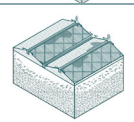
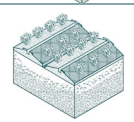
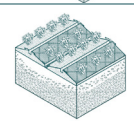
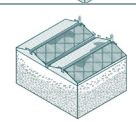
Flood Level

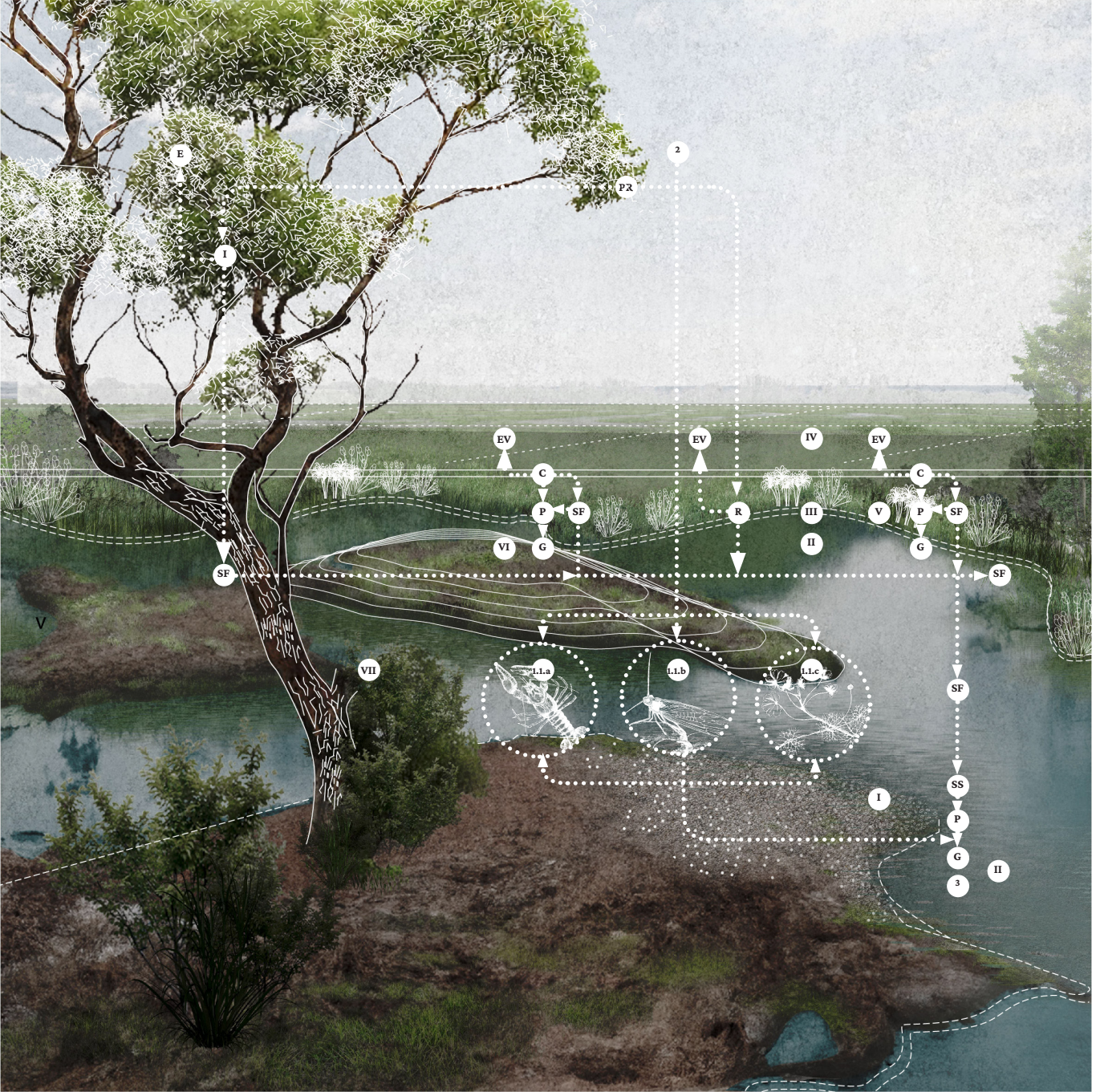


Legend

(1) Carriers	1.1	Conveys flood water from the river as controlled by hatches
(2) Drains	2.1	Drains the field so as to not kill the vegetation through water logging



Landscape as Infrastructure	Winter	Spring	Summer	Autumn
Chanel Field Carriers				
Navigable Waterway Seasonal Flooding				
Threat to Loss of Property Lock and Floodable Landscape				
Source of Pollution Two Step Drain				
Habitat Livestock Earth Mounds				
Water Source Riparian Subsurface Recharge				
Water Source Water Meadow Flood Water Harvesting				



Engineered Elements in the Landscape

Gravel Shoals	I
Re-profiled Banks	II
Active Flood Plain	III
Two Step Ditch	IV
Reed Beds	V
Earth Mounds for Livestock	VI
Riparian Trees	VI

Altered Hydrology

Interception	I
Conveyance	C
Surface Run off	R
Soil Moisture	SM
Percolation	P
Ground Water Storage	G
Surface Storage	SS
Stream Flow	SF
Evapotranspiration	E
Precipitation	PR
Evaporation	EV

Altered Ecology

Biodiversity Restoration	1
Threatened species that depend on chalk stream habitats are restored	1.1
White-Clawed Crayfish	1.1.a
Winterbourne Stonefly	1.1.b
Stream Water Crowfoot	1.1.c
Shade decreases water temperature and provides more time for species to adapt to changing weather conditions	2
Irregular river beds and banks allow for the thriving of aquatic biodiversity, providing hiding spots for fish, amphibians, and insects to seek refuge from predators.	3

Engineered Elements in the Landscape

Drain Channels	I
Bed-work with gentle slopes	II
Carrier Channels	III
Grazing to limit weed growth	IV
Hatch to control Conveyance	V

Altered Hydrology

Interception	I
Conveyance	C
Surface Run off	R
Soil Moisture	SM
Percolation	P
Ground Water Storage	G
Surface Storage	SS
Stream Flow	SF
Evapotranspiration	E
Precipitation	PR
Evaporation	EV

Altered Ecology

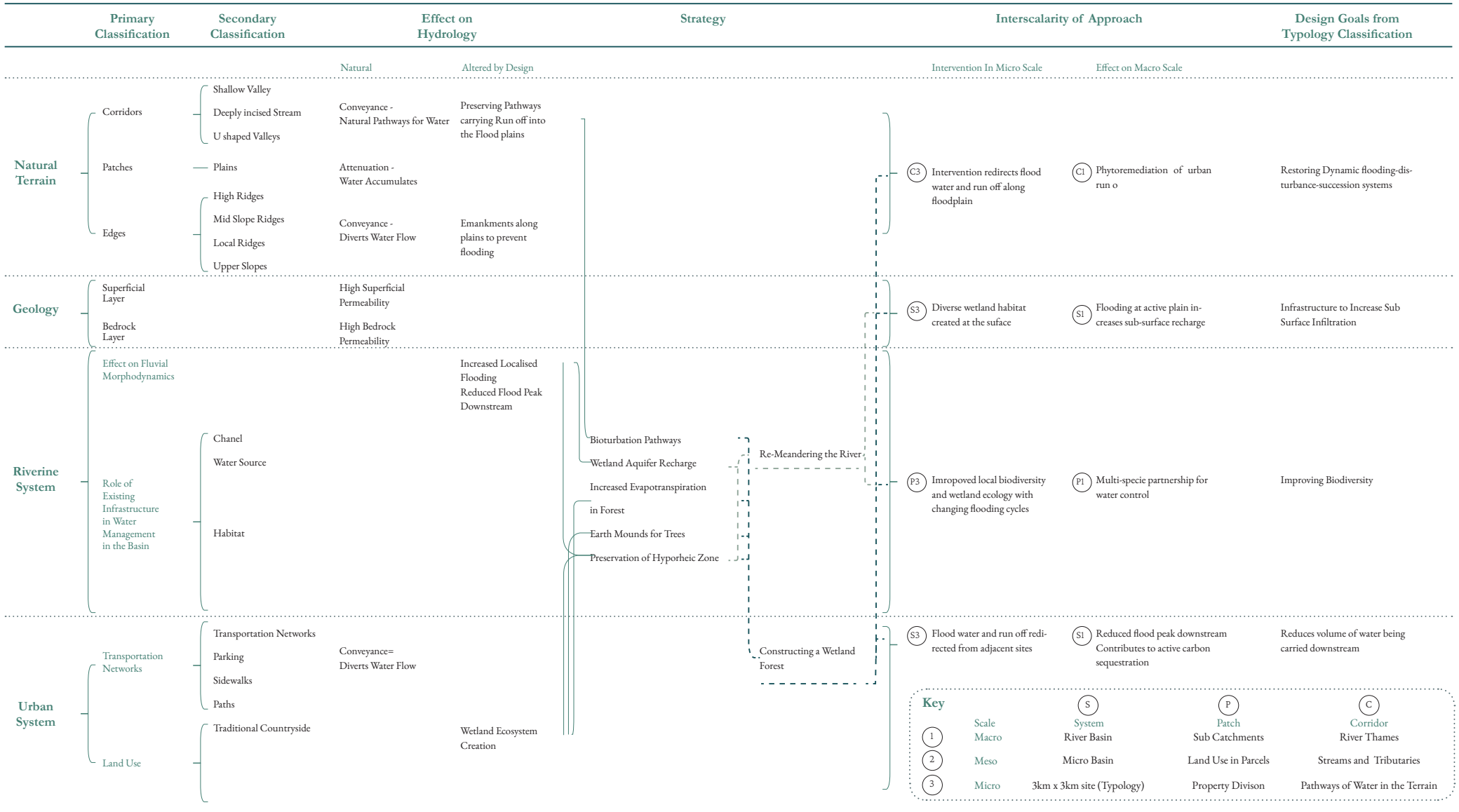
Effect on Biodiversity	1
Ideal breeding for wading birds and waterfowl	1.1
Light grazing with stock as a mode of vegetation control which benefits biodiversity	1.2
Effect on Soil	2
Well-maintained ditches and drains prevent soil loss erosion from uncontrolled run-off	2.1
Deposition of silt and nutrient by flowing water fertilises grass swards	2.2
Reduced eutrophication of the river water by nutrient pollution since the soil absorbs silt and nutrients	2.3

Typology C

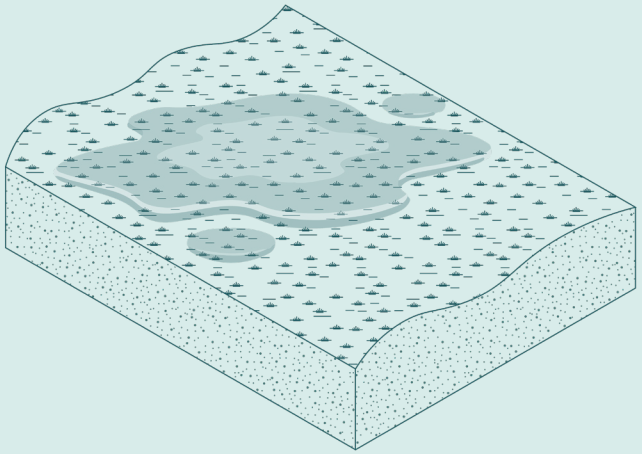
Fig: Positioning Typology C
within the larger context, and connecting strategies to larger network

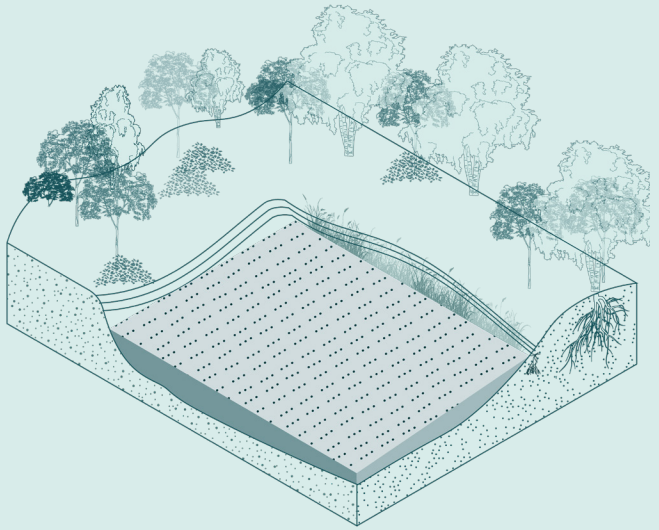
Criteria for Transferability of the Project into other parts of the Site

Enhancing the Larger Basin System: The Replenishing Effects of Design Application



Strategy : Creating a Wetland Forest





Without Intervention

Altered hydrology affects ability to sequester carbon and may even emit green house gasses.

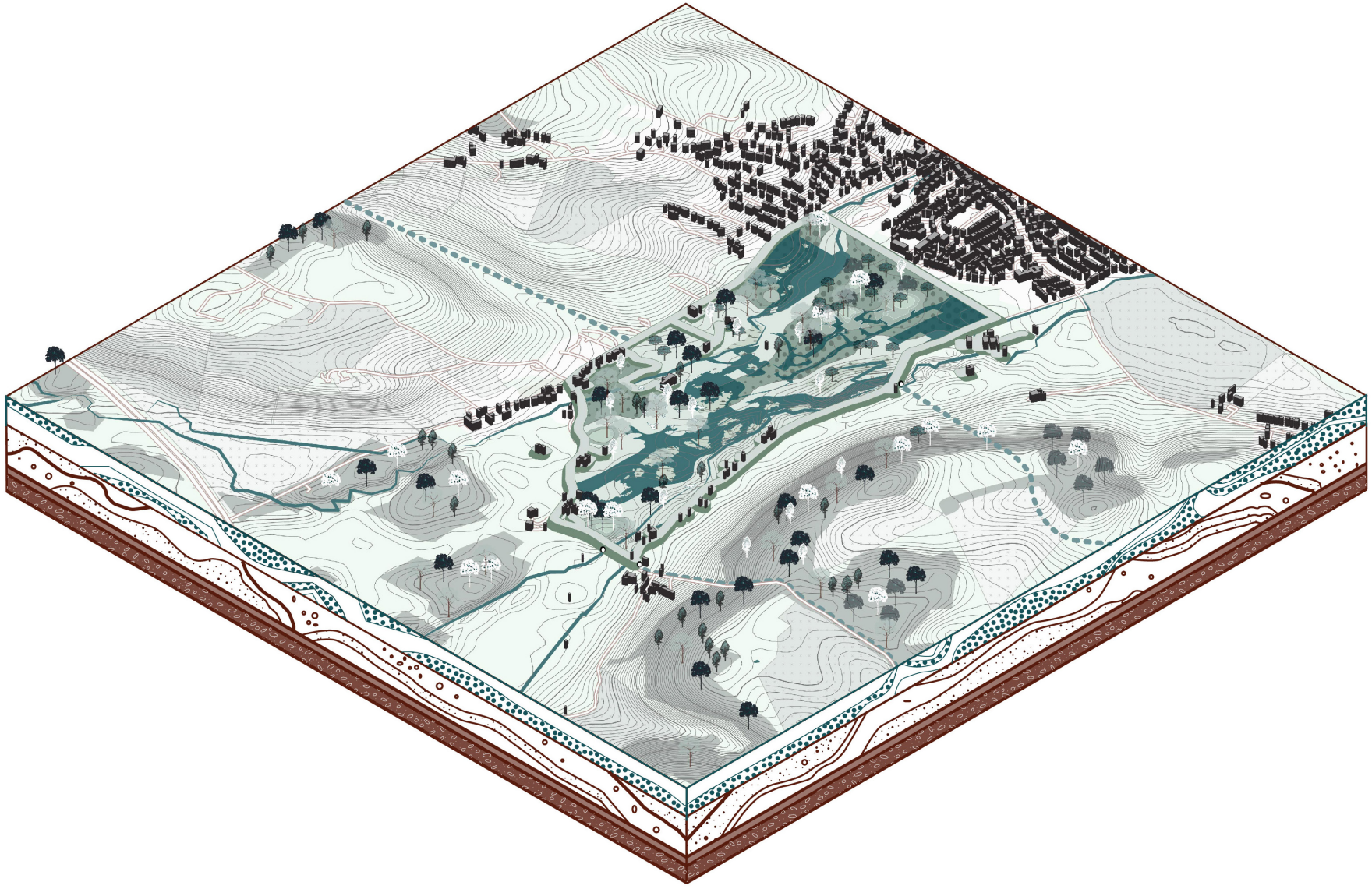
Through Intervention

Wetland Eco-systems have accelerated plant growth and slower decomposition rates thus improving carbon storage.

Improved nutrient cycling and water quality

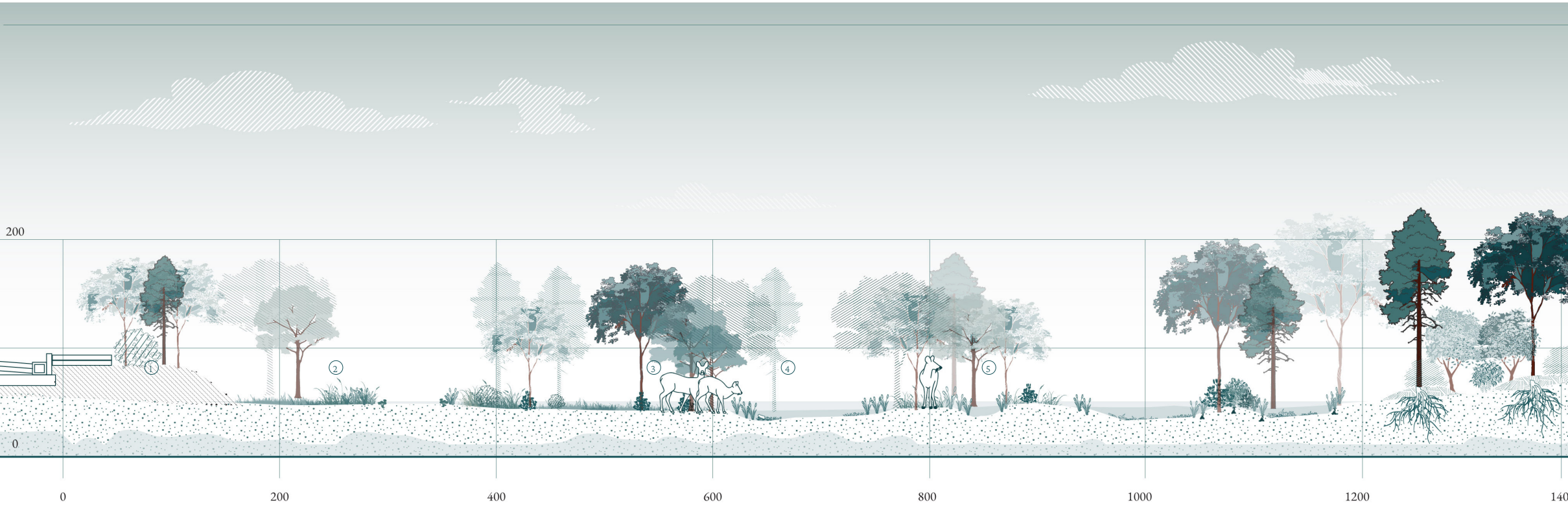
Flood regulation through recharging groundwater

Distribution of aquatic and terrestrial floodplain habitats from changing hydrological regimes, sustains diverse habitats.



Legends

- Recreational
- Farmland
- Wetland Forest
- Natural Grassland
- Woodland
- Willow Woodlands
- Wet Grasslands
- Channels Lakes
- Lowered flood plain
- Culverts to re-direct run-off
- Earth mounds for fruit trees
- Earthern embankment to protect settlements

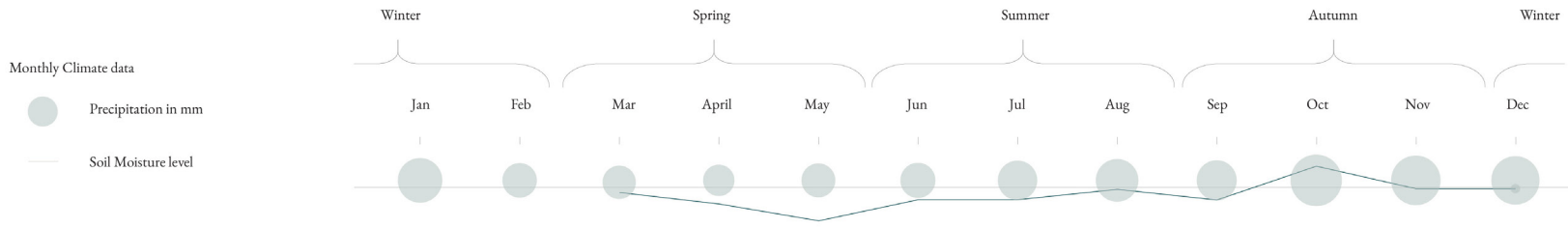


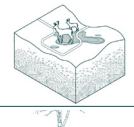
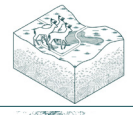
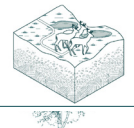
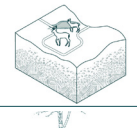
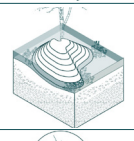
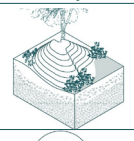
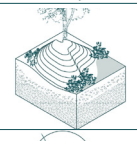
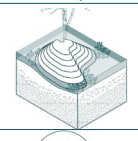
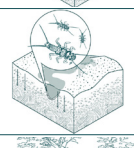
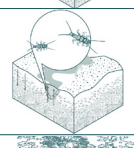
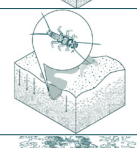
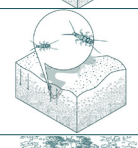
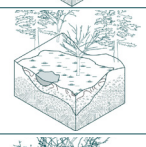
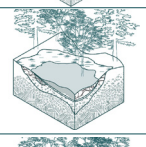
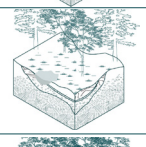
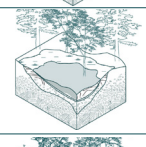
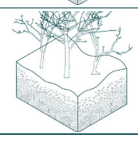
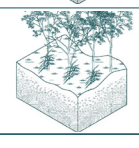
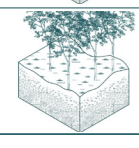
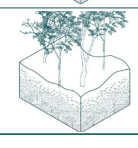
Legend

① Embankments ② Flood Meadow grassland ③ Re-introduction of species for Bio-turbation ④ Deep Channels with shallow margin ⑤ Lake with shallow and aquatic vegetation

Low Flow Level

Flood Level



Landscape as Infrastructure	Winter	Spring	Summer	Autumn
Channel Bioturbation Pathways				
Habitat Earth Mounds for Trees				
Habitat The Hyporheic Zone				
Water Source Wetland Ecosystem as an Aquifer Recharge Zone				
Water Source Woodland in driving evapotranspiration				

Engineered Elements in the Landscape

Pilesa Reed Beds	I
Re-profiled Banks	II
Re-introduction of Beavers	III
Re-profiled Banks along floodplain to harvest flood water	IV
Control of Red Deer Population	V
Mounds for Wetland Trees	VI
Riparian Trees	VII
Seasonal Wetland	VIII

Altered Hydrology

Interception	I
Conveyance	C
Surface Run off	R
Soil Moisture	SM
Percolation	P
Ground Water Storage	G
Surface Storage	SS
Stream Flow	SF
Evapotranspiration	E
Precipitation	PR
Evaporation	EV

Altered Ecology

Bioturbation	1
Carbon Cycling	2
Decomposition of organic matter	2.1
Disturbance of wetland soil hydrology releases carbon	2.2
Photosynthesis	2.3
Sequestration into the soil	2.4
Carbon Storage	2.5
Trophic Interactions	3
Gentle slope along wetland margins promotes amphibian abundance	3.1
Water level fluctuations facilitates species coexistence and promotes high biodiversity	3.2
Trophic Interactions showing direction of energy flow	3.3

Reflections on the Typologies

Engineering Works in A

Earth Movements + Light Infrastructural Work : Directing Water Flows

Forms of Water in the Terrain	Conveyance	Attenuation
Terrestrial Storage	Identifying Keyline points in the terrain to impede fast moving run-off	(-) Siting Storage Ponds at the Keypoint of the site (+) Creating earthern embankments for storage ponds
River Discharge	*Weir removal to restore natural riparian landscape* *Brush Dams addition to slow fast flowing brook*	Brush Dams spread out stream flows and slows it along channel widths
Run Off	(-) Channel incisions to connect system of storage ponds (-) Off contour swales between croplines (+) Redirecting water flows from valleys to ridges	(-) Level Sill to collect excess run off in the scenario of heavy rainfall. (+) Creating earthern embankments to contain / slow down heavy volumes of run off
Ground water		(-) Protected recharge zones along channels and streams
Soil Moisture	Expanding water pathways along vegetated cover	

(-) Excavation

(+) Fill

Vegetation Works : Filtration, Increasing Organic Content, Stabilizing Earth Work

Forms of Water in the Terrain	Crop Cover	Tree Cover	Pasture Cover
Terrestrial Storage		(-) Wide Canopies Intercepts rainfall (-) Increased leaf litter amount reduces surface water run-off or contribution to stream depth	
River Discharge		Stabilizes river banks, reduces erosion Greater amount of carbon carried by the rivers	(-) Reduces silt in stream and reduces flood risks downstremes Vegetation strips reduce the transfer of sediment, nutrients, and pesticides into freshwater ecosystems.
Run Off	(-) Crop cover with with high organic matter can reduce runoff in flood years by nearly one-fifth and cut flood frequency	(-) Reduces Runoff	
Ground water			
Soil Moisture	(+) Increases water holding capacity of soil by increasing soil organic matter	(+) Increases rate of soil infiltration (+) Effect of shade may act to reduce water loss from soil by limiting evapotranspiration rates from plants. (+) Decomposing leaf litter amount Improved soil moisture	(+) Manure Increases water holding capacity of soil by increasing soil organic matter (+) Planting Forage improves soil organic matter

Effect on

(-) Decrease

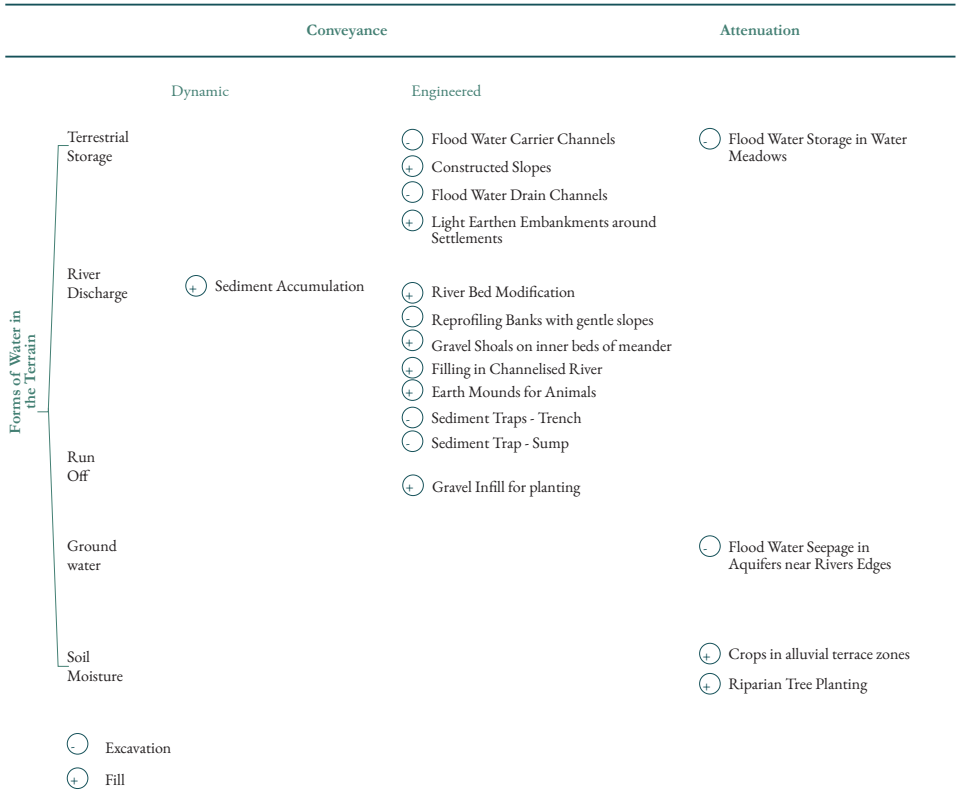
(+) Increase

Filtration

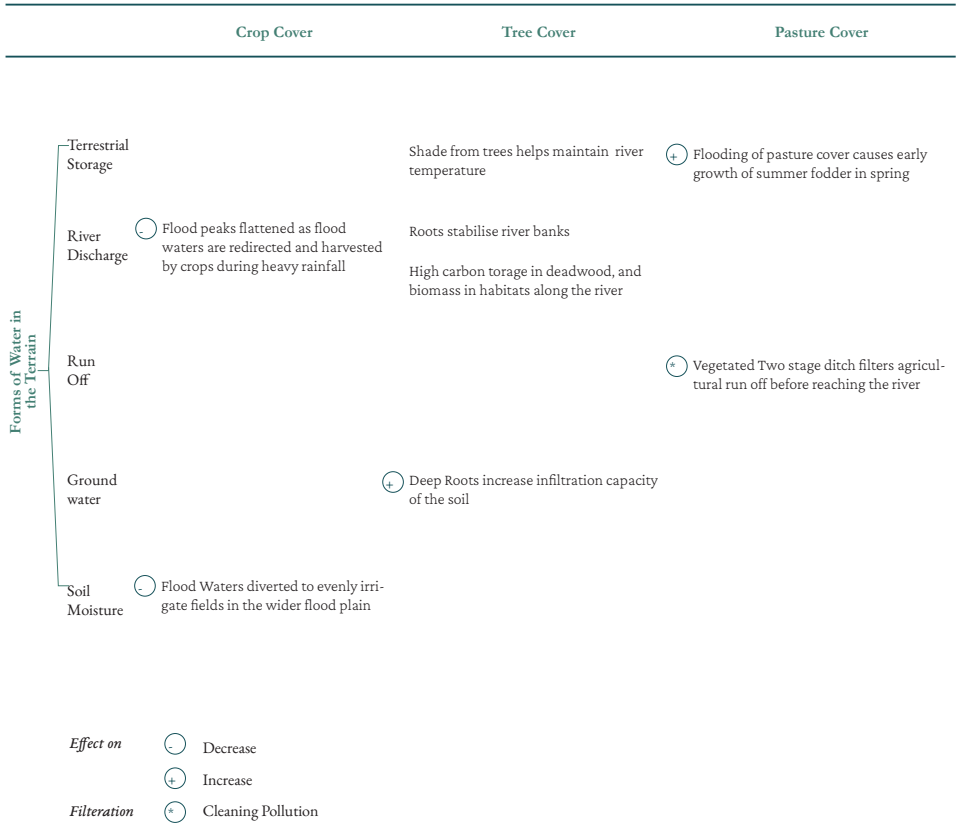
(+) Cleaning Pollution

Engineering Works in B

Earth Movements + Light Infrastructural Work : Directing Water Flows

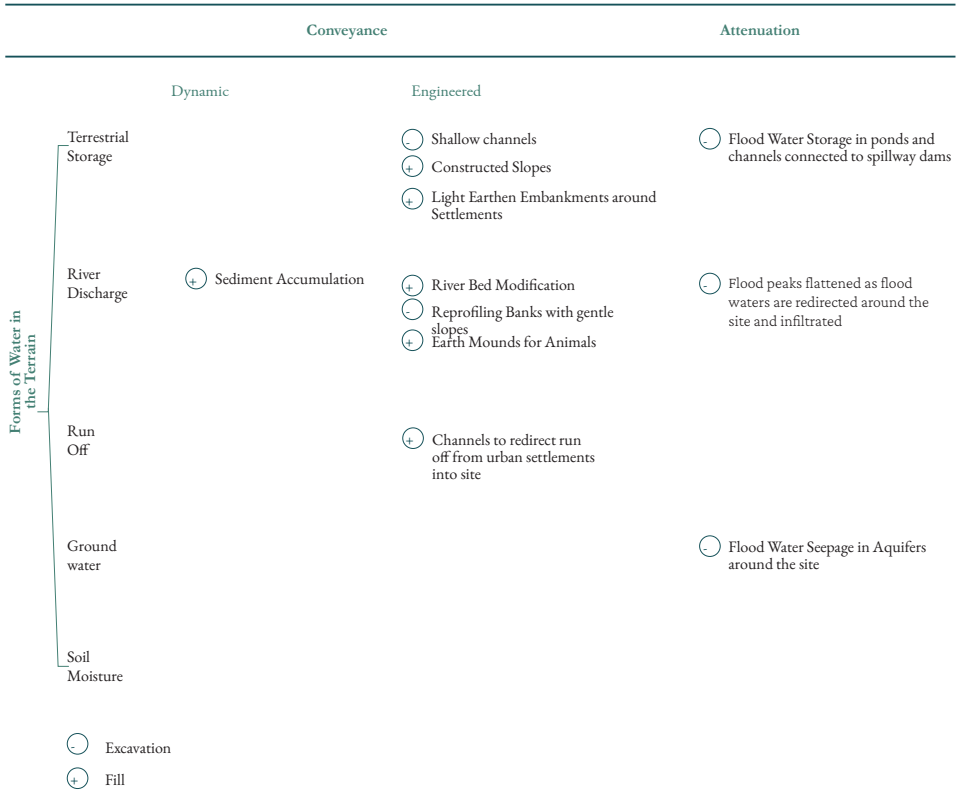


Vegetation Works : Filtration, Increasing Organic Content, Stabilizing Earth Work

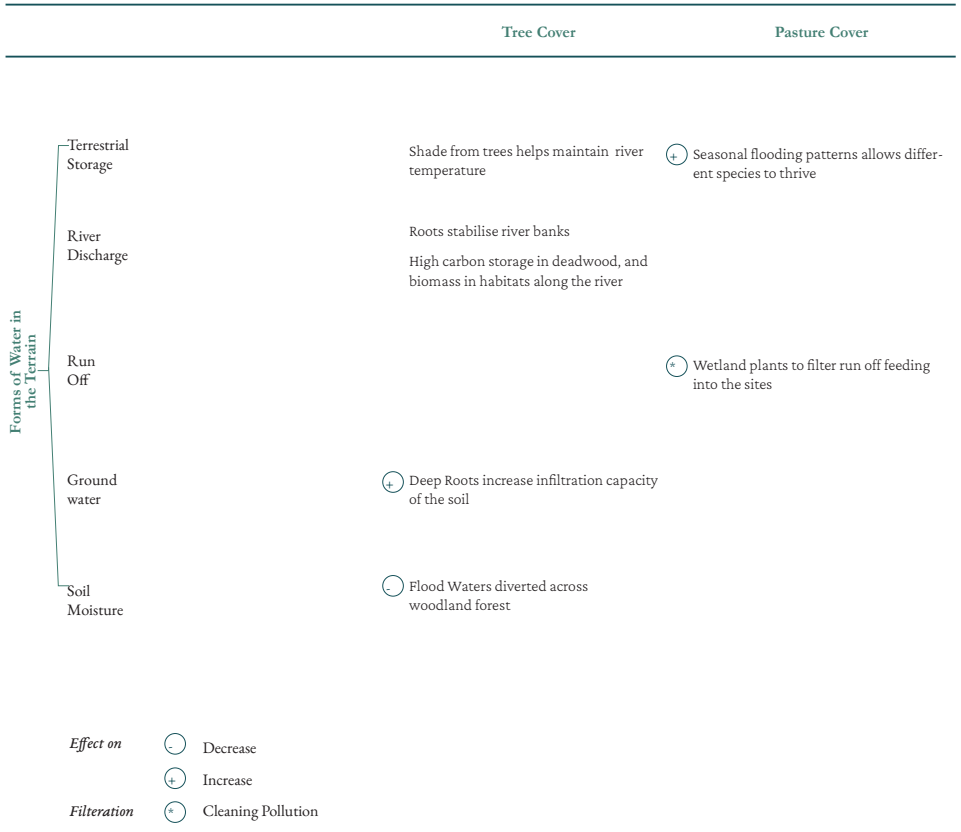


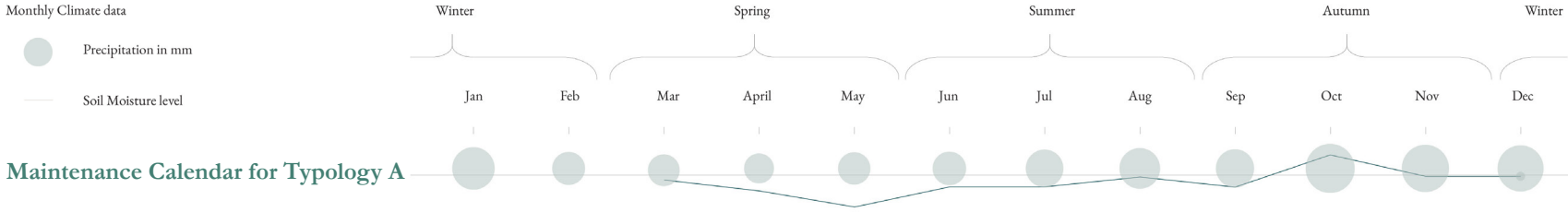
Engineering Works in C

Earth Movements + Light Infrastructural Work : Directing Water Flows

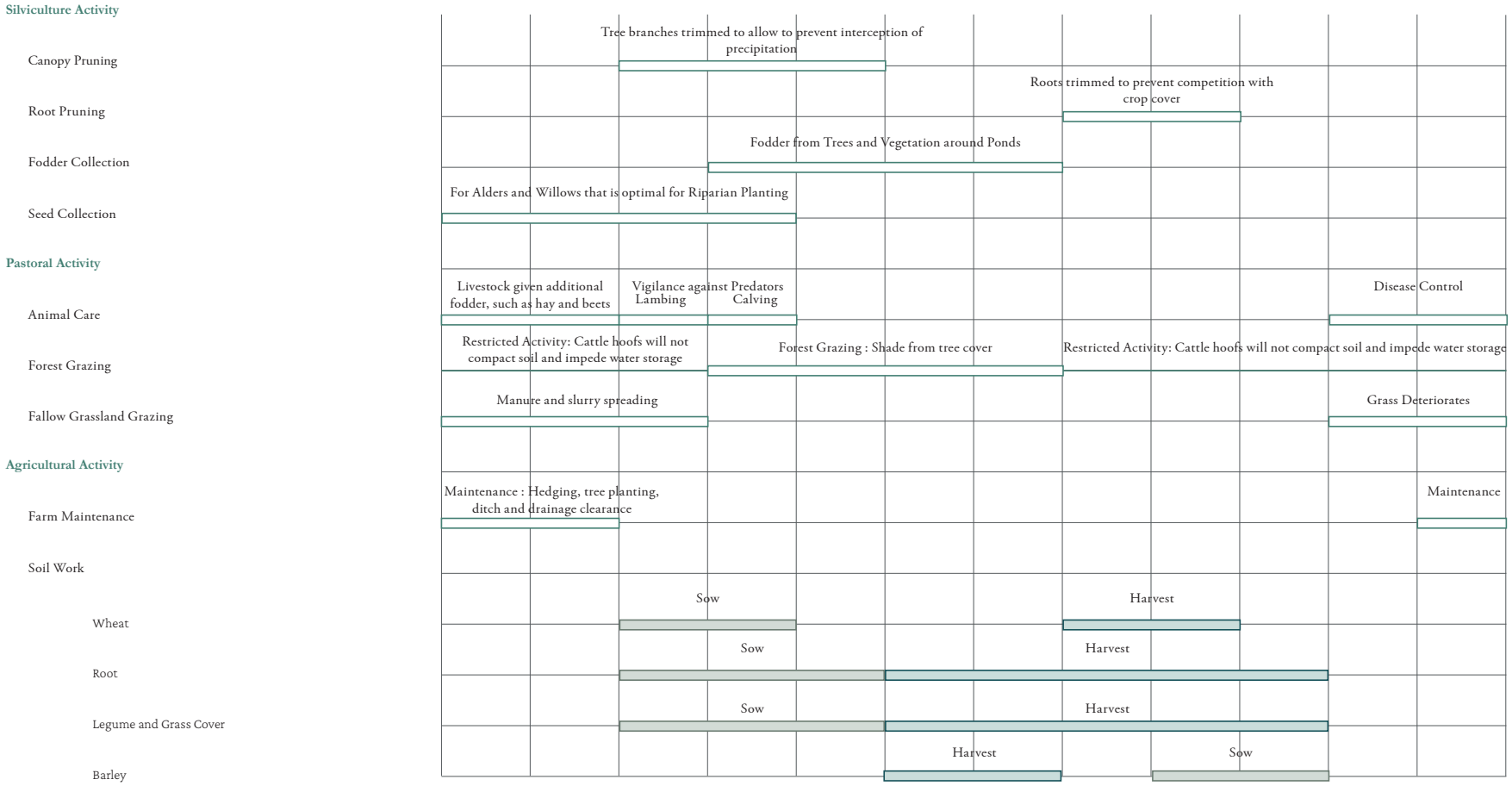


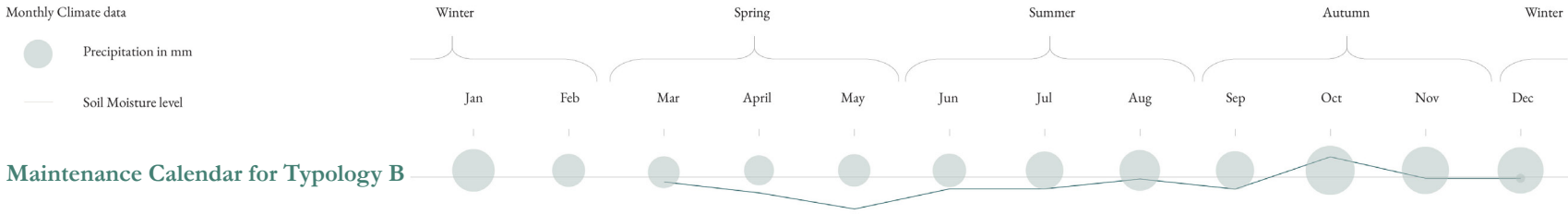
Vegetation Works : Filtration, Increasing Organic Content, Stabilizing Earth Work



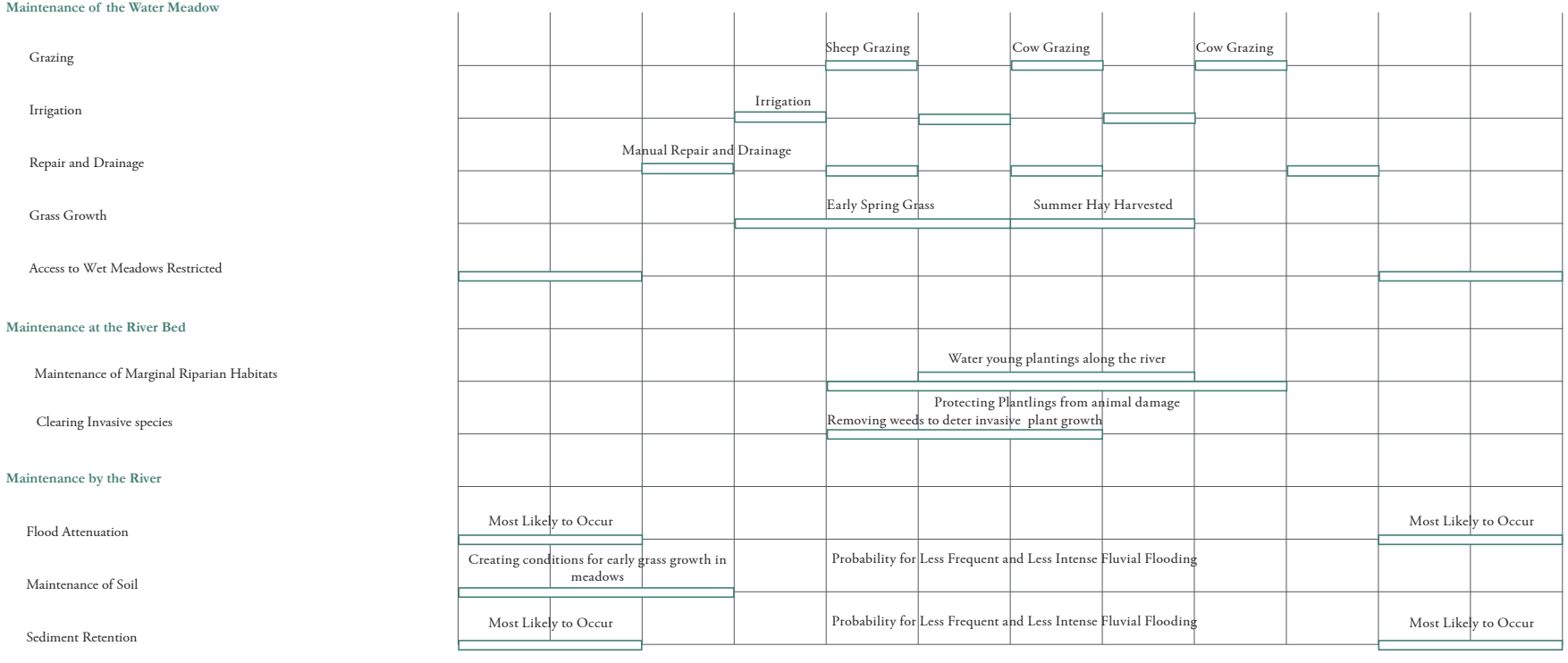


Maintenance Calendar for Typology A

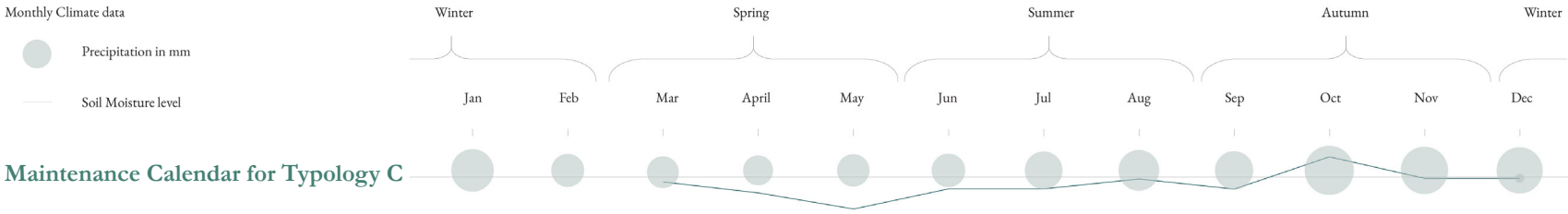




Maintenance Calendar for Typology B



Maintenance Calendar for Typology C

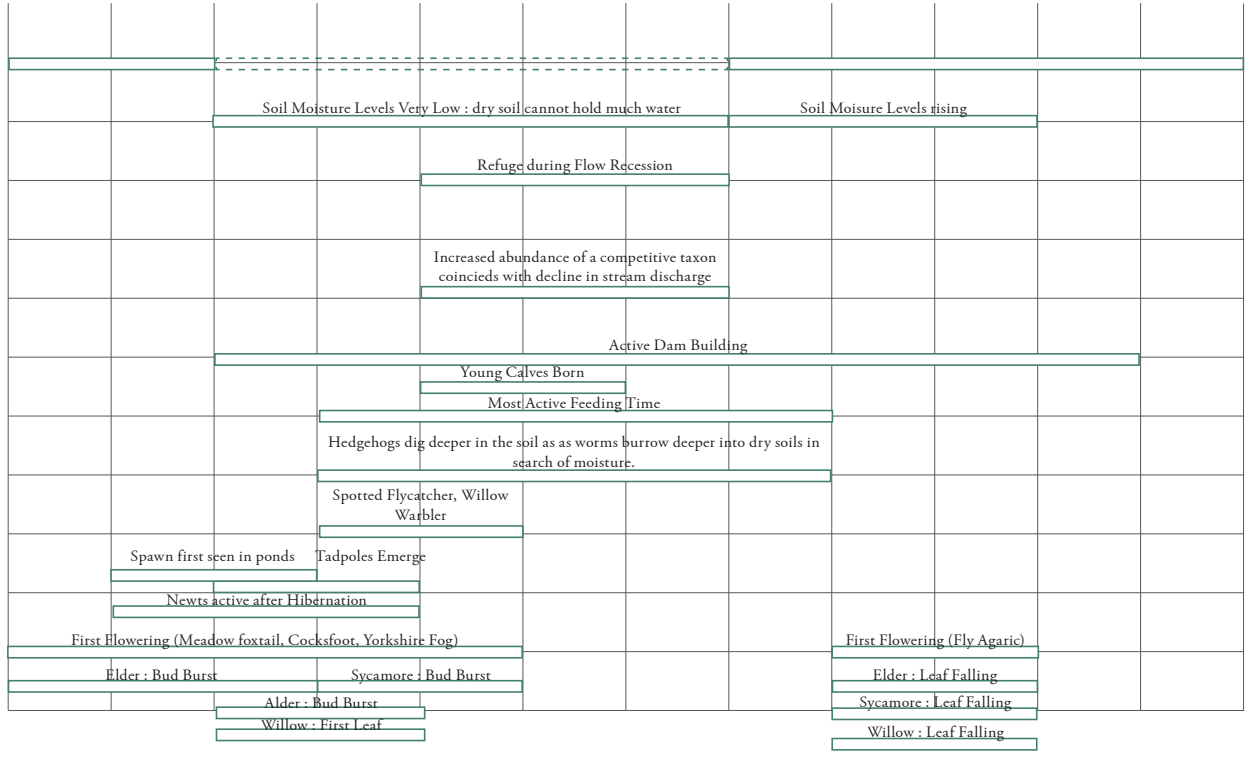


Maintenance by the River

- Flood Pulse
- Flood Attenuation
- Hyporheic Activity

Maintenance By Species

- Hyporheic Invertebrates
- Beaver Activity
- Red Deer Activity
- Hedgehogs
- Birds
- Amphibian Activity
- Vegetative Cover
  - Grasses and Fungi
  - Riparian Trees



Terra Fluxus

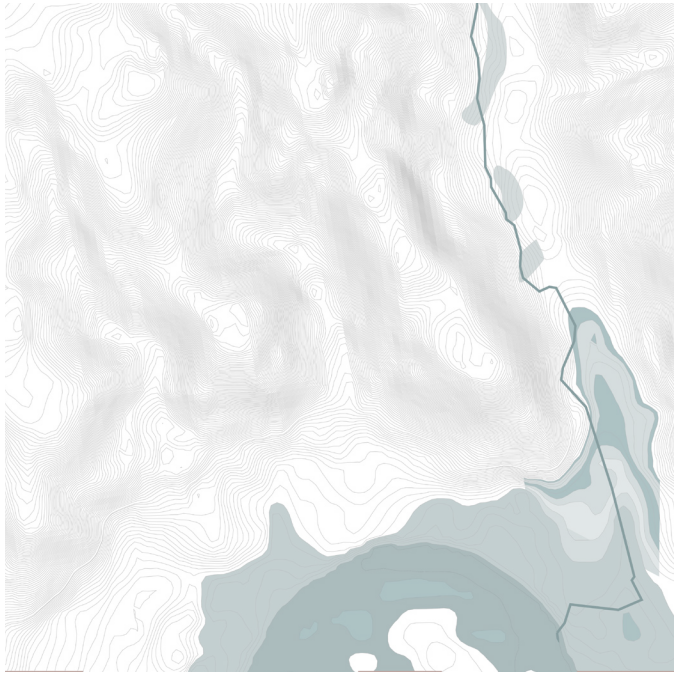


Fig: Floodscapes in Typology A : Seasonal Indeterminacy

Fig: Floodscapes in Typology B: Seasonal Indeterminacy

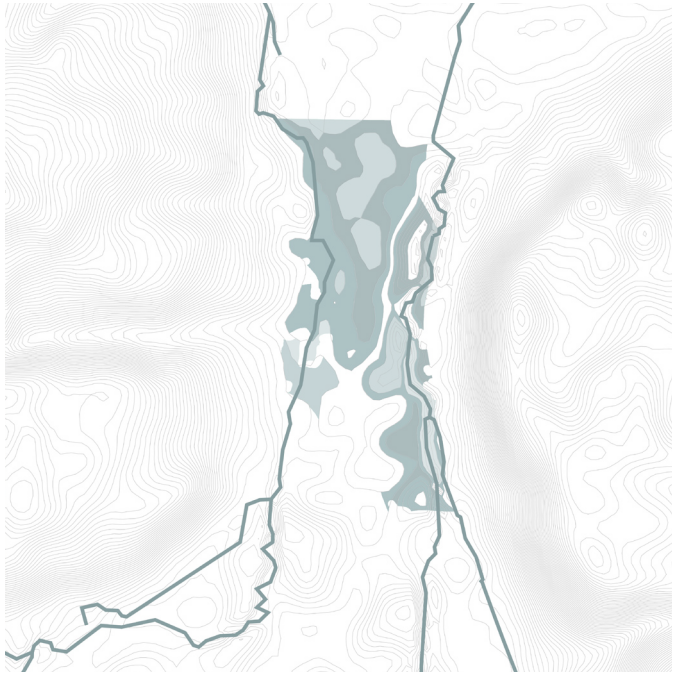


Fig: Floodscapes in Typology C : Seasonal Indeterminacy

Legend : Floodscapes

Stage for Uncertainity

Rivers Form in Flux

Terra Fluxus

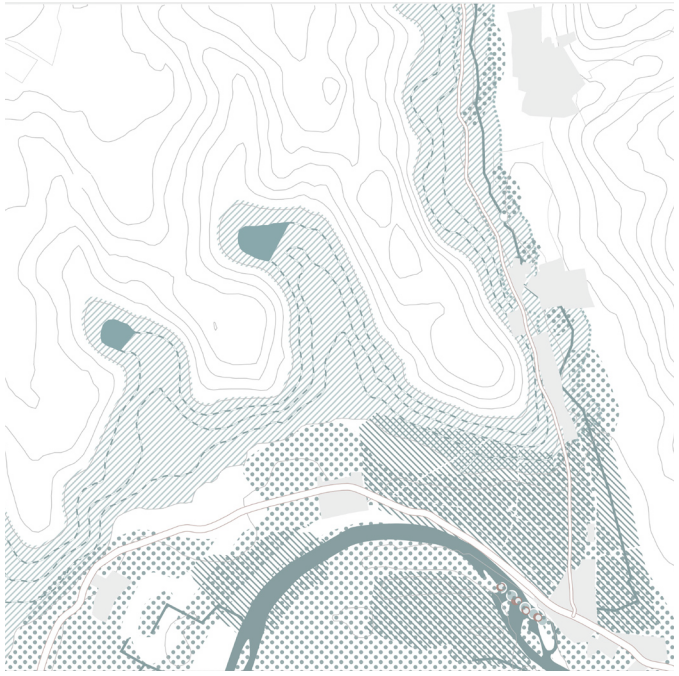


Fig: Staging of Surfaces in Typology A

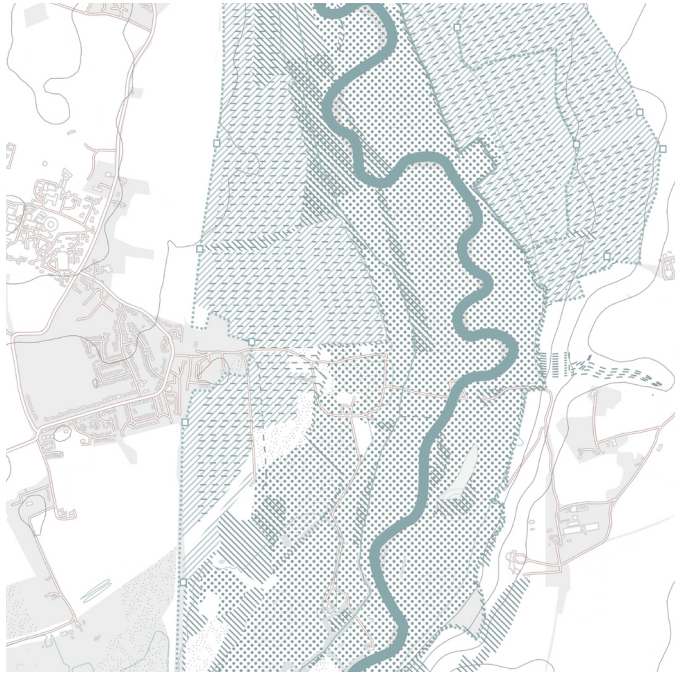


Fig: Staging of Surfaces in Typology B

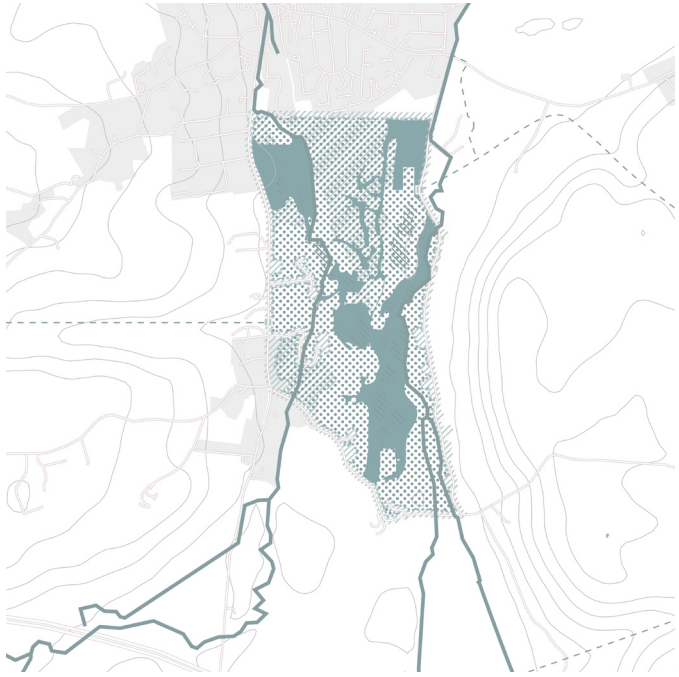


Fig: Staging of Surfaces in Typology C

Legend : The Staging of Surfaces

Process Unfolding

Surface Storage

Flood water Harvesting

Seepage

Conveyance

Filterations

Soil Conservation

Stage for Uncertainity

Existing Urban Footprint

Open Soil Cover

Reviving the Commons

Regulation of Land and Water Management

(RL) Riparian Land Owners

(FO) Farm Owners

Identifying Common Goals and Targets at a community level for Landscape recovery

Sharing of Tools and Knowledge

(C) County Council

Plays a role in appointing representatives of the Commons

Legal Owners of the Commons Land

(L) Local Rivers Trust

Provides Funding

Monitors Riparian Zones

(D) Department for Environment, Food & Rural Af- Natural England

Provides Funding through Environmental Stewardship

Provides Funding through Countryside Stewardship

Provides Funding through Basic Payments Scheme

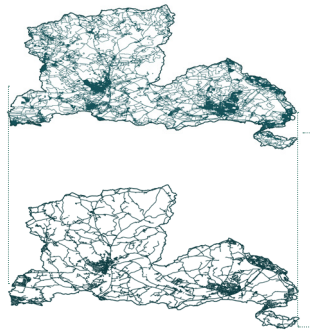
(TW) Thames Water

Regulates Public Water Useage Limits

(EA) Environmental Agency

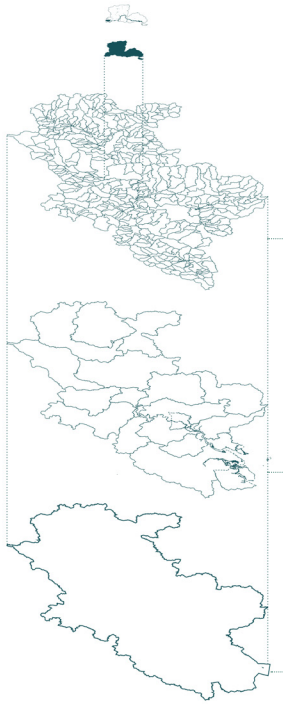
Grants Ground Water Abstraction Licenses

Scales of Management



Land Ownership

Land Parcellation



System of Micro Basins

System of Sub Catchments

Thames River Basin

Adapting Ostroms 8 Rules for the Management the Commons

1. Commons need to have clearly defined boundaries.
2. Rules should fit local circumstances. (RL) (FO)
3. Participatory decision-making (C)
4. Monitoring (EA) (C)
5. Sanctions (C)
6. Accessible Conflict Resolution (C) (EA) (D)
7. Right to Organise (C) (EA) (D)
8. Commons work best when nested within larger networks (L) (C) (EA) (TW)

Phasing the Project

2023 - 2030 → 2030-2035 → 2035 onwards

Action	Organisation and Initiation of Processes	Infrastructure Construction	Cyclic Maintenance and Inspection
Soil Management	Inspection of soil conditions Mechanically aerating soils Farmer Training Programmes Creating Systems for Temporary Land Swaps		Routine Inspections and management
Growing Winter Cover Crops	Integrating plan with crop rotation strategy	Selection of winter crops Leaving crop residues throughout winter	
Cross drains across Road Networks	Determining the size of drains depending on local conditions	Construction of cross drains across roads to channel water	Inspection and Routine Cleaning
Tree Planting Riparian Tree Planting Cross Slope Tree Planting Management of Existing Woodlands		Construction of small earts mounds along strip and planting native species Plant native species such as holly, blackthorn, hazel, hawthorn or woodrush.	
Planting and Managing Hedgerows		Constructing tree shelters for growing trees Preparing the ground Planting double staggered hedgerow with hawthrons and blackthorn mixed with hazel, geulder rose, rowan and holly. Growing oak, lime, aspen, alder every 10m Remove individual tree gaurds once fully grown	Newly planted hedgerows need high levels of maintenance
Bunds to store Temporary Run Off	Determining the size of drains depending on local conditions Consideration for where water should flow in case of excedance	Construction of exceedance flow paths to avoid new flood risks	Regular inspection to make sure bund is intact and not filled with silt
Bush Dam / Leaky Barrier Construction	Determining the number and positions of brush dams at catchment levels	Constuction must allow fish passage underneath Use of locally sourced wood	Ensuring brush dams location is correct Periodic clearance of debris and sediment to prevent blockae and over flow of water
Storage Pond Construction	Test pits to see how well pond holds water Pond design according to site charchteristics	Construction of Pond Construction of spillway in relation to pond	Check for scouring in inlet and outlet drains Sediment removal Vegetation Management
River and Flood Plain Restoration	Re-meandering needs careful planning needs co-operations between landowners on both sides of the channel Dimensions are entirely site dependent and will need detailed specialist advice. Pre-work assessments and surveys	Regrading flood plains Construction of Riffles and Pools in the river bed	
Wetland Creation		Regrading flood plains Stabilising and re-wetting Planting vegetative cover	

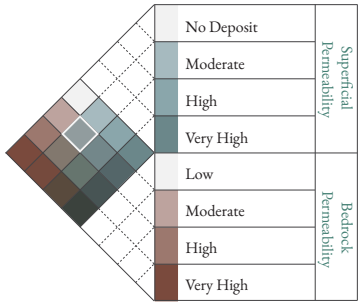
Cyclic Programmes

- Improved movement of air and nutrients through the soil profile
- Reduces soil and sediment in run off
- Reduces loss of soil and sediment into watercourses
- Little to no fertiliser input
- Increased leaf litter for soil quality
- Improved drought tolerance
- Increase in soil moisture retention
- Increases Infiltration
- Reduces soil loss
- Allows sediment settlement
- Reduces Nutrient Losses
- Traps Sediments, improving water quality
- Carbon Storage
- Diverts and reduces run off volume
- Slows run off
- Intercepts surface runoff
- Intercepts surface flow
- Filters run off
- Intercepts Rainfall
- Tree Roots stabilize water course
- Treed canopies keeps river cool for aquatic wildlife
- Provides habitat for polinaors and predators of pest
- Provides habitat for diverse species
- Shelter for livestock
- Reduced risk of water borne diseases to livestock
- Slow high flows, reducing maximum flood peak
- Flood water spillage for infiltration
- Slow drainge from the pond after flood period via infiltration or an outlet point.
- Retension of water for drought store
- Controlled discharge back into the river
- Allowing Natural lower energy flooding reduces risk of bank failure.
- Increases Infiltration

Transposing the Countryside in the City

Recreational
Farmland
Meadow
Natural Grassland
Woodlandk
Green Network 1
Retrofitting Road Network for Green Infrastructure 2
West Warwick Reservoir 3
East London Waterworks Park 4
Hackney Marshes 5
Hackney Marshes Center 6
Olympic Park
River Lee Flood Relief channel a
Middlesex filter beds
Pond Lane Flood Gates b
London Olympic Stadium c

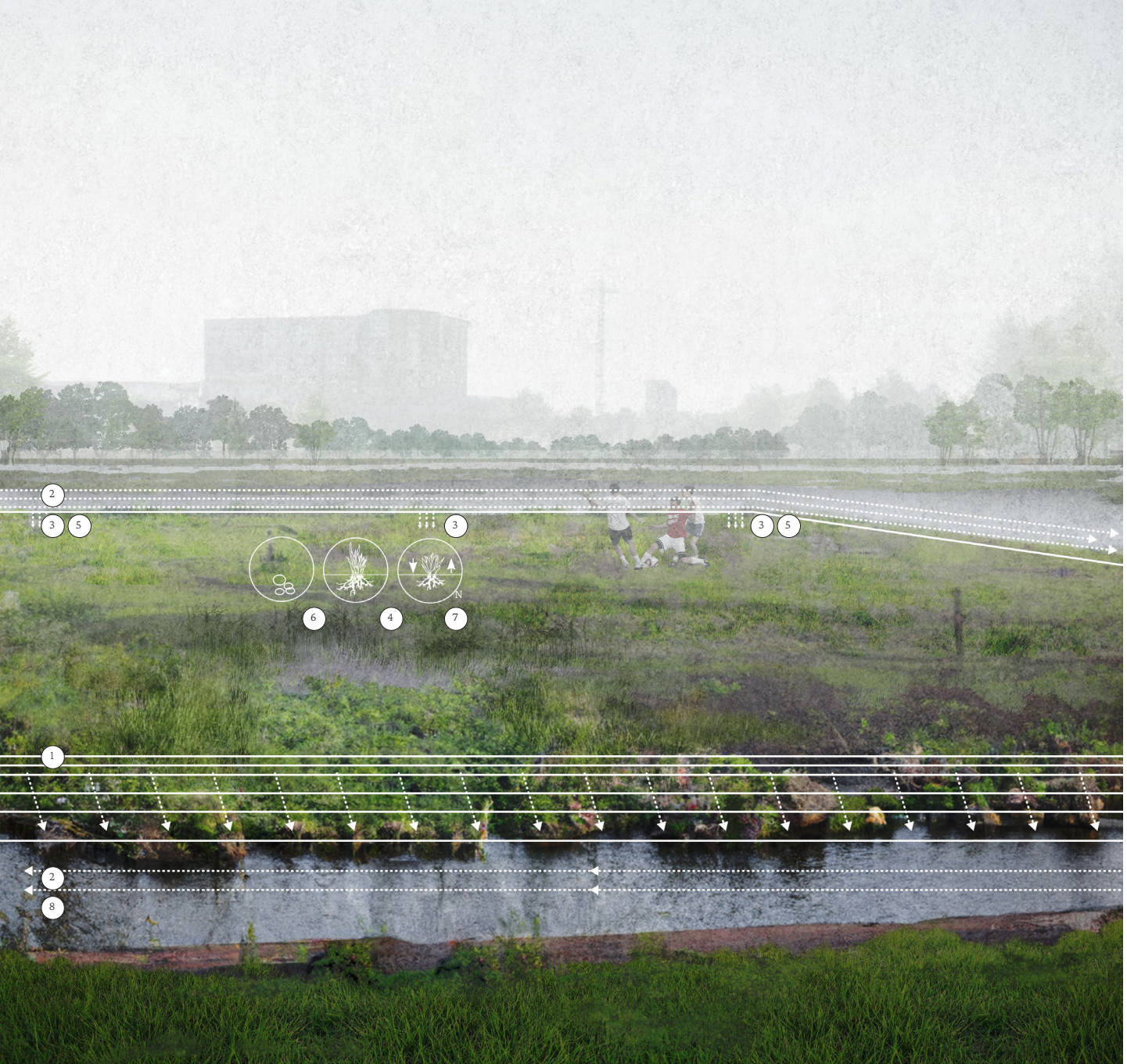
Fig: Positioning
within the larger context, and connecting strategies to larger network



Typology

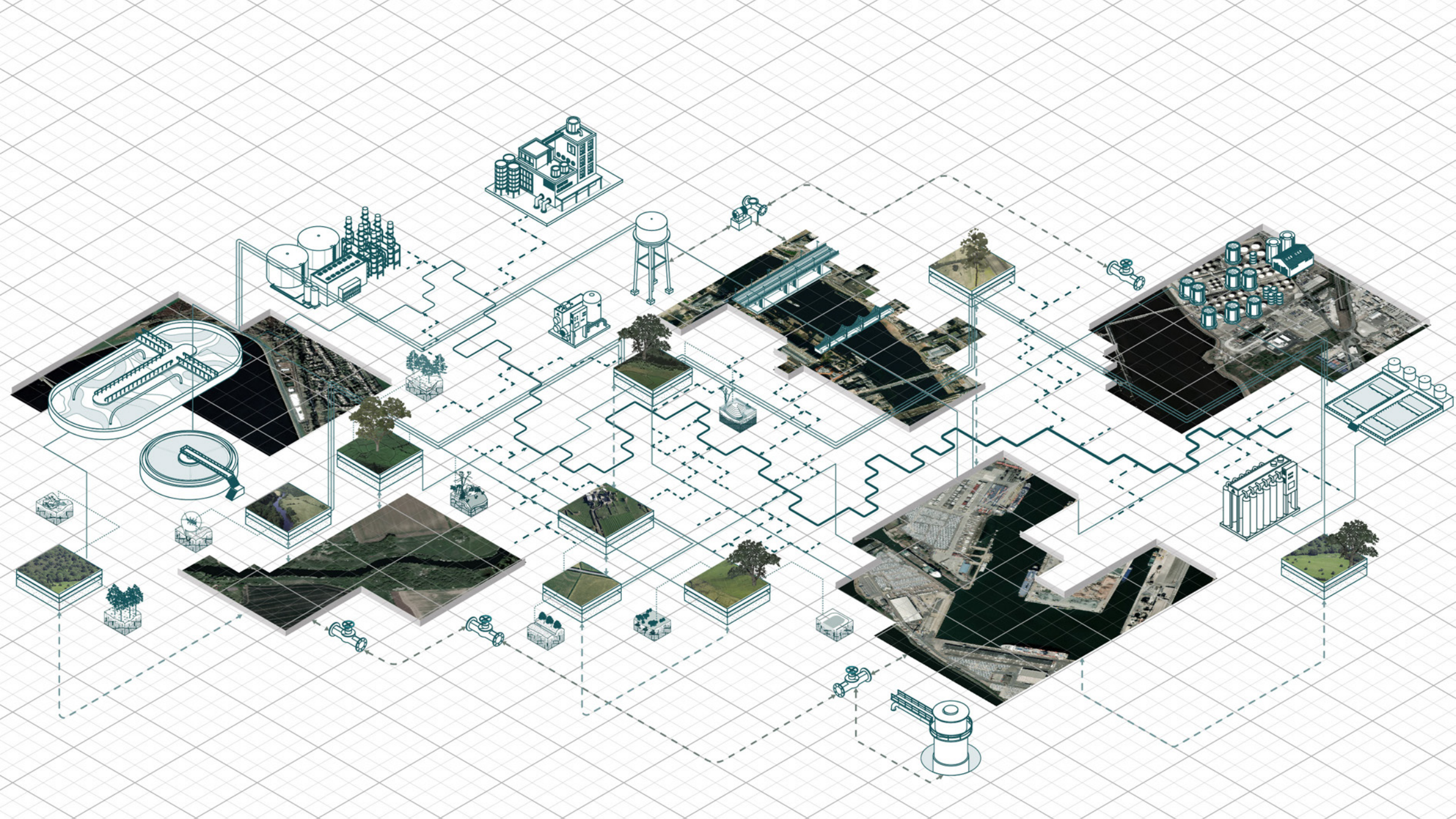
Geological Classification	Alluvial Terrace
Primary Terrain Category	Plains
Proximity to River Body	High
Infiltration Capacity	Low

Fig: Classification of Testing site
in Terrains Geology



Engineered Elements in the Landscape

Wetland Terraces	1
Carriers and drains for high flow events	2
Macrophyte zone for aquatic species	3
Vegetation to filter run off and promotes even flow	4
Slowing Run off increases sediment deposition rates	5
Wetting and drying cycles leads to fixation of pollutants in sediments	6
Promotes conditions for nitrogen removal	7
Water leaves the wetland with reduced sediment, nutrient and pollutant loads.	8



Thank you

Appendix

The Role of Terrain in Water Storage : Mapping Zones of Flow Accumulation

Fig 78: River and Historic Extend of Flooding

River Historic Flood Zones

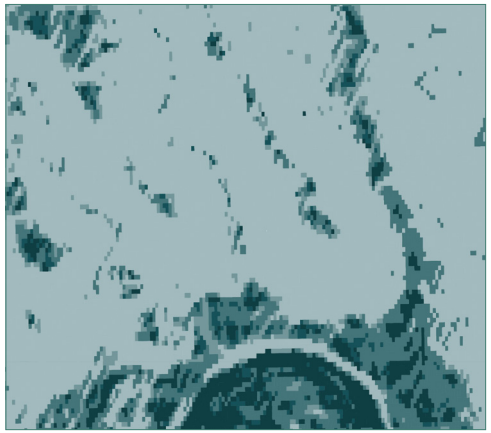


Fig 79: Topographic Wetness Index

Wetter Regions Drier Regions

The Role of Terrain in Conveyance: Mapping Natural Water Pathways

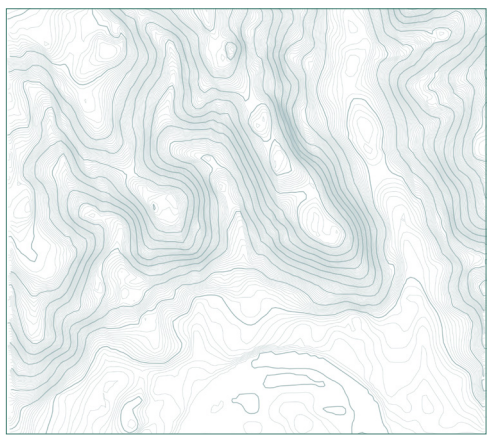


Fig 80: Natural Contours

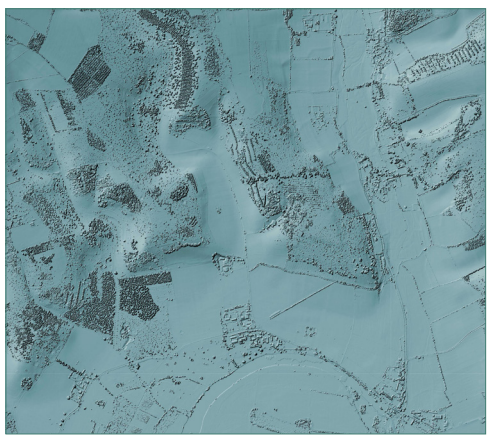
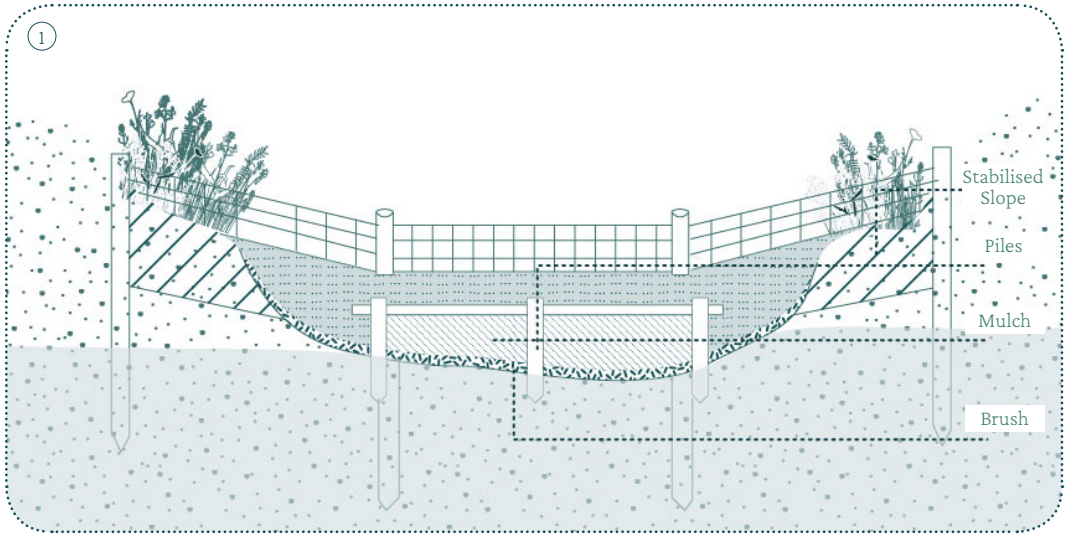
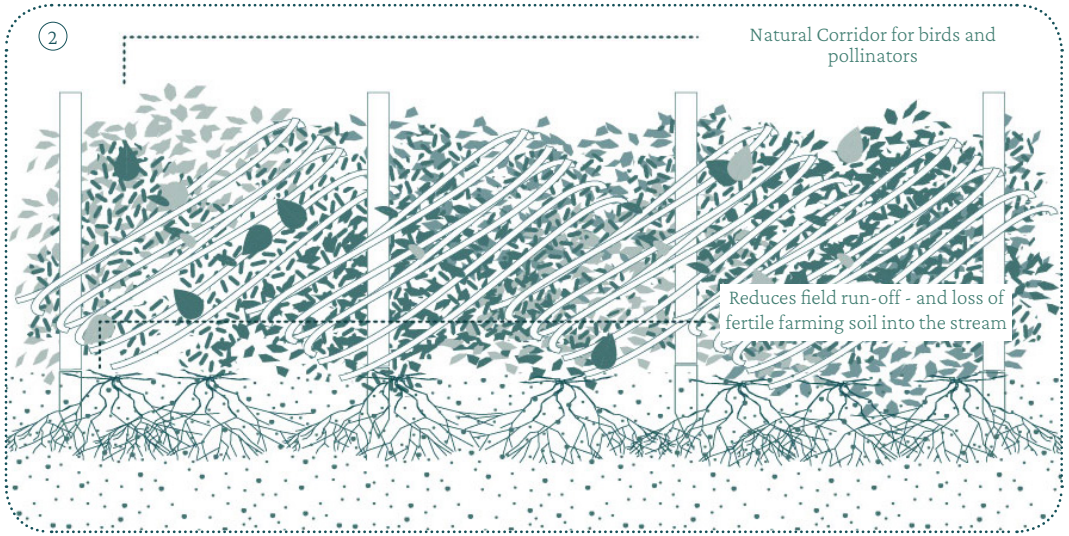


Fig 81: LIDAR Data for higher precision

Design Details: Typology A

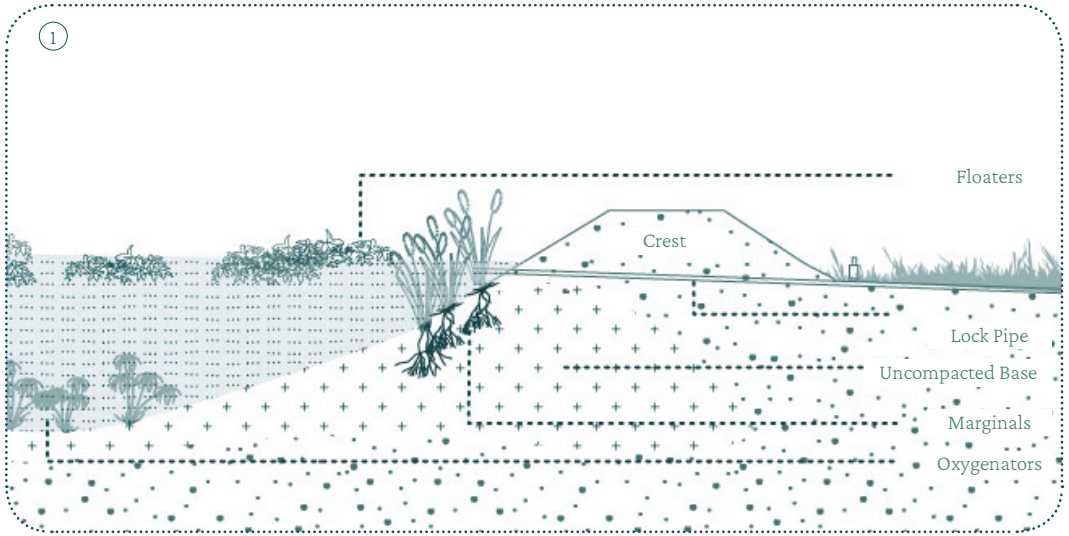


Brush Dam

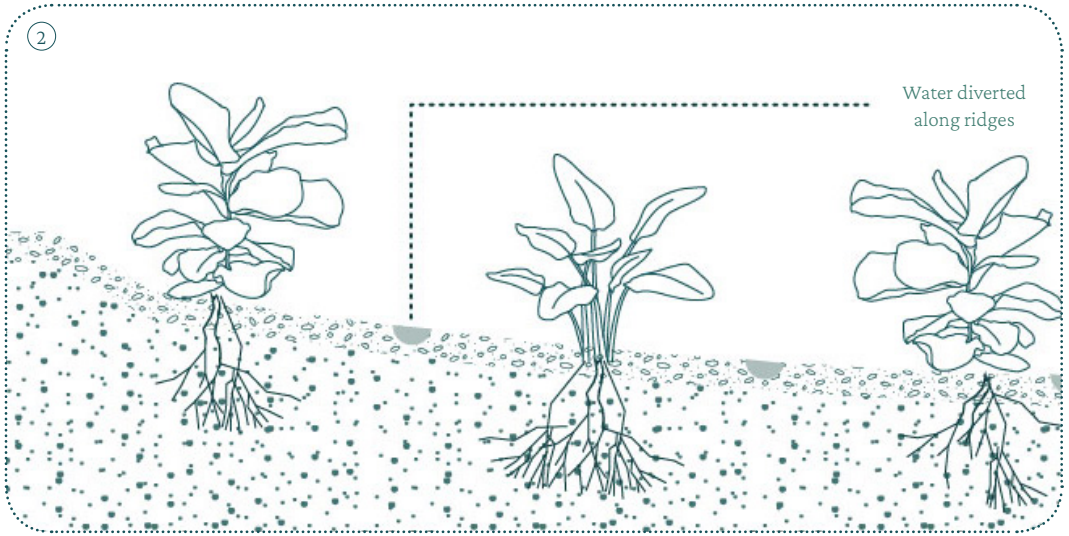


Hedgerow

Design Details: Typology A



Edge of Key Line Dam



Off Contour Cropping

The Role of Terrain in Water Storage : Mapping Zones of Flow Accumulation

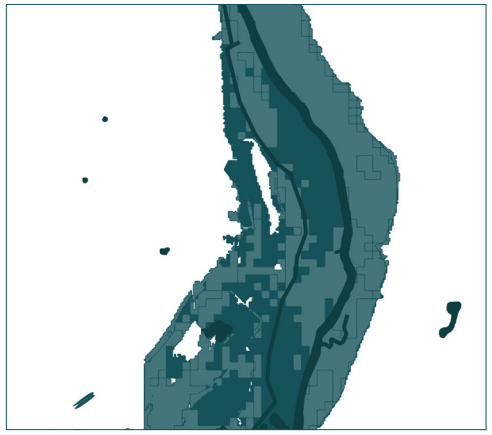


Fig 95: River and Historic Extend of Flooding

River

Historic Flood Zones

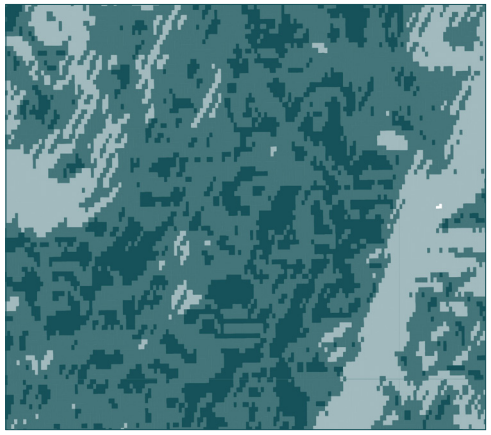


Fig 96: Topographic Wetness Index

Wetter Regions

Drier Regions

The Role of Terrain in Conveyance: Mapping Natural Water Pathways

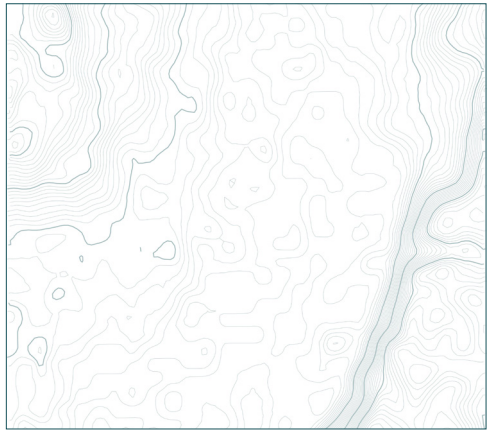
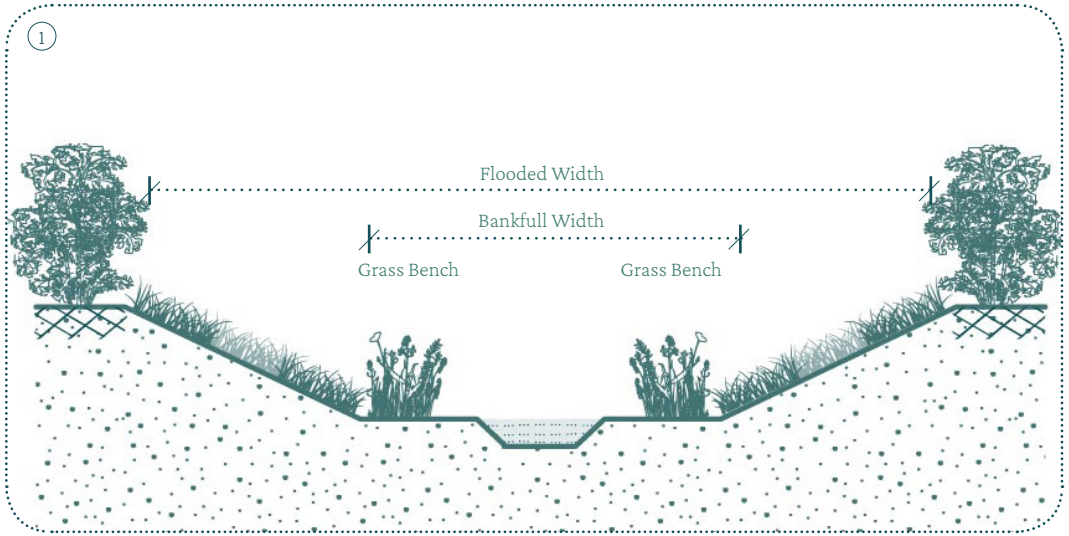


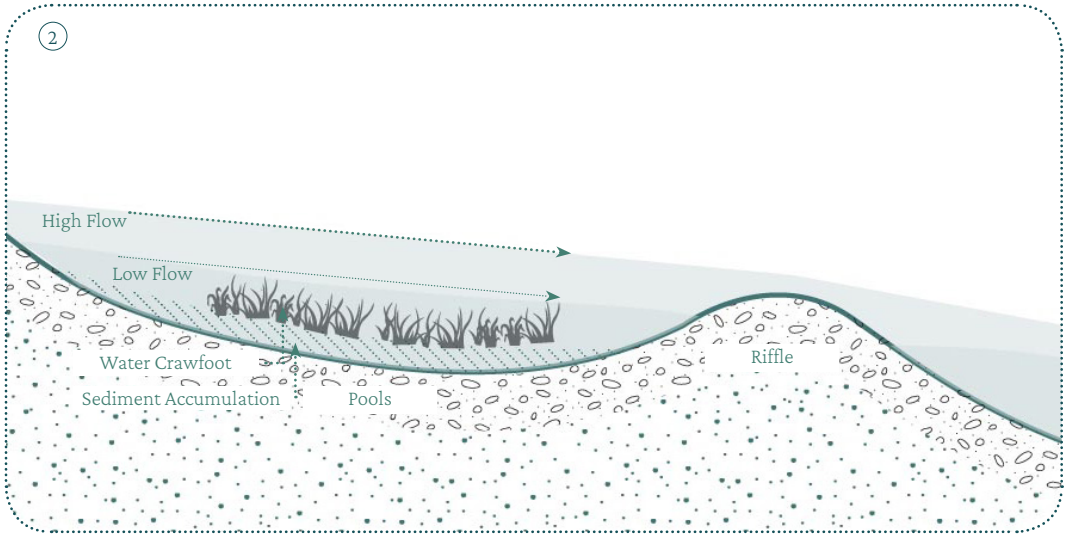
Fig 97: Natural Contours

Fig 98: LIDAR Data for higher precision

Design Details: Typology B



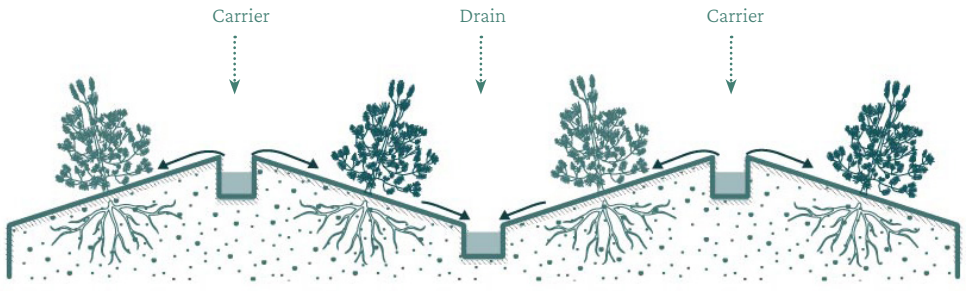
Two Step Ditch



Riffle and Pool Restoration at the River Bed

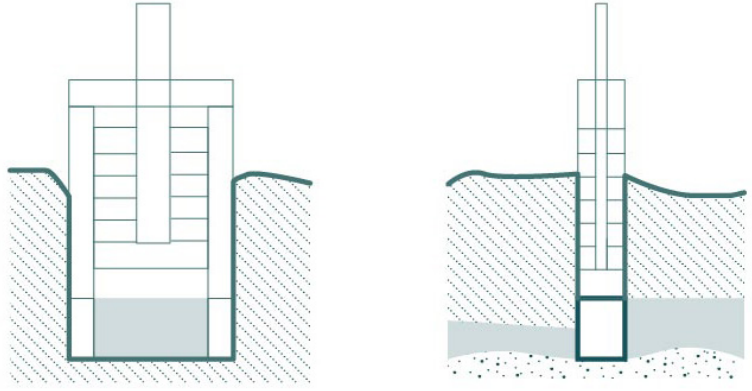
Design Details: Typology B

1



Bed Work to convey water in the Water Meadow

2



Hatchs to control conveyance

The Role of Terrain in Water Storage : Mapping Zones of Flow Accumulation

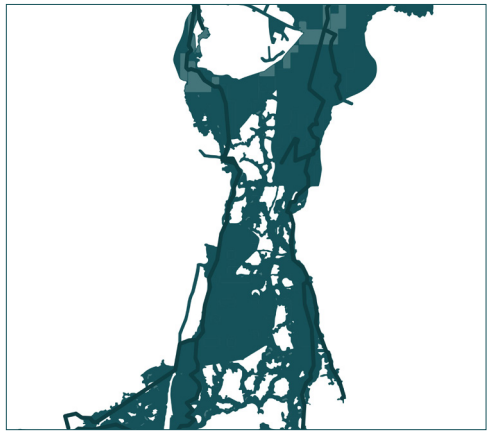


Fig 111: River and Historic Extend of Flooding

River Historic Flood Zones

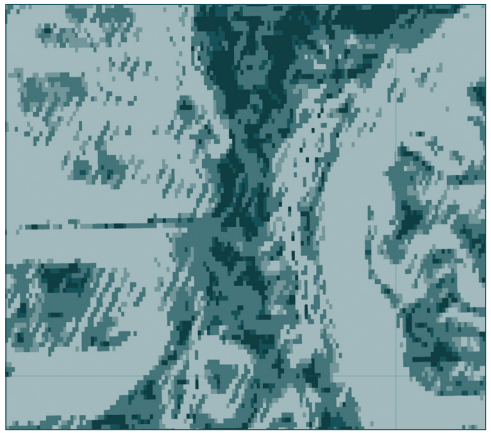


Fig 112: Topographic Wetness Index

Wetter Regions Drier Regions

The Role of Terrain in Conveyance: Mapping Natural Water Pathways

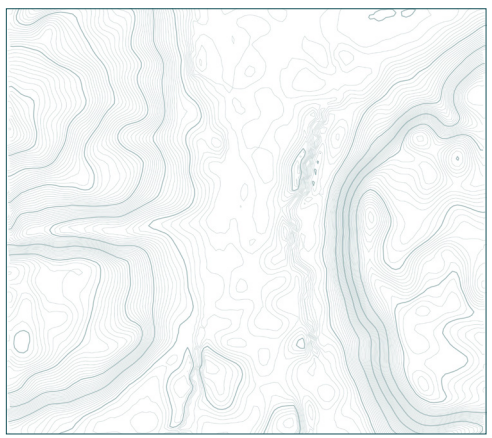


Fig 113: Natural Contours

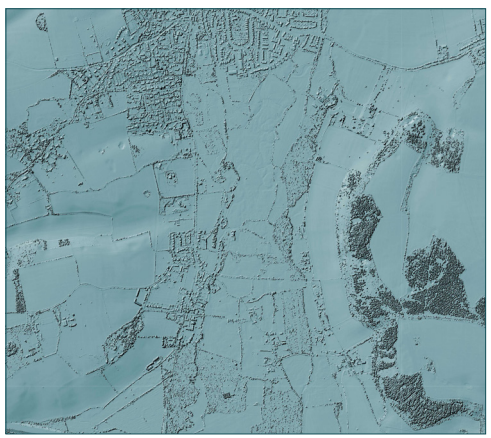
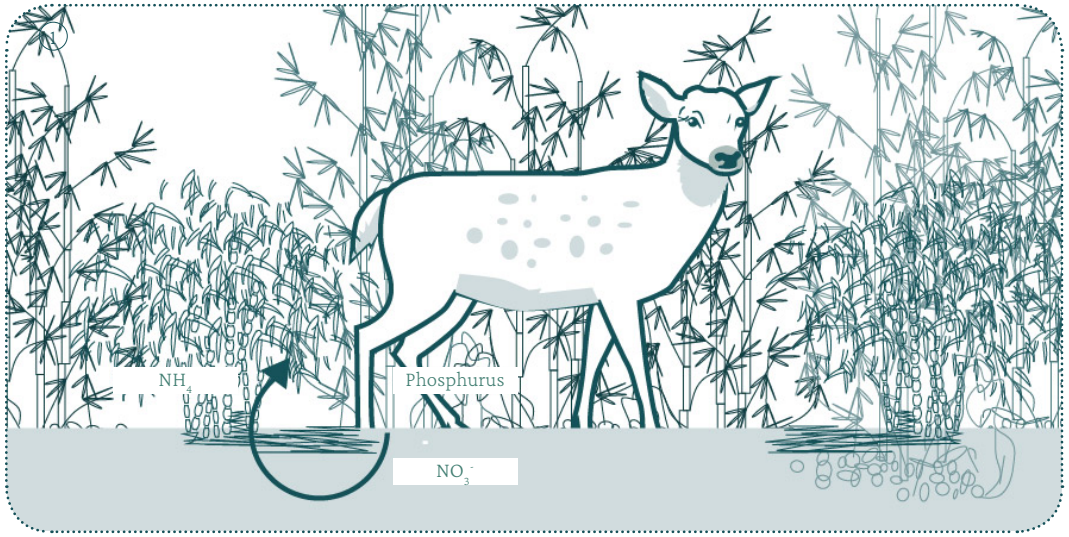
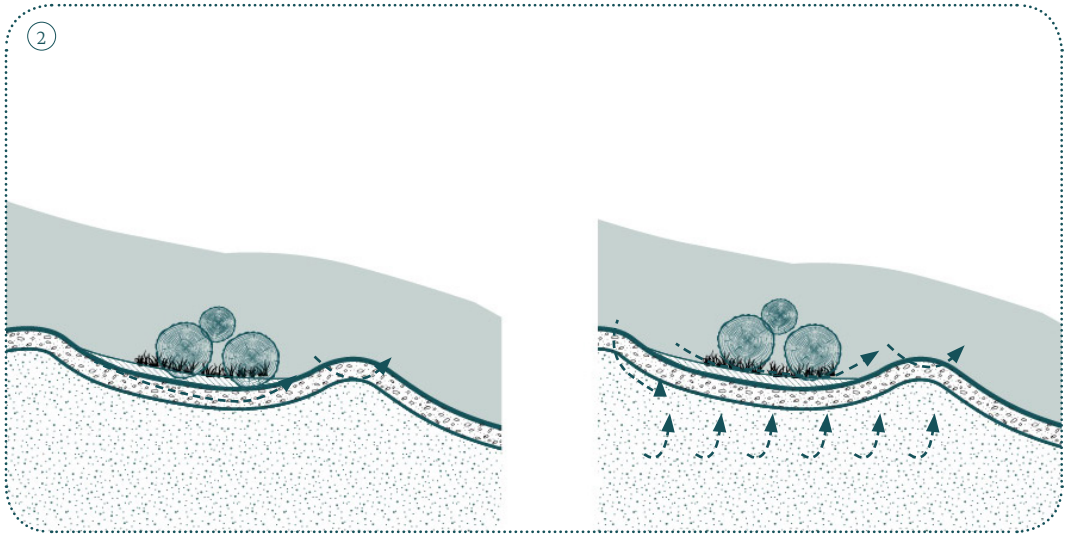


Fig 114: LIDAR Data for higher precision

Design Details: Typology C



Creating conditions for Bio-turbation



Restoring hyporheic exchange flows

Theoretical Framework

Theoretical Framework

Anamnesis :
Recollection, especially of a supposed previous existence.

Urban Political Ecology
Examining the Geometries of Power - the social power relations that facilitates environmental transformations

Eco-Criticism
Examining the definition of nature that justified the 'modern' project

Environmental History
Transformation of the River basin and the creation of an ecological hinterland in relation to London

The River Basin as a unit of Design

Quantifying Water Resource Management
Defining a Basin in Deficit

Reframing Historical Precedents
Theories that reframe nature-culture relations in a more restorative manner

Post Humanism

The Politics of Care
Care is a mode of engaging with the neglected and under-valued

Non-Human Agency
A call for collaborative approach, that emphasizes our connection with the natural world

Landscape Urbanism

Agrarian Urbanism
Urban design as a medium to redefine the role of the agrarian in organizing public and private space.
Reversibility of Environmental Externalities through Infrastructural Ecologies

Re-contextualizing Floodscapes
Controlled Flooding as a vaccine against Uncontrolled Flooding

Flexible Programming
Designing flexible programs for seasonal fluxes