Clay-Celium

A MATERIAL COOPERATION OVER TIME

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MLA Landscape Architecture, RISD

Understanding materials and time in the landscape

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A MATERIAL COOPERATION OVER TIME

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MLA Landscape Architecture, RISD 2020

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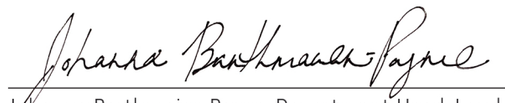
By Diana Marcela Gallo
May 23, 2020

Approved by Masters Examination Committee:



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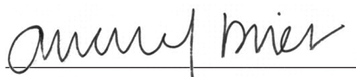

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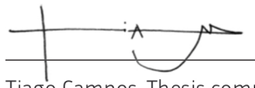

Tiago Campos, Thesis committee

Abstract

The use of materials like clay, concrete and biomaterials have given a meaning and identity to the outcomes we produce through time. Materials absorb and release energy that passes through them. Transformation processes in materials can be revealed when they get in touch with a phenomenon like infiltration of water. Changing stages in materials and weathering, should not be considered as a negative condition but as a new opportunity to feel and perceive the same surface differently.

The illusion of permanence should be replaced by a more fluid idea that nothing lasts or keeps the same condition forever. Since all materials come from living resources, this work explores the use of clay as part of the geologic composition in New England; concrete that is the result of clay and other minerals exposed to high temperatures and finally, mycelium that is a fungus based material as an invitation to incorporate nature in a different way to stop producing pristine and timelessness objects but instead producing livable materials that transform themselves and are more adaptable to the external conditions. In the need of sustainable and local alternatives, this thesis is also an invitation for industries to consider the option of going back to rescue and explore the unique resources from each place.

Acknowledgements

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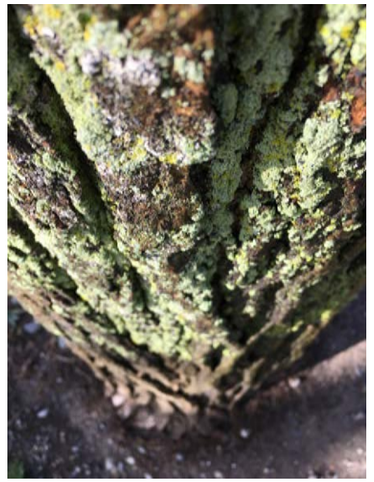
Finally, I would like to acknowledge my family for their enduring support. This is also a dedication to my father who unfortunately passed away this year.



Contents

Left: Material exploration using cement and straw - concave shapes for rainwater collection.

Introduction

The modern discourse from different fields of arts tends to give more importance to form over matter. Architecture from the 1990s and early 2000s still consider matter as a secondary element that is manipulated to achieve a formal effect rather than a thing with its own life.[1] However, all materials come from a natural resource regardless of their processes, and all materials will eventually decay and die. It is through this process and understanding of materials as living and changing agents in the landscape that their soul can be revealed through their use.

As they get older, materials transform over time too. We shouldn't necessarily say they die but they weather, rot, deteriorate, and patinate.[2] Those processes could be unpredictable. Usually, when we design landscapes based on that idea of material's timelessness, there is a shock when changes appear unexpectedly. Then, how to take advantage of those changes to generate positive and intentional outcomes?

One of the ways where time is revealed is through the interaction between materials and natural phenomena, like water infiltration. The infiltrated water is part of the water table. This groundwater begins as precipitation. It remains in the shallow soil layer and after that it moves vertically and horizontally through the soil. Water in the ground not only keeps plants alive but it also remains in groundwater storage for long periods before returning to the surface or seeping into the rivers and other water bodies. Most cities use impervious materials to cover that surface prioritizing transportation by vehicles.

However, materials used to create impervious surfaces act as a "fast lane" for rainfall so water drains directly into streams contributing to the erosion of soils and increasing the risk of flooding areas. In addition, one of the side effects when impermeable materials cover the surface in the urban areas is the temperature rise known as urban heat island effect[3].

1 Janet McGau, "Dark Matter", Architectural Theory Review, vol.22, issue.1 (January 2018): 120-139

2 Christopher Bardt, Material and Mind (MIT, 2019), 60-300

3 Lakis Polycarpou, "No More Pavement! The Problem of Impervious Surfaces", State of the Planet, Earth Institute, Columbia University, July 2010, https://www.chicagomanualofstyle.org/tools_citationguide/citation-guide-1.html#cg-journal

Right: Material exploration. Growing Mycelium, step1.

Some studies suggest that paving over anything above 10 to 20 percent of the landscape is bad for the water runoff.[4] The percentage of impervious surface in urban areas like Rhode Island, one of the most densely populated states in the country, results in an average of 60.8 percent according to studies conducted by the government of RI in 2010.[5]

The amount of runoff across the surface of Providence is high because of its topography. During the heavy rains and after the snow falls all this amount of water runs over the streets like streams. It goes into the Providence River because the use of concrete, asphalt and other impermeable materials do not allow the infiltration of water into the ground – and instead it rushes across the landscape, carrying pollutants and biological contaminants into the waterways, poisoning fish, wildlife, and us.[6]

Thus, this thesis is a proposal of four ideas at different scales, from the River to the dowspouts of buildings. All them dealing with the stormwater that cannot go back into the soil because of the use of impervious surfaces. Focused on the East Side of Providence, all the proposals use the runoff as the main resource to create landscapes at different scales, from the tiniest to the largest one. In addition, they are framed by these conditions :

- The speed of water that should be reduced to minimize erosion.
- The collection of stormwater with different purposes: to hydrate green areas, to create new habitats, and to clean it before it reaches the River.

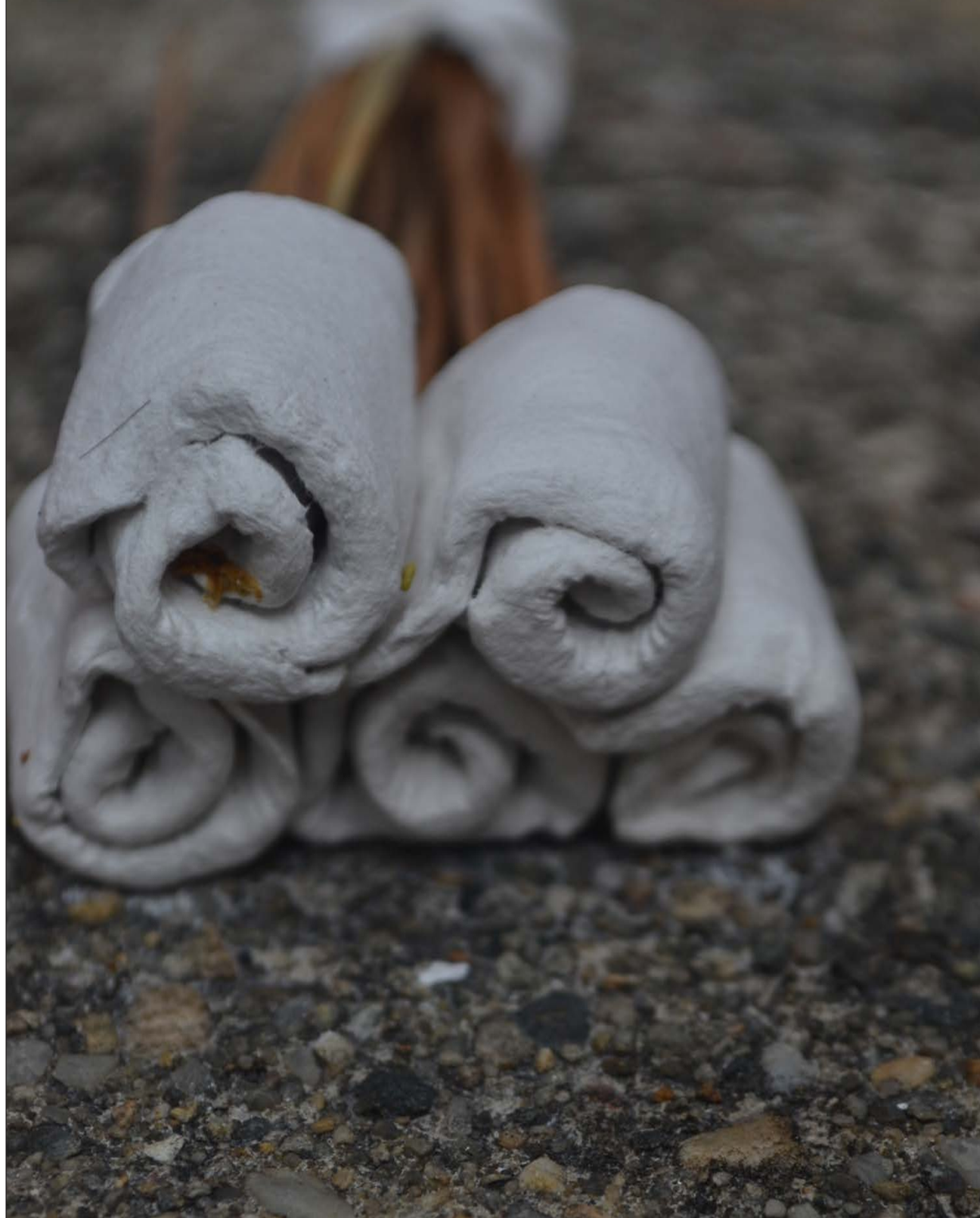
To achieve those solutions, the research of this dissertation is focused on the exploration of three materials: clay, concrete and mycelium, in order to

4 Idem
5 "The Need to Reduce Impervious Cover to Prevent Flooding and Protect Water Quality", DEM Rhode Island, Google, Last Modified May 2010, http://www.dem.ri.gov/programs/bpoladm/suswshed/pdfs/imperv.pdf
6 Lakis Polycarpou, "No More Pavement! The Problem of Impervious Surfaces", State of the Planet, Earth Institute, Columbia University, July 2010, https://www.chicagomanualofstyle.org/tools_citationguide/citation-guide-1.html#cg-journal

"A future in which architecture is messy and bioactant rather than clean, durable, and stable requires not just new technologies, but a new mental ecology."

Janet McGaw

Right: Material exploration for water infiltration. Wrapping layers of clay and straw.



explore the four solutions to let the water back into the ground, exploring the sponge effect process that includes infiltration, retention and release, and the time that those processes require.

Clay is one of the ingredients in making red bricks, and Providence has a very characteristic architecture where most of its buildings use those bricks in the facades but also for the sidewalks as pavers. Three centuries ago, there were some glacial lake bed deposits where clay and silt were abundant, especially around Barrington.[7] The use of clay in Providence is not only because of the aesthetic features but about its properties, resources and geology, too. That's why it is the first material that will open up this conversation about material exploration.

When clay and silt are exposed to different chemical and physical processes, we can obtain cement. However, the contaminant processes, the amount of energy to produce it and the ecological impacts are some of the negative criticisms. Cement is one of the ingredients of concrete and it is impermeable, meaning it holds water on the surface but doesn't allow water to pass through.[8] Its behavior is not affected when exposed to a high level of humidity and/or moisture (for example from the soil) for a long time, as clay is.

The use of Mycelium is another way of thinking about ecology because it is trying to break old habits to allow restoration of environmental ecologies. Mycelium, which is a vegetative part of any fungus, is a new alternative in design that does not have side effects or generate negative impacts in the environment.[9] Although its properties and behavior in terms of infiltration are still unknown, the purpose of using this "clean" material is to take advantage of the weaknesses of the previous two elements. (insert visual)

Initially, my working process is composed of material experiments and medium explorations that are carried out observing the behavior of the three materials

7 http://www.barrington.ri.gov/community/history/brickyard.php

8 https://www.cement.org/docs/default-source/market-economics-pdfs/2019-state-pdfs/ri-statefacsht-19.pdf?sfvrsn=5b7ae3bf_2

9 Janet McGau, "Dark Matter", Architectural Theory Review, vol.22, issue.1 (January 2018): 120-139

Left: Hybrid clay and mycelium to absorb surface runoff.

when they meet water and are exposed to outside conditions.[10] This stage examines the three main materials separately to establish a comparison among them, but also to see what happens when these materials -that work well in compression- meet other local resources (like straw) that allow them to work in tension, too. Subsequently, a hybrid collaboration among clay, concrete and mycelium starts happening and the project evolves into visual studies of physical models and computational prototypes.

The final stage is determined by the design of a prototype that is the origin of an entire system that can be applied in different places around the city where landscapes emerge in contrasting scales. The repetition of this model gives multiple possibilities in a collaborative work.

10 Idem

Diana Marcela Gaitán / Clay-Kelium [= material combination over time]

Left: Decaying processes reveal a different type of beauty.

Aims & questions

STATEMENT

The aim of this thesis on material and time is to establish a new dialog between the use of clay, cement, and mycelium in a collaborative way to reduce the amount of impervious surfaces we have in our cities. The goal is to create a formula that collects water from rain and snow to re-use it or to give it back into the soil through infiltration processes at different stages. It would intend to reduce the secondary effects produced in our cities that endanger our health and increase the effect of the climate change.

The outcome of this material research is intended to fit the criteria of sustainable design and is guided through these questions or objectives:

How can we take advantage of clay, concrete and mycelium to reduce the use of impermeable materials generating positive outcomes over time through the implementation of infiltration processes?

How can we develop morphologies and systems inspired by natural behaviors that aim to implement, improve and optimize infiltration processes as well as the aesthetic, environmental and structural qualities of the components?

How can we take advantage of a system to apply this concept at different scales in the city?

How can time be revealed in this dialog to show how weathering and decaying play a key role that allow infiltration processes to be successful?

Conceptual Mapping

DEFINITION OF TERMS

The main terms that guide this thesis were studied from other fields like philosophy and science to complement the artistic point of view.

MATERIALS

Philosophical view

MATTER

It has an intimate relationship with form. Matter and form were incomplete co-principle of things.

Three important elements:
-Substance.
-Atomism.
-Infinite.

Body and soul as a subdivision of substance.

Gottfried Leibniz

Material substances or things from the physical world.

Rene Descartes

The world is not a source of true, eternal or unchanging knowledge.

The world is in a constant change.

Nothing is ever permanent.

The material world is changeable, it is also unreliable. The world of appearances.

Plato
429 BC

SCEPTICISM

TIME

How our mind perceives and order the different experienes.

Oliver Sacks
1933-2015

If we know what time means, we could also know how to measure it, how is the relation between time-space and of course, its relation and meaning for human beings.

Paul Ricoeur
1913-2005

Transformation

Landscape: "Land" means the place where people live in and "scape" means to shape.
According to Bart R. Johnson and Kristina Hill, "Landscape connotes a sense of both the given and the purposefully shaped and recovers the dynamic connection between place and those who dwell there."

PROCESSES

Entropy
This apparent disorder idea was used among the Minimalist artists to provide an anbtidote to static and the unchanging forms of modernism.

Decaying, erosion notion of slowing down.

Use of materials as a metaphor.

Science view

MATERIALISM

Carlo Rovelli
1956-

Why can we remember the past but not the future?

Matter as the fundamental substance in nature.

Antoine Lavoisier

"matter is neither created nor destroyed although it may be rearranged in space" or the entities associated with it may be changed in form.

PERCEPTION

Bergson
1859-1941

"time experience depends on mind"
Duration.

Biology
+ Computation
+ Design

Sculpture
- Maurizio Montalti — S(e)Amenes

Landscape
- Georges Descombes — Aire River / Geneva
- Princeton Univ. — Princeton University
- PWD, Streets Philadelphia, Mayor's Office of Transportation. — City of Philadelphia Green Streets Design Manual
- CMG Landscape Arch. — Crack Garden

DIANA GALLO — Clay-Celium

Architecture
- Marcos Cruz — Poikilohydric Living Walls
- David Benjamin Columbia GSAPP — Tower of "grown" bio-bricks

"Nothing is constant but change! All existence is a perpetual flux of 'being and becoming!' That is the broad lesson of the evolution of the world."

Ernst Haeckel

SOIL AND TOPOGRAPHY

The composition of the ground surface and topography in Providence comes from the glacial deposits and activities over the past two million years.

Movements of ice sheets created lakes when they were melted, and a new type of soil was developed. Those lakes helped organize the sediments in different layers of clay, silt, and fine sand. As a result of the retreat of the glaciers, the movement of stones created a new topography of seven hills, with the highest elevation of 400 feet. Providence has been compared to Rome, as both cities have occupied similar topographic shapes. When the sea level rose to the current position, salt marshes were developed forming peat deposits along the coast of New England. Nowadays, the soil composition has layers of sandstone, hard coal, different types of granites as well as shale or sedimentary rocks; a mix of flakes of clay, minerals and tiny fragments.[1]

As clay is the main ingredient in the production of bricks, it has a relationship with the history of Providence and has given the city an aesthetic that remains today. When Europeans arrived in New England three centuries ago to build this city, they searched out local areas that had clay suitable for brickmaking to build their chimneys and cellars.[2] The imported bricks were not enough to keep up with the growing demand, so they needed to establish a local production. By this time, extensive deposits of clay were found 10 miles to the south of Rhode Island, in Barrington, where the first company was established.[3]

The manufacturing and production of bricks was a profitable business in New England between 1874 and 1912. However, in the beginning of the XX century the clay beds were 15 feet below sea level, and workers had

1 http://www.barrington.ri.gov/community/history.php
2 https://brickcollecting.com/NEB.htm
3 https://www.stilesandhart.com/aboutus.html

Below: **"View of the City of Providence as seen from the Dome of the New State House" [1896]**
Right page: **View of the East Side of Providence [1930]**

Right Page: Providence, the city of seven hills. Topographic model.

to constantly pump water out of the pits in order to dig the clay. This became more difficult within a few years, and with the clay running low, production ceased during the 1930s.[4] Almost by this time, the use of steel and concrete (made by cement) became more popular in Providence. This material was used to provide impermeable surfaces in big areas like Kennedy Plaza, as well as the construction of high-rise buildings like the Industrial National Bank, the tallest structure in the city until now. However, its use has often been restricted by the code of ordinances in order to preserve the old aesthetic of the city.[5]

In order to start the explorations for this thesis, the simplest way to understand topography is through abstraction. As a result, the land is seen as a collection of several bowls upside down. From here, and going into more refinement, the conceptual idea of bowls results in convex shapes of different sizes with a concave body, that is no other but the Providence River crossing through them.

4 http://choosing-providence.blogspot.com/2013/06/the-barrington-brickyard.html

5 https://library.municode.com/la/kenner/codes/code_of_ordinances?nodeId=APXAUNDECO_ARTVIIOREPALORE_S7.12PAFRYA

Time & weathering

Left: When pinecones start a decaying process,
the fibers that compose their structure are revealed.

As we age, materials transform over time too. We do not necessarily say they die but they weather, rot, deteriorate, and patinate and those processes are unpredictable in the manner they happen. Usually, when design is based on the idea of material timelessness, there is a shock when changes appear unexpectedly.[1] Over time, the pristine debut of materials is transformed, and weathering appears.

Decaying processes can be seen everywhere, and nature gives many examples. Pinecones come from pine trees such as the Australian and the White species, which grow in the East Side of Providence. This example provides extra information to this thesis, since the decaying process reveals information that wasn't visible before. When pinecones weather, a structural fiber is revealed from the inside. These fibers are the linkage piece that

1 Katie Lloyd Thomas, Material Matters (New York: Routledge, 2017), 96-107

forms a central spine inside the pinecone. Without the fibers, the outer and rigid crust of the pine scales can no longer perform by themselves since these enable their flexibility and thus, release the seeds stored inside the pinecone. Both elements coexist and work in partnership with each other.

Concrete and cement have a long lifespan, so the perception of weathering is difficult. The design service life is around 30 years for Portland cement, and between 50 to 100 years or longer for concrete.[2]

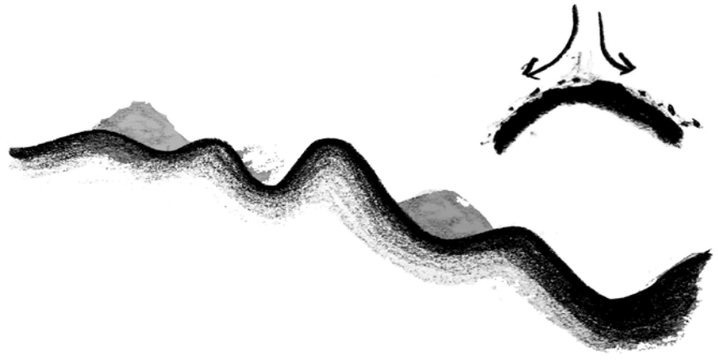
Although cracks could appear after the material is poured and finished, this is not necessarily related to a decaying process. However, same as decaying materials, those cracks will be utilized by nature, and time makes this process noticeable. Clay has a lifespan of 100 years or more, too. Most of the time, decay is caused by the strength of water movements, the excess of moisture, and coastal climates. When water causes saturation, mold grows, and the material starts a process of decaying. In addition, color change and porosity are two features revealed through time. As Mycelium comes from fungus, the outdoor weathering process starts after 6 to 8 weeks if the material is dried previously. Those lifetime differences will be explored during the different tests and experiments this thesis is conducting in order to find their pros and cons.

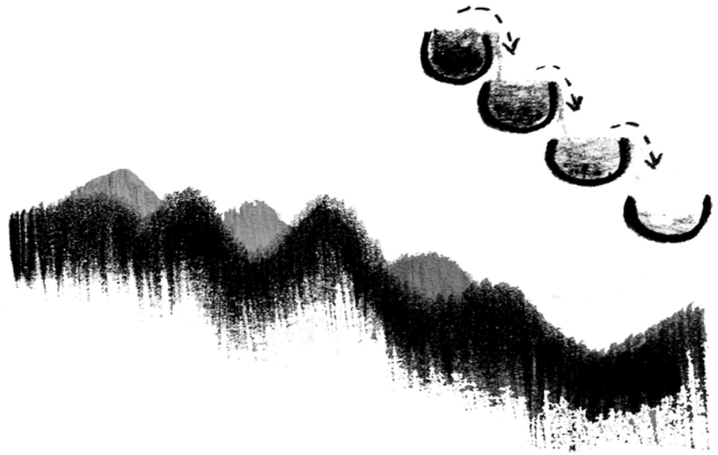
The East Side of Providence is trying to preserve a colonial aesthetic of the architecture in a modern urban grid. What it shows is that even when the city tries to preserve its original look, it has to adapt to the modern conditions because, same as with materials, this city is occupied by living species, and has a life of its own. The general aesthetic is preserved but it has a dynamic structure which changes constantly, and the substance of its materials is there to tell about history.

2 https://www.cement.org/learn/concrete-technology/durability

“...even unfinished wood, as it darkens and the grain grows more subtle with the years, acquires an inexplicable power to calm and sooth.”

Jun’ichirō Tanizaki





Top left: Section diagram of topography in Providence. Concave shapes covered by impervious surfaces.
Bottom left: Section diagram of topography where the concave shapes are covered with porous surfaces [proposal]

Next page: Top view of East Side Providence topography. The first test using water shows how it overflows the riverbanks, and floods unexpected areas, too. When the same surface is covered by concave shapes (shells), they can collect water releasing it at a different pace when they are full.

THE CONFLICT BETWEEN INFILTRATION AND IMPERMEABILITY

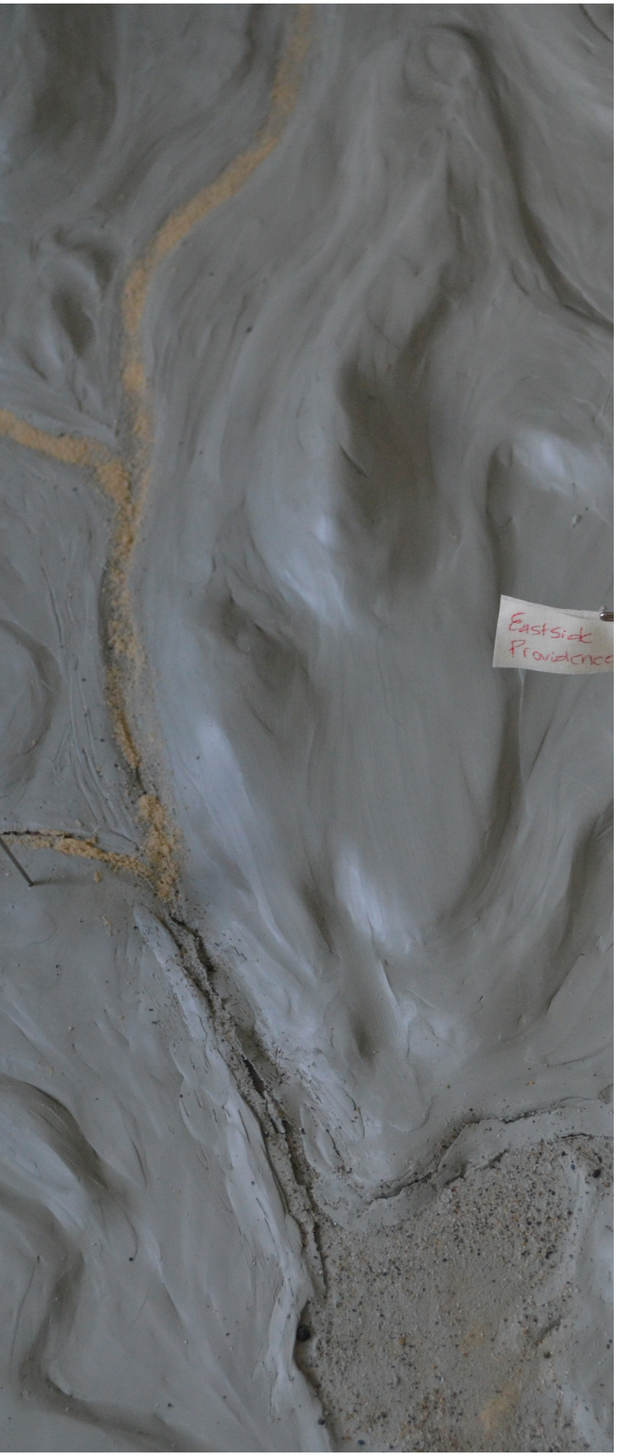
The infiltration phenomenon starts when the water is soaked up by the soil. The soil is like a sponge; it can store the water until it is evaporated or released to the lower layers of soil through percolation and / or absorbed by a plant root to be transpired later. The rate of water absorbed depends on the soil type, existing presence of water, topography and the amount of vegetation. In an ideal condition, water from rainfall and snowmelt would be allowed to enter into the soil where the water cycle process can be completed through the evaporation, transpiration, condensation, precipitation, interception and infiltration stages.[1]

Through the infiltration processes the water is cleaned and purified and it can involve either natural or artificial procedures, or both. When a fluid passes through a strainer, particles of different sizes are separated from it. It happens the same when water penetrates through the different layers of the soil before it reaches the water table. Additionally, the infiltration system prevents the disintegration and the decrease in quality of soils.[2] The water also helps to keep the topsoil together because of the moisture level it contains. It is the glue that helps the particles to stay together (cohesiveness).

When infiltration is not completed or it does not happen, plants cannot grow and it leads to soil erosion where all the nutrients, organic matter and sediments like suspended solids, toxins, heavy metals, pathogens, floatable matter, oils, and oxygen-demanding compounds are among the pollutants discharged directly or through the combined sewer systems into the water beds creating unexpected flooding areas, poisoning animal species, plants, and us. It usually happens when the amount of impervious areas occupies more than the 20% of the total surface and Providence is one example.[3]

Impervious surfaces can be concrete or asphalt. They can be roofs or parking lots. All of them have at least

1 https://www.nwrfc.noaa.gov/info/water_cycle/hydrology.cgi
2 https://extension.psu.edu/infiltrating-stormwater
3 https://www.epa.gov/sites/production/files/2015-12/documents/csofinal.pdf


Eastside
Providence

Left: Section diagram. Existing "fast lane" condition of runoff .
Right: Section diagram. Proposal to slow down the runoff, collect water and infiltrate it.

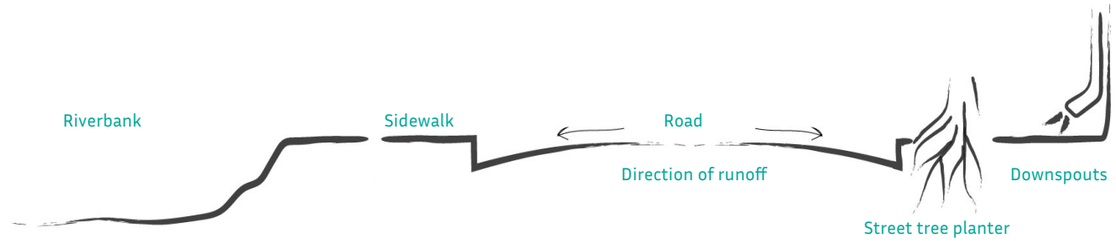
one thing in common -- water runs off of them, not through them, so the surface acts as a "fast lane."[4] Then, runoff comes with a host of problems, as described previously, with another side effect known as "urban heat island" that is basically the increment of the temperature.[5] This effect is multiplied when the impervious materials are exposed to the sun rays because they release the excess of heating into the air. Conventional paving materials can reach peak summertime temperatures of 120–150°F (48–67°C), transferring excess heat to the air above them and heating stormwater as it runs off the pavement into local waterways. Since the amount of vegetation does not cover those surfaces, the temperature cannot cool down easily.[6]

According to a study made by The Rhode Island Department of Environmental Management (DEM) in 2010, under natural forested conditions, only about 10 percent of precipitation runs off the surface, 50 percent soaks into the ground and 40 percent is absorbed by trees and other vegetation. "As roads, houses and office buildings are built, this ratio starts to change, with runoff increasing as the amount of impervious cover grows. For example, the total runoff volume for a 1-acre parking lot is about 16 times that produced by an undeveloped 1-acre meadow."[7]

The study goes on to say the amount of impervious surfaces in Providence is on average 60.8 percent of its total extension. Unfortunately, the current RI trend of large-lot, low-density development with segregated uses is creating significantly more impervious cover

4 https://www.usgs.gov/special-topic/water-science-school/science/infiltration-and-water-cycle?qt-science_center_objects=0#qt-science_center_objects
5 Lakis Polycarpou, "No More Pavement! The Problem of Impervious Surfaces", State of the Planet, Earth Institute, Columbia University, July 2010, https://www.chicagomanualofstyle.org/tools_citationguide/citation-guide-1.html#cg-journal
6 https://www.epa.gov/heat-islands/using-cool-pavements-reduce-heat-islands
7 "Impervious Cover Lets Runoff to Storm Ahead", ecoRI News, Google, Last Modified May 24, 2010, https://www.ecori.org/smart-growth/2010/5/24/impervious-cover-lets-runoff-to-storm-ahead.html

Section diagram. Downspouts release rainwater from buildings in the East Side of Providence. This water goes directly into the sidewalk and the road. The common typology shows a road crown with a parabolic section. The rainwater goes to the gutters located on both sides of the road before it reaches the riverbank.

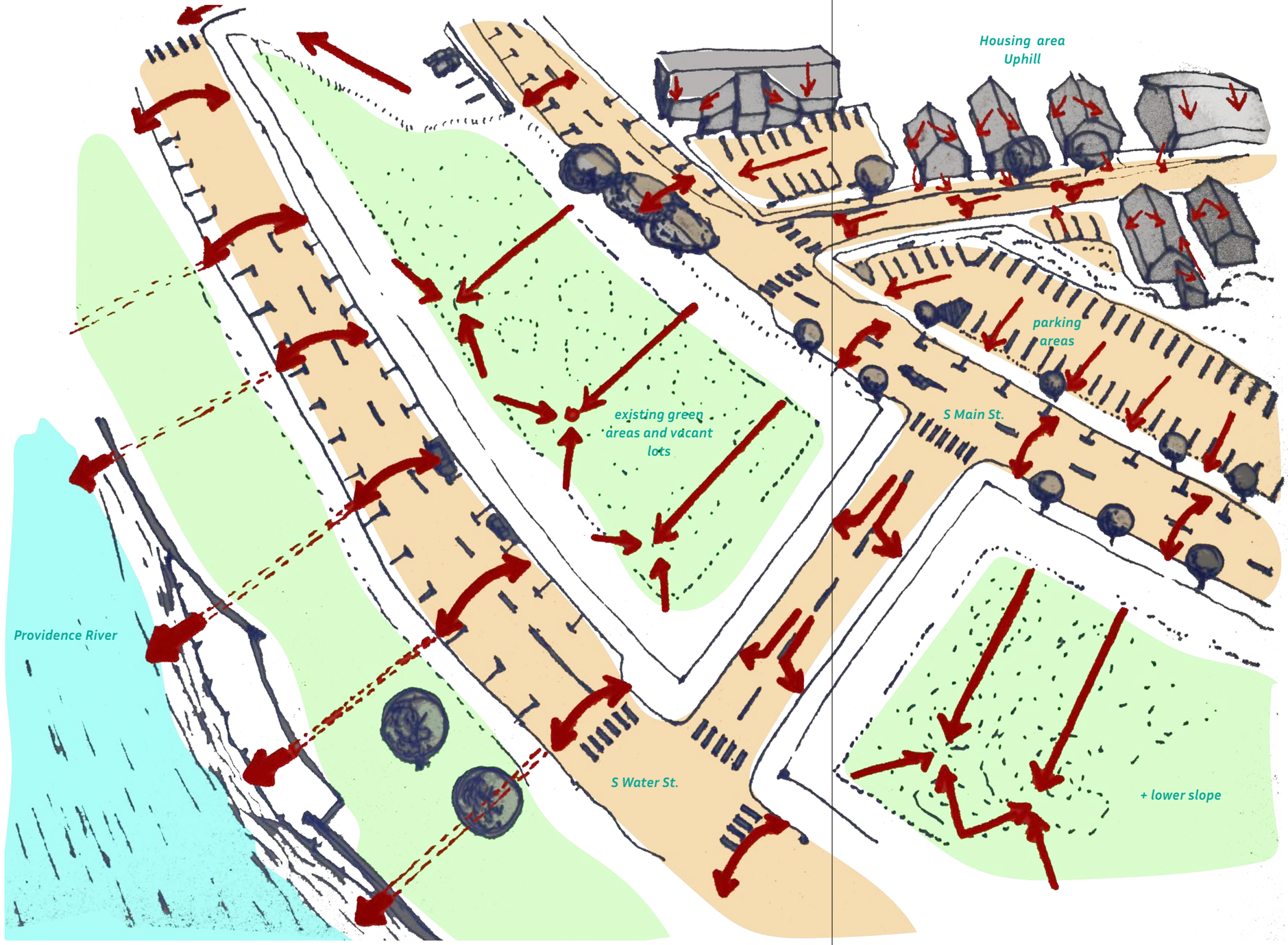


than necessary to meet growth needs. For example, Providence, with a population of 178,042; a land area of 18.3 sq.mi.; a density of 9,729 sq.mi., the impervious area is 7,672 acres or 63.8%.[8] This is very high considering that Providence is a medium-size city, and a really stark illustration of this is in the contrast between Warwick and Providence, for instance. Providence is almost twice as impervious as Warwick by percentage, but by absolute area the two are about equal. When a landscape features 25 percent to 40 percent of impervious surfaces, damage becomes severe; any percentage above that there's a good chance any damage caused will be beyond repair, according to Scott Millar, chief of DEM's Sustainable Watersheds Office.[9]

Considering the large scale of the city, an initial observation based on the topography reveals that Providence is a collection of convex shapes of different sizes with 60 percent of that surface covered with an impermeable material. The wide roads are some of the biggest and most wasteful public liabilities; they represent almost 40 percent of that impermeable surface. In gathering this information, a mock-up was made in order to understand what is happening.
In the mock-up process, topographic conditions were represented using an impermeable clay-like material. This involved covering the whole area to show how the speed of water is associated with the material that dresses that surface. A second exercise was made in which the same area was occupied with a texture of concave shapes trying to generate a porous covering. The results were different since the surface was able to slow down the speed of water and additionally, the fluid was collected for a while instead of letting it run off the surface. It also meant that some of the particles the water carried as part of the erosion process were retained. Here, the chances of having emerging landscapes of different sizes increases too.

8 https://www.rifuture.org/not-all-impervious-surfaces-equal-when-it-comes-to-stormwater/
9 Idem

Fisheye view of East Side Providence to show where the stormwater goes. It starts in the housing area and ends in the Providence River.



The sewer systems collect stormwater from rooftops of buildings, parking lot areas, and streets.

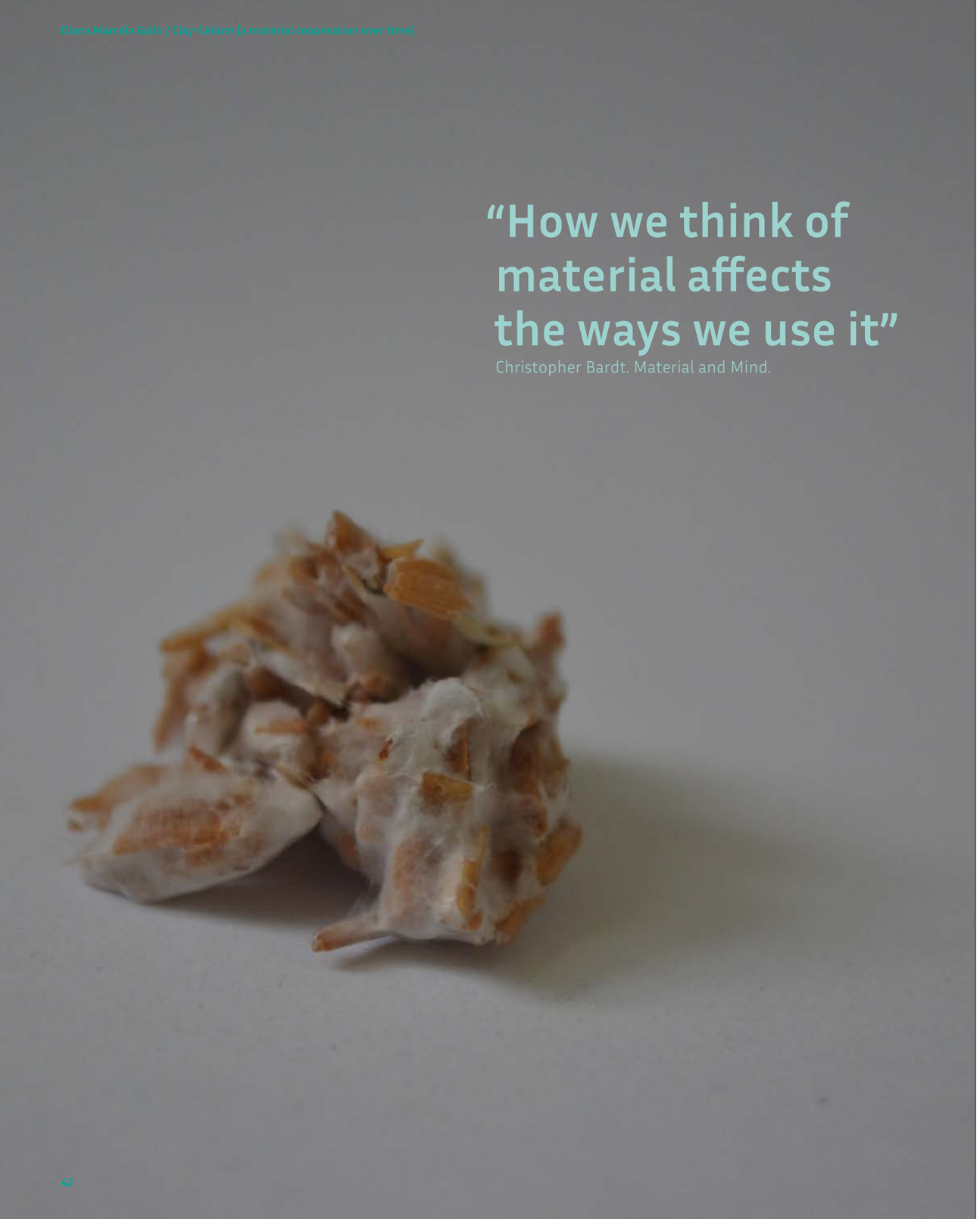
The infrastructure becomes bigger downhill because of the amount of stormwater that should be collected increases too.

To slow down and catches the water, the 4 proposals are based on the idea of the waved shape or a wrinkled shape.

Right page: Cracks in the asphalt collect material same as rivers collect stormwater.

“Most of the state’s impervious surfaces can be found within a 40-mile-long urban/suburban corridor along the shores of Narragansett Bay and in the watersheds of the Blackstone, Woonasquatucket and Pawtuxet rivers. Within this area, which the report refers to as the urban services boundary, impervious cover makes up 25 percent of the landscape.”

https://www.ecori.org/smart-growth/2010/5/24/impervious-cover-lets-runoff-to-storm-ahead.html



“How we think of material affects the ways we use it”

Christopher Bardt. Material and Mind.

Material & matter

Left page: Mycelium in its first stage of growth.

By definition, matter is the substance that gives shape to form, which is not determined by matter, this is inert in itself. Materials are extracted or manufactured, they must be worked and, once in situ, they must be maintained.

Philosophers like Plato, Aristotle, Descartes and Bergson, had a debate about the importance and the meaning of matter. Aristotle for example, created the doctrine known as “hylomorphism”, which contends that every physical object is a compound of matter and form. He was particularly interested in explaining how substances come into existence even though, as he said, nothing comes from nothing. Aristotle believed that everything was made of earth, air, fire and water.

These elements were defined by their possession of one of each of the two fundamental pairs of opposites, hot-cold and wet-dry. Aristotle also thought that these elements can change into one another[1] . Although Plato talked of “space” instead of “matter”, the interpretation is the same (we should also remember Plato taught Aristotle). This thinking was rationalized during the XVII century, where, for René Descartes, the concept of the matter was the result of dividing the universe into two sorts of science, the physical and the spiritual. Although he admitted that the two were linked, he valorized the latter over the former. By this time, matter fell within the domain of modern physics, who replaced the concept of matter with that of mass.

The philosopher Henri Bergson, lamented this move because for him, matter cannot be considered as unchanging since this eliminates the concept of time, and he took time seriously. Bergson explored the possibility that matter might differ from itself over time[2] . This debate about material and its relationship with mind and time is still happening today in other fields too.

Later, during the XX century, material was considered secondary, this was the resource to accomplish an idea.

1. Form Vs. Matter. https://plato.stanford.edu/entries/form-matter/
2 Material Matter. Gordon Matta-Clark. Matter, Materiality, Entropy, Alchemy, 44-46

Left: Concave shape made of mycelium to collect rainwater.

“...in other projects by Le Corbusier, through its apparent imprecision suggest a love of both the tectonics of the material and the hand of the maker.”

Elizabeth Shotton.

Right page: When conditions for Mycelium are modified and other ingredients like sand from the River, and corn starch are mixed in, new types of shapes and fungus show up on the surface.

The discourse of architecture for example, privileged discussions of form over matter. The formal effect was achieved through the manipulation of the substance.[3] Matter was considered passive. However, the artistic movement known as Minimalism, which emerged in the middle of the same century, rethought the meaning of materials because matter matters. Since then, many artistic fields, including landscape architecture, have considered materials the medium and the core of any outcome, they are increasingly considered in terms of their performance as well as their appearance.

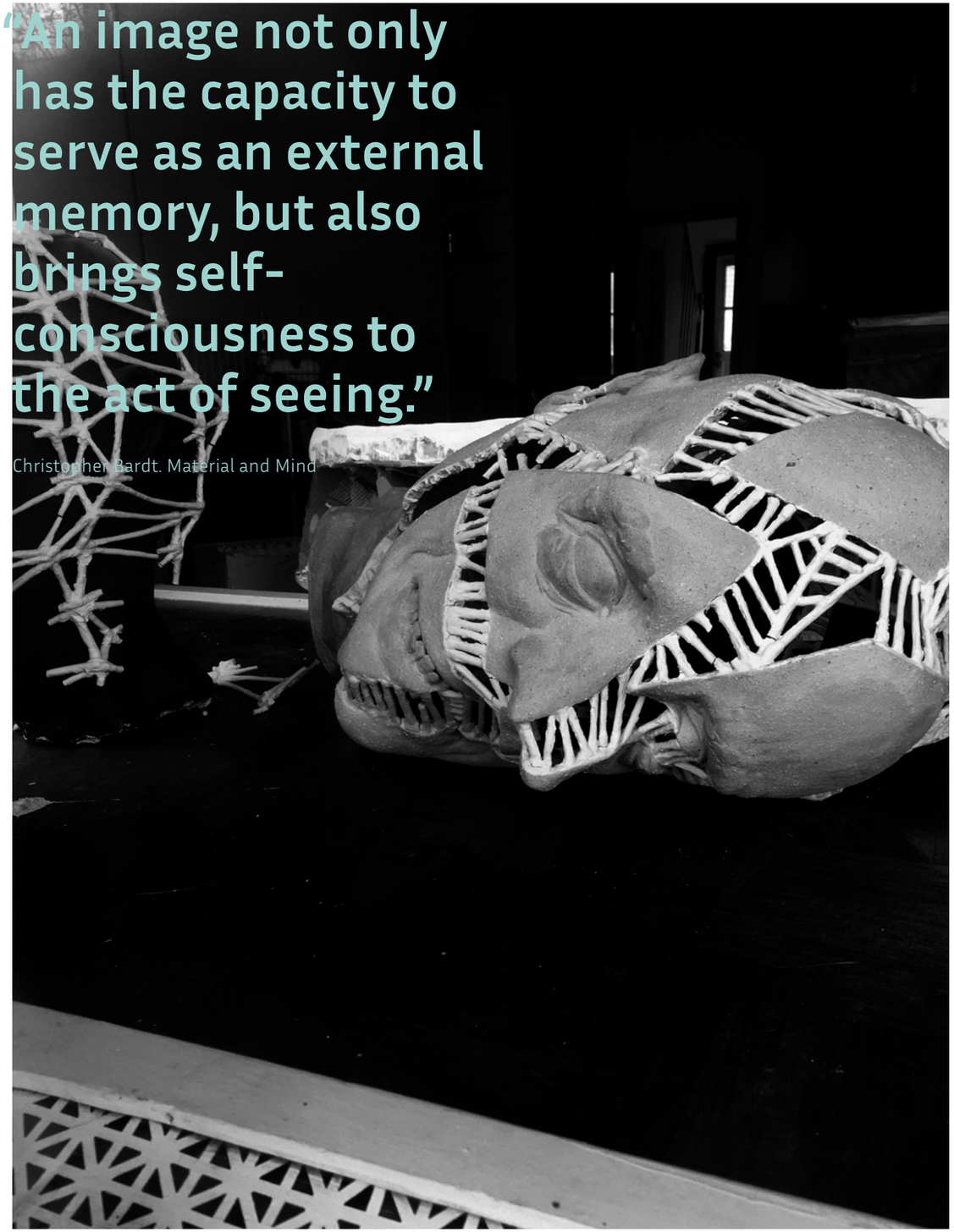
The behavior of materials is unpredictable, they do not act in the way we wish. What is true is that materials generate different ways of thinking, imagining and creating. These are resources that shape and surround us, but they do not have meaning by themselves.[4] Although materials have their own soul, we give the meaning in order to establish a relationship between human beings and materials through perception, and it is deeply related to time.

The material choice for this dissertation has been a result of the cultural and local memory and history, the existing technology, and the environmental issues that require a new ecological mentality to break old habits. This new way of thinking enables restoration of ecosystems where environmental relations are core .

This thesis aims to establish a language where materials tell the story by themselves, considering infiltration as a medium, where clay, cement and mycelium will reveal their principles and properties to deal with this phenomenon at different stages. Slow, heavy, clumsy, these materials are deep and can be felt. They stir primal sensibility while allowing nature to keep growing among those interstices and gaps that appear as a result of a deliberate decision and sometimes just by accident. These materials speak about relationships of site- form and system-topography, opening up a space to reflect on design not only from a changing aesthetic condition, but also from an environmental and structural perspective.

3 Comission, Rhode Island Historical Preservation. 1989. “Historic and Architectural Resources of the East Side, Providence: A Preliminary report. survey, Providence: http://www.preservation.ri.gov/pdfs_zips_downloads/survey_pdfs/prov_eastside.pdf .

4 Christopher Bardt, Material and Mind (MIT, 2019), 60-300



Left page: Sculptural piece found during the field exploration. Single pieces are not very meaningful until they are assembled together. The idea of a structural element came from this image.

Reference projects

The following projects are examples of how materials have been explored in the field of landscape architecture and sculpture. Both projects have in common the use of material as the main resource that shows how the interaction with time changes the perception and the relation between material, space and the spectator.

The waste of resources and other environmental issues have brought up new concerns about the meaning of materials and is questioning our relationship with them. Artists and professionals from different fields have addressed this issue in different ways. The renowned Swiss landscape architect Georges Decombes, with his landscape project Aire, used the soil as the main resource, which is shaped by the force of the water and the erosive processes. The changes of material and the final outcome can be predicted to some extent, but the final outcome is unexpected. Here, nature and material establish an intimate relationship where one cannot exist without the other.

The Italian sculptor Maurizio Montalti examines the meaning of borders (mentally and physically) through sculpture. In this case, the artist used organic bricks colonized by different types of fungus. Again, the outcome was unexpected. Here, they established a symbiotic relationship where each type respected the space of the next one, exchanged tasks beneficial for the whole group.

Other artists and professionals like Neri Oxman, David Benjamin, Olga Mesa, Toshiko Mori, and Nele Azevedo from fields such as architecture, apparel design, sculpture, arts, are working in a collaborative research with science, technology or other areas to offer a different perspective of what should be happening in the near future about a new interpretation of material transformation and its relation with the surroundings.

BUILDING GREENER CITIES WITH POIKILOHYDRIC LIVING WALLS

Category: Architec ture
Where: London - UK
When: 2019
By Whom: Marcos Cruz, Professor of Innovative Environments at The Bartlett School of Architecture.

The purpose of this project is to use the external exposed surfaces of buildings, from walls and facades to roofs which offer a vast area to absorb and store water through the hydrophilic implementation, where plants will help to improve the storm-water management of facades and increase absorption of CO2, nitrogen and pollutants while emitting significant levels of oxygen.

This project is an inspirational example to see how infiltration processes can be implemented to take advantage of the runoff instead of letting it go. To achieve this involves a collaboration between plants (like algaes, mosses and lichens) and materials like concrete.

AIRE

Category: Landscape architecture
Where: Aire River near Geneva-Switzerland
When: 2001-2015
By Whom: Georges Descombes

This project proposes to bring back the former shape of a channelized river surrounded by farming areas. The transformation lets the water shape the soil.

Topography in this project is not only the canvas but the main resource and material that is shaped by water and erosion processes. The final outcome is unexpected although it was predicted. Here, we can see how material and time are the core of the project.

This project was a good reference to study the importance of meanders in rivers, the concept of boundary, and the importance of having intermediate spaces between water beds and the city land.

S(e)AMENESS

Category: Installation (landscape)
Where: Jerusalem-Israel
When: 2017
By Whom: Maurizio Montalti from Italy

This installation raises the question of what a border means today and how it is constructed to reformulate our relationship with the world we live in. The border is a visible boundary in constant state of fluctuation according to his author.

What the author defines as border is understood as separation into an exchanging space where one stands but also where one could extend to. Fungus leads this process of degradation and decay and shows how material is impermanent and subject to a process of transformation and change at the same time.

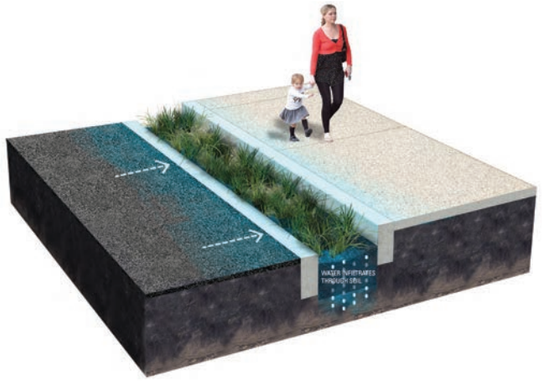
The influence of this approach represents a rich source of inspiration for this work since it explores fungus and its transformation over time. The concept of border acts as an intermediate space and as a field of exchange.

PRINCETON UNIVERSITY

Category: Urban plan for their campus
Where: Princeton, NJ.
When: 2019-2026
By Whom: Princeton University

This is a project that wants to enhance the biohabitat of the area by recovering the stream that passes through the campus. The goal is to have less erosion controlling the amount of sediment going into the stream.

This project is highly valuable to this thesis since it explores the role of the academic institution as the main actor to promote improvement to the city. The proposal is still going on and would be tested in their own campus. This example could apply to Providence to incorporate its educational institutions to these proposals as well.

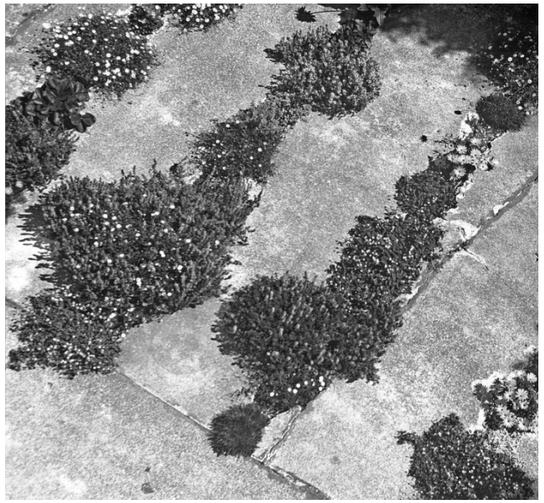


CITY OF PHILADELPHIA GREEN STREETS DESIGN MANUAL

Category: Landscape Architecture
Where: Philadelphia, PA
When: 2014
By Whom: PWD, Streets Philadelphia, Mayor's office of transportation and utilities

This manual developed a series of medium-scale proposals that can be applied to the city. These are focused on a pedestrian scale to generate the link between the sidewalk and the street through the stormwater collection system.

The idea of using permeable asphalt was an inspiration to think of a street like a big inlet that allows water to go through it and to help water to reduce the speed when it goes through the gutters.



CRACK GARDEN

Category: Landscape Architecture
Where: San Francisco, CA.
When: 1999
By Whom: CMG Landscape Architecture.

This project was inspired by the plants that fill and grow up in the tiny cracks of the urban landscape. It was developed with a minimal budget. This intervention created the possibility for a new garden to emerge.

This project is important for this thesis since the final outcome and idea behind it is similar to what this proposal intends for the typology 2.

"Inspiration can come to us at any time and from many sources."

Jim Rohn

Convex / Concave

Left: Exploring the thckiness of concave shapes made of clay to collect and release water through a drip method.

Next page: The same piece after a big storm in Providence in early April.

EXPLORATION OF GEOMETRY

To provide a simple definition for the two terms, a concave shape illustrates the inside part of a bowl. The function of this geometry is related with the collection of either material and/or fluids. By contrast, the convex shape is curved outwards so in this case neither material and /or fluids can be collected.[1] Nature has a lot of concave / convex shape examples going from elements to systems of different sizes. On a big scale, the Providence River can be abstracted as a concave body. Going into more detail, tiny elements like the cone scales of the pinecones, the tiny lichens on trees, as well as the cracks in the asphalt resemble concave shapes, too.

1 https://www.grammarly.com/blog/concave-vs-convex/

"...form is only a snapshot view of transition..."

Henri Bergson.

“All materials, each in its own particular fashion, meet our actions, resist them, transform them, and reflect new possibilities back at us, and in doing so bring our volition into a process of imagination and creativity.”

Christopher Bardt. Material and Mind

Next page: First explorations of concave shapes using different types of clay for water collection.

Some of the examples are just single pieces. However, most of the time they are part of a bigger organization, where similar elements perform in a collaborative way.

Each individual piece plays a key role in the behavior of the entire component because of the communication or linkage established between the pieces. Cone scales for example, will react when the pinecone is sunk into water. The single pieces will move to close the pinecone before the whole system gets soaked, and this ensures the release of seeds only on dry days.

Additionally, the cone scales have not a random organization, a central spine structures the single cone scales and ensures that the whole system is working in harmony.

The first stage of the hands-on process used the single materials to explore the concave shape as a starting point to move on to other variations where the bowl shape idea is re-thought, modified, distorted, or even destroyed.

Since this experimental thesis is trying to incorporate the concept of sponge effect to deal with the infiltration process, the single idea of having a bowl shape is not enough. Then, different operations are applied to the basic shape to achieve this goal.

Perforating, cracking, bending, cutting, or warping have been some of the strategies to adapt the convex and concave shapes to deal with infiltration processes. These transformations refer not just to spatial anomalies placed in any compact body, where water, air and impurities can pass through, but to the possibility of retaining pollutants from the water. Time plays a key role since infiltration, retention, and release happen at different paces. Here, the aesthetic, and structural qualities of the components should be optimized. Nature has been a referent and inspiration to achieve this goal.

On this page: Exploring clay and straw to provide a stronger structure to the clay, but also to generate a linkage element between pieces.

Right page: The first materials exploration for this dissertation were focused on how to collect stormwater.

On this page: When wet, the pine cone cells expand and open the whole system. When dried, they shrink and close themselves This is a natural behaviour that ensures the pinecones release seeds on dry days. Additional to this, a central spine organizes and structures the pine scales.

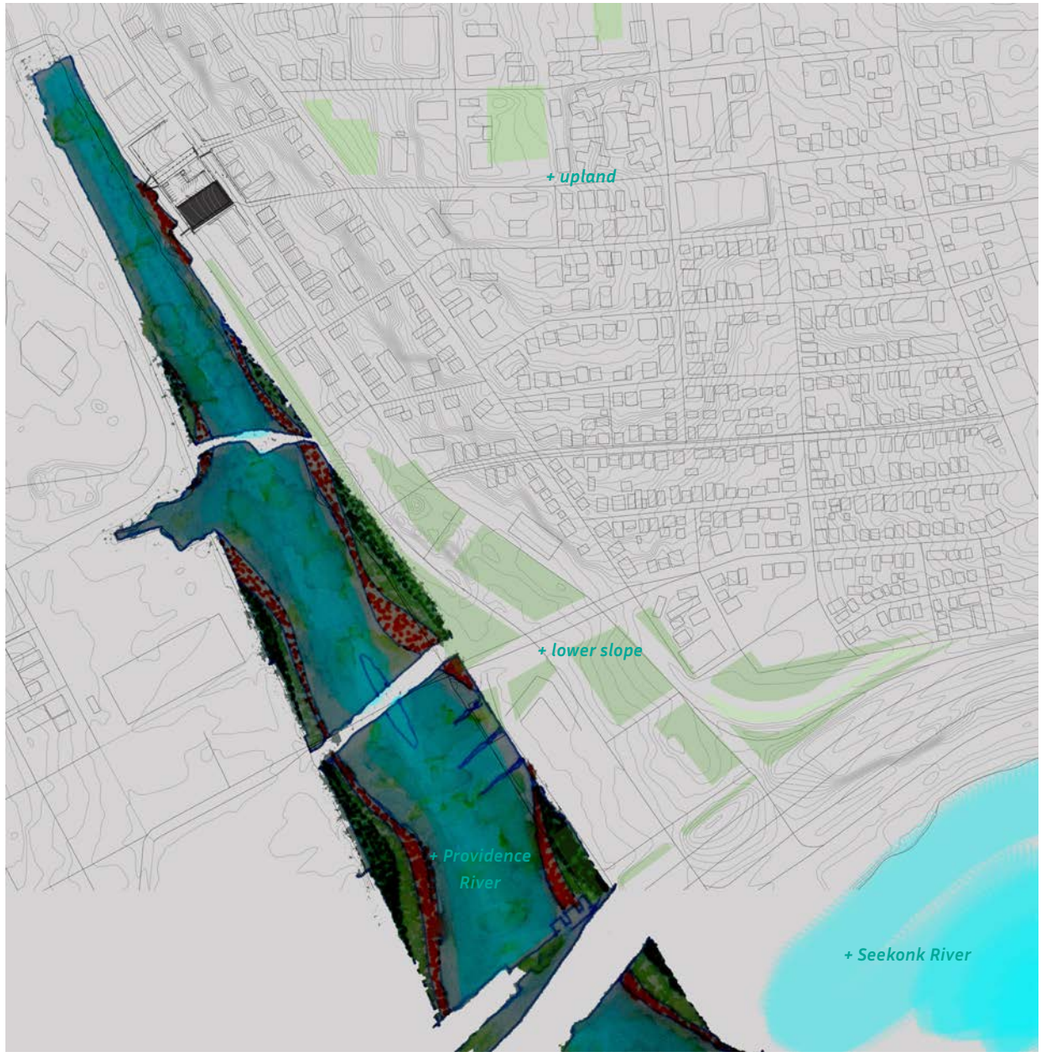
Inspiration from nature

On this page: Mosses take water from air or rainwater when it is available. They can hibernate for various lengths of time. They are natural sponges.

Next page: Stormwater at different scales. From the small scale of downspouts, to the medium and large scale of street gutters and the river. The runoff rushes across the landscape, carrying pollutants and biological contaminants into the waterways, poisoning fish, wildlife, and us.

The sponge effect

Exploring the material qualities, the study of water absorption is one of the key points to develop this research. Nature has free samples where we can see how this happens, this has been taken as an inspiration resource to develop some of the mockups. Little mosses take water from air or rainwater when it is available. When they do not have this resource, they do not die right away. First, they dry almost completely out (or desiccate), turning brown in color and go dormant. They can hibernate for various lengths of time. Although they can survive without water, they require water to grow. They are natural sponges.
During one of the first experiments where the concrete was mixed with sponge, they became one single element. The concrete was casted allowing water to pass through it in order to reach the sponge, so the outcome was a single element with a hard surface on top and a softer one below that caught the water and released it under pressure.
This experiment was also inspired in a referent project about stormwater management through using porous asphalt design developed by the University of New Hampshire and the Stormwater Center in March of 2011. The system combines stormwater infiltration, storage, and structural pavement in a single system. It uses a bed of uncompacted soil under the pavement porous asphalt surface to facilitate infiltration. The pros of this technique are that the amount of runoff water is reduced, and it lets water go back into the ground, reducing the sediment loading and the drainage structures, too. The cons are related to qualified and successful installation processes with the high costs during the installation, it requires a maintenance using a powerful vacuum system where vacuuming is required minimum of 2-4 times per year for low use sites and up to weekly -monthly for high use sites, and the measure of the surface infiltration should be rated annually. In addition to this, this system does not promote the use of more environmental and eco-friendly alternatives.



Left page: Top view of the Providence River in the East Side of Providence. The proposal wants to bring the meanders back to the river. All the nutrients from the soil, organic matter, and sediments like suspended solids, toxins, heavy metals, pathogens, floatable matter, oils, and oxygen-demanding compounds are among the pollutants discharged directly or through the combined sewer systems into the river.

Typology 1

THE RIVER

The first typology corresponds to the Providence River, where all the runoff is collected. Here, all the nutrients, organic matter, and sediments like suspended solids, toxins, heavy metals, pathogens, floatable matter, oils, and oxygen-demanding compounds are among the pollutants discharged directly or through the combined sewer systems into the water beds.

The Providence River and the Seekonk River have been channelized with transportation purposes. However, channelizing a river has its cons because all the complexities of a natural stream ecology are homogenized. That disrupts all the fish, amphibians, birds, mammals and plants that live there. The aesthetics, too, come to be degraded. The result is just not a natural looking river. According to the online article from Hv1, “Channelization: a solution or a problem?” “Nature’s sublime beauty is replaced by something that looks like it should be in a highly manicured park, picturesque but not natural.”[1]

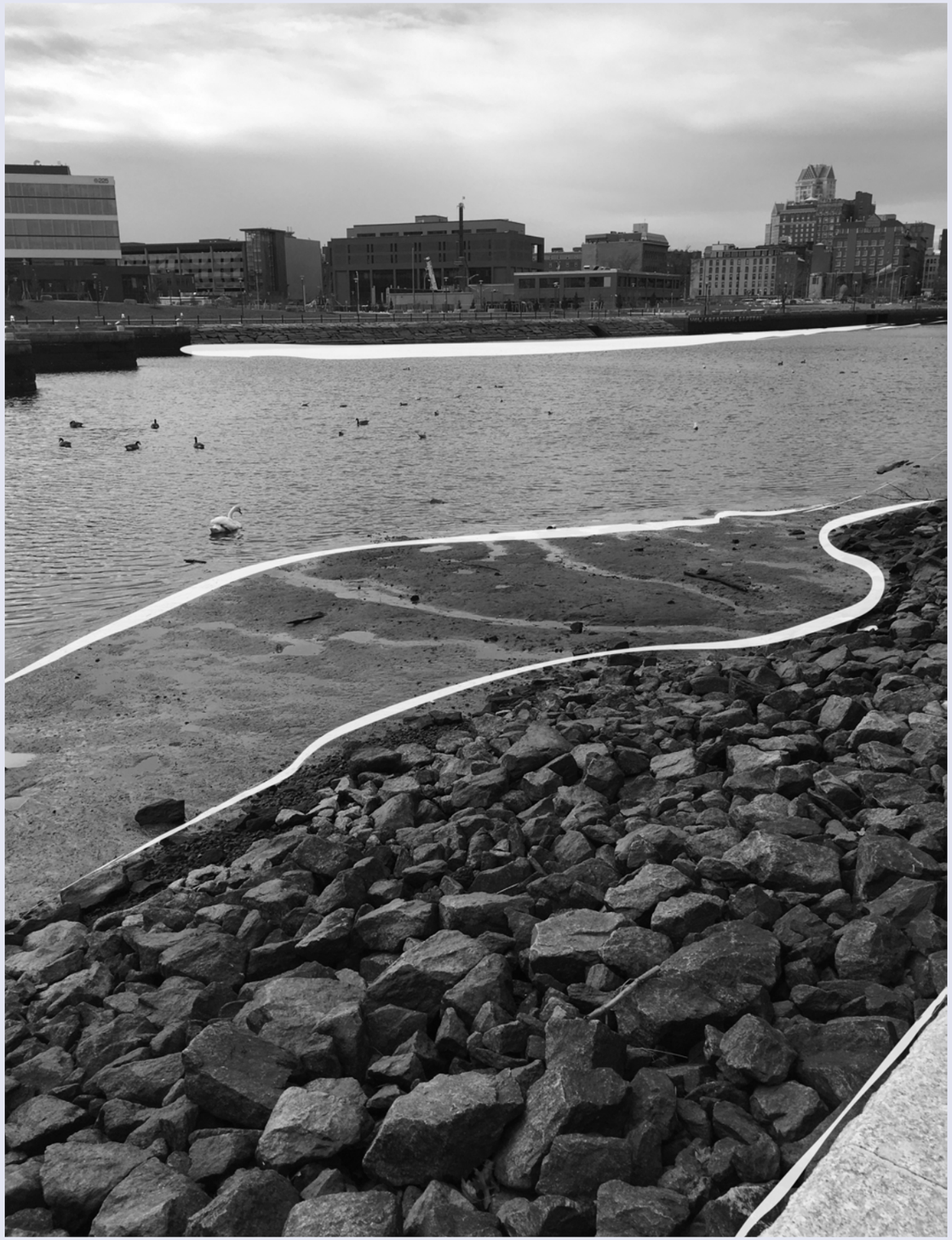
The same article talks about another problem: a channelized stream encourages a faster flow of water when it floods. Instead of mitigating flood damage it quite very possibly will increase the threat. All the natural irregularities of the stream provided a needed friction and they are now gone. Floods of fast flowing waters are powerful agents of erosion. They can sweep up very large cobbles and even large boulders and carry them long distances, and this is bound to happen, sooner or later.

At this scale, the main goal is to create a space that works as an intermediate area between the street system and the River where all the stormwater is collected. Following the shape of the Providence River during low and medium tide the edges are not straight lines, but they meander. Other projects like Aire in Switzerland are trying to preserve the natural contours of rivers, where the boundaries of the stream are naturally formed by the water.

1 Titus, Robert. 2012. “Channelization: a solution or a problem?” hv1

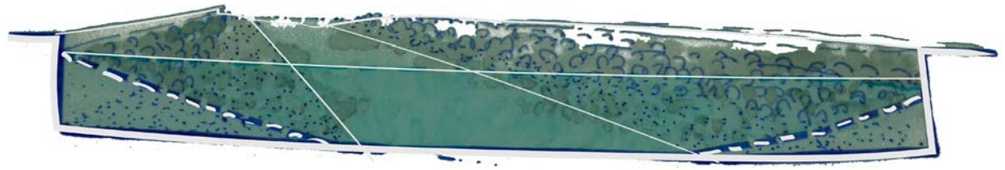
Right page: Following the shape of the River during low and medium tide the edges are not straight lines, but they meander.

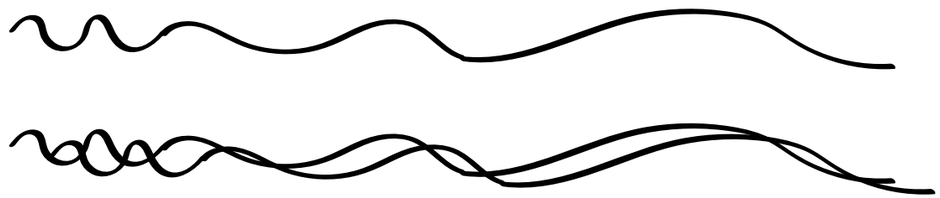
River pockets where plants and gardens can grow in a bigger system



Left page: Actual view of the channelized Providence River from the new pedestrian bridge.

On this page: [Upper sketch] Section of the existing condition of the Providence River. The movement of water meanders instead of going straight.
[Lower sketch] A birds-eye view uses wrinkled shapes to bring the meanders back into the river and to create an intermediate area where the runoff can be collected before it reaches the river.

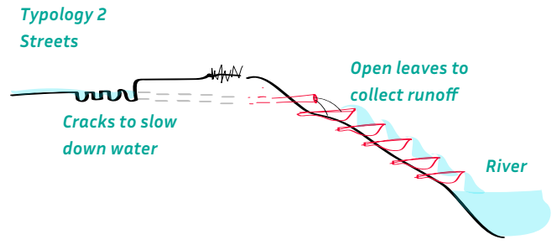




Intermediate areas

Left: According to this proposal, having warped or curved riverbanks, new areas will appear between the River and the street network.

Lower sketch [section view] , The proposal is based on creating elements like spoons buried into the soil to catch and collect the storm water. Those elements would cover the entire surface in order to start a particle cleaning process.



Based on that referent, the proposal is using wrinkled shapes to bring the meanders back into the Providence River and to create an intermediate area where the runoff can be collected before it reaches the River. The purpose of doing this is to improve the bio-habitat in the area as well as reduce the sediment going into the River. The creation of these areas through the implementation of meanders, should have an impact on the surrounding ecosystems and will give the opportunity to restore wetland areas, too.

Right: The open leaves or spoons would cover the surface of the meanders to catch the water from the runoff to start a cleaning process before it reaches the river. This will create tiny swimming pools during low tide.

Next page: The same elements after a decaying process, where half of the spoon still remains *in situ*. The element is not collecting the same amount of water, but it is still retaining sediments and small particles from the water.

“We shape clay into a pot, but it is the emptiness inside that holds whatever we want”

Tao Te Ching.

Having the warped or curved riverbanks, the material proposal is based on creating elements like spoons buried into the soil to catch and collect the storm water.

Those elements would cover the entire surface in order to start a cleaning process of particles. During low tide, most of the water is released but a small amount will remain there as tiny swimming pools.

Studying the life span of the element, the cantilever part of the spoon failed after a big storm in Providence in early April. However, even after that failure, the half of “spoon” that remained there was still working, and its function was adapted to the new shape having a slightly different change because the concavities were not collecting water but storing little particles of sediments. This offered a new texture for the edges of the River, too. As a conclusion, using clay and mycelium as a transitional element gives the opportunity to help nature to conquer the place again.

Left page and below and the next page: Different explorations between Clay-celium and different types of fibers found in the surroundings of the East Side of Providence.

Material exploration

2

"you can have a conversation with concrete...the beautiful of what you create comes if you honor the material for what it really is"

Louis Kahn

One of the biggest challenges is how to link two different elements, and how to link different states of matter among liquid, solid and malleable materials like clay. So, the possibility of using fibers to create that connection is explored in this chapter, where jute and straw are the most successful to achieve tension and the most resistant to outdoor conditions. However, the development of a linkage system is unsuccessful at this stage.

Hybrid explorations among clay, cement, mycelium, and fibers like yarn, straw, jute, as well as fibers from phragmites, and invasive specie in the New England area, were some of the materials used for the exploration.

Left page: Top view of the typology 2. The system between streets and parking areas increases in size and number when they are closer to the river in the lower slope.

On this page: Diagram in section. A wrinkled system that allows water to slow down when passing through it, and at the same time, allows mosses to grow there since they are natural sponges.

Typology 2

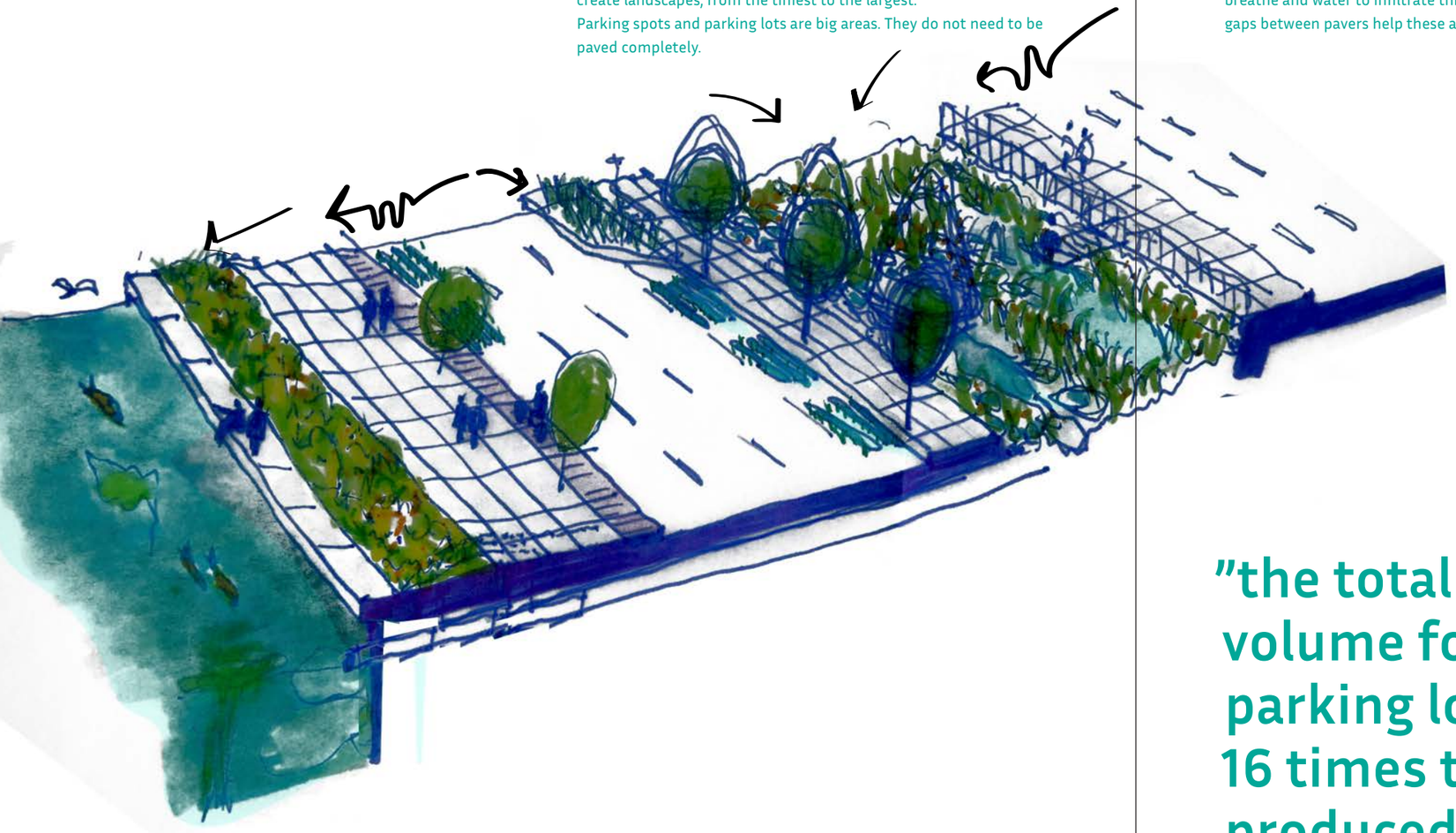
STREET NETWORK SYSTEM AND PARKING LOTS

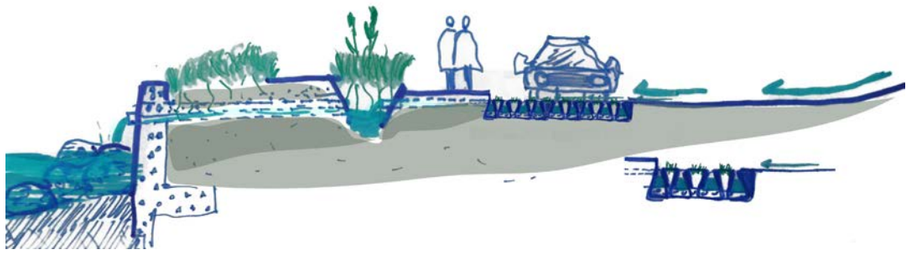
This is about the street network system and parking lots, where the streets are like open channels carrying stormwater. The entire system between streets and parking areas increase in size and number when they are closer to the River in the lower slope.

This typology was mainly focused on the parking areas on the street and in the parking lots. Having studied some referent projects like the Crack Garden project by the CMG Landscape office, the proposal was inspired by cracks located in the space between the wheels of vehicles to let water infiltrate into the ground to create gardens in parking areas because these spaces are not occupied 24/7, so the implementation of a green system means a lot. In addition to this, pavers with infiltration gaps would create big inlets in the streets that also help to slowdown the speed of water running through the street gutters.

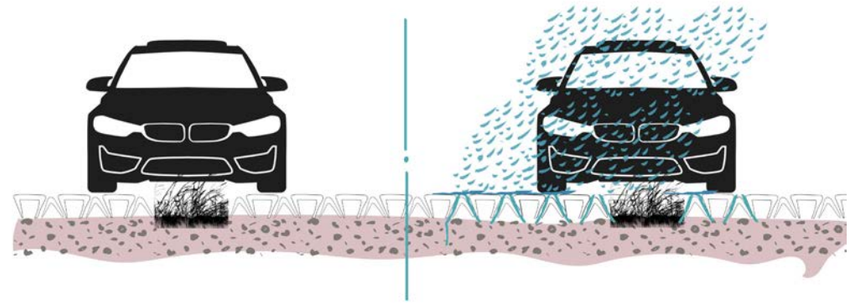
In the East Side of Providence, RISD and Brown Universities are occupying a big portion of that area, part of which is used as parking lots and as part of the street system. The schools generate a big income and impact in terms of mobility and transportation in Providence. Same as other universities like the University of Pennsylvania, their campuses could become an open laboratory to test and to implement a solution that benefits the whole city.

Perspective view and section. When the street system meets the intermediate spaces or green areas. The runoff could be collected to create landscapes, from the tiniest to the largest.
Parking spots and parking lots are big areas. They do not need to be paved completely.



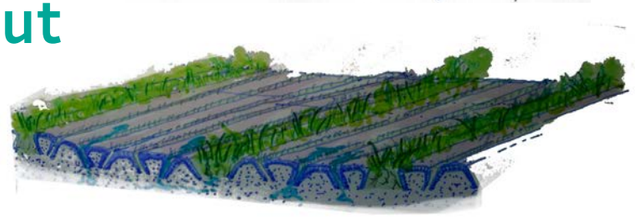


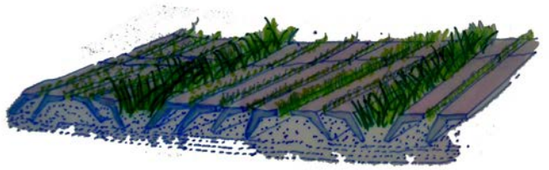
Top: Section. The creation of a crack system allows using the space between the wheels of vehicles. Cracks would allow the soil to breathe and water to infiltrate through them as well. In addition, gaps between pavers help these areas to be more permeable.



”the total runoff volume for a 1-ace parking lot is about 16 times that produced by an undeveloped 1-acre meadow.”

According to DEM Rhode Island.





Perspective: different types of pavers

The implementation of a green system means a lot. Pavers with infiltration gaps would create big inlets in the streets that also help to slowdown the speed of water running through the street gutters.

“Providence has 60 percent of the land covered with an impermeable material.”

According to DEM Rhode Island

The exploration of the geometry for those cracks was an opportunity to try mosses in collaboration with mycelium and clay. The collaboration was very successful. This could be implemented in a bigger scale since mosses can store water, and even when the material of these cracks starts decaying the crack system will remain there and mosses will take that place.

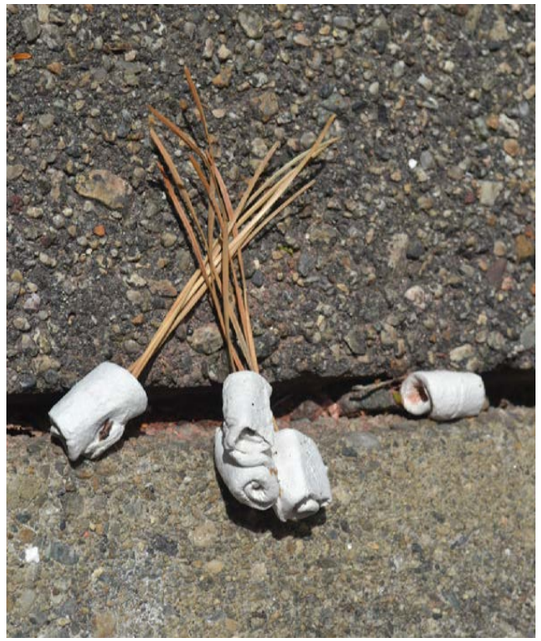
Right page: The collaboration between mosses, clay and mycelium has been very successful. This could be implemented on a bigger scale since mosses can store water too.

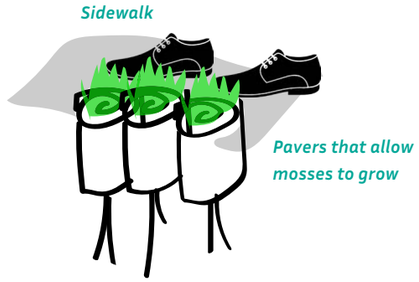
“We hammer wood for a house, but it is the inner space that makes it livable.

We work with being, but non-being is what we use”

Tao Te Ching

Clay-celium exploration in order to create elements where mosses could grow, water stored and collected. The explorations include straw since it is the strongest fiber.





Left page: The third typology is the transition between the street and the sidewalk. The solution would be focused on uphill, where the residential area is established.

On this page: Diagram of proposal [top view]. The straight line that divides the sidewalk and the road is modified to use a wrinkled shape instead. The purpose of this is to have some concavities or green pockets where potential gardens are proposed.

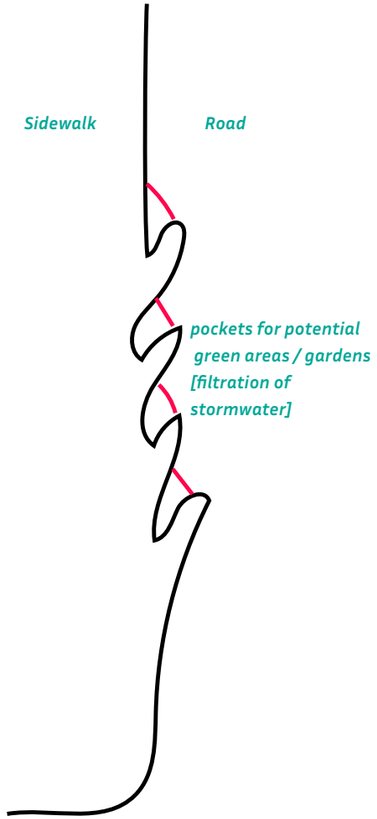
Typology 3

STREET SYSTEM - SIDEWALKS

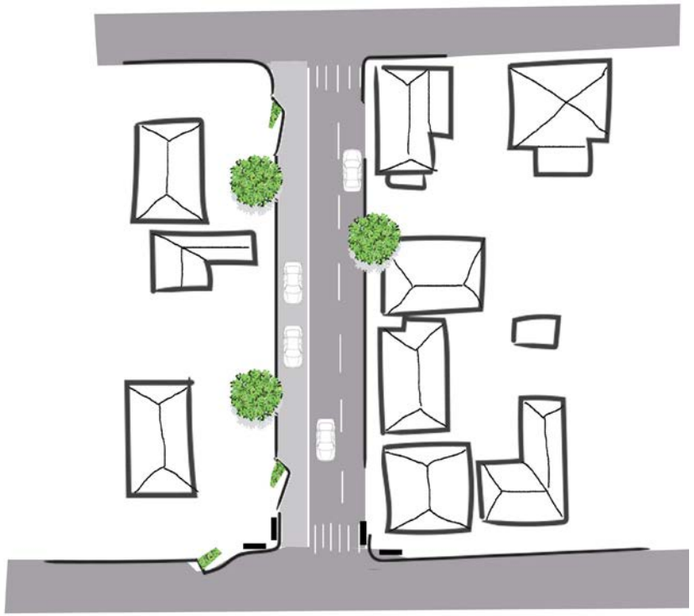
The third typology is the transition between the street and the sidewalk. The typical cross-section of a street in the East Side of Providence has two components, gutters on both sides of the street and a parabolic shape or a crown in the middle. Drain inlets appear on both sides of the streets to start collecting the stormwater.

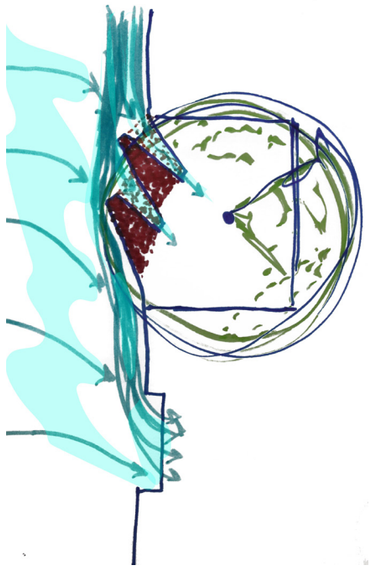
The straight line that divides the sidewalk and the road is modified to use a wrinkled shape instead. The purpose of this is to have some concavities or green pockets where potential gardens are proposed. Other cities and similar projects like bioswales have been referents for a general proposal at this scale.

Understanding that those options have been widely developed, this thesis is not proposing a detailed idea at this scale but brings forth a general idea that tries to link the big scale with a smaller one. Although this is not completely developed, the space created between the elements frames the space for parking spots where the previous typologies could be implemented as well.



Top left: Plan view with the proposal of green pockets for streets.
Top right: Plan view-detail uses the same system to infiltrate water into the existing planters.
Bottom center: Perspective view of the proposal for this typology.





On this page: How to improve the street system of tree planters or complement it through the implementation of green pockets to infiltrate water, and to have green spaces?

Left page: Top view. The fourth typology corresponds to a smaller scale where downspouts become the link between the private and public areas in terms of stormwater management.

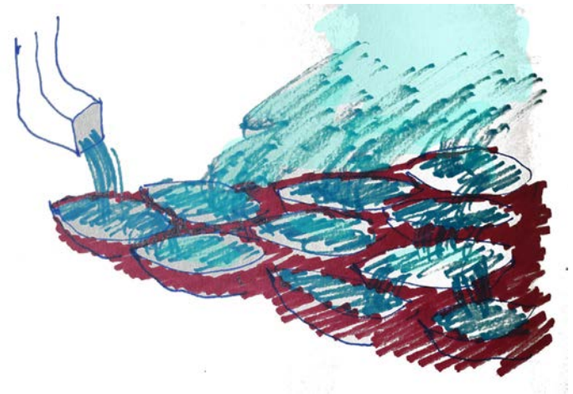
On this page: A general view of the proposal. A perforated element slows down the rainwater, catches small particles, and releases the water to the next downspout element or to the next typology.

Typology 4

SIDEWALKS - DOWNSPOUTS

One of the biggest challenges is how to link two different elements, and how to link different states of matter among liquid, solid and malleable materials like clay. So, the possibility of using fibers to create that connection is explored in this chapter, where jute and straw are the most successful to achieve tension and the most resistant to outdoor conditions. However, the development of a linkage system is unsuccessful at this stage.

Hybrid explorations among clay, cement, mycelium, and fibers like yarn, straw, jute, as well as fibers from phragmites, an invasive species in the New England area, were some of the materials used for the exploration.

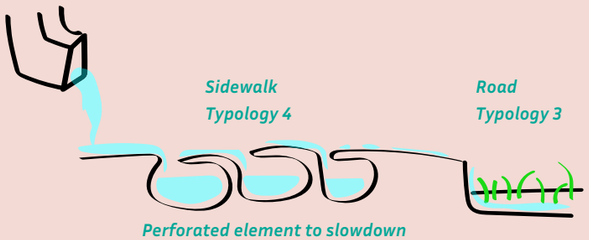


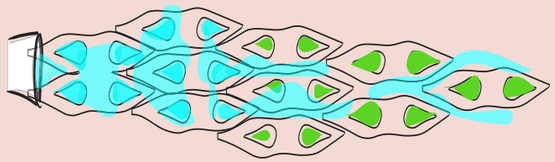
Diana Marcela Gallo / Clay-Celium [a material cooperation over time]

Middle left: Diagram in section [proposal]. The wrinkled shape, creates concavities of different sizes to catch the water from downspouts in order to slow down the stormwater when it runs over the slope before it reaches the next downspout element.

Bottom left: Top view [proposal]. This uses a similar strategy of typology 2. Some concavities collect water as tiny swimming pools to release it through a gap system, and others are used mainly as tiny pockets for mosses and plants.

Right: A successful experiment of flower seeds [Alaska, and Cynoglossum Blue] growing from Mycelium.





Left page: A concave shaped cement was used to test the amount of sediment collected week-to-week from a downspout. After three weeks of rains, the amount of particles is noticeably increased.

On this page: When it rains, downspouts expel all the water from the roofs to outside, but since the surfaces are not ready to receive that amount of water, it starts eroding immediately.

“They are important species that will pave the way for diverse biological life to re-emerge after an environmental catastrophe.”

About fungus...
Janet McGaw

...REFLECTIONS AND RECOMMENDATIONS

The East Side of Providence is one of the areas where big universities like RISD and Brown have been established. Even when they occupy less than 50% of the total area of the East Side of the city, they generate a big income and a huge impact in terms of mobility, transportation, use of the land, and population.

After this research, one of the conclusions is that RISD could have active participation in the construction of this part of the city. RISD’s campus is spread out and it gives a big potential to re-think some areas like parking lots, and streets in terms of stormwater management. Thinking of RISD as an open laboratory to test ideas would have a positive impact on the development of this city and it would be a good example for other institutions that occupy similar areas in other cities. Universities shouldn’t be focused just on making economic contributions without taking advantage of all the resources they already have and the knowledge they generate every year. The control and management of stormwater through the participation of different departments like the Landscape Architecture Department is an opportunity to re-think the parking lot areas to enhance infiltration processes and to replace part of the impervious surfaces.

The use of Clay-celium, could be applied at many scales. However, since the three materials work in compression, it is highly recommended to incorporate a fiber or other material that works in tension to have a stronger linkage element. Other options to replace the traditional cement has been discovered. It would be recommended to look for alternatives in order to replace the use of traditional cement.
As a conclusion, during the explorations, one of the findings is that trying the collaboration between two materials gives a better result.

One of the failures during this process was not to focus on the material exploration of hybrids as climate-responsive structures that perform differently according to external conditions like climate. Since Mycelium is a material that is alive, it could give the chance to think of hybrids that may perform differently. Hybrids might be adjusted to perform according to what happens outside.

Finally, nature gives us not only an inspiration but a lesson of how materials could perform better. This might be considered an initial exploration that utilizes Clay-celium as a potential material.

Lexicon

C

CEMENT: Concrete is the final outcome after mixing cement, sand, aggregates, and water. It sets after days when a curating activity should be implemented because a fast process of dehydration. It is able to adopt any shape when it is still liquid and reaches its maximum strength when it becomes solid.

Cement is an ingredient which plays a key role to produce concrete when it is mixed with water, sand and aggregates like gravel. It is also used to create mortars. It sets after hours so a curating activity should be implemented because its fast process of dehydration. The pleasure of this material lies in its ability to retain the history of its former state, the moment when it is casted. It gives opposing qualities of fluidity and solidity in a final form that emulates a stone.
It is made by clay and other materials like limestone under temperatures that reach 1500 C in a kiln.

The boom of its popularity happened by the time of its implementation in the construction of high-raise buildings at the beginning of the XX century. Nowadays, the use of this material happens around the around the world. Even in some countries, the use of concrete is linked to development and financial status. However, this is also a problem because local materials -with much less impact to the environment- have been replaced. In addition, its production process has been questioned because of the decaying of many ecosystems and the contamination of water during the extraction activities, which have had negative consequences on nature and its surroundings. Finally, the implementation of this material in big areas contributes to the “heat island effect”.

According to the Materiology book, cement is one of the materials that in combination with other agregates (sand and other agregates) creates concrete, its properties are enhanced by mixing those materials.
This can be considered a new material since it appeared for the first time in the 19th century. Its components are limestone and clay. Cement is a fired mineral powder that becomes a paste when it is mixed with water. It is produced around the world and nowadays, it is the most common material used in construction.

Based on Materiology. book. Pages 99-103. by Materio. Published by Frame publishers Amsterdam and Birkhauser.

CLAY: Since the 5,000 year this material was used to fabricate tokens because its capacity to be easily shaped and tooled to be marked with an instrument. This material can be easily formed, impressed, imprinted and marked because its elasticity. When it is fired it changes from soft to hard.

It is also a noble material since it can be printed with a series of marks and fingerprints that tell us about a process.

It is constituted with fined-grained mineral. This is the major component of sedimentary rocks.
When wet some of its propierties include swelling behaviour and low permeability. The composition of clay depends on the mineral and chemical compositions of the parent material. This is considered as an optional aggregate material for concrete.

Based on Materiology. book. Pages 94-100. by Materio. Published by Frame publishers Amsterdam and Birkhauser.

CONCRETE: It is the fundamental element of construction used from egyptians. This has played a key role in the development of cities around the world. A wide range of agregates and cements can be used.
When it states in a liquid state it has almost no limitations in terms of form. It works really good under compression and with the addition of reinforcing steelbars its resistance (to tension forces) is increased.

Based on CONCRETE DESIGN book. edited by paul w. McMullin, Jonathan S. Price, and Esra Hasanbas Persellin. Introduction chapter.

D

DECAY: A transformation process where the decomposition and disintegration happens because of the interaction of many factors like fungus, bacteria or other organisms. It is also caused by phenomena like erosion, or exterior conditions like sunlight, wind, saltywater, and so on. We shouldn’t necessarily say in the case of materials that they die, but they weather, rot, deteriorate, and patinate. Those processes could be unpredictable.

F

FILTRATION: Mechanical process where the liquid gets separated from the solid particles floating in it. This practice is important for detention of stormwater runoff and to treat pollutants in stormwater runoff. Vegetation can be used in this practice with additional benefits such as cleaning air, improvement of habitats, improving of habitats and retention of carbon particles.

I

INFILTRATION: The process of a fluid to penetrate or get access into a porous substance like the soil. We could say infiltration is the rate or the amount of water that passes to the soil when a process of filtration happened before.

M

MATERIAL: Materials are the primary resource to build up a landscape. They have the power to reinforce or establish a relationship between the design and the place with the human beings. Materials are made from matter and they can change shape, color, size among others. They tell us about the relationship between the sites (place of origin) and Non sites (more abstract spaces where the materials gave sense to the architecture or landscape design.

Based on Reciprocal Landscapes by Jane Hutton

MYCELIUM: Mycelium is a vegetative part of any fungus and this one is something between animal and plant. Its body is made by carbon. The material that compounds their cell walls is more similar to the shells of insects than a leaf. The energy it gets comes from ingesting organic matter (like animals) Fungi has to stablish connections to other living matter since they do not photosynthesize. They are very important in any ecosystem because they turn waste into compost.

In addition to this, the research made by the professor of forest ecology Suzanne Simmard over the past 25 years, has demonstrated that mycelium networks enable trees to warn one another of impending insect attack. They use mycelium to send electrical signals so these can release toxic tannins or acids in defense. Then, the work of mycelium could be compared to the neurons in the brain or the data that flows on internet. Mycelium uses the same strategy when is used in architecture projects, protecting buildings from plagues like ants. As they can grow without light and decompose living and non-living materials to produce energy, they can transform landscapes that has been contaminated with diesel, oil, petroleum, and biological wastes into productive soils in less than three months.

As Paul Stamets (mycologist: expert on fungi) observes, Mycelium could be seen as “dark matter”, the invisible substance that scientists believe makes up a quarter of the universe: the black between the celestial bodies.

Mycelium could be considered as a mass of branching (tubular filaments). The amount of branches depend on the nutrients the soil has. It performs in a varied range of projects but in the field of landscape it can be used to break down toxic waste improving the health of the evnironment by filtering water, helping plants to grow and controlling insect pests.

Based on MYCELIUM RUNNING. book. Paul Stamets. Pages various. Ten Speed Press. Berkeley.

S

SITE: It is the space defined by physical and non-physical features such as its location, lenght, depth, hegith, texture, shape, scale, proportions, cultural limits, history, ethnic, political causes, disenfranchised, social group. The site gives the material source and inspiration in design, through different approaches to the “site”, artists, performers and installations define limits and boundaries in a different way. The globalization redefines this concept because the artistic element
does not belong anymore to the site. It is just set up in any context.

based on Genealogy of site especificity by Miwon Kwon and Groundwork by Robert Drips

SPEED: It has a strong relationship with time, movement and perception (mind-brain). Nature, dreams, photography, drugs, illness, age, technology are some resources that allow people to experience different kinds of speed. [speed it up or slow it down].

It is associated also with the perception [brain] and the external stimuli. “I wondered sometimes whether the speeds of animals and plants could be very different from what they were: how much they were constrained by internal limits and how much by external gravity of the earth, the amount of energy received from the sun, the amount of oxygen in the atmosphere, and so on.”

Based on Aberrations of Time and Movement by Oliver Sacks

T

TEMPORARY: It is the condition that makes a landscape disappear after lengthy time periods.
Social conditions can change our perception. Parades, funerals, concerts can be some examples that modify our perception of the landscape space without modify it phisicality.

From this term, we could talk about temporality that is not applied to spaces literally but just to talk about special qualities of the temporary rather than the actual duration of use. When we try to reveal unique qualities from the idea of temporality we can talk about “temporary uses”

Based on Journal of architectural and planning research _Temporary Landscapes by James M. Mayo

TIME: It is a dimension of our being. It can being measured if there is a reference in terms of movement and space. According to Ricoeur, it is used to explain ourselves how and where things happen. To reinforce this idea “the conclusion is that we can be aware of time and measure it only while it is passing”
We could also relate the term time with velocity, to understand how this term can be applied deppending on the observer or the context. How we perceive the world outside with different outcomes depending of the strategie that we use to modify the time.The perception of time is directly related to the brain and it differs from one specie to another. Sacks uses time as a unit to measure speed “William James
speculated that our judgment of time, our speed of perception, depends on how many events we can perceive in a given unit of time”

“Objects do not preexist as such” says Donna Haraway. “Objects are boundary projects. But boundaries shift from within boundaries are very tricky. What boundaries provisionally contain remains generative productive of meaning and bodies”

Based on Aberrations of Time and Movement by Oliver Sacks and Spatial Agency by Nishat Awan; Tatjana Schneider and Jeremy Till.

TYPOLOGY
It is a collection of a single type , class or category. The assemblage is based on a shared attribute
WEATHERING: The word that describes material’s behavior over time. This is a constant and unavoidable condition. The effects when it weathers, rots, deteriorates, and patinates surrounds us. Each of these shows us unexpected outcomes. “Time’s effects on materials are often unsettling” says Christopher Bardt

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“...one must study not only finished forms, but also the forces that moulded them: the form of an object is a ‘diagram of forces”

D’Arcy Wentworth Thompson.

I am...a landscape architect with a background in architecture who enjoys and respects nature and explores new experiences. I believe materials have their own soul. Then, since everything comes from a natural source, everything has life. I am committed to use my knowledge and experience to contribute and show to others how we can make little changes to preserve landscape. I am committed to not losing hope because when you think that there are no possibilities for landscape, a tiny and green grass appears on a stone or a log.

As flowers have a time to grow, blossom and die, I am committed to contribute from every “final stage” and make from this a new start of a landscape experience.