

NOVEL ECOLOGY

NOVEL ACTIVITY

master of landscape architecture
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**NOVEL
ECOLOGY**

**NOVEL
ACTIVITY**

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This thesis wouldn't have been possible without you all.

Dedicate to my family

How can the idea of novel ecology improve the opportunities of a potential habitat, provide self-organized form, and instigate novel activities for people?

ABSTRACT

Ecosystems are complex, dynamic, and unpredictable to change, evolve, and behave. Change is a normal part of life, and through adaptive and flexible design, we can respond to this complexity. Dynamic ecosystem and novel ecology, which is the system that results from disturbances, such as natural disasters or human implementations can affect the design intervention to the surrounding ecosystem. Such is the case where the dam can provide habitat for species, even though it has lots of negative effects on the creek.

This thesis researches the possibilities using the Southern Clubshell Mussel, as an indicator species and design catalyst to produce a form that engages the public, provide habitat, educational purposes, increase awareness, and improves watershed health.

The strategy for being adaptive, flexible, and responsive is a design that can be small enough to fail, and then altered again, without endangering the community, ecosystem, or habitat. A theoretical framework is based on the long-term performance assessment and monitoring throughout the installation, post-installation, and maintenance phases of development through the years. Studying the relationship between natural process, (such as the water flow, sediment aggregation, erosion, and run off) and design intervention, and the potential to transform a single-purposed installation into recreational, ecological awareness, and educational purposes, and offer community engagement.

The present thesis offer community partake in the novel ecology by engaging in novel activities that support the ecology and wildlife habitat. These activities promote a sense of ownership amongst the community, allowing them to see their part in setting initial condition and as a result, how it emerges a new ecology. These novel activities, over the time, support a change in landscape perception that leads to better habitat for species.

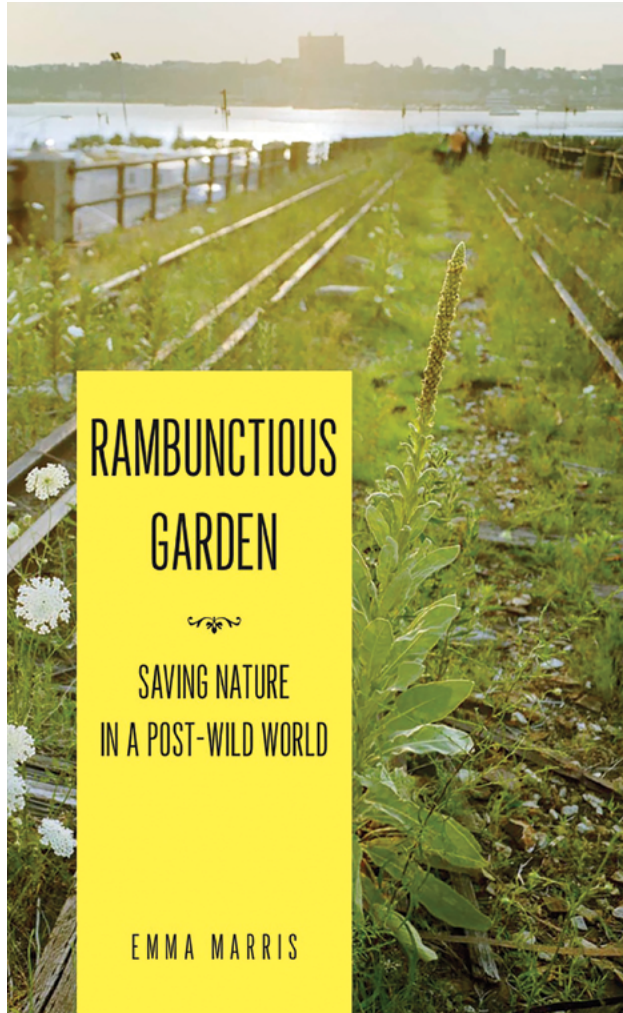
NOVEL

ecology
activity

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**NOVEL
ECOLOGY**



We've forever altered the earth, and so now, we can't abandon it to a random fate. It is our duty to manage it. Let the rambunctious garden begin.

(Emma Marris, 2011)

[a] Emma Marris' approach

Emma Marris is a writer about conservation, and ecology.” *Rambunctious Garden*” is her book that explains “why,” and more importantly, “how” humans influence the earth.

In this book, she set a menu of new goals which introduce the idea of novel ecology and ecological design. She has coined 7 goals, which I use as a tool for unpacking the theoretical frameworks, and this present thesis, respond to them by supporting or critiquing the goals.

We must choose among the goals based on an experiment in which whole ecosystem are pitted against one another. No single goal work in all situations. This means that for every piece of land, its owner, its managers, governments, and other people who care about it will have to come together and hash out a common set of goals.

(Emma Marris,2011)

Novel ecology vs. Restoration ecology



novel ecosystem in Hawaii
Image credit Emma Marris

As the presence of humankind's in the landscape is clear, there is no place unaffected by human. Also, ecologies are forever changing and adapting, and no ecology is permanent. Novel ecosystems are defined by anthropogenic change but are not under active human management. This is nature's response to what we have done to it.

Novel ecosystem could be our best hope for the future, as their components adapt to human-dominated world using the time-tested method of natural selection (Emma Marris, *Rambunctious Garden* 2011).

On the other hand, restoration ecology is defined by returning the nature to a stable natural state. In stream restoration, restoration ecologists creating streams that look like they used to be and hoping that these streams will improve biodiversity and reduce the sediments and nitrogen carried into bigger bodies of water.

The new picture of streams will just replace one arbitrary baseline with another, neither of which takes into the account the changing nature of the landscape. If our goal is to reduce the sediment load, we should focus on that and not worry about making the stream look the way it did at pre-settlement time, because nothing else is the same as it was pre-settlement (Margaret Palmer, stream restoration expert at UMUC).

Strict preservationists fight novel ecologies, but there is a new current of energy. We should see the possibilities of designing and engineering something new, as Emma Marris proposes. The most radical kind of designer ecosystem is not emulating any baseline at all, but building anew to achieve a particular goal.

As a designer, we design for now and the future. The idea of "novel ecology" can affect the design intervention to the surrounding ecosystem. The new ecosystem may not look familiar, but it will do something for us or for the species we care about. We need to look to the future.

Professor Dee Boersma
image credit: University of Washington



Dee Boersma, is an ecologists at University of Washington, who support the idea of novel ecology and ecological design. Her main goal is to save Galapagos penguin. They are at the risk of extinction, and only two thousand remain, and introduced rats eat the chicks.

The automatic reaction of the restoration ecologists is to try to turn back the clock and get rid of the rats. But getting rid of the rats is hard. So scientists are instead drilling more nesting holes into the rocks for the birds, which is an example of novel ecology. Now the population can expand and perhaps stay ahead of the reduction due to rat predation.

The manipulation does not return penguin habitat to any particular baseline, it makes the habitat better than normal for birds.

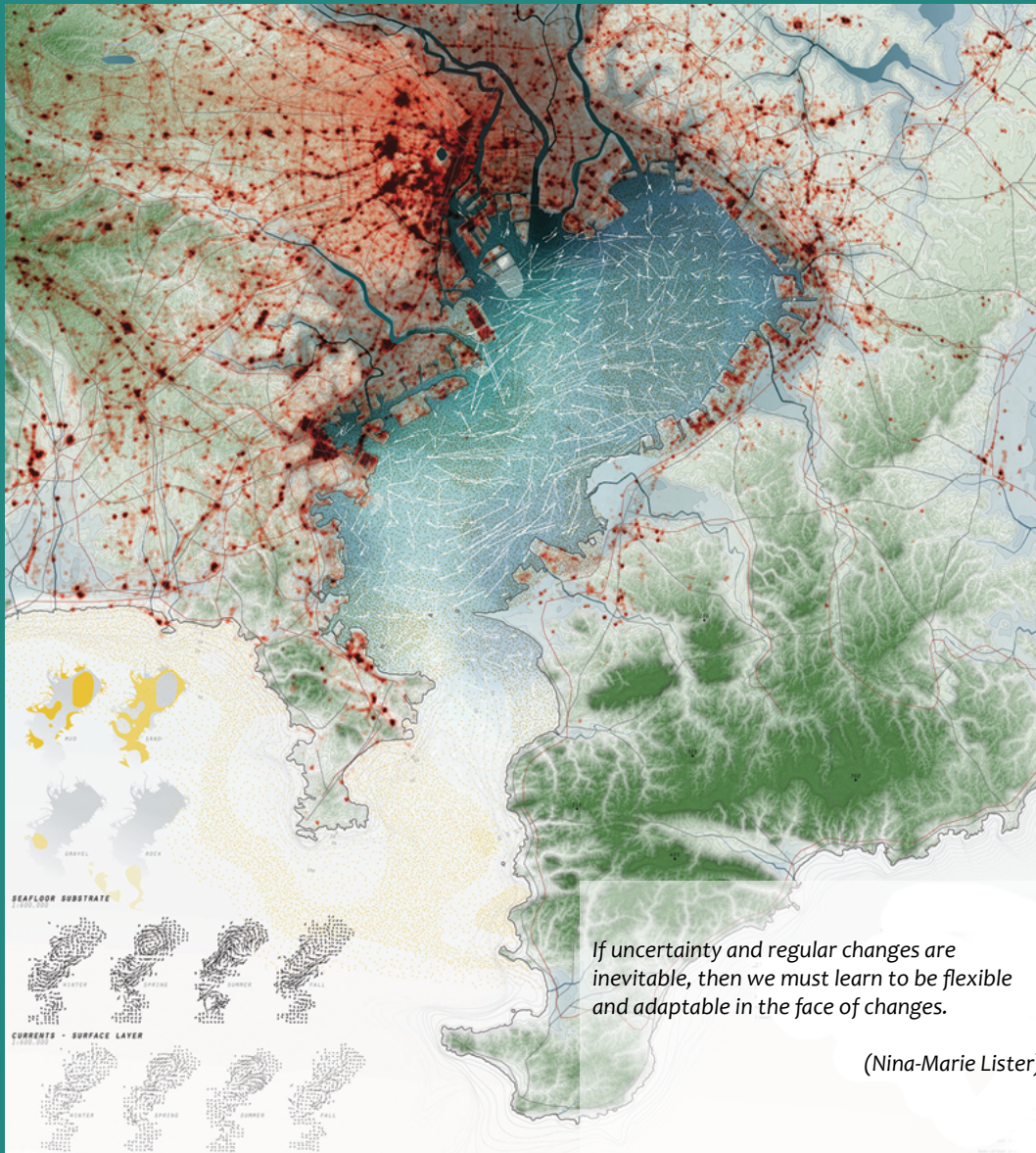


A designer ecosystem may be better than a recreation of historical ecosystem.

(Emma Marris 2011)

Strict preservationists fight novel ecologies, but we have to admit that man is part of the nature and that human activities have and will continue to impact all ecosystems. Ecologists need to learn to manage all ecosystems, regardless of their origin.

(Emma Marris 2011)



If uncertainty and regular changes are inevitable, then we must learn to be flexible and adaptable in the face of changes.

(Nina-Marie Lister)

[b] Adaptive Design

A novel ecosystem is a system that having a tendency to self-organize and manifest novel qualities without intensive human management. McHarg (1969), Hough (1995), Lyle (1985, 1999), emphasize that good design should follow the dictates of nature's form and process, often at the expense of human creativity and originality.

The present thesis is built on the relationship of novel ecology and adaptive design. I embrace my lack of knowledge about the complicated world and its ecosystems, and build upon the strategy as a diversity of potential by using adaptive and experimental design. So, from this view point, adaptive design is embedded in the novel ecology, and these two frameworks support each other.

[c] Initial Condition

Ecological design is one of the approaches to more sustainable, and environmentally responsible development. As such, it may navigating the interface between culture and nature. Van der Ryn and Cowan (1996) described ecological design as a hinge that connects culture and nature, allowing humans to adapt and integrate nature's processes with human creations. So, what are the consequences of this conception for landscape architecture design?

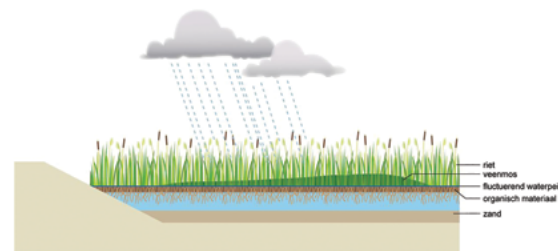
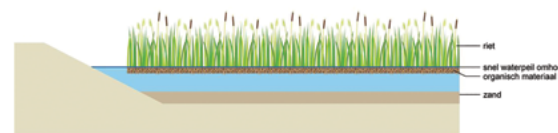
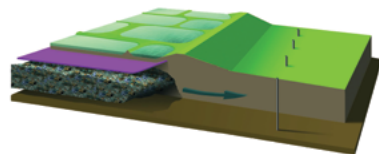
Change is the baseline condition in landscape systems. Landscape is an ever-changing field that encompasses environmental, social, economic, technological, and informational. Throughout the design process, landscape architecture faces the struggling of design in a truly dynamic landscape, to navigate ever-changing, natural processes, and the inevitable uncertainty of the physical world.

Designers do not 'create' ecologies, though they do manipulate the processes, elements and conditions that enable ecologies to develop and evolve.

(Barnett, 2009)

According to Rod Barnett, one way to respond to our complex and forever changing world, is setting up the initial condition, and then managing the process based on the natural process in an adaptable and flexible approach. Rod Barnett, in ten point for guide to initial condition says: "Designers do not 'create' ecologies, though they do manipulate the processes, elements and conditions that enable ecologies to develop and evolve. As Corner has put it, landscape architects 'stir' ecologies into different conditions. In ecological situations, design intervention, again, is a matter of setting up the initial conditions."

This is best illustrated by Roel van Gerwen's figure of a stick in the sand. The process of water and wind will create a mound over the time, instead of building it. "In van Gerwen's analogy placing the stick is less exhausting, gives a less predictable result, and is more dynamic. It is also bottom-up." (Barnett, 2009)



Vista Landscape and Urban Design project which is a type of “process design” that provides a look into how “initial conditions can be designed to direct the future movement of the conditions” on site.

This project looks at a “strategy that guided the regeneration of a bog landscape” in Amsterdam. Plants are allowed to grow in the shallow water, which in the long run will create peat. The water also attracts many birds. Cattle and sheep interact with the developing water bodies.

If a pond was isolated from fauna it could develop into a forest; if grazed by cattle it would turn into grassland. Vegetation would regenerate rather than being planted, its final configuration and composition being a matter of what seeds were already in the soil, and what seeds were carried there by wind and birds. The repetitive interaction of these agents over time will guide the life of the project. This type of “process design” provides a brief look into how “initial conditions can be designed to direct the future movement of conditions” on site (Barnett, 2009).

Images credit: Vista Landscape and Urban Design

**NOVEL
ACTIVITY**



Novel activities refer to the activities which are new to the site, that support the ecology and wildlife habitat. These activities promote a sense of ownership amongst the community, allowing them to see their part in setting initial condition and as a result, how it emerges new ecology, at the first phase, and then offer more new activities for the community as a maintenance process in the second phase. These novel activities, over the time, support a change in landscape perception that leads to the better habitat for species.

People participation in the process of initial condition, define the first phase of the novel activities. Residents of the area taking an active role in shaping their landscape, which is one of the most efficient ways to promote ownership and pride in their environment.

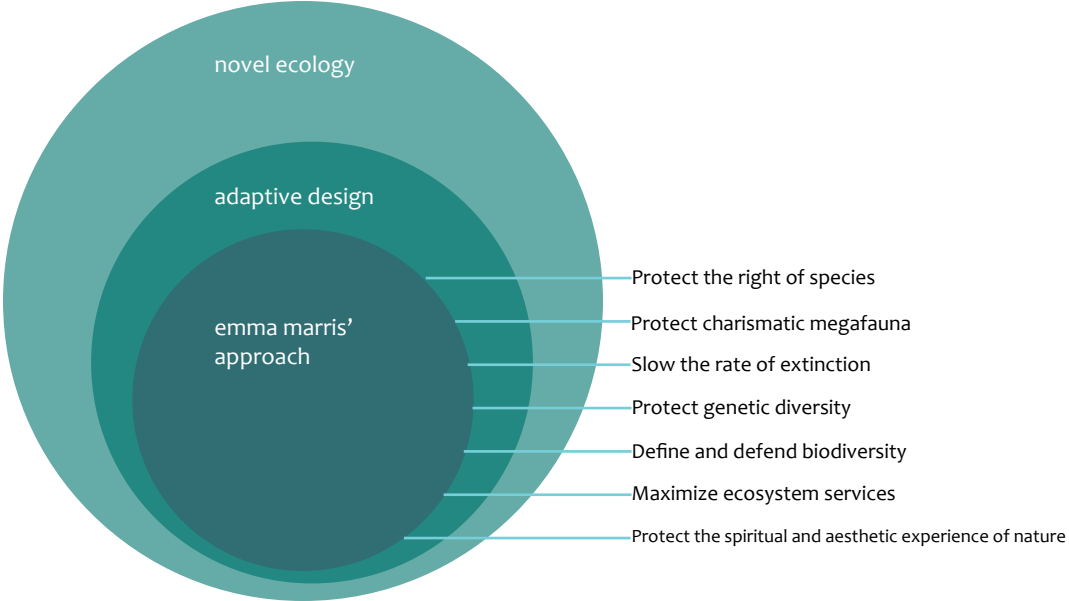
Second phase is defined by long-term performance assessment and monitoring throughout the adaptive design and maintenance phases of development through the years. Novel activities will result from the adaptive design and novel ecology over time, because of the emergence of the new ecology, and the processes of supporting the ecology.

The aim for this investigation is to find a strategy that reveals the novel activities for people, that reveals ecological situation in relation to the design intervention, and transfer the pace in an interactive way to engage people with activities that promote educational purposes, public awareness about the novel ecology and ecology in general, improves watershed health and potential habitat, by visualizes dynamic processes of change throughout the design.

A great example of novel activity which is result from novel ecology is the project of University of Washington, that Professor Dee Boersma, as an ecologists, attempted to save Galapagos penguin. Drilling nesting holes into the rocks for the birds, is an example of getting scientists to engage in novel activity (page 14).

These activities are all about participating together, and letting people experience their active role in shaping their landscape, and realize the acts and the results of their ecological footprint. Over the time, people's perception of the landscape will change and they will see the result of the habitat that they, "themselves" have helped develop, and support, and understand their ownership of the landscape within the community.

EVAUATIONS



From these theoretical frameworks, the overall strategies for creating novel ecology and novel activities can be identified.

The first strategy is creating the ecosystem which is defined by change and nature's response to what people have done to it, and design for now and the future. The idea of "novel ecology" can affect the design intervention to the surrounding ecosystem. The new ecosystem may not look familiar, but it will do something for us or for the species we care about. We need to look to the future.

The second strategy is creating the ecosystem that have a tendency to self-organize and manifest novel qualities without intensive human management and follow the dictates of nature's form and process. The strategy for being adaptive, flexible, and responsive that can be small enough to fail, and then altered again, without endangering the community, ecosystem, or habitat. By setting up initial conditions for the landscape using these two strategies, the perception of people can be altered and people can understand their connection to their surroundings.

The third strategy is using Emma Marris approach as a tool, since she is the one who define novel ecology in rambunctious garden. My design proposals respond her 7 goals and make them less or more important, by supporting or critiquing them. Overall, this thesis uses these goals to evaluate the design tests.

Restoring an ecosystem we have destroyed is too hard, and we can't get the magic back. The alternative is to design for specific goals to meet the challenges of our time. Once you admit that you can't put thing back they were, you often find yourself having to choose between goals that all sound pretty and good.

(Emma Marris, Rambunctious Garden 2011)

Protect the right of species

Ecologists believe that all living things have intrinsic value and deserved to be protected. In fact, each human should expand his conception that taking care of ourselves become the same thing as taking care of the environment.

In order to respond to this goal, and focus on the ecological design, one threatened species is selected to be served as a “target species” for design, which is at the risk of extinction and deserved to be protected.

Protect charismatic megafauna

This present thesis, protect the charismatic, but not just the megafauna, which are the large and beautiful animals that people like and really don't want to see go extinct. But instead the protecting the ugly mussels, which seems not very special.

But, ecological theory predicts that many of these species may be also keystone species.

Species that have a great effect on how an ecosystem works. Just like mussels that function as “environmental logbooks” effectively recording changes in water and habitat quality over time. So, in this project, I'm critiquing this goal and advancing it to ugly animals.

Slow the rate of extinction

Perhaps a more sophisticated approach is to treat all species as equally valuable. This is the assumption behind legislation as the endangered species.

This thesis, use this goal because target species for design, “Southern Clubshell Mussels” are at risk of extinction, and perfectly fit to test as an indicator species and design catalyst to produce a form that engages the public, provide habitat, educational purposes, increase awareness, and improves watershed health.

Protect genetic diversity

Few effort are specifically focused on protecting genetic diversity. One of them, called EDGE (Evolutionarily Distinct and Globally Endangered), seeks to save the most genetically weird animals in the world, arguing that by losing the specific species, we lose millions of years of evolution not represented in any other gene pool.

Protecting the right of species and slowing the rate of extinction of target species are in fact protecting the genetic diversity.

Define and defend biodiversity Maximize ecosystem services

Biodiversity is the most widely shared value among conservationists and ecologists, and it embraces a whole ecosystem or even the whole earth. The idea is that species evolution produces a beautiful web of interaction, and inherently valuable. The difficulty of linking biodiversity to ecosystem services wouldn't be a problem if the promoters of ecosystem services really valued nature only insofar as it contributes to human well-being. This thesis offer more diversity by getting the Southern clubshell Mussels to the stream, and as mussels act as an indicator species. The presence of mussels indicate a healthy stream system, and is an indication of a lot of other species being healthy, as mussels are recognized as a sensitive keystone species.

Protect the spiritual and aesthetic experience of nature

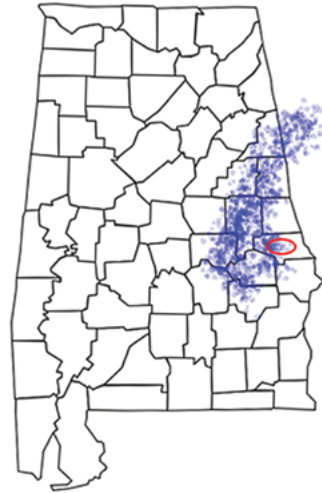
This thesis offer some novel activities which people can involve as a result of the form-making process of adaptive design in regards to novel ecology. Providing the opportunity for people to set the initial condition to emerge this novel ecology happen, and long-term performance assessment and monitoring throughout the adaptive design and maintenance phases of development through the years

Also, offer community partake in the new novel ecology by engaging in novel activities of community engagement that support the mussel habitat, and support a change in landscape perception that leads to better habitat.

**DESIGN
INVESTIGATIONS**

[a] Targer Species For Design

Tallapoosa Watershed



RED-COCKADED WOODPECKER
Picoides borealis
ENDANGERED



BALD EAGLE
Haliaeetus leucocephalus
THREATENED



WOOD STORK
Mycteria americana
ENDANGERED



EASTERN INDIGO SNAKE
Drymarchon corais couperi
THREATENED



GOPHER TORTOISE
Gopherus polyphemus
THREATENED



FINE-LINED POCKETBOOK MUSSEL
Lampsilis altilis
THREATENED



CHATOOGA CRAYFISH
Cambarus scotti
ENDANGERED



SOTHERN CLUBSHELL MUSSEL
Pleurobema decisum
THREATENED

OVATE CLUBSHELL MUSSEL
Pleurobema perovatam
THREATENED

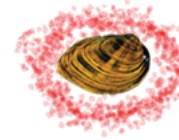


ARMORED SNAIL
Pyrgulopsis marstonia pachyta
ENDANGERED

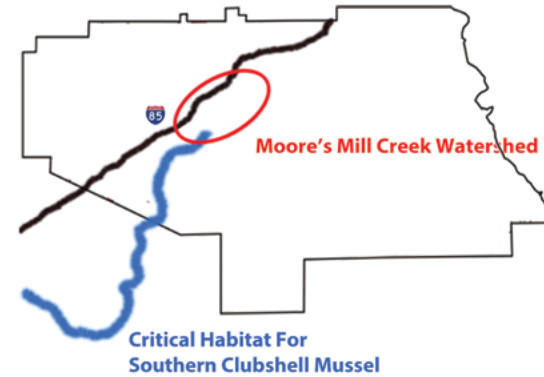
Coldwater Darter
Etheostoma ditrema
ENDANGERED



SOTHERN CLUBSHELL MUSSEL
Pleurobema decisum
THREATENED



Moore's Mill Creek Watershed



Moore's Mill Creek is a rapidly urbanizing watershed in the lower part of the Tallapoosa Watershed, but it is still recognized as a potential habitat for some species, according to Alabama Fish & Wildlife.

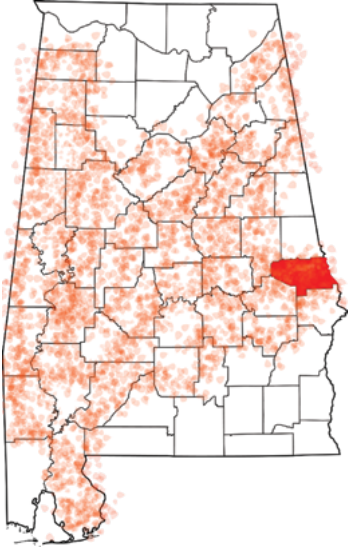
In order to respond to Emma Marris' goals and focus on the ecological design, one threatened species is selected to serve as "target species" for design, in hopes that the habitat will be improved to support this specific species.

MUSSELS IN ALABAMA

Target Species Profile

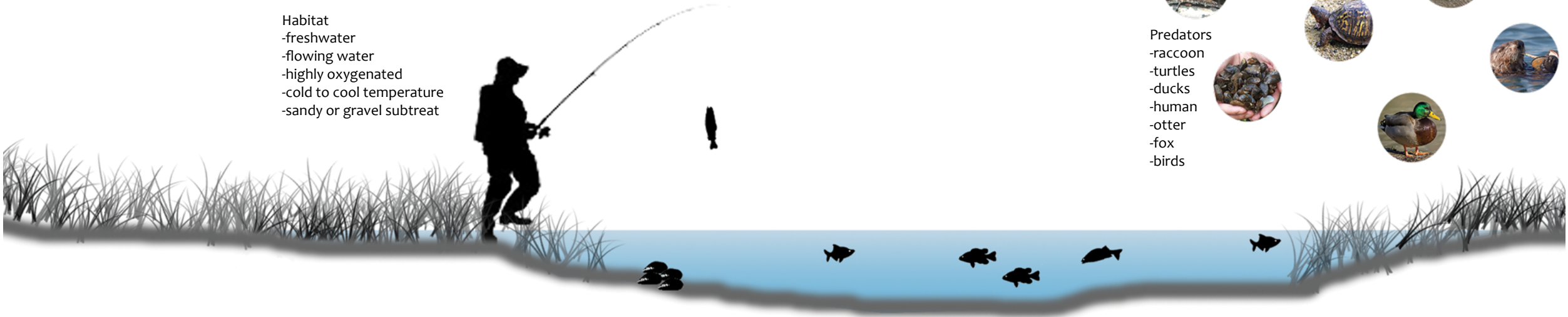
MUSSELS

Location

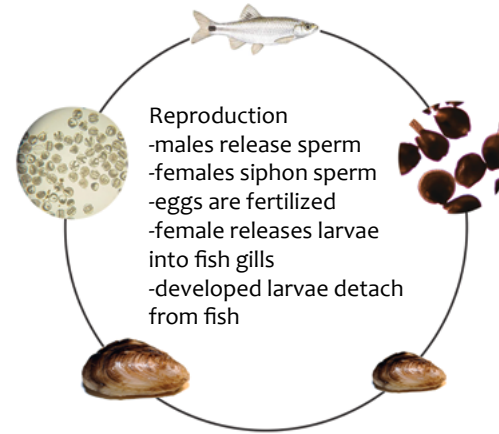


Habitat

- freshwater
- flowing water
- highly oxygenated
- cold to cool temperature
- sandy or gravel subtreat



blacktail shiner fish host



Mussels are bivalve mollusks that prefer gravel bottoms of streams and rivers with good water quality and a stable stream channel of free flowing water. They live off of algae, tiny plants and animals like plankton, and bacteria that they filter from the water. Also, mussels can filter one gallon of water per hour and live up to 50 years.

Alabama's rivers used to be extremely abundant in freshwater mussels, but, many species have gone extinct for a couple of reasons. Mussels have the complicated life cycle. Female mussel releases larvae into fish gills, and the larvae live on the fish for several weeks before transforming into juvenile mussels.

Predators

- raccoon
- turtles
- ducks
- human
- otter
- fox
- birds



As I move forward through the design development, I will unpack the process of the species selected and what the selected species bring to the design, as well as the development of the principles that framed this design.

To respond to Emma Marris' goals and ecological design, Southern Clubshell Mussels are selected, as a target species for design, which is at the risk of extinction and deserved to be protected. Ecologists believe that all living things have intrinsic value and deserved to be protected.

This thesis offer more diversity by getting the Southern Clubshell Mussels downstream of the dam; and as mussels act as an indicator species, of a lot of other species being healthy.

Also, this present thesis, protecting the charismatic, but not just the megafauna, which are the large and beautiful animals that people like and really don't want to see go extinct. But instead protecting the ugly mussels, which seems not very special, which is not right. They living of the filtering water, and from this view they are very important in ecosystem services.

In fact, they function as "environmental logbooks" effectively recording any changes in water and habitat quality over time. This target species, respond to all Emma Marris' goal and critiquing the idea of -just- protecting charismatic megafauna.

The juveniles settle into the river bottom where they remain for their entire life, often ranging between 50-100 years. During this time, mussels feed by filtering microscopic bacteria and algae from surrounding water.

Mussels function as "environmental logbooks" effectively recording changes in water and habitat quality over time. Exhibit sensitivity to habitat or watershed changes that alter flow regimes, reduce substrate stability, or cause siltation and erosion. The presence of mussels indicates a health stream system.

Like a canary in a coal mine.

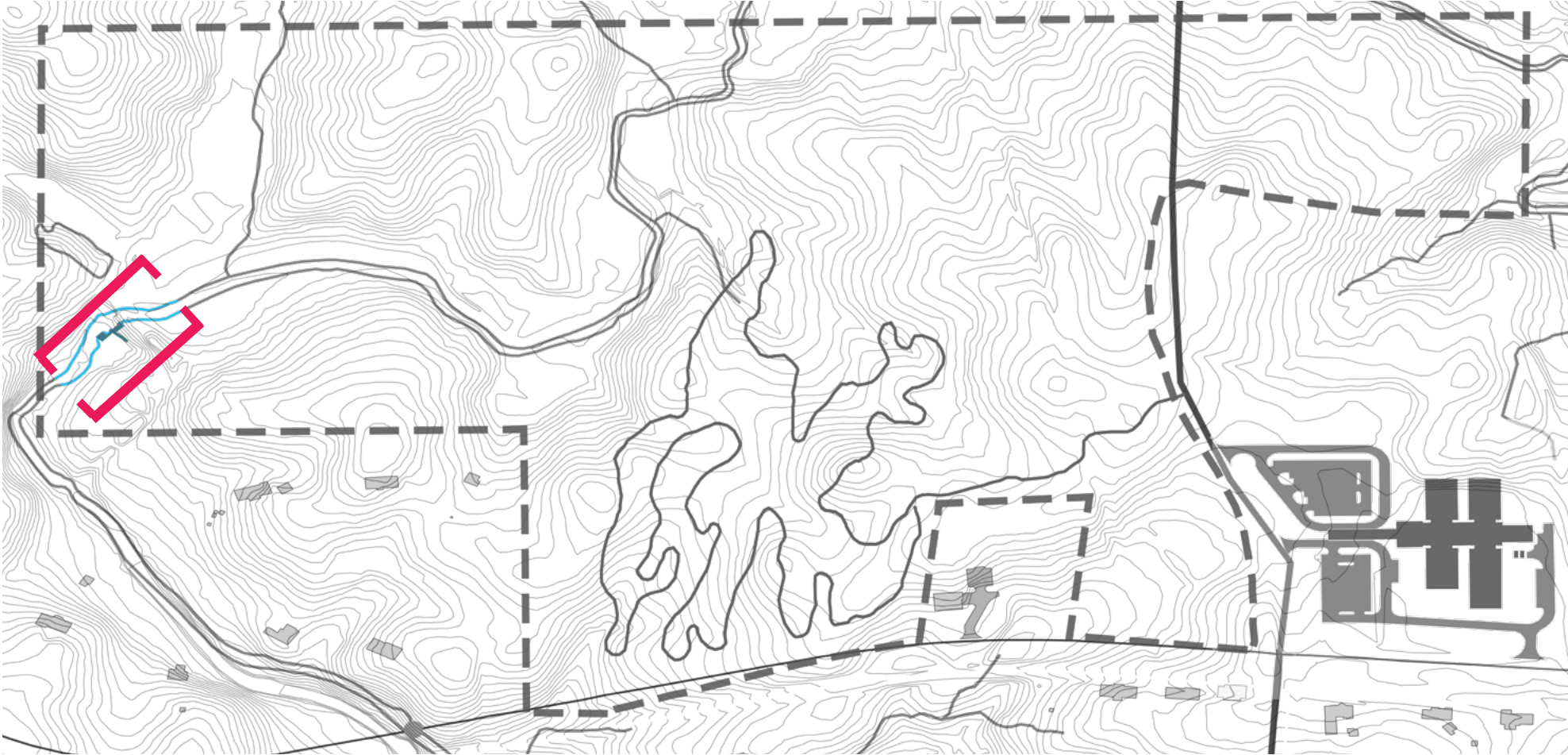
It means that Canaries are especially sensitive to methane and carbon monoxide, which made them ideal for detecting any dangerous gas build-ups in a coal mine. So, miners would bring a caged canary into the coal, and as long as the bird kept singing, the miners knew their air supply was safe. A dead canary signaled an immediate evacuation.

Based on the mussels' need this new ecosystem is introducing to the stream. Freshwater, flowing water, highly oxygenated water, cool to cold temperatures, a fish host for reproduction, and a sandy or gravel substrate are the factors the habitat required to introduce mussels. Some factors such as freshwater, flowing water, a fish host, and enough food source are already prepared by dam; The other factors will be provide by means of intervention.

Mussel's needs is going to guide the design. Though this species is chosen, many benefit from its presence and needs will happen. The relationships between predators and prey, so if we design for one species' food source, the other will be present, and allowing the opportunity for greater biodiversity. It is not just about the mussels, it is about the whole system, and the whole web of connections that would be improved, as well as biodiversity.

SITE SELECTION

This location shall serve as a field for experimentation and testing of the ideals put forth in this thesis project.



[b] OVER WILLMORE DAM

It is interesting to note how infrastructure overlooked to most people until they fail or stop working. The aim is to extend landscape to look at these overlooked infrastructural systems to make them present and protect the valuable ecosystems that are being degraded, due to the constructions of dams.

Infrastructure has the potential to investigate in different ways that can reduce the negative effects of them.

Based on water analysis conducted on the Chewacla Creek, in Auburn, Alabama, which is a critical habitat for “Southern Clubshell Mussel”, and the personal interview with “Dr. Cliff Webber”, an Auburn University biologist scientist researching threatened mussels, a number of threatened mussels have been found below the Lake Ogletree Dam in Chewacla Creek. The Southern Club Shell Mussel is very sensitive to sediment and dams have the ability to trap the silt and sediment, so from this view, below the dam is perfect point to work from and a site for a design intervention.



Dams have the ability to trap the silt and sediment, so from this view, below the dam is perfect point to work from and a site for a design intervention.

How could the dam provide the habitat for mussels, even though it has lots of negative effect on the creek?



Through this investigations, the ways that can reduce the negative effects of the dam, and the potential ways to thrive mussel habitat, and taking advantage of this habitat for educational purposes, engaging the public, and improve watershed health is considered.

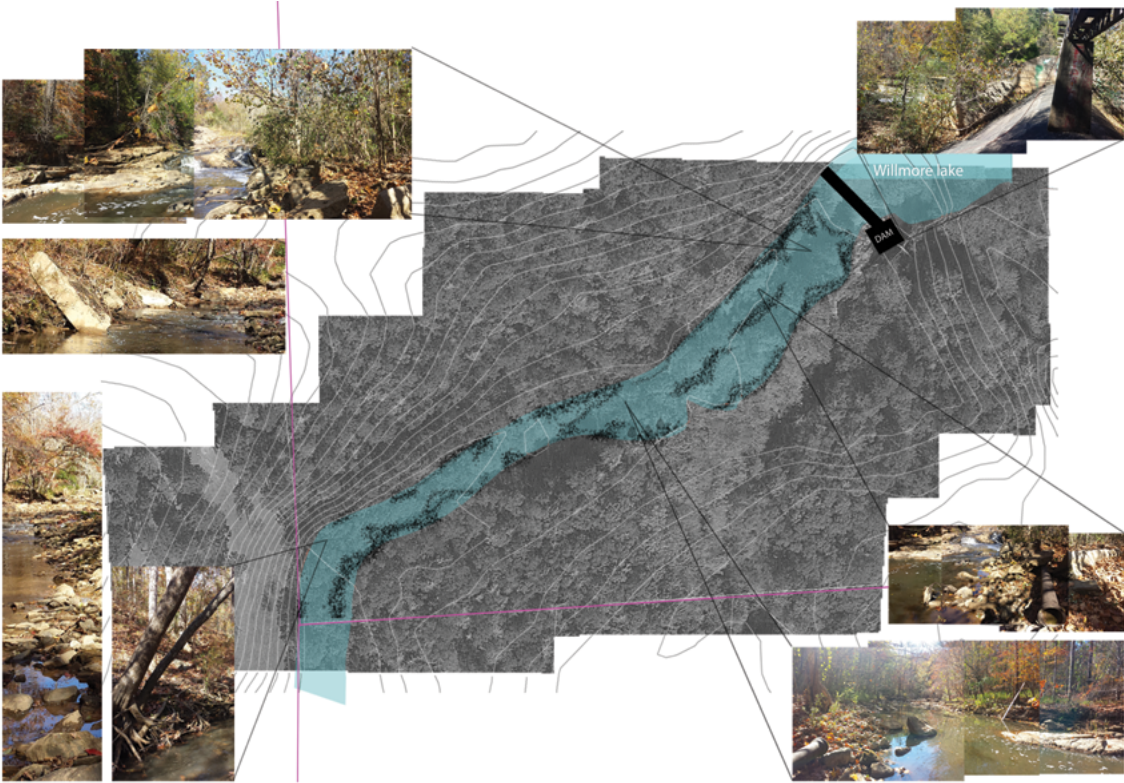
This is the part that advance novel ecology theoretical framework. Dams are always consider the negative impact on habitat by increasing the temperature, slowing the water at the lake, building up the sediment, and preventing the flow of plants and nutrients by trapping a lot of food source and algae.

The idea of novel ecology results from taking advantage of this negative impacts of the dam, tweak it, and [re]introduce mussels as a new ecosystem to the downstream of the dam, which has good water quality and flowing water. The water at the Wilmore Lake over the dam, also, can provide enough food source for mussels.

SITE PHOTOS



SITE INVENTORY



[c] Fluvial Processes

By investigating the existing condition, and mapping the fluvial process, such as sandbars, rocky edges, and the water current, I am able to predict locations that show good give me an indications to work with natural processes.

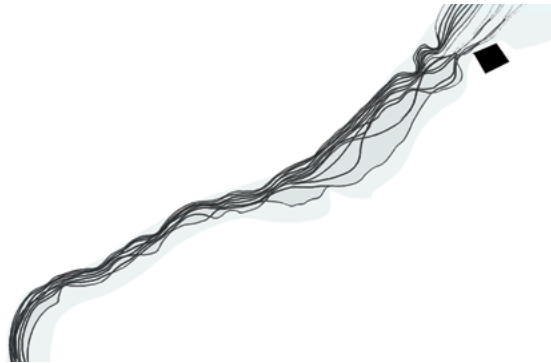
TOPOGRAPHY



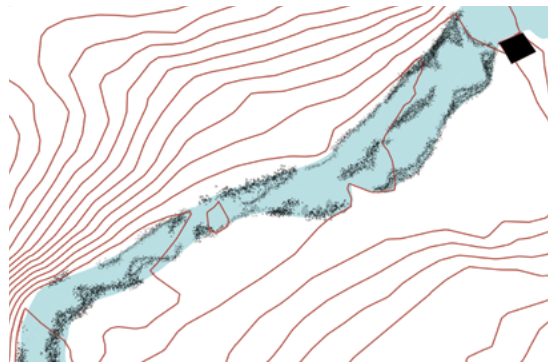
SANDBAR FORMATION



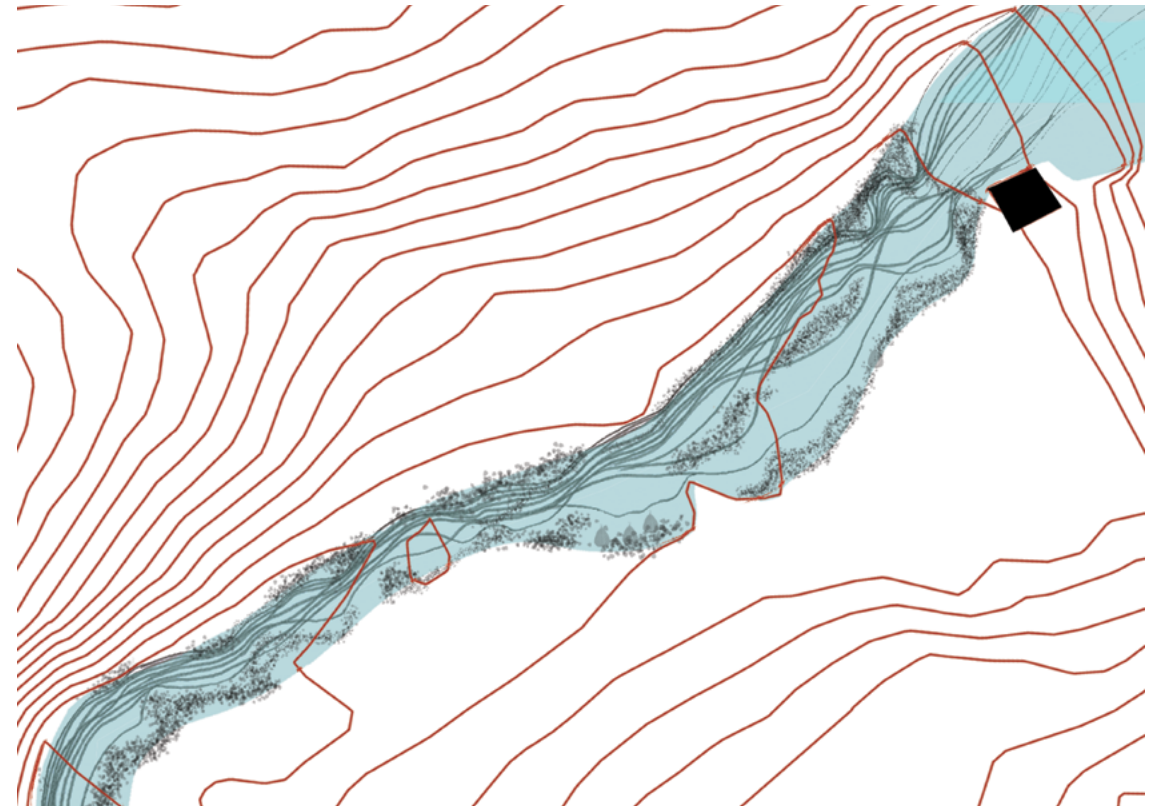
FLOW/CURRENT



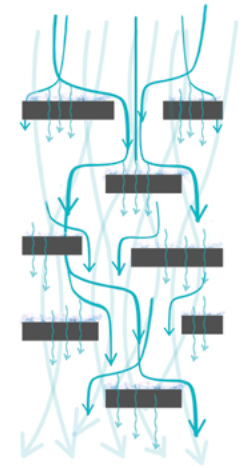
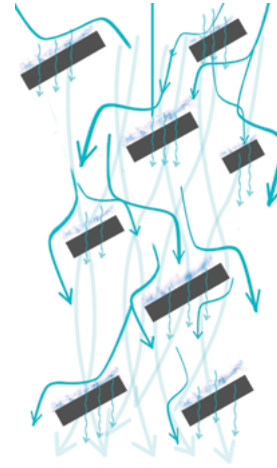
TOPO+SANDBAR



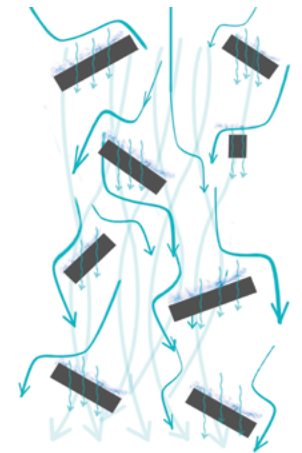
FLUVIAL PROCESS COMBINED



GABIAN INVESTIGATIONS AND CURRENT FLOW



Gabions are commonly used as inexpensive retaining walls but can be utilized in a different ways. This thesis developed the idea of concentrating the volume of water right after the dam, and testing the arrangement of series of gabion baskets filled with gravel to modify the water flow. Gabion baskets reduces the width of the creek and concentrate the volume and flow, but still let the water flows through it, rather than impeding it. This diagram tested the arrangement of the gabion baskets to examine the potential for modify stream flow, and still let the water go through it. Also the gabion baskets filled with gravel, act as a substrate for mussels to attach themselves on it, and mimic their preference substrate. Most importantly, gabion baskets are used to deflect the fastest flow, based on the fluvial process that revealed by mapping study.



GABIAN LAYOUTS

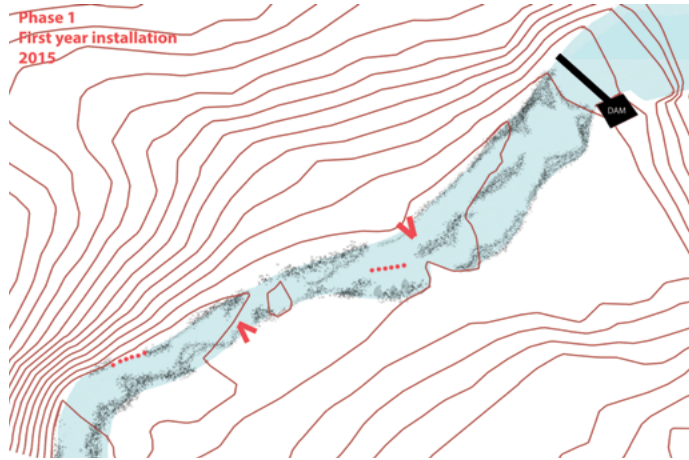
[d] 10 YEAR SCENARIO OF ADAPTIVE DESIGN

Setting an initial condition

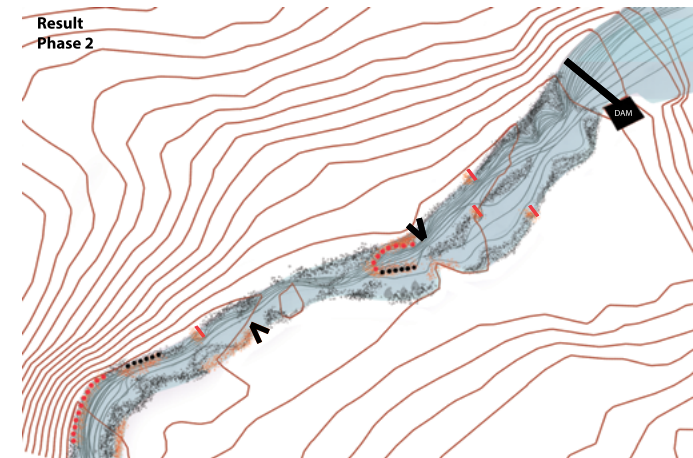
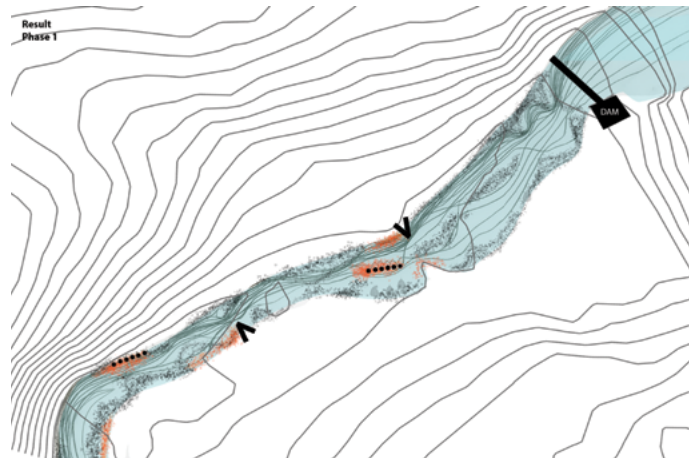
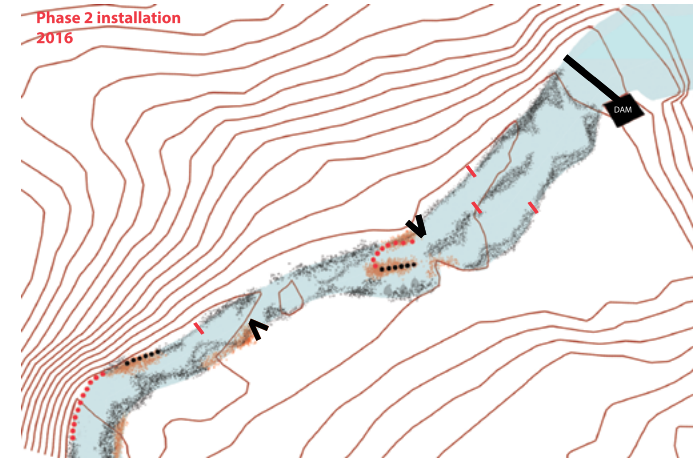
The scattering of gabion walls and wooden piles at the stream reach is the first step in setting up the initial conditions for the formation of a dynamic and adaptive design to provide an excellent habitat for species.

Phase 1 is the first year of installation of gabion baskets to deflect the fastest flow of water to the channel and the wooden piles to create sediment beds of silt, sand, and gravel for mussels, and other species.

Then the result of this new condition is how the water flow deflects, where the water concentrate, where erosion and deposition might happen. Through this process kids and neighbor community can help make these changes happen in each phase. People participation in the process is the most vital elements of setting the initial condition.

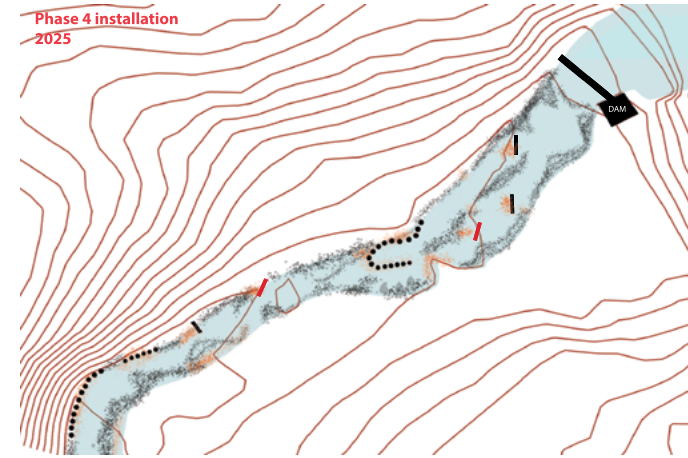
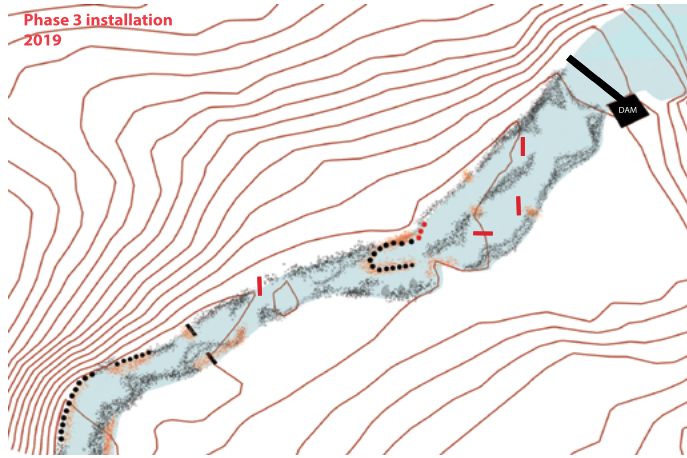


NOVEL ACTIVITIES IN SETTING INITIAL CONDITION



In each phase this adaptive design aimed to deflect the fast flow of water to the whole stream reach to provide excellent habitat for mussels. Within each responding design, there is some monitoring test of number of mussels placing in the stream, and data collection for educational purposes. Residents of the area taking an active role in shaping their landscape, which is one of the most efficient ways to promote ownership and pride in their environment.

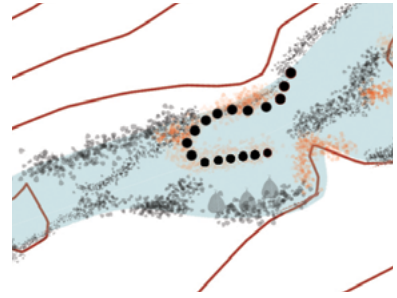
This adaptive design is small enough to fail, and then be altered again, without endangering the community, ecosystem, or habitat. It is revealed on the long-term performance assessment and monitoring. The neighborhood community and local people will engage to the process of and assist in making these changes to happen in each phase.



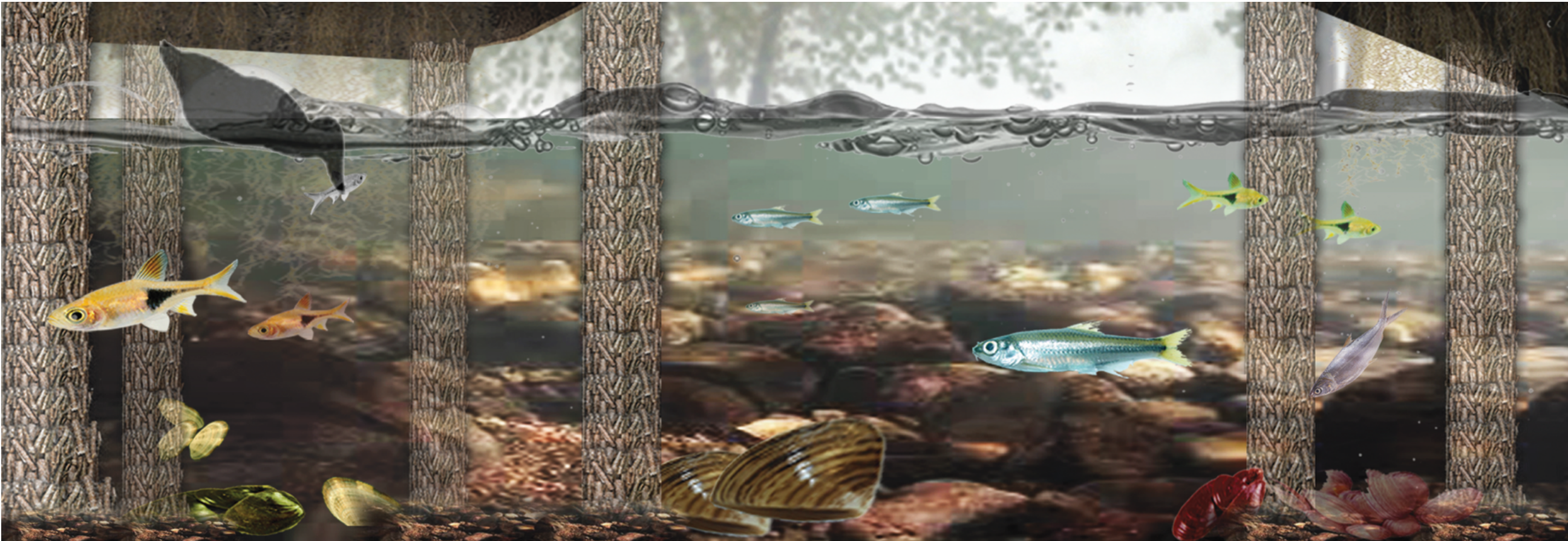
Adaptive design facilitate the form-making rather than form-finding, over the time wooden piles may transfer to the fish and mussels shelter and a bridge for people to cross over the creek. This design intervention, has the potential to transform a single-purposed installation into recreational, ecological awareness, and educational purposes, as well as, providing novel activities for people. New recreational and programmatic potentials appear through time and will be revealed by each phase.

UNDER WATER VIEW OF WOODEN PILES

Adaptive design facilitate the form-making rather than form-finding, over the time wooden piles may transfer to the fish and mussels shelter. This design meets all of the qualifications to be considered as an adaptive designed for mussel's habitat. Underwater at the stream where wooden piles are installed, coarse gravel, silt and sediments collect on the bottom which is supportive for mussels and many other species.



view of the wooden piles in the stream reach





STRENGTHENING THE NEIGHBORHOOD THROUGH STREAM RESTORATION BY WALTER HOOD

According to Walter Hood, residents of the community taking an active role in shaping their landscape is one of the most efficient ways to promote ownership and pride in their environment.

Building relationships within the community during the construction process will promote a sense of ownership amongst the community, allowing them to see their part in this initial condition and how it emerges a new ecology, and claim the stream and this habitat as part of their landscape.

The Courtland Creek Project by Walter Hood utilizes stream restoration as a tool for strengthening neighborhood bonds. The Courtland Creek Project in Oakland, California, combined the restoration of a creek and the provision of recreational infrastructure to one of the city's most trouble neighborhood.

Concerns for the ecological health of the stream had been long overshadowed by issues of crime, employment, safety, and maintaining the character of the neighborhood (Walter Hood, 1995).

Residents of the area taking an active role in shaping their landscape is one of the most efficient ways to promote ownership and pride in their environment.

(Walter Hood, 1995)

[e] NOVEL ECOLOGY + ACTIVITY

COMMUNITY ENGAGEMENT IN SETTING THE INITIAL CONDITION

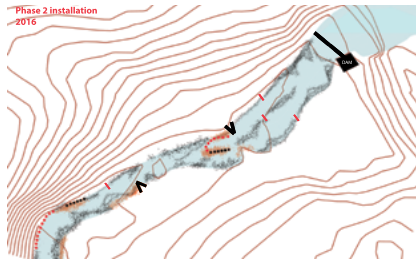
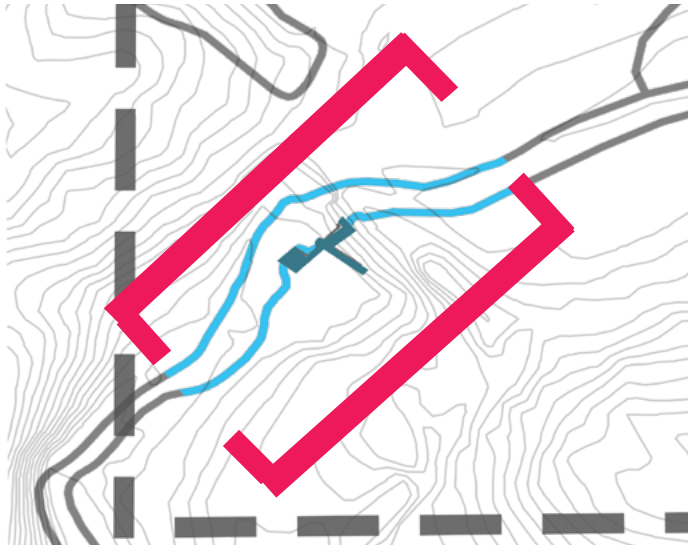
The design proposal for this site is a set of initial conditions meant to shape the self-organization of the landscape not only ecological diversity, but socially as well, to create novel activities.

Gabion walls and wooden piles will be placed into the creek by members of the community. The creek, and holds a history of interaction of people with the creek to make these novel ecology happens.

Building relationships within the community during the construction process will promote a sense of ownership amongst the community, allowing them to see their part in this initial condition and how it emerges a new ecology, and claim the stream and this habitat as part of their landscape.

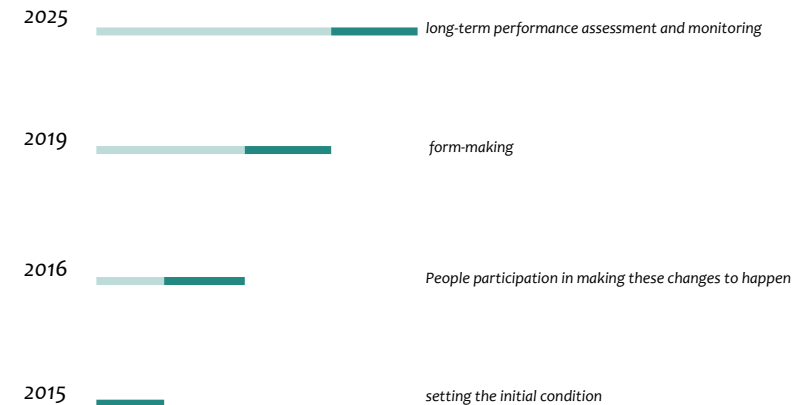


NOVEL ACTIVITY + ADAPTIVE DESIGN



These novel activities happen here along the time line. In each phase, more activities for community engagement happen to make evaluation and adjustments to the design based on the natural process and also improving the novel ecologies which is the aim of this research.

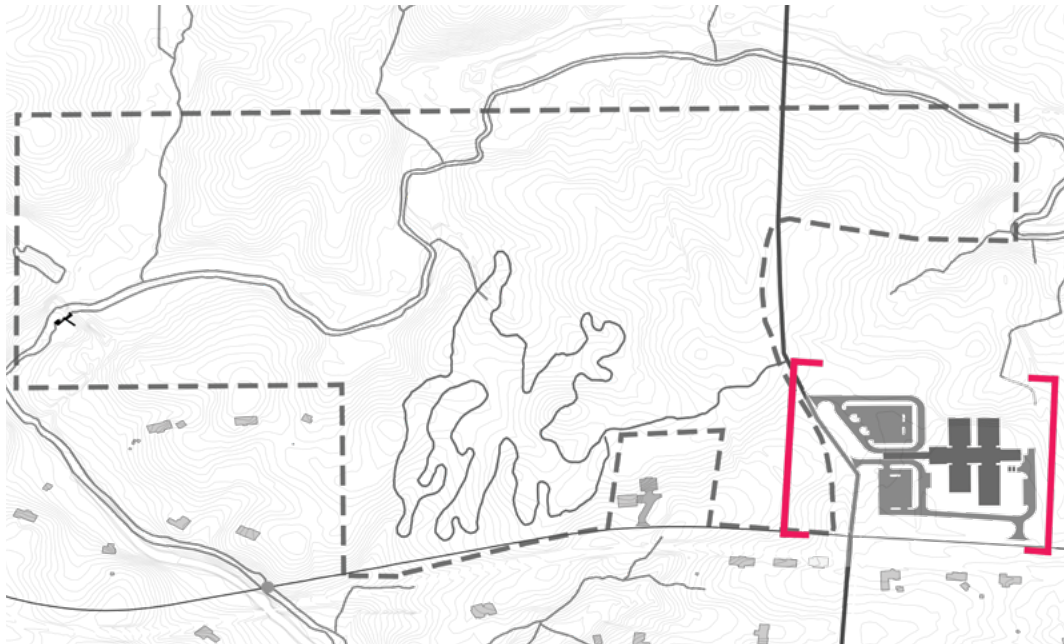
Strengthen the community through the engagement of active roles within the community in setting the initial condition and novel activities for people to allow the new ecology to happen is one of the most important elements in this thesis, but is not the only element to success. If people are not interested in participating in any of these activities, then the place eventually becomes a space for a new ecosystem. The place still has benefits for new ecosystem to emerge, and people can promote, foster, and accelerate the emergent of new ecologies.



MAKING CONNECTION

Making connections with local schools, Auburn University, community organizations, church groups, and environmental organizations, can promote long-lasting relationships within the Wilmore Park and the people as well as understand their connection with the landscape.

The proposal is a strategy specific to the Wilmore Park, novel ecology emergence, and the programs rather than designs that are product. The processes of formation and adaptive design served as a creative end to create a dynamic living system.



Ogletree Elementary School



There is a clear consensus among researchers that education enhances productivity. Local schools indisputably influence residential values. Public education, public awareness, communications, and social interaction are an important value within the community. The schools have a potential to explore these assets.

This proposal is a strategy specific to Wilmore Park and its programs. It suggest designs for people, especially students, to mentor the mentality and realize how their participation in the process is important to changing their surroundings.

NOVEL ACTIVITIES: CIVIC MONITORING PROGRAMS

The aim for this investigation is to find a strategy that reveals the novel activities for people, specifically student of the school, to transform the Wilmore Park into a public open space in an interactive way to engage people with activities that promote educational purposes and public awareness about the novel ecology and ecology in general.

The Ogletree School grounds with its access trail to the stream, enabling a new stream access, opening its students and neighborhood to the situation that nobody valued them before. Re-valuing the values and histories of the Moore's Mill Creek that are neglected over the time, and result in the transforming the stream ecology and habitat.

An activity is proposed that visualize dynamic processes of change in number of mussel's population and overall quality of water, and modes an ecological situation in relation to the design intervention.

This strategy redefines the school as a Research Station, so that volunteers, local neighborhoods, and students can monitor the population of species with the help of scientists and Auburn University Fishery and Ecology Department.

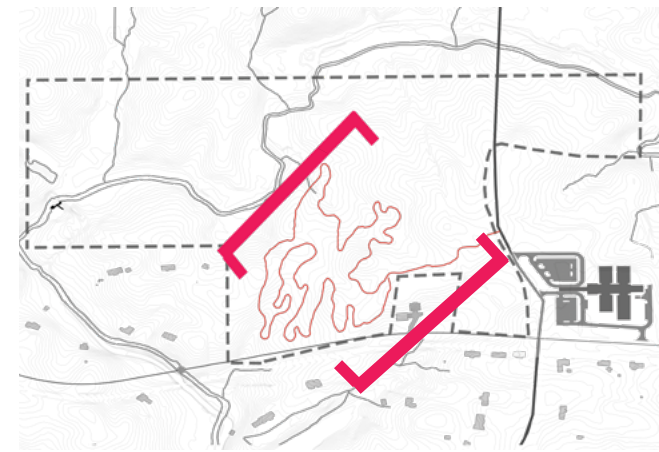




NOVEL ACTIVITIES: PLANTING PARTY

Each monitoring event results in celebration as a memorial by planting a tree and letting people mark the landscape thus establishing a connection with the emergent of novel ecology.

This event enables people to better understand the revealed dynamics of landscape. Over the time the trail will be transferred to a niche for wildlife, by means of the added diversity of fruit berries and future shade trees. The introductions of these elements which can provide a food source and habitat for birds, insects, and the wildlife and connect the wildlife throughout the trail and creek.



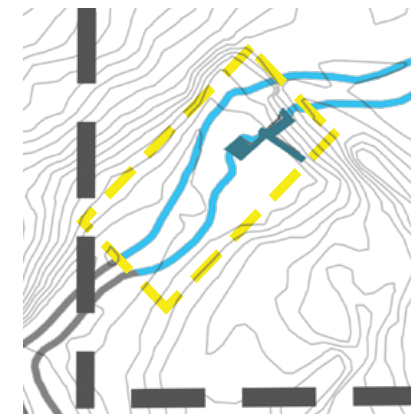
NOVEL ACTIVITIES: DIGGING DAYS

Many urban streams have undergone historic manipulation and the highly urbanized watershed of Moore's Mill Creek is no different. Due to upstream urbanization, it is included on the list of impaired streams for sedimentation and siltation by ADEM.

The next proposed novel activity reveals this ecological situation in relation to the design intervention. Removing the sediment upstream of the dam to promote the set initial condition downstream of the dam, is attained by removing the sediment and letting the turbidity settle out down at the dam.

In this strategy, volunteer's people can shovel and dig the sediment at the river bank and re-use the sediment as a highly nutrient and fertilize soil within the Wilmore Park.





The yellow sticks, control where people walk and dig out the sediment, and allow them to know that this is the place that “they” participate. It sets the initial condition for mussels, and novel ecology happens.

So, it is not a right place to dig out the sediment it will navigate them to upstream of the dam.

NOVEL ACTIVITIES: NUTRIE DAYS

Moore's Mill Creek is touched by thousands of invasive mussels called Asian Clams or Corbicula, that are reproducing rapidly. These mussels have nutrient value such as calcium, lime, and phosphorus which are all good for tree growth. These are the perfect nutrient load to mix with the removed sediment and soil.

People can activate these nutrient by crushing the shells, stepping on them, or kids jumping on them, and mix them with the soil to intensify the diversity of planting, and improving novel ecology.

Also, having some planter pots in the workshop to allow people put the removed sediment in them and replant them with native and bioremediation grasses, such as Switch Grass (*Panicum virgatum*) to remove pollutants, recycle native soils, improve the diversity of plant community and increase the wildlife in the park.



AMPHIBIOUS ARCHITECTURE



This project is “two networks of floating interactive tubes, installed at sites in the East River and the Bronx River, house a range of sensors below water and an array of lights above water. The sensors monitor water quality, presence of fish, and human interest in the river ecosystem. The lights respond to the sensors and create feedback loops between humans, fish, and their shared environment. An SMS interface allows citizens to text-message the fish, to receive real-time information about the river, and to contribute to a display of collective interest in the environment.”

The use of technology in this project encourages user engagement with SMS that offer real-time information about the river’s situation.



SOCIAL MEDIA AND EDUCATION

The use of technology, and integrated it with an accessible technology is a stimulus tool for using data, that taken from monitoring. This way the collected data about the mussels population, sediment accumulation and movement, and water quality in relation to the design intervention, can be visible through the social media like Facebook page, twitter, or Instagram.

The use of technology in this thesis encourages user engagement with social media that offer real-time information about the ecology and habitat.

Like these official pages to keep up with Willmore Park’s events and happenings.



VISUALIZATION OF THE DATA

In this investigation, the eco-visualization of converting real-time ecological data into insights is a bridge between data and knowledge, for the purpose of public education and awareness.

The data is translated visually, which makes the conditions of water quality and habitat more legible. Here the light transforms the trail into an engaging view. Where the level of lightening shines, it shows different water and pollution levels.





CHANGING PERCEPTION TIE TO THE CULTURE

Community engagement and improving the wildlife habitat with the help of people foster pride, understanding, and ownership of the landscape amongst the surrounding community. Community partake in the new novel ecology by engaging in novel activities of community engagement, support the wildlife habitat. These activities are essential in reestablishing community ownership of the creek. These activities support a change in landscape perception that leads to better habitat.

No-Rooz, is a word that means “New Day”. This is the new day that starts exactly at the beginning of the spring and celebrates renewal and rebirth. A customary thing that people do on this day is spend time outdoors. They also throw traditional home-grown wheat sprouts into a stream, a river, or anywhere where water flows.

Reflecting on this tradition, one way to encourage adults and children to participate in such events, is to tie them to their own American culture. An example of such events where people gather together and celebrate something special include Easter.

So, it is all about participating in these events together, and letting people experience their active role in shaping their landscape. If they attend the sediment party for the first time, they will realize the acts and the results of their ecological activities.

Over the time, people’s perception of the landscape will change and they will see the result of the habitat that they, “themselves” have helped develop. They will understand their ownership of the landscape within the community.

Persian New Year, No-Rooz



REFLECTIONS

Upon reflection, after the development of this design research, outcomes become crucial to evaluate its results. Due to time constraints and project limits, not every possibility could be explored, but these reflections should give insight into the design decisions made during the thesis process.

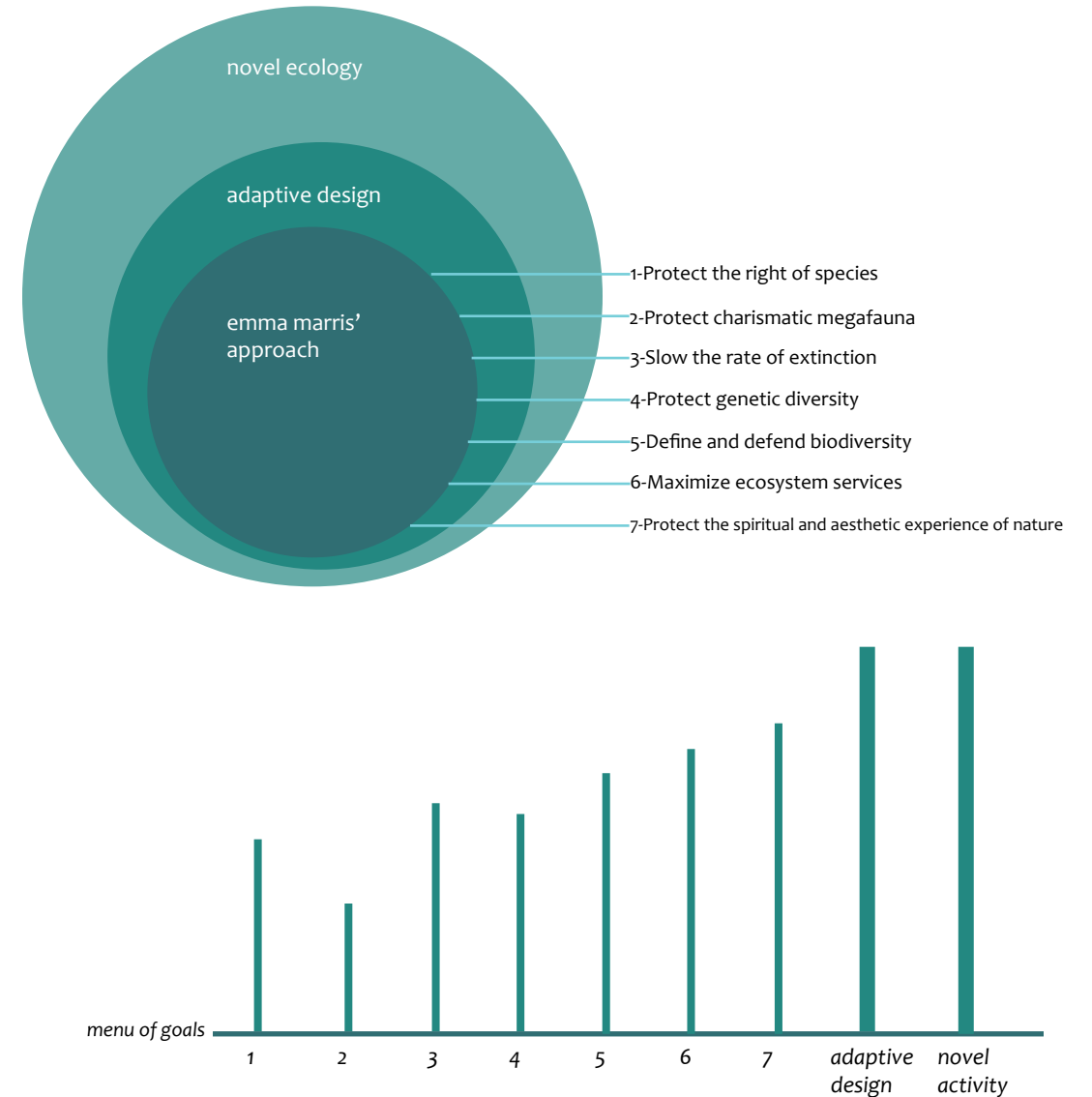
As a designer, we design for now and the future. We can never know the exact final form of a design, since the self-organizing systems of nature are unpredictable. These designs are intended to be uncertain, and require the designers and the community to stay with the project after the initial conditions have been set. This method allows the designer to offer more activities for community engagement to make evaluation and adjustments to the design based on the natural process and also improving the novel ecologies which is the aim of this research.

Processes of formation were investigated at the Willmore dam. The exploration relied on ecological relations to the design intervention, but a missed opportunity was not designing the Willmore Park that relate to the novel ecologies and activities.

Novel ecology serves as a lens to describe adaptability and the activities that support the ecology. Emma Marris is the one who define novel ecology in the “Rambunctious Garden”, and the success of this project is not only rest on the menu of goals that she have set in her book. This present thesis uses her goals as a matrix to evaluating each design tests, and then adding two more goals that might be projected in the future and impact the landscape architecture. A major challenge is to assume that change is the base line condition. So, adaptive design is the strategy that can be added to the menu of goals that impact the result of the project by following the nature’s processes and then managing them.

The second challenge is to change in landscape perception that leads to better habitat by providing novel activities that support ecology. Strengthen the community through the engagement of active roles within the community in setting the initial condition and novel activities for people to allow the new ecology to happen is one of the most important elements in this thesis, but is not the only element to success. If people are not interested in participating in any of these activities, then the place eventually becomes a space for a new ecosystem. The place still has benefits for new ecosystem to emerge, and people can promote, foster, and accelerate the emergent of new ecologies.

The diagram on the next page shows the matrix that the design decisions are made based on. Some of the goals are more important and some are less.



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**NOVEL
ECOLOGY**

**NOVEL
ACTIVITY**

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Thanks to the rest of the faculty for their criticism
This thesis wouldn't have been possible without you all.

Dedicate to my family

How can the idea of novel ecology improve the opportunities of a potential habitat, provide self-organized form, and instigate novel activities for people?

ABSTRACT

Ecosystems are complex, dynamic, and unpredictable to change, evolve, and behave. Change is a normal part of life, and through adaptive and flexible design, we can respond to this complexity. Dynamic ecosystem and novel ecology, which is the system that results from disturbances, such as natural disasters or human implementations can affect the design intervention to the surrounding ecosystem. Such is the case where the dam can provide habitat for species, even though it has lots of negative effects on the creek.

This thesis researches the possibilities using the Southern Clubshell Mussel, as an indicator species and design catalyst to produce a form that engages the public, provide habitat, educational purposes, increase awareness, and improves watershed health.

The strategy for being adaptive, flexible, and responsive is a design that can be small enough to fail, and then altered again, without endangering the community, ecosystem, or habitat. A theoretical framework is based on the long-term performance assessment and monitoring throughout the installation, post-installation, and maintenance phases of development through the years. Studying the relationship between natural process, (such as the water flow, sediment aggregation, erosion, and run off) and design intervention, and the potential to transform a single-purposed installation into recreational, ecological awareness, and educational purposes, and offer community engagement.

The present thesis offer community partake in the novel ecology by engaging in novel activities that support the ecology and wildlife habitat. These activities promote a sense of ownership amongst the community, allowing them to see their part in setting initial condition and as a result, how it emerges a new ecology. These novel activities, over the time, support a change in landscape perception that leads to better habitat for species.

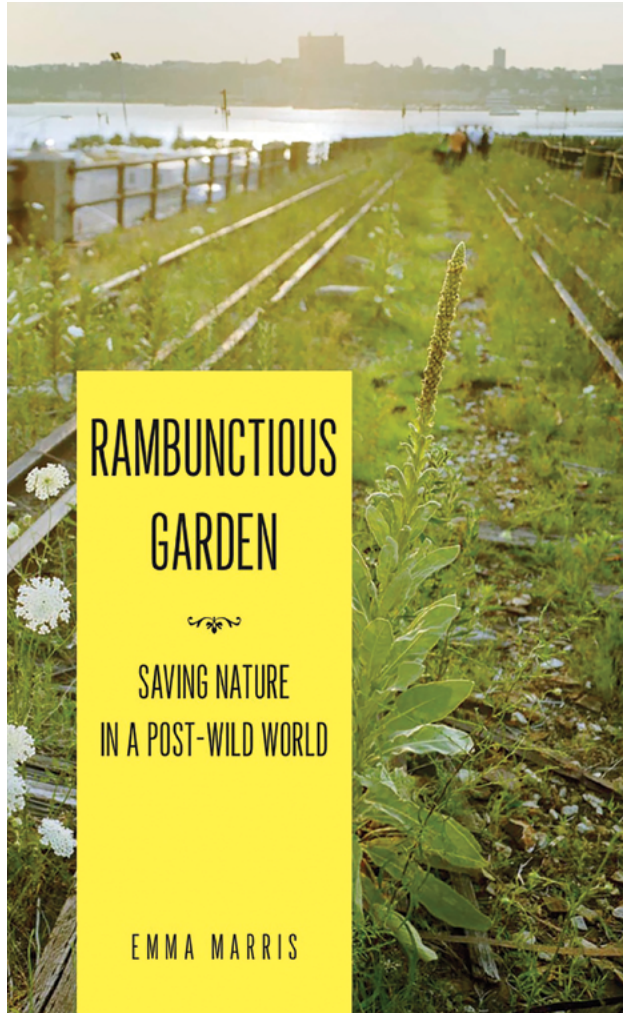
NOVEL

ecology
activity

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**NOVEL
ECOLOGY**



We've forever altered the earth, and so now, we can't abandon it to a random fate. It is our duty to manage it. Let the rambunctious garden begin.

(Emma Marris, 2011)

[a] Emma Marris' approach

Emma Marris is a writer about conservation, and ecology.” *Rambunctious Garden*” is her book that explains “why,” and more importantly, “how” humans influence the earth.

In this book, she set a menu of new goals which introduce the idea of novel ecology and ecological design. She has coined 7 goals, which I use as a tool for unpacking the theoretical frameworks, and this present thesis, respond to them by supporting or critiquing the goals.

We must choose among the goals based on an experiment in which whole ecosystem are pitted against one another. No single goal work in all situations. This means that for every piece of land, its owner, its managers, governments, and other people who care about it will have to come together and hash out a common set of goals.

(Emma Marris, 2011)

Novel ecology vs. Restoration ecology



novel ecosystem in Hawaii
Image credit Emma Marris

As the presence of humankind's in the landscape is clear, there is no place unaffected by human. Also, ecologies are forever changing and adapting, and no ecology is permanent. Novel ecosystems are defined by anthropogenic change but are not under active human management. This is nature's response to what we have done to it.

Novel ecosystem could be our best hope for the future, as their components adapt to human-dominated world using the time-tested method of natural selection (Emma Marris, *Rambunctious Garden* 2011).

On the other hand, restoration ecology is defined by returning the nature to a stable natural state. In stream restoration, restoration ecologists creating streams that look like they used to be and hoping that these streams will improve biodiversity and reduce the sediments and nitrogen carried into bigger bodies of water.

The new picture of streams will just replace one arbitrary baseline with another, neither of which takes into the account the changing nature of the landscape. If our goal is to reduce the sediment load, we should focus on that and not worry about making the stream look the way it did at pre-settlement time, because nothing else is the same as it was pre-settlement (Margaret Palmer, stream restoration expert at UMUC).

Strict preservationists fight novel ecologies, but there is a new current of energy. We should see the possibilities of designing and engineering something new, as Emma Marris proposes. The most radical kind of designer ecosystem is not emulating any baseline at all, but building anew to achieve a particular goal.

As a designer, we design for now and the future. The idea of "novel ecology" can affect the design intervention to the surrounding ecosystem. The new ecosystem may not look familiar, but it will do something for us or for the species we care about. We need to look to the future.

Professor Dee Boersma
image credit: University of Washington



Dee Boersma, is an ecologists at University of Washington, who support the idea of novel ecology and ecological design. Her main goal is to save Galapagos penguin. They are at the risk of extinction, and only two thousand remain, and introduced rats eat the chicks.

The automatic reaction of the restoration ecologists is to try to turn back the clock and get rid of the rats. But getting rid of the rats is hard. So scientists are instead drilling more nesting holes into the rocks for the birds, which is an example of novel ecology. Now the population can expand and perhaps stay ahead of the reduction due to rat predation.

The manipulation does not return penguin habitat to any particular baseline, it makes the habitat better than normal for birds.

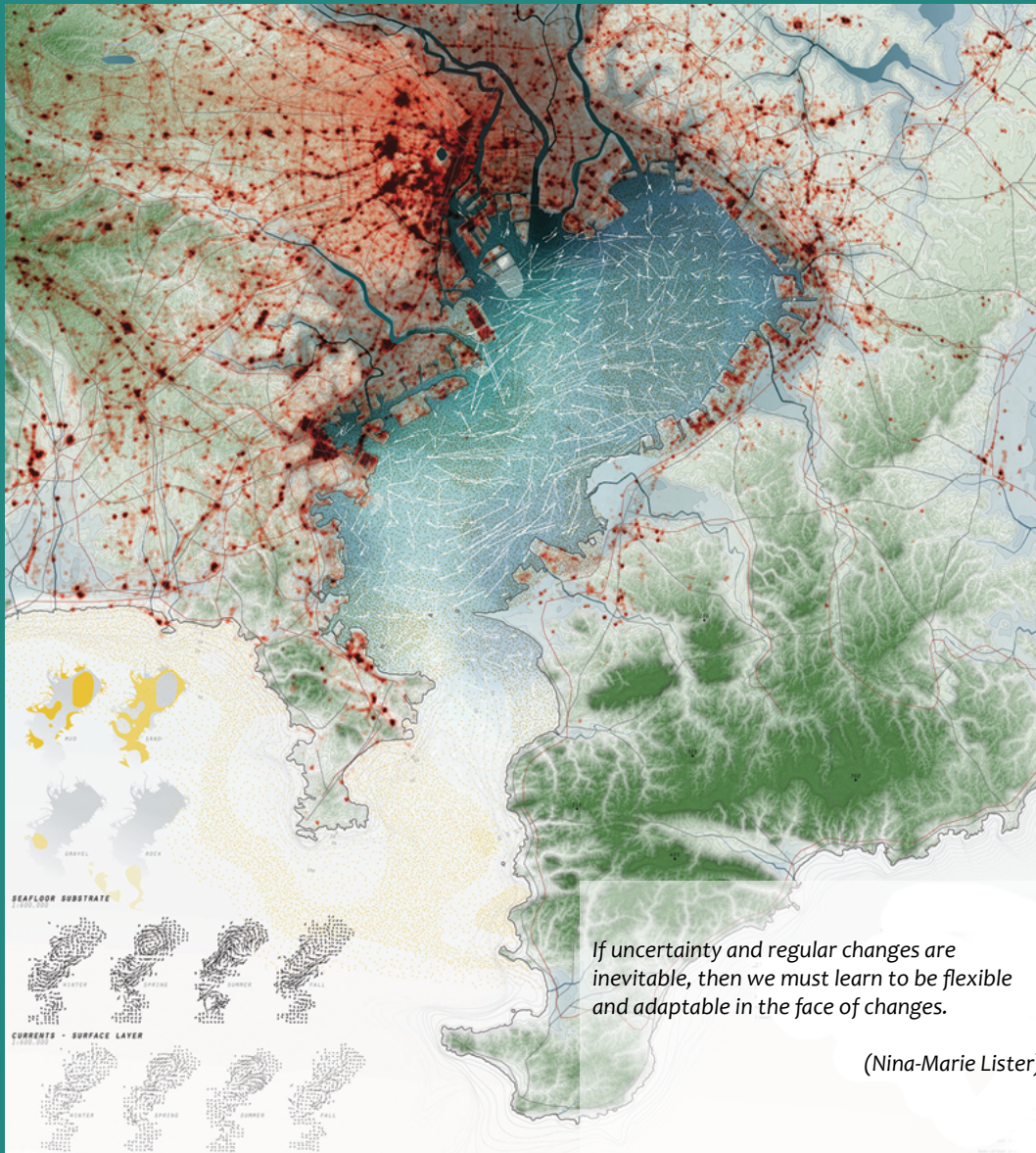


A designer ecosystem may be better than a recreation of historical ecosystem.

(Emma Marris 2011)

Strict preservationists fight novel ecologies, but we have to admit that man is part of the nature and that human activities have and will continue to impact all ecosystems. Ecologists need to learn to manage all ecosystems, regardless of their origin.

(Emma Marris 2011)



If uncertainty and regular changes are inevitable, then we must learn to be flexible and adaptable in the face of changes.

(Nina-Marie Lister)

[b] Adaptive Design

A novel ecosystem is a system that having a tendency to self-organize and manifest novel qualities without intensive human management. McHarg (1969), Hough (1995), Lyle (1985, 1999), emphasize that good design should follow the dictates of nature's form and process, often at the expense of human creativity and originality.

The present thesis is built on the relationship of novel ecology and adaptive design. I embrace my lack of knowledge about the complicated world and its ecosystems, and build upon the strategy as a diversity of potential by using adaptive and experimental design. So, from this view point, adaptive design is embedded in the novel ecology, and these two frameworks support each other.

[c] Initial Condition

Ecological design is one of the approaches to more sustainable, and environmentally responsible development. As such, it may navigating the interface between culture and nature. Van der Ryn and Cowan (1996) described ecological design as a hinge that connects culture and nature, allowing humans to adapt and integrate nature's processes with human creations. So, what are the consequences of this conception for landscape architecture design?

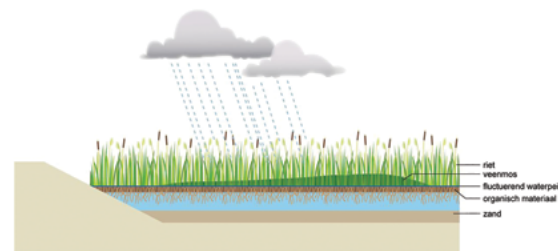
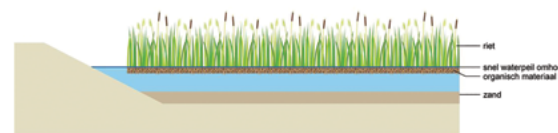
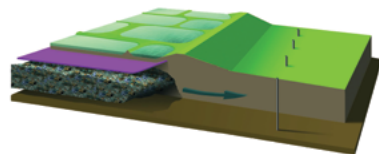
Change is the baseline condition in landscape systems. Landscape is an ever-changing field that encompasses environmental, social, economic, technological, and informational. Throughout the design process, landscape architecture faces the struggling of design in a truly dynamic landscape, to navigate ever-changing, natural processes, and the inevitable uncertainty of the physical world.

Designers do not 'create' ecologies, though they do manipulate the processes, elements and conditions that enable ecologies to develop and evolve.

(Barnett, 2009)

According to Rod Barnett, one way to respond to our complex and forever changing world, is setting up the initial condition, and then managing the process based on the natural process in an adaptable and flexible approach. Rod Barnett, in ten point for guide to initial condition says: "Designers do not 'create' ecologies, though they do manipulate the processes, elements and conditions that enable ecologies to develop and evolve. As Corner has put it, landscape architects 'stir' ecologies into different conditions. In ecological situations, design intervention, again, is a matter of setting up the initial conditions."

This is best illustrated by Roel van Gerwen's figure of a stick in the sand. The process of water and wind will create a mound over the time, instead of building it. "In van Gerwen's analogy placing the stick is less exhausting, gives a less predictable result, and is more dynamic. It is also bottom-up." (Barnett, 2009)



Vista Landscape and Urban Design project which is a type of “process design” that provides a look into how “initial conditions can be designed to direct the future movement of the conditions” on site.

This project looks at a “strategy that guided the regeneration of a bog landscape” in Amsterdam. Plants are allowed to grow in the shallow water, which in the long run will create peat. The water also attracts many birds. Cattle and sheep interact with the developing water bodies.

If a pond was isolated from fauna it could develop into a forest; if grazed by cattle it would turn into grassland. Vegetation would regenerate rather than being planted, its final configuration and composition being a matter of what seeds were already in the soil, and what seeds were carried there by wind and birds. The repetitive interaction of these agents over time will guide the life of the project. This type of “process design” provides a brief look into how “initial conditions can be designed to direct the future movement of conditions” on site (Barnett, 2009).

Images credit: Vista Landscape and Urban Design

**NOVEL
ACTIVITY**



Novel activities refer to the activities which are new to the site, that support the ecology and wildlife habitat. These activities promote a sense of ownership amongst the community, allowing them to see their part in setting initial condition and as a result, how it emerges new ecology, at the first phase, and then offer more new activities for the community as a maintenance process in the second phase. These novel activities, over the time, support a change in landscape perception that leads to the better habitat for species.

People participation in the process of initial condition, define the first phase of the novel activities. Residents of the area taking an active role in shaping their landscape, which is one of the most efficient ways to promote ownership and pride in their environment.

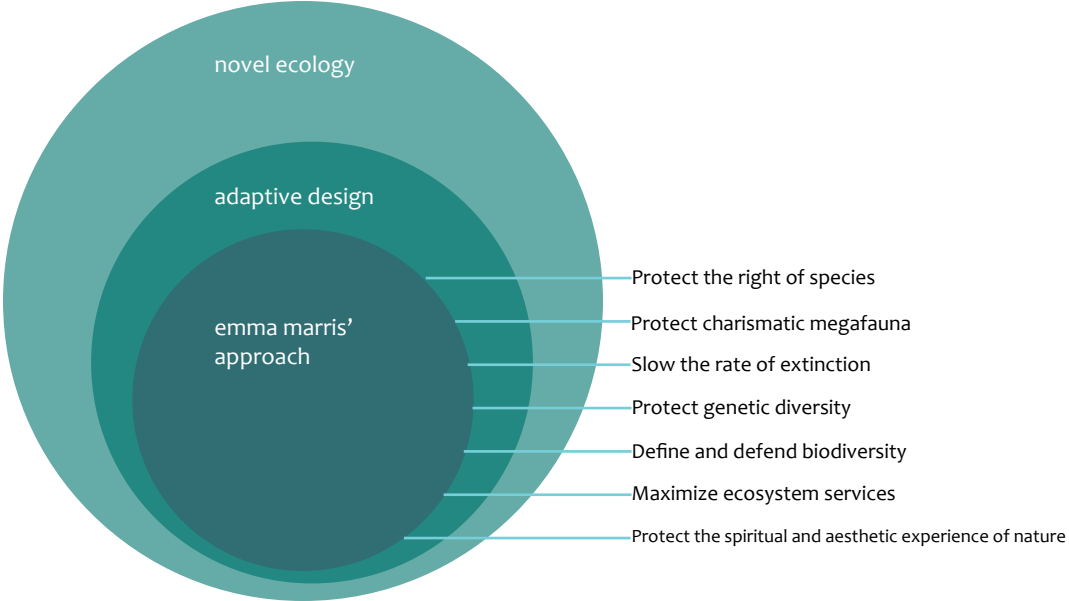
Second phase is defined by long-term performance assessment and monitoring throughout the adaptive design and maintenance phases of development through the years. Novel activities will result from the adaptive design and novel ecology over time, because of the emergence of the new ecology, and the processes of supporting the ecology.

The aim for this investigation is to find a strategy that reveals the novel activities for people, that reveals ecological situation in relation to the design intervention, and transfer the pace in an interactive way to engage people with activities that promote educational purposes, public awareness about the novel ecology and ecology in general, improves watershed health and potential habitat, by visualizes dynamic processes of change throughout the design.

A great example of novel activity which is result from novel ecology is the project of University of Washington, that Professor Dee Boersma, as an ecologists, attempted to save Galapagos penguin. Drilling nesting holes into the rocks for the birds, is an example of getting scientists to engage in novel activity (page 14).

These activities are all about participating together, and letting people experience their active role in shaping their landscape, and realize the acts and the results of their ecological footprint. Over the time, people's perception of the landscape will change and they will see the result of the habitat that they, "themselves" have helped develop, and support, and understand their ownership of the landscape within the community.

EVAUATIONS



From these theoretical frameworks, the overall strategies for creating novel ecology and novel activities can be identified.

The first strategy is creating the ecosystem which is defined by change and nature's response to what people have done to it, and design for now and the future. The idea of "novel ecology" can affect the design intervention to the surrounding ecosystem. The new ecosystem may not look familiar, but it will do something for us or for the species we care about. We need to look to the future.

The second strategy is creating the ecosystem that have a tendency to self-organize and manifest novel qualities without intensive human management and follow the dictates of nature's form and process. The strategy for being adaptive, flexible, and responsive that can be small enough to fail, and then altered again, without endangering the community, ecosystem, or habitat. By setting up initial conditions for the landscape using these two strategies, the perception of people can be altered and people can understand their connection to their surroundings.

The third strategy is using Emma Marris approach as a tool, since she is the one who define novel ecology in rambunctious garden. My design proposals respond her 7 goals and make them less or more important, by supporting or critiquing them. Overall, this thesis uses these goals to evaluate the design tests.

Restoring an ecosystem we have destroyed is too hard, and we can't get the magic back. The alternative is to design for specific goals to meet the challenges of our time. Once you admit that you can't put thing back they were, you often find yourself having to choose between goals that all sound pretty and good.

(Emma Marris, Rambunctious Garden 2011)

Protect the right of species

Ecologists believe that all living things have intrinsic value and deserved to be protected. In fact, each human should expand his conception that taking care of ourselves become the same thing as taking care of the environment.

In order to respond to this goal, and focus on the ecological design, one threatened species is selected to be served as a “target species” for design, which is at the risk of extinction and deserved to be protected.

Protect charismatic megafauna

This present thesis, protect the charismatic, but not just the megafauna, which are the large and beautiful animals that people like and really don't want to see go extinct. But instead the protecting the ugly mussels, which seems not very special.

But, ecological theory predicts that many of these species may be also keystone species.

Species that have a great effect on how an ecosystem works. Just like mussels that function as “environmental logbooks” effectively recording changes in water and habitat quality over time. So, in this project, I'm critiquing this goal and advancing it to ugly animals.

Slow the rate of extinction

Perhaps a more sophisticated approach is to treat all species as equally valuable. This is the assumption behind legislation as the endangered species.

This thesis, use this goal because target species for design, “Southern Clubshell Mussels” are at risk of extinction, and perfectly fit to test as an indicator species and design catalyst to produce a form that engages the public, provide habitat, educational purposes, increase awareness, and improves watershed health.

Protect genetic diversity

Few effort are specifically focused on protecting genetic diversity. One of them, called EDGE (Evolutionarily Distinct and Globally Endangered), seeks to save the most genetically weird animals in the world, arguing that by losing the specific species, we lose millions of years of evolution not represented in any other gene pool.

Protecting the right of species and slowing the rate of extinction of target species are in fact protecting the genetic diversity.

Define and defend biodiversity Maximize ecosystem services

Biodiversity is the most widely shared value among conservationists and ecologists, and it embraces a whole ecosystem or even the whole earth. The idea is that species evolution produces a beautiful web of interaction, and inherently valuable. The difficulty of linking biodiversity to ecosystem services wouldn't be a problem if the promoters of ecosystem services really valued nature only insofar as it contributes to human well-being. This thesis offer more diversity by getting the Southern clubshell Mussels to the stream, and as mussels act as an indicator species. The presence of mussels indicate a healthy stream system, and is an indication of a lot of other species being healthy, as mussels are recognized as a sensitive keystone species.

Protect the spiritual and aesthetic experience of nature

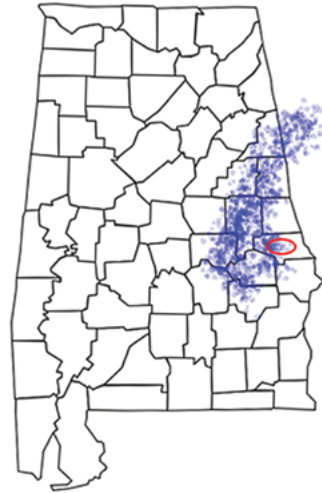
This thesis offer some novel activities which people can involve as a result of the form-making process of adaptive design in regards to novel ecology. Providing the opportunity for people to set the initial condition to emerge this novel ecology happen, and long-term performance assessment and monitoring throughout the adaptive design and maintenance phases of development through the years

Also, offer community partake in the new novel ecology by engaging in novel activities of community engagement that support the mussel habitat, and support a change in landscape perception that leads to better habitat.

**DESIGN
INVESTIGATIONS**

[a] Targer Species For Design

Tallapoosa Watershed



RED-COCKADED WOODPECKER
Picoides borealis
ENDANGERED



BALD EAGLE
Haliaeetus leucocephalus
THREATENED



WOOD STORK
Mycteria americana
ENDANGERED



EASTERN INDIGO SNAKE
Drymarchon corais couperi
THREATENED



GOPHER TORTOISE
Gopherus polyphemus
THREATENED



FINE-LINED POCKETBOOK MUSSEL
Lampsilis altilis
THREATENED



CHATOOGA CRAYFISH
Cambarus scotti
ENDANGERED



SOTHERN CLUBSHELL MUSSEL
Pleurobema decisum
THREATENED



OVATE CLUBSHELL MUSSEL
Pleurobema perovatam
THREATENED

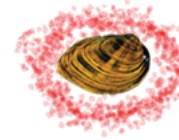


ARMORED SNAIL
Pyrgulopsis marstonia pachyta
ENDANGERED

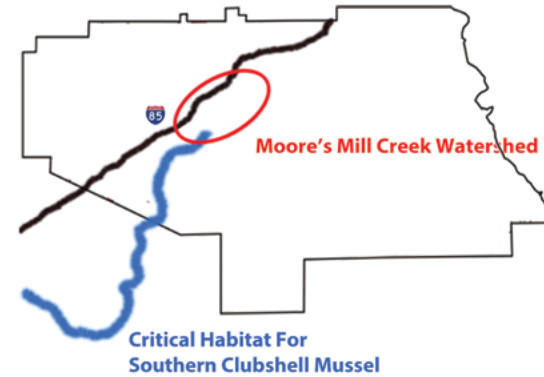
Coldwater Darter
Etheostoma ditrema
ENDANGERED



SOTHERN CLUBSHELL MUSSEL
Pleurobema decisum
THREATENED



Moore's Mill Creek Watershed



How can Moore's Mill Creek, as a potential habitat, be improved and provide habitat for "Southern Clubshell Mussel"?

Moore's Mill Creek is a rapidly urbanizing watershed in the lower part of the Tallapoosa Watershed, but it is still recognized as a potential habitat for some species, according to Alabama Fish & Wildlife.

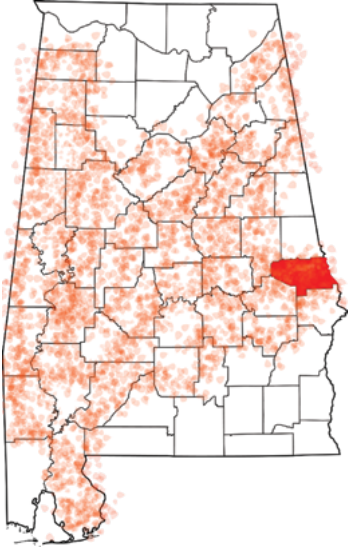
In order to respond to Emma Marris' goals and focus on the ecological design, one threatened species is selected to serve as "target species" for design, in hopes that the habitat will be improved to support this specific species.

MUSSELS IN ALABAMA

Target Species Profile

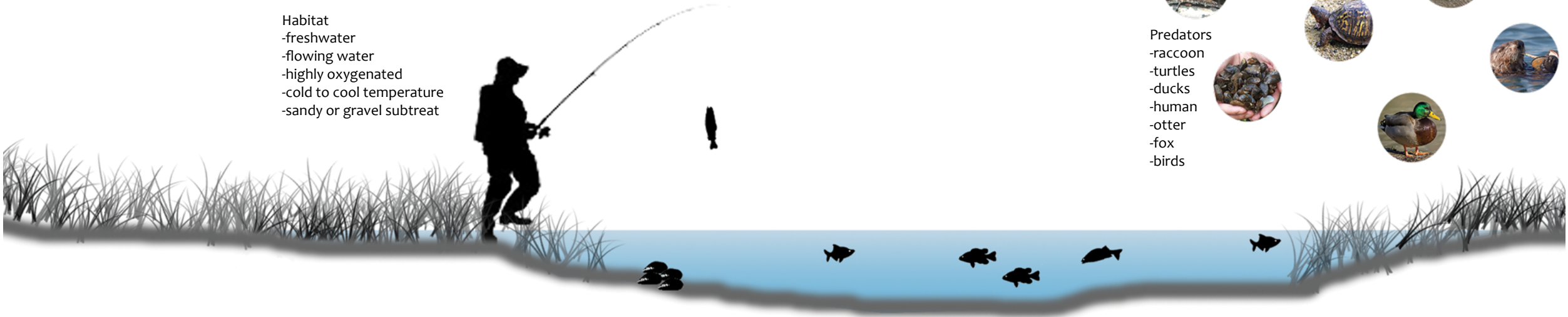
MUSSELS

Location

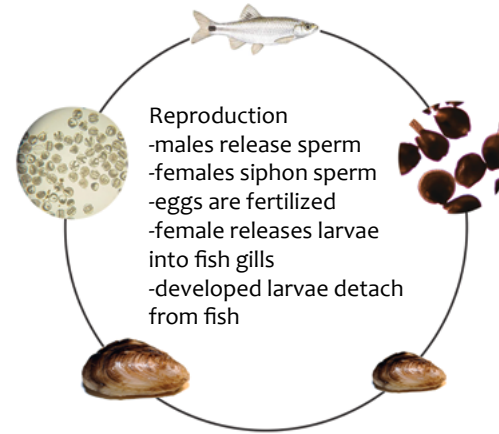


Habitat

- freshwater
- flowing water
- highly oxygenated
- cold to cool temperature
- sandy or gravel subtreat



blacktail shiner fish host



Reproduction

- males release sperm
- females siphon sperm
- eggs are fertilized
- female releases larvae into fish gills
- developed larvae detach from fish

Mussels are bivalve mollusks that prefer gravel bottoms of streams and rivers with good water quality and a stable stream channel of free flowing water. They live off of algae, tiny plants and animals like plankton, and bacteria that they filter from the water. Also, mussels can filter one gallon of water per hour and live up to 50 years.

Alabama's rivers used to be extremely abundant in freshwater mussels, but, many species have gone extinct for a couple of reasons. Mussels have the complicated life cycle. Female mussel releases larvae into fish gills, and the larvae live on the fish for several weeks before transforming into juvenile mussels.

Predators

- raccoon
- turtles
- ducks
- human
- otter
- fox
- birds



As I move forward through the design development, I will unpack the process of the species selected and what the selected species bring to the design, as well as the development of the principles that framed this design.

To respond to Emma Marris' goals and ecological design, Southern Clubshell Mussels are selected, as a target species for design, which is at the risk of extinction and deserved to be protected. Ecologists believe that all living things have intrinsic value and deserved to be protected.

This thesis offer more diversity by getting the Southern Clubshell Mussels downstream of the dam; and as mussels act as an indicator species, of a lot of other species being healthy.

Also, this present thesis, protecting the charismatic, but not just the megafauna, which are the large and beautiful animals that people like and really don't want to see go extinct. But instead protecting the ugly mussels, which seems not very special, which is not right. They living of the filtering water, and from this view they are very important in ecosystem services.

In fact, they function as "environmental logbooks" effectively recording any changes in water and habitat quality over time. This target species, respond to all Emma Marris' goal and critiquing the idea of -just- protecting charismatic megafauna.

The juveniles settle into the river bottom where they remain for their entire life, often ranging between 50-100 years. During this time, mussels feed by filtering microscopic bacteria and algae from surrounding water.

Mussels function as "environmental logbooks" effectively recording changes in water and habitat quality over time. Exhibit sensitivity to habitat or watershed changes that alter flow regimes, reduce substrate stability, or cause siltation and erosion. The presence of mussels indicates a health stream system.

Like a canary in a coal mine.

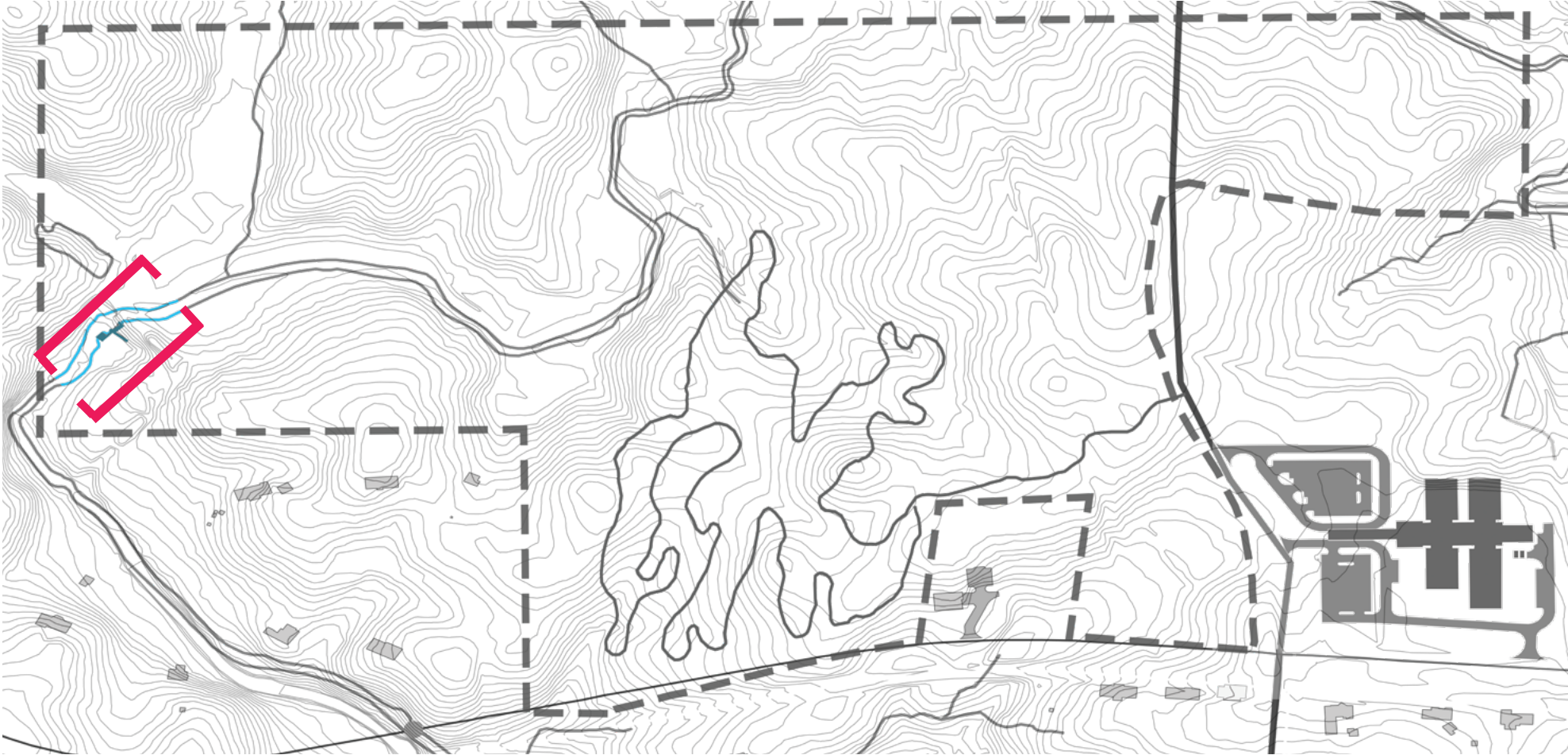
It means that Canaries are especially sensitive to methane and carbon monoxide, which made them ideal for detecting any dangerous gas build-ups in a coal mine. So, miners would bring a caged canary into the coal, and as long as the bird kept singing, the miners knew their air supply was safe. A dead canary signaled an immediate evacuation.

Based on the mussels' need this new ecosystem is introducing to the stream. Freshwater, flowing water, highly oxygenated water, cool to cold temperatures, a fish host for reproduction, and a sandy or gravel substrate are the factors the habitat required to introduce mussels. Some factors such as freshwater, flowing water, a fish host, and enough food source are already prepared by dam; The other factors will be provide by means of intervention.

Mussel's needs is going to guide the design. Though this species is chosen, many benefit from its presence and needs will happen. The relationships between predators and prey, so if we design for one species' food source, the other will be present, and allowing the opportunity for greater biodiversity. It is not just about the mussels, it is about the whole system, and the whole web of connections that would be improved, as well as biodiversity.

SITE SELECTION

This location shall serve as a field for experimentation and testing of the ideals put forth in this thesis project.



[b] OVER WILLMORE DAM

It is interesting to note how infrastructure overlooked to most people until they fail or stop working. The aim is to extend landscape to look at these overlooked infrastructural systems to make them present and protect the valuable ecosystems that are being degraded, due to the constructions of dams.

Infrastructure has the potential to investigate in different ways that can reduce the negative effects of them.

Based on water analysis conducted on the Chewacla Creek, in Auburn, Alabama, which is a critical habitat for “Southern Clubshell Mussel”, and the personal interview with “Dr. Cliff Webber”, an Auburn University biologist scientist researching threatened mussels, a number of threatened mussels have been found below the Lake Ogletree Dam in Chewacla Creek. The Southern Club Shell Mussel is very sensitive to sediment and dams have the ability to trap the silt and sediment, so from this view, below the dam is perfect point to work from and a site for a design intervention.



Dams have the ability to trap the silt and sediment, so from this view, below the dam is perfect point to work from and a site for a design intervention.

How could the dam provide the habitat for mussels, even though it has lots of negative effect on the creek?



Through this investigations, the ways that can reduce the negative effects of the dam, and the potential ways to thrive mussel habitat, and taking advantage of this habitat for educational purposes, engaging the public, and improve watershed health is considered.

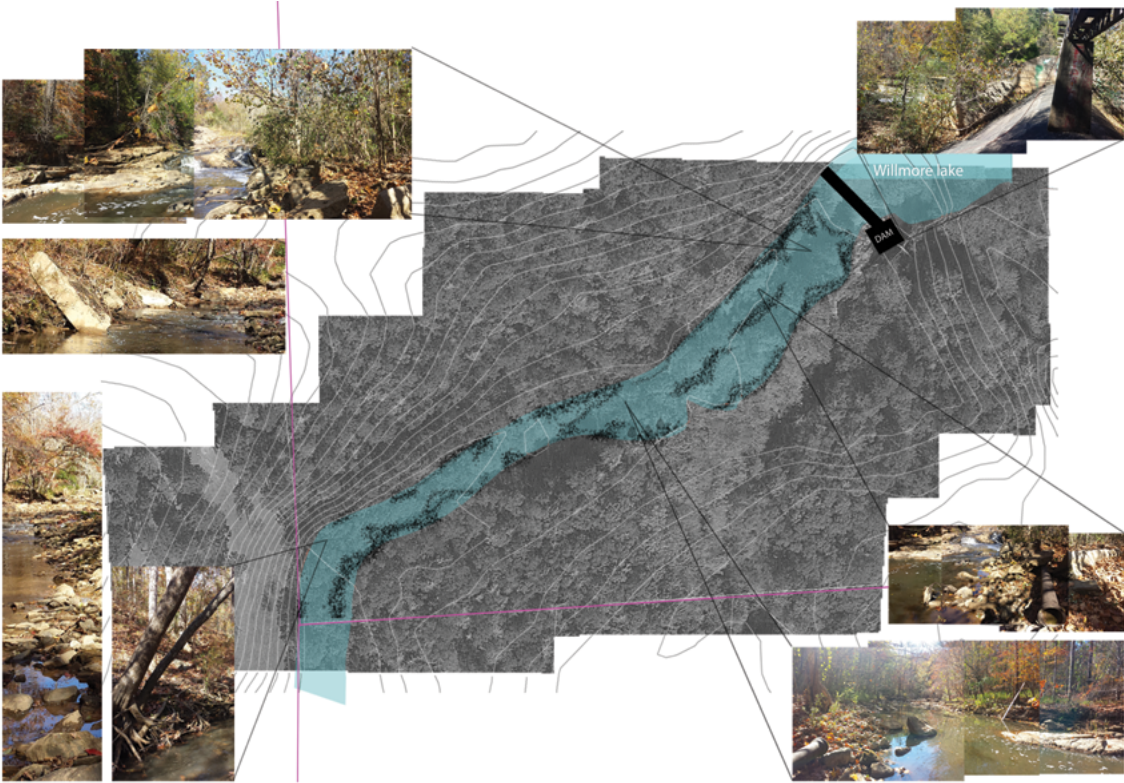
This is the part that advance novel ecology theoretical framework. Dams are always consider the negative impact on habitat by increasing the temperature, slowing the water at the lake, building up the sediment, and preventing the flow of plants and nutrients by trapping a lot of food source and algae.

The idea of novel ecology results from taking advantage of this negative impacts of the dam, tweak it, and [re]introduce mussels as a new ecosystem to the downstream of the dam, which has good water quality and flowing water. The water at the Wilmore Lake over the dam, also, can provide enough food source for mussels.

SITE PHOTOS



SITE INVENTORY



[c] Fluvial Processes

By investigating the existing condition, and mapping the fluvial process, such as sandbars, rocky edges, and the water current, I am able to predict locations that show good give me an indications to work with natural processes.

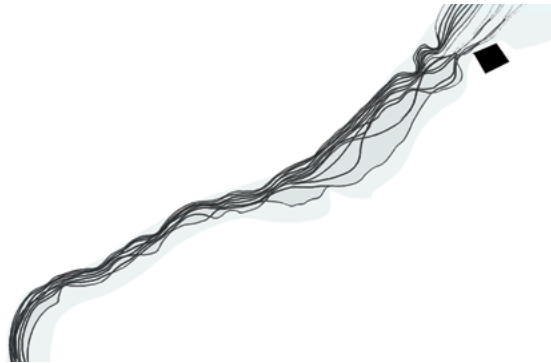
TOPOGRAPHY



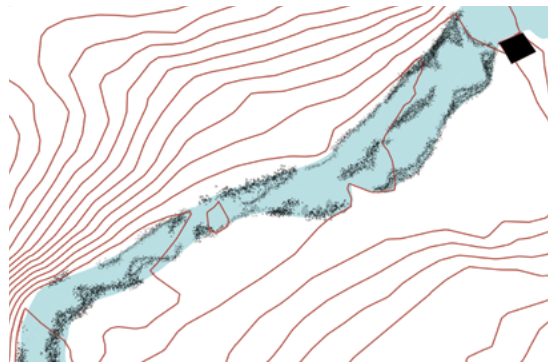
SANDBAR FORMATION



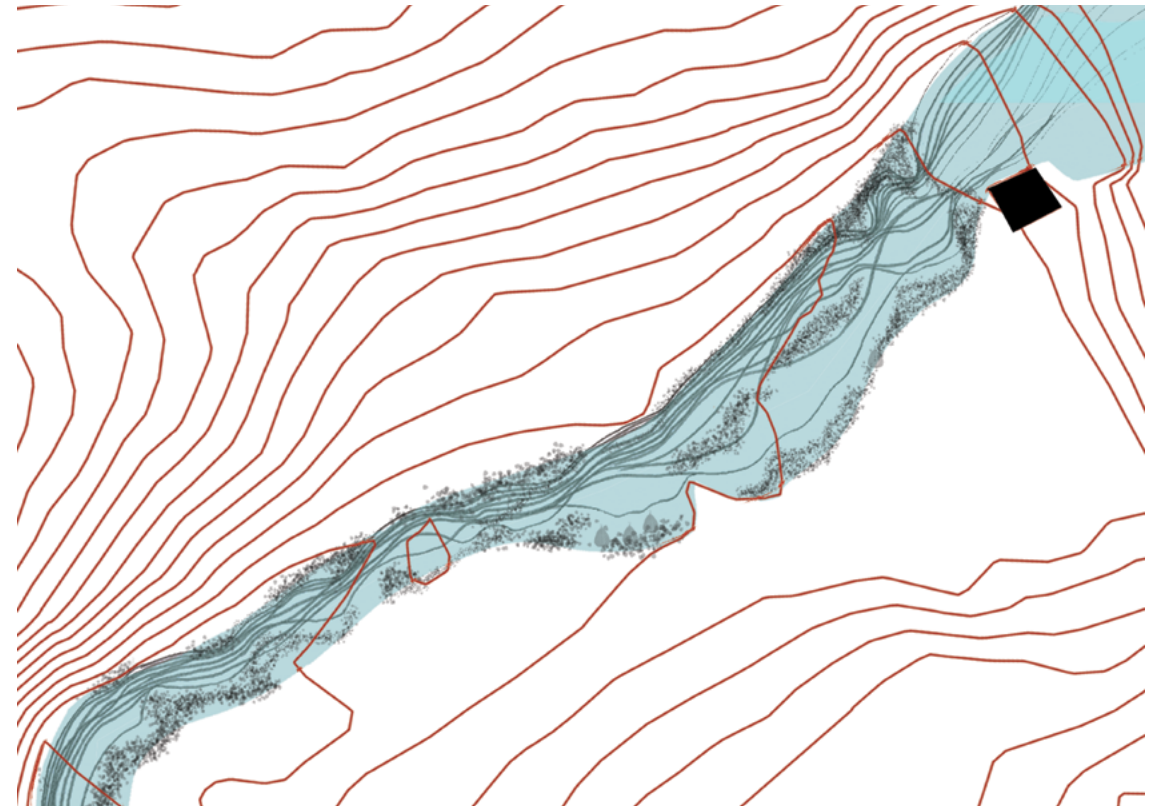
FLOW/CURRENT



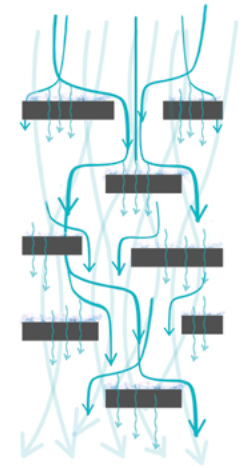
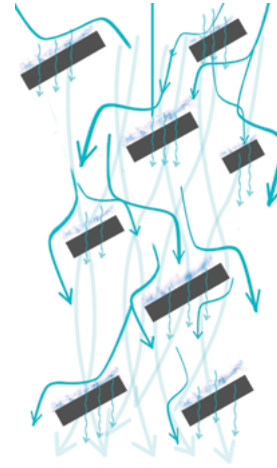
TOPO+SANDBAR



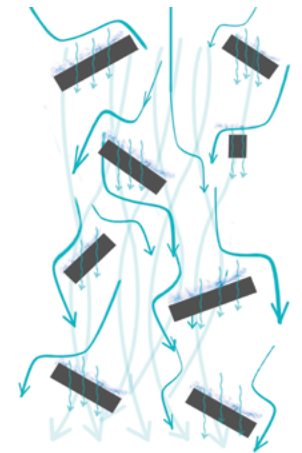
FLUVIAL PROCESS COMBINED



GABIAN INVESTIGATIONS AND CURRENT FLOW



Gabions are commonly used as inexpensive retaining walls but can be utilized in a different ways. This thesis developed the idea of concentrating the volume of water right after the dam, and testing the arrangement of series of gabion baskets filled with gravel to modify the water flow. Gabion baskets reduces the width of the creek and concentrate the volume and flow, but still let the water flows through it, rather than impeding it. This diagram tested the arrangement of the gabion baskets to examine the potential for modify stream flow, and still let the water go through it. Also the gabion baskets filled with gravel, act as a substrate for mussels to attach themselves on it, and mimic their preference substrate. Most importantly, gabion baskets are used to deflect the fastest flow, based on the fluvial process that revealed by mapping study.



GABIAN LAYOUTS

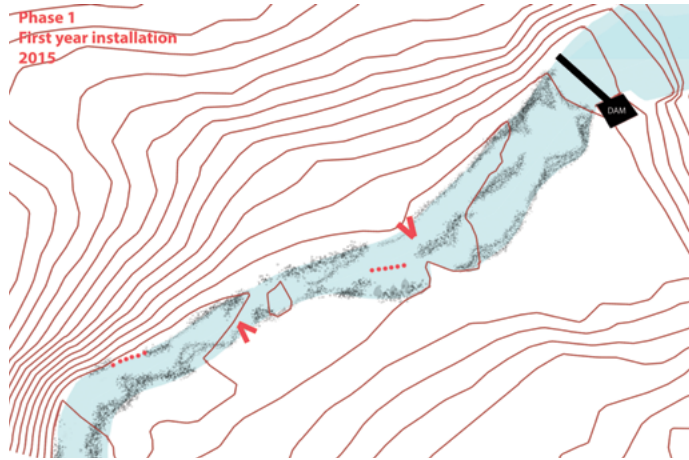
[d] 10 YEAR SCENARIO OF ADAPTIVE DESIGN

Setting an initial condition

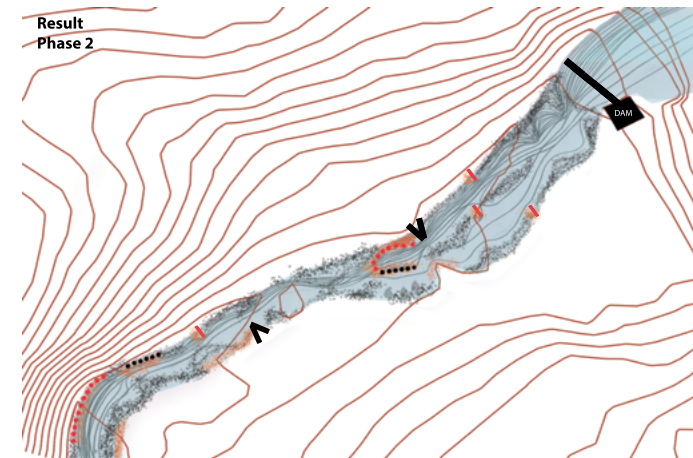
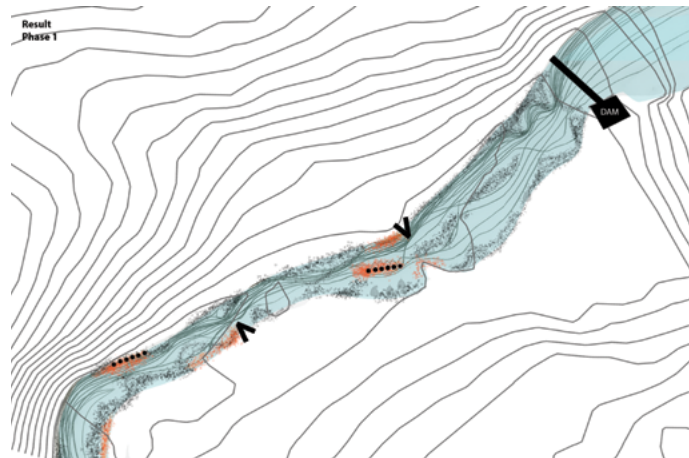
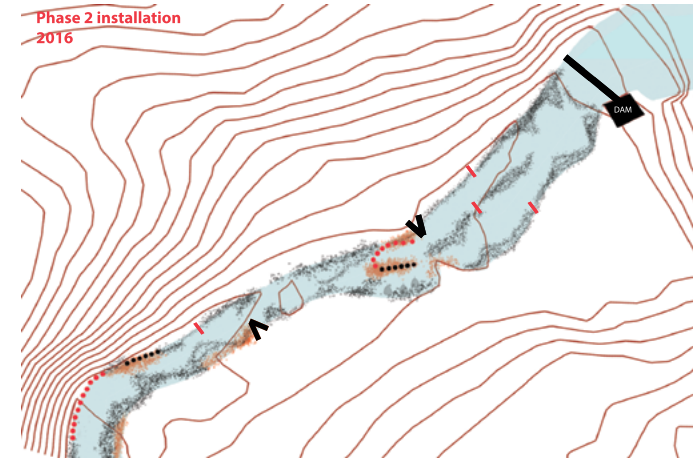
The scattering of gabion walls and wooden piles at the stream reach is the first step in setting up the initial conditions for the formation of a dynamic and adaptive design to provide an excellent habitat for species.

Phase 1 is the first year of installation of gabion baskets to deflect the fastest flow of water to the channel and the wooden piles to create sediment beds of silt, sand, and gravel for mussels, and other species.

Then the result of this new condition is how the water flow deflects, where the water concentrate, where erosion and deposition might happen. Through this process kids and neighbor community can help make these changes happen in each phase. People participation in the process is the most vital elements of setting the initial condition.

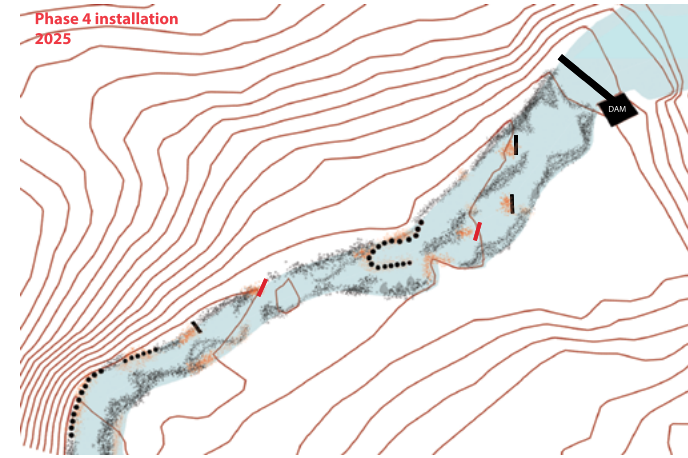
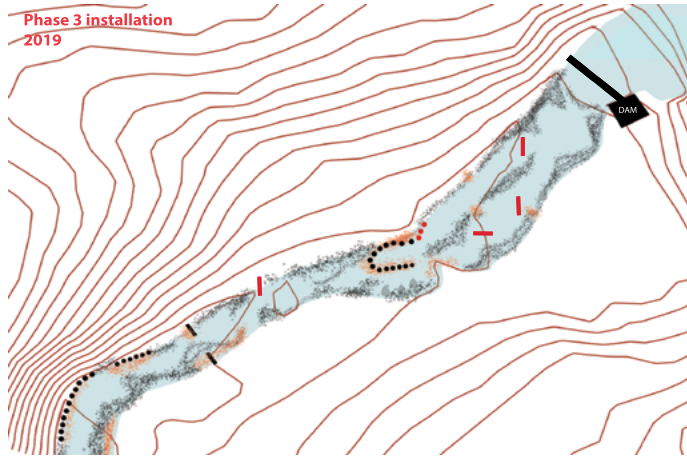


NOVEL ACTIVITIES IN SETTING INITIAL CONDITION



In each phase this adaptive design aimed to deflect the fast flow of water to the whole stream reach to provide excellent habitat for mussels. Within each responding design, there is some monitoring test of number of mussels placing in the stream, and data collection for educational purposes. Residents of the area taking an active role in shaping their landscape, which is one of the most efficient ways to promote ownership and pride in their environment.

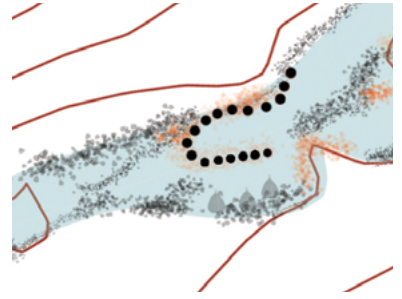
This adaptive design is small enough to fail, and then be altered again, without endangering the community, ecosystem, or habitat. It is revealed on the long-term performance assessment and monitoring. The neighborhood community and local people will engage to the process of and assist in making these changes to happen in each phase.



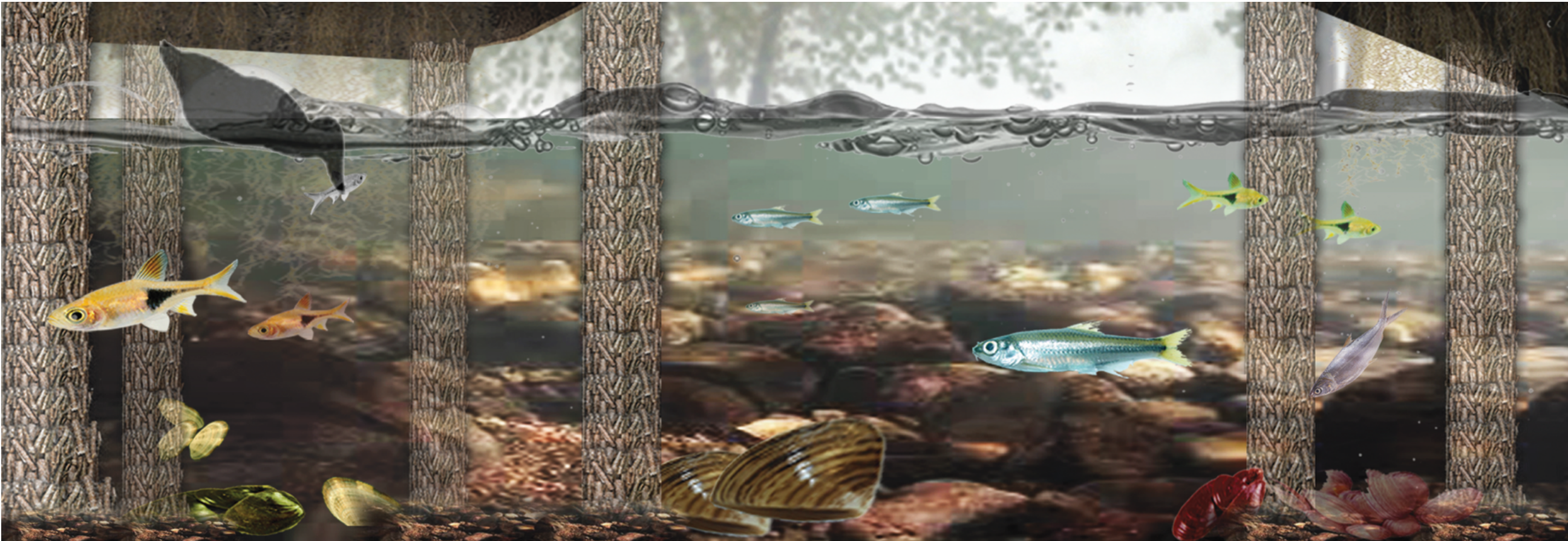
Adaptive design facilitate the form-making rather than form-finding, over the time wooden piles may transfer to the fish and mussels shelter and a bridge for people to cross over the creek. This design intervention, has the potential to transform a single-purposed installation into recreational, ecological awareness, and educational purposes, as well as, providing novel activities for people. New recreational and programmatic potentials appear through time and will be revealed by each phase.

UNDER WATER VIEW OF WOODEN PILES

Adaptive design facilitate the form-making rather than form-finding, over the time wooden piles may transfer to the fish and mussels shelter. This design meets all of the qualifications to be considered as an adaptive designed for mussel's habitat. Underwater at the stream where wooden piles are installed, coarse gravel, silt and sediments collect on the bottom which is supportive for mussels and many other species.



view of the wooden piles in the stream reach





STRENGTHENING THE NEIGHBORHOOD THROUGH STREAM RESTORATION BY WALTER HOOD

According to Walter Hood, residents of the community taking an active role in shaping their landscape is one of the most efficient ways to promote ownership and pride in their environment.

Building relationships within the community during the construction process will promote a sense of ownership amongst the community, allowing them to see their part in this initial condition and how it emerges a new ecology, and claim the stream and this habitat as part of their landscape.

The Courtland Creek Project by Walter Hood utilizes stream restoration as a tool for strengthening neighborhood bonds. The Courtland Creek Project in Oakland, California, combined the restoration of a creek and the provision of recreational infrastructure to one of the city's most trouble neighborhood.

Concerns for the ecological health of the stream had been long overshadowed by issues of crime, employment, safety, and maintaining the character of the neighborhood (Walter Hood, 1995).

Residents of the area taking an active role in shaping their landscape is one of the most efficient ways to promote ownership and pride in their environment.

(Walter Hood, 1995)

[e] NOVEL ECOLOGY + ACTIVITY

COMMUNITY ENGAGEMENT IN SETTING THE INITIAL CONDITION

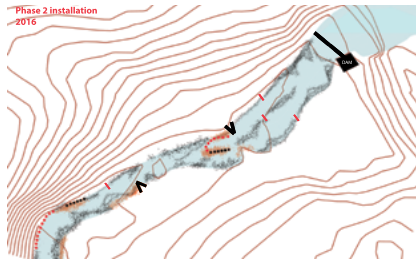
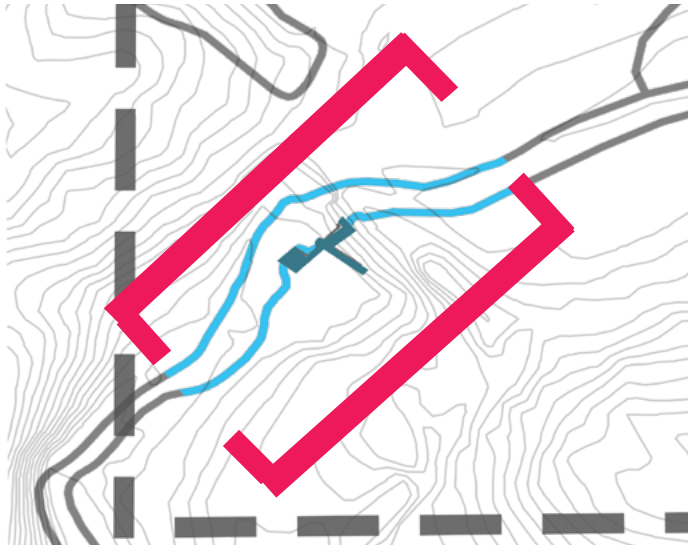
The design proposal for this site is a set of initial conditions meant to shape the self-organization of the landscape not only ecological diversity, but socially as well, to create novel activities.

Gabion walls and wooden piles will be placed into the creek by members of the community. The creek, and holds a history of interaction of people with the creek to make these novel ecology happens.

Building relationships within the community during the construction process will promote a sense of ownership amongst the community, allowing them to see their part in this initial condition and how it emerges a new ecology, and claim the stream and this habitat as part of their landscape.

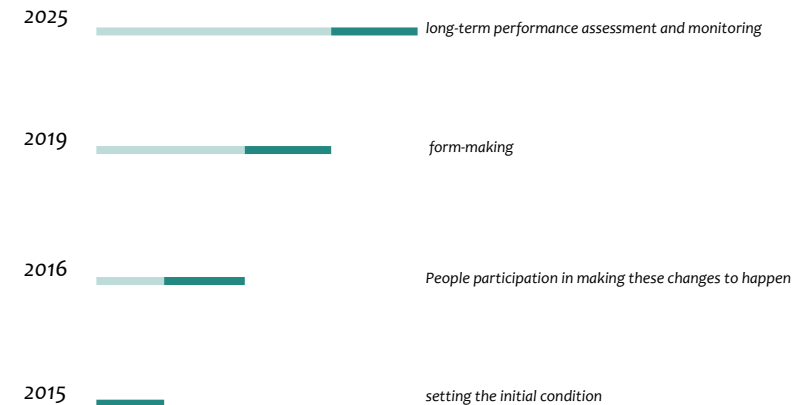


NOVEL ACTIVITY + ADAPTIVE DESIGN



These novel activities happen here along the time line. In each phase, more activities for community engagement happen to make evaluation and adjustments to the design based on the natural process and also improving the novel ecologies which is the aim of this research.

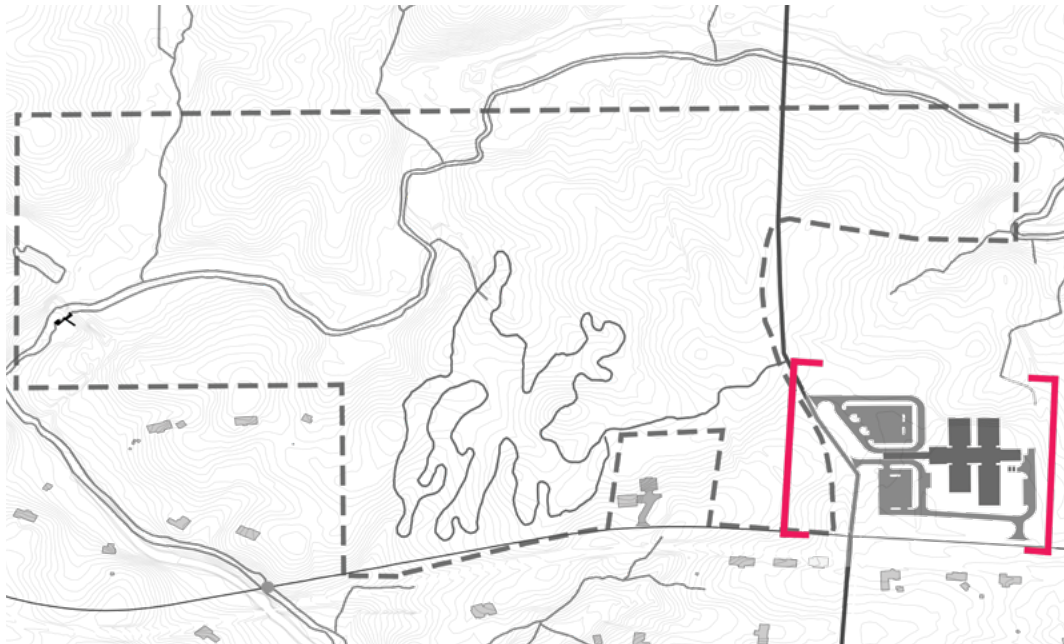
Strengthen the community through the engagement of active roles within the community in setting the initial condition and novel activities for people to allow the new ecology to happen is one of the most important elements in this thesis, but is not the only element to success. If people are not interested in participating in any of these activities, then the place eventually becomes a space for a new ecosystem. The place still has benefits for new ecosystem to emerge, and people can promote, foster, and accelerate the emergent of new ecologies.



MAKING CONNECTION

Making connections with local schools, Auburn University, community organizations, church groups, and environmental organizations, can promote long-lasting relationships within the Wilmore Park and the people as well as understand their connection with the landscape.

The proposal is a strategy specific to the Wilmore Park, novel ecology emergence, and the programs rather than designs that are product. The processes of formation and adaptive design served as a creative end to create a dynamic living system.



Ogletree Elementary School



There is a clear consensus among researchers that education enhances productivity. Local schools indisputably influence residential values. Public education, public awareness, communications, and social interaction are an important value within the community. The schools have a potential to explore these assets.

This proposal is a strategy specific to Wilmore Park and its programs. It suggest designs for people, especially students, to mentor the mentality and realize how their participation in the process is important to changing their surroundings.

NOVEL ACTIVITIES: CIVIC MONITORING PROGRAMS

The aim for this investigation is to find a strategy that reveals the novel activities for people, specifically student of the school, to transform the Wilmore Park into a public open space in an interactive way to engage people with activities that promote educational purposes and public awareness about the novel ecology and ecology in general.

The Ogletree School grounds with its access trail to the stream, enabling a new stream access, opening its students and neighborhood to the situation that nobody valued them before. Re-valuing the values and histories of the Moore's Mill Creek that are neglected over the time, and result in the transforming the stream ecology and habitat.

An activity is proposed that visualize dynamic processes of change in number of mussel's population and overall quality of water, and modes an ecological situation in relation to the design intervention.

This strategy redefines the school as a Research Station, so that volunteers, local neighborhoods, and students can monitor the population of species with the help of scientists and Auburn University Fishery and Ecology Department.

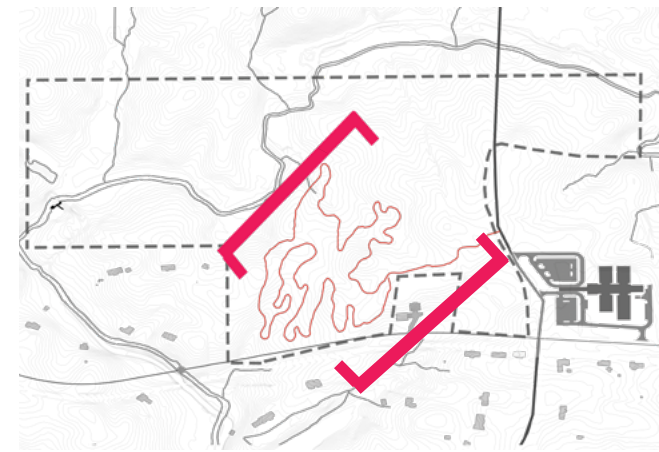




NOVEL ACTIVITIES: PLANTING PARTY

Each monitoring event results in celebration as a memorial by planting a tree and letting people mark the landscape thus establishing a connection with the emergent of novel ecology.

This event enables people to better understand the revealed dynamics of landscape. Over the time the trail will be transferred to a niche for wildlife, by means of the added diversity of fruit berries and future shade trees. The introductions of these elements which can provide a food source and habitat for birds, insects, and the wildlife and connect the wildlife throughout the trail and creek.



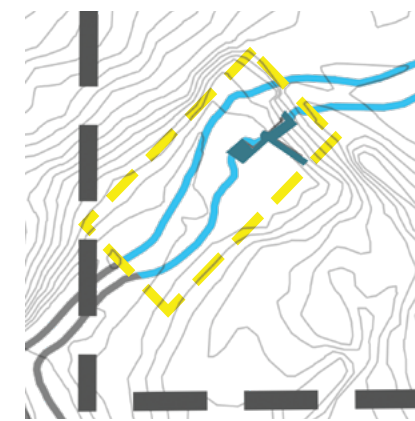
NOVEL ACTIVITIES: DIGGING DAYS

Many urban streams have undergone historic manipulation and the highly urbanized watershed of Moore's Mill Creek is no different. Due to upstream urbanization, it is included on the list of impaired streams for sedimentation and siltation by ADEM.

The next proposed novel activity reveals this ecological situation in relation to the design intervention. Removing the sediment upstream of the dam to promote the set initial condition downstream of the dam, is attained by removing the sediment and letting the turbidity settle out down at the dam.

In this strategy, volunteer's people can shovel and dig the sediment at the river bank and re-use the sediment as a highly nutrient and fertilize soil within the Wilmore Park.





The yellow sticks, control where people walk and dig out the sediment, and allow them to know that this is the place that “they” participate. It sets the initial condition for mussels, and novel ecology happens.

So, it is not a right place to dig out the sediment it will navigate them to upstream of the dam.

NOVEL ACTIVITIES: NUTRIE DAYS

Moore's Mill Creek is touched by thousands of invasive mussels called Asian Clams or Corbicula, that are reproducing rapidly. These mussels have nutrient value such as calcium, lime, and phosphorus which are all good for tree growth. These are the perfect nutrient load to mix with the removed sediment and soil.

People can activate these nutrient by crushing the shells, stepping on them, or kids jumping on them, and mix them with the soil to intensify the diversity of planting, and improving novel ecology.

Also, having some planter pots in the workshop to allow people put the removed sediment in them and replant them with native and bioremediation grasses, such as Switch Grass (*Panicum virgatum*) to remove pollutants, recycle native soils, improve the diversity of plant community and increase the wildlife in the park.



AMPHIBIOUS ARCHITECTURE



This project is “two networks of floating interactive tubes, installed at sites in the East River and the Bronx River, house a range of sensors below water and an array of lights above water. The sensors monitor water quality, presence of fish, and human interest in the river ecosystem. The lights respond to the sensors and create feedback loops between humans, fish, and their shared environment. An SMS interface allows citizens to text-message the fish, to receive real-time information about the river, and to contribute to a display of collective interest in the environment.”

The use of technology in this project encourages user engagement with SMS that offer real-time information about the river’s situation.



SOCIAL MEDIA AND EDUCATION

The use of technology, and integrated it with an accessible technology is a stimulus tool for using data, that taken from monitoring. This way the collected data about the mussels population, sediment accumulation and movement, and water quality in relation to the design intervention, can be visible through the social media like Facebook page, twitter, or Instagram.

The use of technology in this thesis encourages user engagement with social media that offer real-time information about the ecology and habitat.

Like these official pages to keep up with Willmore Park’s events and happenings.



VISUALIZATION OF THE DATA

In this investigation, the eco-visualization of converting real-time ecological data into insights is a bridge between data and knowledge, for the purpose of public education and awareness.

The data is translated visually, which makes the conditions of water quality and habitat more legible. Here the light transforms the trail into an engaging view. Where the level of lightening shines, it shows different water and pollution levels.





CHANGING PERCEPTION TIE TO THE CULTURE

Community engagement and improving the wildlife habitat with the help of people foster pride, understanding, and ownership of the landscape amongst the surrounding community. Community partake in the new novel ecology by engaging in novel activities of community engagement, support the wildlife habitat. These activities are essential in reestablishing community ownership of the creek. These activities support a change in landscape perception that leads to better habitat.

No-Rooz, is a word that means “New Day”. This is the new day that starts exactly at the beginning of the spring and celebrates renewal and rebirth. A customary thing that people do on this day is spend time outdoors. They also throw traditional home-grown wheat sprouts into a stream, a river, or anywhere where water flows.

Reflecting on this tradition, one way to encourage adults and children to participate in such events, is to tie them to their own American culture. An example of such events where people gather together and celebrate something special include Easter.

So, it is all about participating in these events together, and letting people experience their active role in shaping their landscape. If they attend the sediment party for the first time, they will realize the acts and the results of their ecological activities.

Over the time, people’s perception of the landscape will change and they will see the result of the habitat that they, “themselves” have helped develop. They will understand their ownership of the landscape within the community.

Persian New Year, No-Rooz



REFLECTIONS

Upon reflection, after the development of this design research, outcomes become crucial to evaluate its results. Due to time constraints and project limits, not every possibility could be explored, but these reflections should give insight into the design decisions made during the thesis process.

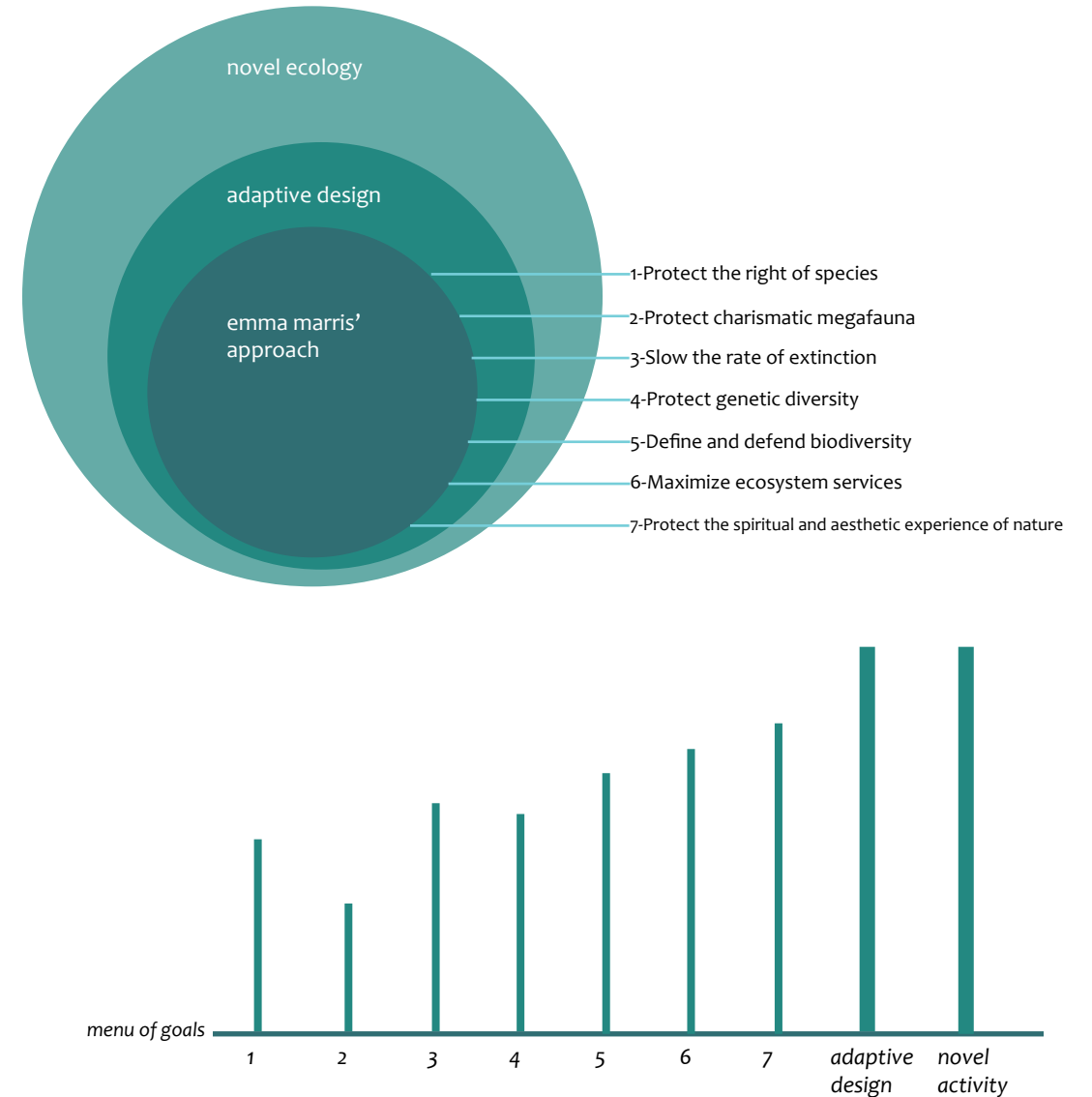
As a designer, we design for now and the future. We can never know the exact final form of a design, since the self-organizing systems of nature are unpredictable. These designs are intended to be uncertain, and require the designers and the community to stay with the project after the initial conditions have been set. This method allows the designer to offer more activities for community engagement to make evaluation and adjustments to the design based on the natural process and also improving the novel ecologies which is the aim of this research.

Processes of formation were investigated at the Willmore dam. The exploration relied on ecological relations to the design intervention, but a missed opportunity was not designing the Willmore Park that relate to the novel ecologies and activities.

Novel ecology serves as a lens to describe adaptability and the activities that support the ecology. Emma Marris is the one who define novel ecology in the “Rambunctious Garden”, and the success of this project is not only rest on the menu of goals that she have set in her book. This present thesis uses her goals as a matrix to evaluating each design tests, and then adding two more goals that might be projected in the future and impact the landscape architecture. A major challenge is to assume that change is the base line condition. So, adaptive design is the strategy that can be added to the menu of goals that impact the result of the project by following the nature’s processes and then managing them.

The second challenge is to change in landscape perception that leads to better habitat by providing novel activities that support ecology. Strengthen the community through the engagement of active roles within the community in setting the initial condition and novel activities for people to allow the new ecology to happen is one of the most important elements in this thesis, but is not the only element to success. If people are not interested in participating in any of these activities, then the place eventually becomes a space for a new ecosystem. The place still has benefits for new ecosystem to emerge, and people can promote, foster, and accelerate the emergent of new ecologies.

The diagram on the next page shows the matrix that the design decisions are made based on. Some of the goals are more important and some are less.



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