

# Severing Ties: A Pedagogy for Envisioning New Typologies of Environmentally-Attuned Architecture

CHRISTIANNA BENNETT

Rensselaer Polytechnic Institute

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**The relationship between architecture and landscape must undergo fundamental change to deal with the urgency of the climate crisis, adapt to changing cultural values, and support local environmental conditions. Although there has been progress in modifying architectural construction methods and implementing the use of sustainable materials, structures continue to depend on extractive infrastructure through integrated building systems such as electricity, telecom, heating, and cooling. The ongoing reliance on extractive infrastructure bonds architecture to exploitative technologies and industries, which has fundamentally altered its relation to landscape. At present, architecture relies on an abundance of fuel from distant locations to operate, and ignores its surroundings as a result.**

**In recent design studios, I ask students to generate alternate connections between architecture and environment. Specifically, I teach students how to critically disengage from extractive processes and systems, and instead knit architecture into local ecosystems. This is achieved through critical analysis of existing infrastructure and the design of new systems. Supported by the integration of interdisciplinary perspectives, the rewiring of systems results in new, speculative architectural typologies that engage reciprocally with complex ecologies.**

**According to this framework, students interrogate the role architecture plays in the sustenance of the environment and are challenged to design in ways that depart from the status quo. Lessons include a) direct observation and interpretation of nature, b) translation of observations and interpretation into systems-focused interventions, c) an integrative approach linking systems and objects, and d) exercises in 'making worlds' and 'futuring,' for forming speculative narratives about architecture's future role in the environment. By addressing these issues, architecture becomes an instrument for reimagining human relationships with nature and serves as the basis for forming new bonds with the environment.**

## INTRODUCTION

We have reached a turning point: the ubiquity of ecological problems we witness and are challenged to confront today demand a thorough reassessment of architecture's role in the environment. Despite the progress that has been made in modifying architecture's construction methods and material composition, structures continue to be embedded with technologies that are dependent upon the industrial extraction of natural resources. Alternatives, such as structures retrofit with non-extractive thermal, water, or energy systems, or architecture that radically excludes extractive infrastructure, are notably missing.

As Brook Muller observes, we are enmeshed in a prolonged stage of lament about a sense of loss about our connections with nature. Muller notes "we are destroying the foundations of life and what sustains it" by continuing to engage with nature in extractive ways. What's more, "We pollute our sacred springs" and "fill our wetlands" to the point that this "frenetic narrative driving contemporary culture brings design up short and curtails our ability to imagine beyond the profitable now into the landscapes, wetlands, and welfares of the future."

A transition away from the ongoing use of extractive technologies and infrastructure has been slow, if not nonexistent; and this reliance exacerbates the rift between architecture and its immediate environment. With time, the use of extractive energy sources and infrastructure has fundamentally transformed both architecture and landscape. Simply put, by relying upon materials and sites of extraction in distant places, architecture has become disengaged from its immediate surroundings. In this infrastructural milieu, architecture becomes a terminus of the extractive networks of fuel, energy, and water, and has yet to be reconfigured in ways that disengage it from this role. Over time, I have developed an interest in finding ways of uniting the practice of building architecture with that of making ecologies; in finding ways for architecture to be a force for regenerative processes in the landscape.

To develop these alternatives, my studio pedagogy leverages expertise from a range of interdisciplinary perspectives including landscape architecture, critical geography, and ecocritical

<p><b>Name</b>  <b>Observations Log</b>  <i>Spring 2023</i></p> <p><b>Directions:</b>                  Walk outside for a minimum of 15 minutes. Include a recording of only one day per log entry.                  Absorb the environment.</p> <p><i>Note: No phone use while making observations, i.e. no phone use for the 15 minutes of observation.</i></p> <p>Respond to prompts provided below, or add your own observations.</p> <p>Input 1x entry minimum for Mon, Tues, Wed, &amp; Thurs each week.                  (For extra credit: Include Fri, Sat, &amp; Sun)</p> <p>-</p>	<p><b>Entry Formatting</b></p> <p><b>Entry #1</b>                  Date: — Time: —</p> <p><b>Walk Rating:</b>                  Good / Bad / Neutral / Other</p> <p><b>Temperature:</b>                  -  <i>As-felt temp:</i>                  (according to feel, not numerical celsius or fahrenheit)</p> <p><b>Color of the sky:</b>                  -</p> <p><b>Other atmospheric observations:</b>                  Wind / Rain / Mist / Fog / Other</p>
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Figure 1. Example of a blank Observation Log, First Year Design Studio, Spring 2023. Students were asked to record their findings in an Observation Log that was developed over the course of the semester, from January to May. Students also recorded findings from their walks as informal sketches and photography. Image credit: this author.

scholarship to catapult architecture into a new paradigmatic model: one where it gains new capacity as a positive ecological and environmental force, rather than a repository of extracted materials, energy, and fuel. I see this as a new role for architecture where it redefines infrastructure in the world as a force of sustenance rather than an extractive pipeline. This position also holds a departure from the common alternative—where self-contained separation from the environment, as in the case of zero-energy structures, encases architecture in an internal system disconnected from its surroundings. I argue that none of our existing strategies go far enough to forge meaningful relations with ecosystems, and that new relations must be formed for architecture to become a symbiotic entity actively participating in the natural world.

Students are asked to consider: *While we are often confronted with questions about how the environment can be useful to architecture, we should instead begin asking, how can architecture be useful to the environment?* And furthermore: what are examples of architecture that can begin to achieve this reversal?

The projects discussed in this paper explore the speculative possibilities for new social-ecological and architectural-ecological systems. New models of architecture are developed in dialogue with the materials, flows, and processes of the surrounding environment and landscape. This pedagogy is deployed across a variety of levels of design studios in the undergraduate curriculum, from the first- and second-year (“core studios”), to upper-year “option studios.” A scalable framework for engaging these topics empowers students across a range of skill levels to revise former paradigms and imagine more reciprocal relations between architecture and landscape. As a result of these projects, architecture becomes an instrument for reimagining human relations and establishing new interactions with the natural and nonhuman world.

**CONTEXT**

It is common for architecture students to be presented with utilitarian and symbolic methods for integrating projects within landscapes. It is less common, however, for students to be asked to consider how architecture actively impacts local ecosystems. Furthermore, an often unstated reality in the practice of architecture is that infrastructural systems, such as water and sewage lines, gas, electricity, telecom, and HVAC perpetuate a harmful relationship between architecture and the environment in which the object of architecture becomes a repository of extracted materials, energy, and matter. As a result of this overlooked reality, students often are not invited to discuss the implications of infrastructure as a component of design decision-making. This creates a blind spot in thinking about how the materials that leave architecture are mostly harmful to the surrounding environment, such as wastewater released as sewage, or chemicals that leak from laundry machines or air conditioning units. This problematic oversight in architectural pedagogy and practice begs the question: What if we acknowledged these impacts and asked students to grapple with these infrastructural systems in more radical ways? What if as a profession we truly started confronting the ethics of infrastructure as it is intimately woven into our practice? And finally, what if architecture transitioned into a new role, with a capacity and focus on reviving ecosystems, rather than fracturing and polluting them?

Historically, these questions have not been discussed or adequately addressed for a variety of reasons. This is partly because landscapes and architecture have largely been designed and crafted together to provide beauty and utility, often solipsistically. One result of this dual ideal focused on beauty and utility, is that many utilitarian functions have been obscured to produce a particular image of beauty, one unencumbered by the imprints of its production. Thus, the auxiliary utilities embedded within architecture are rendered invisible. One goal of the pedagogical inquiry presented here is to critically address how aesthetics and existing construction systems perpetuate

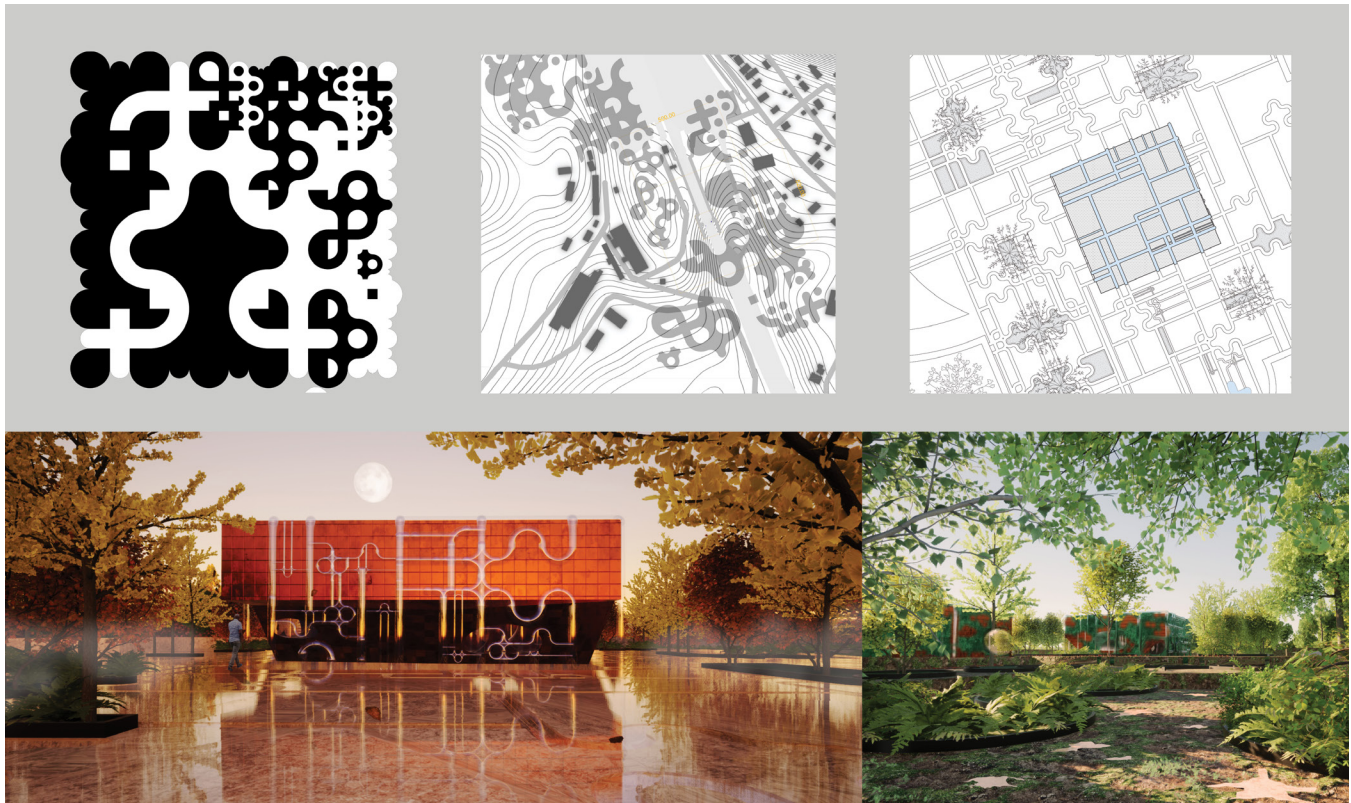


Figure 2. One student developed an intricate network of water filtration ponds and structures that together worked to clean water that could then be distributed to the surrounding landscape (vegetation and animal species) or to nearby homes as clean water for a neighborhood adjacent to the lock. Her design approach for the architecture was that it operated as a filtration hub, and also as objects that would promote an awareness of the water and the health of the local environment for visitors to the site. Rather than develop architecture solely for the purpose of gathering for humans, or as a repository of extracted materials, this project collects humans, nonhumans, and water into the body of architecture and space of a designed landscape, where a relationship can be forged between humans and the environment through architecture. Project by [names redacted], 2023.

the invisibility of infrastructure, and how this erasure facilitates ongoing extraction and the removal of ethics from consideration in the design of architectural systems.

To overturn this paradigm, architecture's formal, spatial, and material ideas will need to emphasize environmental awareness, as well as environmental legibility, literacy, and responsibility. Critical assessment of these blindspots begins in my design studios with a review of scholarship by ecocritical theorists and human geographers. In this educational context, I find it important to include authors from beyond the discipline to critically challenge the definitions of beauty and utility inherited from centuries of architectural theory and practice. Reading beyond the canon offers perspectives that prioritize the environment and its conditions as a starting point for design, rather than an architectural program or spatial proposition guiding intervention. Furthermore, many of these authors and disciplines have also done the work of imagining

alternative futures, including the function of architecture in their future-worlding.

Informed by these environmentally-attuned perspectives, I ask students to further consider *how "thinking ecologically" means that no building needs to perform all functions within itself. Rather, a collective of new 'species' or building typologies can work together to support the local environment.* Whether designed new, or as a retrofit to an existing structure, this ecologically-oriented architectural model is foregrounded by its ability to initiate new processes of support and exchange within its surroundings. It does so by directly connecting and continually interacting with ecological substrates, materials, flows, and processes in supportive ways. Projects that respond to this proposition emerge as both physical manifestation and manifesto—where claims are asserted for, and about, ways of relating to the earth that have otherwise gone unnamed, unexplored, under-considered, or under-appreciated.

#### **METHODOLOGY: PEDAGOGICAL STRUCTURE**

In the design studios undergraduate students construct innovative architectural typologies to reimagine architecture as an artifact that is intimately connected to its environment. Projects work through speculative formal, spatial, and narrative exercises geared toward generating novel connections of reciprocity between architecture and its surroundings. This pedagogical framework helps students assess architecture's environmental impacts and establishes ways of looking for alternatives.



Figure 3. The student-team located at the King Oil site, selected this location for the challenges they perceived relating to its industrial past and also for its adjacency to the Hudson River. Their design foregrounded the transforming the ground into a series of stone filtration pathways and new planting beds. The filtration pathways furthermore connected to a collection of architectural structures strategically placed throughout the landscape to assist with water filtration on site and flood mitigation of the shoreline along the Hudson. These structures also served as hubs for distributing water throughout the newly planted landscape. Image credit: [names redacted], 2022.

Students are introduced to recent advances in non-extractive biotechnologies and sustainable materials that reduce the carbon footprint of buildings and construction processes, a shift foregrounded by statistics that building practice contributes to roughly 40 percent of global greenhouse gas emissions. We thus acknowledge architecture as among the most polluting human activities and constructs on the planet. Students are asked to consider new design trajectories developed to address this reality, and are asked to speculate further upon the lack of ideation surrounding how to tie architecture to local environments and ecosystems as a supportive scaffolding. This gap in architectural practice and pedagogical models is the starting point for our design inquiry. Expanding upon the progress spearheaded by off-grid and zero-energy movements, this critical design framework aims to further imagine new typologies of architecture that *actively contribute*—energetically and materially—to their surroundings.

The themes of environmental stewardship and ecological symbiosis are foregrounded through texts and design exercises. In making and analysis, students explore architecture from a comparative perspective that examines perspectives from contemporary environmentalism, ecocriticism, landscape architecture, indigenous studies, science fiction, and the environmental humanities—introduced into the design process as new informants of architectural development. One valuable concept is the “gift” theory of Robin Kimmerer, which provides inspiration for imagining futures of newly conjoined assemblages of landscape, architecture, and regenerative infrastructure. Extra-disciplinary concepts such as this, promote the formation of new architectural typologies that are focused on regenerative forms of engagement with local environments. By drawing on perspectives from multidisciplinary sources, students are able to identify how architectural priorities could shift into new terrain, as influenced by the input of other concerns, issues that exist

beyond what we typically encounter in the history of design or in contemporary practice.

The outcomes of this pedagogy are unique: it focuses on foregrounding methods of engaging with interdisciplinary topics and views from beyond the discipline. In doing so, it initiates a search for *a new role* for architecture and it focuses on *the generation of new typologies*, in the search for generating alternative ways of connecting architecture and environment.

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Examples in this paper are drawn from the following design studios conducted at the Rensselaer Polytechnic Institute School of Architecture: (1) Landscape Option Studio, Summer 2022 (third- and fourth-year students), (2) Rome, Italy Study Abroad Studio, Fall 2022 (third- and fourth-year students), and (3) Erie Canal Studio, Spring 2023 (first-year students).

The pedagogy that unites this search for a new role for architecture is conceived foremost as an exercise in critical thinking, one in which insightful analysis, interpretation, and inquiry become the launchpads for imaginative design ideation. Students are tasked with interpreting standing precedents in architecture through interdisciplinary lenses, frameworks, and concerns. They then engage in generative design exercises that incorporate these concepts, leading them to speculate upon what “could be” in comparison to what they know, or what can be found and sourced (through sourcing precedents or analysis). Throughout the design process, “what if” and “if, then”

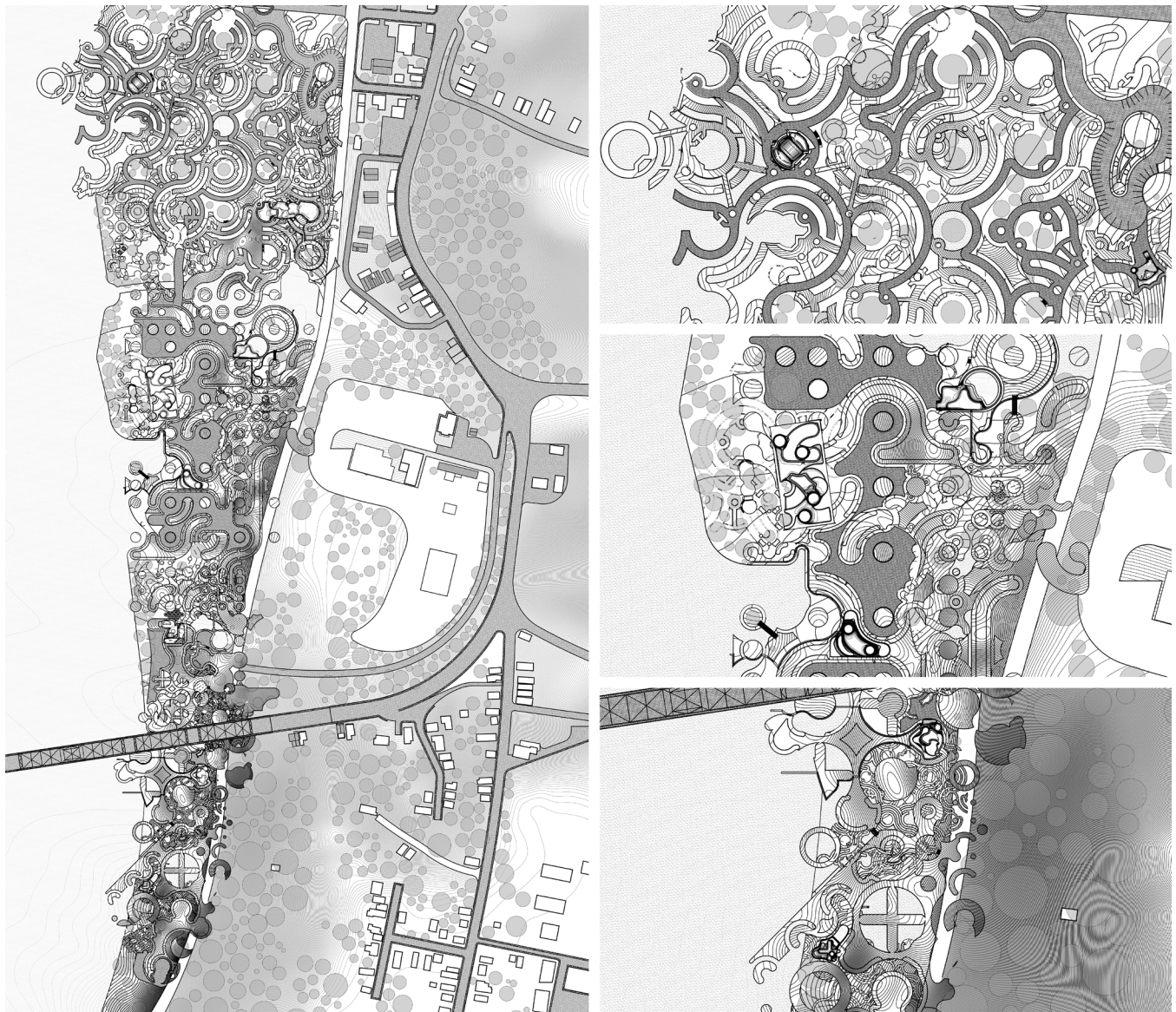


Figure 4. Plans of the landscape-and-architecture system proposal for the King Oil site in [location redacted] by [names redacted], 2022.

questions facilitate the generation of alternatives to existing systems and typologies.

Across the studios, the following structure is followed:

1. Observation (Interpretation of Natural Phenomena)
2. Translation of Phenomena (Designing Systems & Multiscalar Pattern-Making)
3. Systems and Objects Integration (Design Approach)
4. 'Making Worlds,' Futuring, and Speculation (Results, Repercussions)

The projects are further organized according to the following outline:

I Gathering –gathering of source material for future translation, including interdisciplinary texts and authors, as well as insights and direct observation of the environment.

II Methods –offering techniques for translating concepts and findings into architectural and landscape assemblies, which includes physical and digital design methodologies for merging architectural objects with landscape and infrastructural systems.

III Composite –iterating upon different combinations of findings, goals, questions, and techniques to deepen project development and exploration.

IV Visioning (visual and narrative) –honing the visual and narrative representation of the main ideas, goals, and ambitions of the project. Visioning is often in development throughout the entire semester, but is an area of focus for enhanced development and reflection at the end of the project.

The complexity of projects is differentiated based on student ability at each level in the curricular sequence. For example, first-year students are offered more structure and guidance at each phase of the project, whereas more advanced students are asked to make decisions independently.

In first-year and second-year studios, I provide the following guidelines: the project site, scale, program, and generative design methods. In required design method exercises, students follow a step-by-step process to generate the seeds of a spatial design idea, which they expand upon from a basic concept they develop during the gathering phase.

Visioning and Narratives for each project are developed iteratively throughout the semester. This allows students the time and space to interrogate, shift, and change their project narrative and visualization as their ideas develop. A focus on visualization and narration is given special attention at the end of the project and is simultaneously generative and reflective: students have time to reflect upon what they have learned and can incorporate reflections, key findings, or turning points from their own learning experiences into a creative story. A key component of the ideation and storytelling in these projects asks students to consider how their intervention will operate within the social and ecological environments of the future. This gives students the creative flexibility to imagine and determine who or what their project will serve, and how it might be valued by future generations.

In third- and fourth-year studios, site and scale are outlined more broadly. Students ultimately choose their own project site and programmatic itinerary. Furthermore, generative design methods are provided as suggestions, but not requirements, as they are in the earlier studios. At this level of proficiency, students are asked to interpret the project brief independently and to determine their own design parameters, including the site of intervention, scale, and program. Students are encouraged to thoughtfully “construct” the parameters of their inquiry—where their choices inform the project’s narrative, values, and goals. Furthermore, students are encouraged to operate across a range of scales—spatial and temporal—to represent complex social-ecological systems and processes in their design proposal.

Overall, this adaptable pedagogical framework supports student learning by foregrounding creative and critical investigation, interpretation, and experimentation in the search for alternative paradigms of architectural systems that integrate landscapes and environments. The project phases introduce an open-ended framework for gathering source material, new insights, and informed findings, which directly fold into design investigation and making. After a period of generative design and iteration, students are asked to reflect upon their making in terms of assessing their

own project history, as well as to think speculatively about how their work could impact future ecologies, cultures, and architectural practice.

## **RESULTS: PROJECT EXAMPLES**

### **1: FIRST YEAR DESIGN STUDIO (TROY, NY)**

#### **YEAR: 2023, SPRING**

In Spring 2023, the first-year design studios at the Rensselaer School of Architecture were tasked with generating speculative proposals for the future of locks along the Erie Canal. In my studio, students were asked to think about how the locks could be reconfigured to support the adjacent ecosystems. Whereas the locks were historically developed to support the transportation of human goods for trade and commerce, I asked students to instead imagine how the locks could pivot from supporting human activity, to instead supporting ecosystemic function, especially for supporting water, plants, and local wildlife. In the initial gathering phase, students were asked to take 15-minute walks outside at minimum of four times a week. During these walks, students were asked to not have a phone or digital device in their hands as a distraction. Due to our proximity to the Erie Canal, walks gave students a fine-grained reading of the local landscape, including its minute seasonal changes and small details gained through direct observation. Observations and written takeaways from the walks served as a basis of the conceptual direction for the projects.

In the Methods phase, 2D and 3D design techniques were shared with students to guide the development of architectural and landscape spatial configurations—in a parallel framework, as in architecture and landscape were developed simultaneously. This focused on demonstrating to students how to develop a trans-scalar pattern using the Truchet method. Students were invited to develop their own patterns for exploring and visualizing the environmental relationships they observed during their walks. One student chose to explore how visual detail and resolution appeared to subdivide as she got closer to objects in the environment. This student used observations of the forms that appear within the bark of a tree as an example of this subdividing phenomenon. She described seeing certain forms in the bark from far away, and a fracturing of smaller forms and detailed textures as she got closer. The student’s patterns explored the bifurcation of form through scales in nature, translating her observations in real life into an abstract and trans-scalar pattern-relational system. In her project, the idea of information being revealed as one approaches something was further developed in 3D as well as the organizational coordination of site, program, formal massing, and design detail, ultimately asking how architecture can draw viewers and visitors in, to greater degrees of observation and contemplation of their surroundings.

In the third phase, students developed ways of integrating water from the lock and its pumping mechanisms to work in service

of the surrounding landscape. We began to think of the lock in its landscape capacity, as a critical interface within an active floodplain. I asked students to imagine the lock as a pivotal link in the exchange and infiltration of water in the landscape, rather than rely on the spillway as a space for “excess” water to drain away. Whereas the locks mechanically move water for the passage of ships and goods, I asked students to consider moving water through their structures and site to benefit local vegetation as well as the animal and insect occupants of the site. Intricate veins of water were developed by the students that passed through designed sites and architectural structures for filtration, temperature regulation, or to slow floodwater on the overflow channel found alongside each lock. This focus draws upon the earlier critique of infrastructure being culled solely for human use and being deposited within architecture. Rewiring the flow of the locks through architecture to the surrounding environment is seen as one example of a reversal of the function of both infrastructure and architecture as agents in the environment.

## **2: THIRD AND FOURTH YEAR DESIGN STUDIOS YEAR: 2022, SUMMER (TROY, NY) AND 2022, FALL (ROME, ITALY)**

In Summer 2022, this project was offered as an advanced design studio for students in their third and fourth years. Students worked in teams of two to design a botanical garden and system of architectural-scale interventions that worked together for prolonged environmental stewardship.

In this studio, one pair of students created an architecture-landscape system on a former King Oil site located in South Troy, New York. This site is notoriously heavily polluted and has remained abandoned since its former occupant vacated. The site is located in an industrial area of Troy, adjacent to a bridge that crosses the Hudson River, abutted by a waste dump to the south and a county jail and scattered manufacturing facilities to the north. Here, the students considered how architecture could become a “hinge” of the transition from a polluted site to a remedial landscape. They considered the collection, filtration, and transfer of water as architecture’s primary role, with interiors primarily reserved for maintenance of the water systems and visitor access only secondary to their functions as infiltration centers.

Finally, from August to December 2022, I led a study abroad semester in Rome, Italy. In this iteration of the project, I asked students to consider the future of the environment in the context of the roles of architecture, infrastructure, and landscape in Rome. The environmental future of Rome was foregrounded in this studio with Rome’s living systems serving as the “client” for the projects. Students could consider the environment of Rome at-large, or distinguish one entity from the environment to work with as a primary “client.” Examples of “environmental clients” identified by students include the Tiber River, the soil matrix of Rome, and *fontinalis antipyretica* (water moss).

Students worked in pairs to identify a unique project site, their own program priorities, and a design approach for working with their (nonhuman) clients.

One team reflected upon their experiences from the studio, expressing that, “By leveraging inventive techniques and sustainable technologies, architects can construct buildings that breathe life into the landscapes they inhabit. Structures can be conceived as living entities... departing from the conventional view of architecture as a stand-alone, which paves the way for an interconnected ecosystem, in which structures merge harmoniously with the environment.”

### **DISCUSSION: FINDINGS & LEARNING OUTCOMES**

Upon concluding these studios, three findings emerge.

First, this pedagogy provides a framework for students to critically analyze existing building systems and the impacts these systems have on a wider landscape of material, extraction, ethics, labor, and environmental disconnection. It is then up to students to construct ways of disengaging with infrastructure as we know it, to instead reorient architectural systems toward regenerative goals that benefit the surrounding ecosystem and environmental processes.

Second, water becomes a focal point of reciprocal relation-building within the projects. As water flows through both buildings and landscapes, establishing ways of intertwining these currently-disparate systems makes sense as a first step for students to begin imagining new ways of tying architectural systems to landscapes. Additionally, as Brook Muller contends, by “bringing water into the creative ambit,” we can invite the next generation of architects to “proactively contend with hydrological problems” of the future, fostering “expansive thinking about broader hydrological conditions and synergies between [scales].” By developing an understanding of the water systems in to both buildings and landscapes, students develop a “systems-orientation” in design and gain skills in learning how to conceptually and practically “rewire” these systems to form new connections between architecture infrastructures and site.

Third, the concept of systems “reversal” in the formation of reciprocity encourages students to establish new forms of co-regulation of architecture and environment. This reversal, and its resulting reciprocity, presents itself as a new strategy in design. The creation of new forms of co-regulation is prompted by the reversal of existing extractive systems into supportive ones. This transition aims to combat “the losses—of nature and biodiversity, of relationships to nature, and of relationships to one another—that [have accompanied] the onset of [current] economic, technical, and social orders.” Rather than perpetuate systems of depletion, students imagine how architecture becomes a source, or hub, of sustenance for the surrounding environment. For example, by providing thermal regulation for the architecture and its surroundings, uniquely

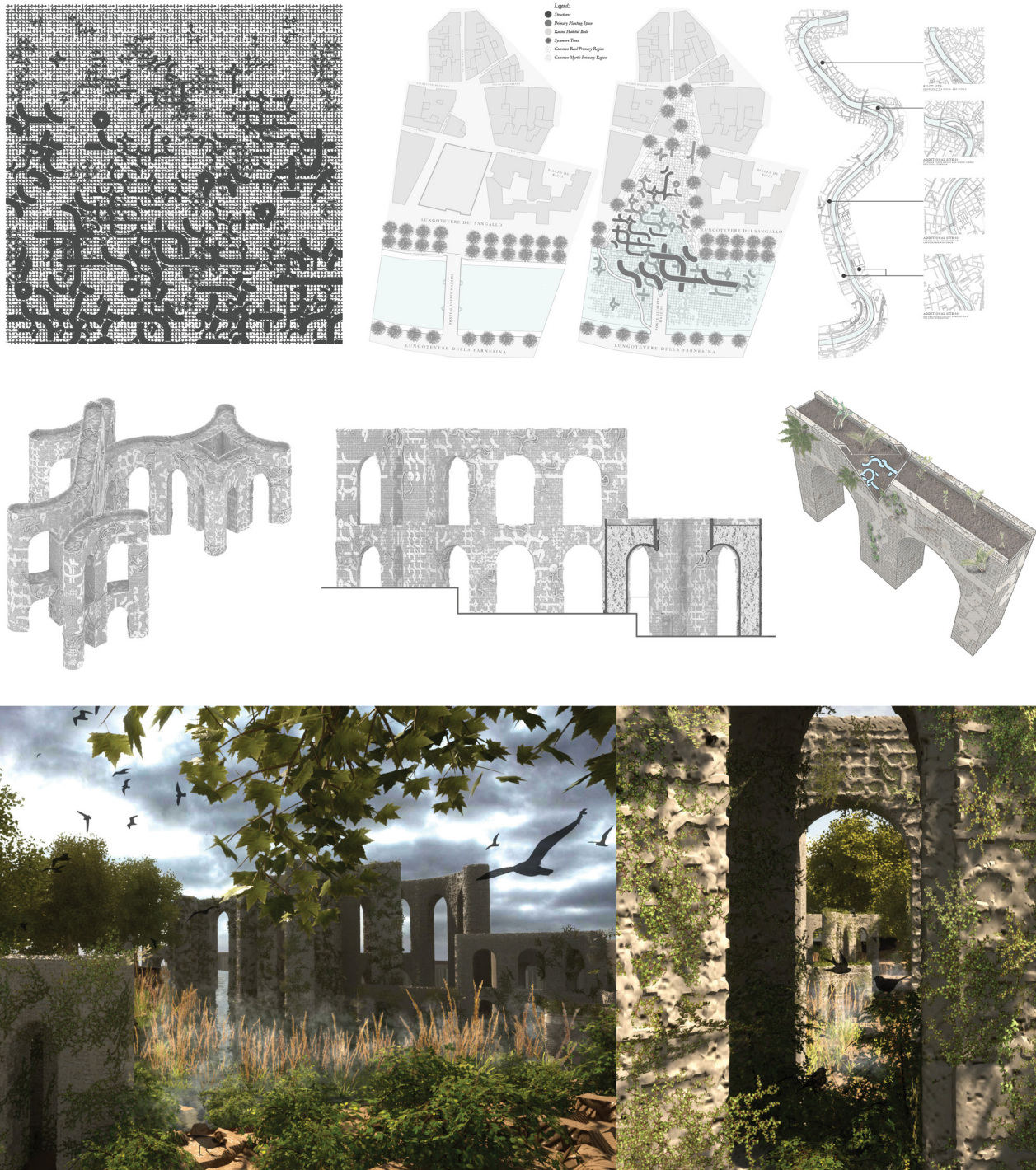


Figure 5. One student-team reimagined the role of aqueducts on the Tiber River in Rome, Italy. The Tiber Riparian Zone project is subversive in its reading of ancient Roman aqueducts. Rather than design aqueducts to transport water for human consumption, the students flipped the conveyance role of these ancient structures. Instead, their aqueducts absorb water by drawing upstream from the Tiber River to provide plant and animal riparian habitat within the city. The form and function of the aqueduct is appropriated and repositioned as a series of interconnected sponge-towers which absorb water through their bases that are rooted in the Tiber. The surfaces of the new soil towers are highly articulated to allow for water absorption through porous openings, the emergence of plant life, and seed and habitat exchange for wildlife. The structures are internally filled with soil, seeds, and a capillary network of veins that distribute water and nutrients. The large embankments that channelize this section of the Tiber are demolished in this proposal, and the site is re-graded to reintroduce flooding for the emergence of marshes. Project by [names redacted], 2022.



important in regulating temperature fluxes as a result of climate change, or serving as a seed bank or nutrient reservoir for sustained distribution.

In addition to the above-mentioned findings, the framework I have developed for thinking about architecture and landscape as co-systems for prospective environmental futures produces unique pedagogical outcomes for the following reasons: 1) it emphasizes the development of new methods for engaging with interdisciplinary themes, topics, and theories; 2) it introduces the search for *a new role* for architecture; and finally, 3) it focuses on *developing new typologies* of architecture to demonstrate alternative ways of integrating within environments and ecosystems.

## CONCLUSION

Architecture is at a critical juncture. At this moment in the trajectory of the discipline, we have an opportunity to reimagine the role architecture plays in contributing to the improvement of environmental conditions. The education of the next generation of architects becomes a key site of action from which we have an opportunity to shift the paradigm of what building really means, and how it chooses to engage with the environment going forward. Problematically, it is common for students to not be confronted with the question of how to design or critically intervene within architecture's infrastructural systems. Instead, a typical pedagogical scenario communicates to students that "architects design space, engineers add [all else]" which perpetuates the condition "where technical concerns are relegated to consultants and seldom seen as a formative agent of design expression and meaning." Students should instead be taught to actively and critically engage with architectural mechanical systems of water, electricity, heating and cooling, especially to reimagine how architecture engages or disengages with these systems to produce a future that is more symbiotic than extractive in relation to its surroundings. Intuitively, we understand that architecture exists at an interface, bridging human and nonhuman realms, through its literal, material connections with the earth, and yet we have yet to leverage this proximity and connection to foster stronger ties with the natural world.

A primary takeaway of this pedagogy is a hopeful outlook about the ability of architecture to create meaningful connections with natural environments. With the help of this framework, students imagine and visualize new types of architecture that actively engage with local environments and processes. In these new architectural typologies, environmental responsibility and reciprocity is posited as a core programmatic goal in the design of any future architecture. As one student reflects, "This studio urged us to challenge the impermeability of the line that is typically drawn between architecture and its environment. While our general understanding is that architecture exists on a site, the idea of reciprocity helps us consider a version of architecture that exists with the site, and could, in a way, be the

site." Within this new role and capacity, students understand architecture having fundamentally changed its place and importance in the world. Architecture in this future becomes a critical device for integrating human spaces and infrastructure with local environments and ecosystems.

One student explains how their view of integration shifted during coursework, "Although we may be physically living in this world, oftentimes we don't give the ground beneath our feet a second glance. Through this studio, I found my own definition of the relationship between architecture and landscape, where architecture is productive in its environment." Another student-pair reflects in a similar manner, stating that, "The transition toward a more empathetic architectural ethos embraces regenerative design principles. Buildings can play a vital role in restoring ecosystems by emulating and respecting the intricate processes of nature. Consequently, architecture not only lessens its environmental impact but actively contributes to the health and vitality of the ecosystem, fostering a regenerative relationship."

This pedagogy facilitates a shift in thinking about how architecture operates in the world. As one student-group noted, "This reimagined architectural paradigm envisions structures as integral components of a larger, interconnected system, enriching and sustaining the landscapes they are part of. It challenges the conventional notion of detachment, propelling architecture into a world where it becomes an active, responsible participant in the flourishing of the environment—a model that harmoniously coexists with and nourishes the delicate fabric of the natural world."

By engaging with these topics, students are motivated to create a better future for the planet through architecture, entailing the creation of conjoined and collaborative models of landscape, architecture, and infrastructure—new typologies that work together to heal the environment.

## ACKNOWLEDGEMENTS

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## ENDNOTES

1. See Benjamin, et al., 2017 and Goldhagen, 2017.
2. Easterling, 2014, Belanger, 2017.
3. Rogers, 1994, Sassen, 2007, Muller, 2022.
4. Benjamin, et al., 2017, Goldhagen, 2017.
5. Muller, 2022.
6. Easterling, 2014, Belanger, 2017.
7. One example of architecture fulfilling its role as a repository of extractive energy networks is its extensive reliance on heating and cooling systems (HVAC). Contemporary architecture's widespread use of glass and thin exterior envelopes has come at a cost. These assembly systems are not environmentally attuned to their surroundings and thus require extensive heating and cooling systems to regulate temperature. These heating and cooling systems are powered by the extensive use of extractive fuel sources, contributing to the irreversible deterioration of environments from processes such as mining and fracking.
8. Haraway, 1991, Kimmerer, 2013, Tsing, 2015, Moe, 2013.
9. See Allen, 1997 for more on architecture's transition from a conventional notion of it as an autonomous object, to a condition where it is understood as operating within a field condition—involving a dynamic and evolving relationship within its context.
10. See B. Castiglioni and M. Cisani "There is a need — especially in Italy where aesthetic, natural and cultural heritage attitudes prevail — to further explore... the pedagogical opportunities and weaknesses of approaches focused on the political dimension of landscape." (145). Additionally, utilizing architecture as a source of environmental sustenance has not been economically viable or desirable as a business model and therefore remains largely unexamined in practice.
11. Lefebvre, 1991, Harvey, 1989, Deamer, 2015, Easterling, 2014.
12. Theoretical positioning of this futuring practice emerges from texts and authors from queer ecology (Mortimer-Sandilands & Erickson, 2012, Griffiths, 2015, Stillman, 2015, Strand, 2022), eco-psychology, traditional ecological knowledge (TEK), and science and technology studies (Daston & Galison, 2010, Daston, 2019, Haraway, 1991, 2016.). Insight from these disciplines challenges ideas about what architecture is and does (or could do), and offers alternative mechanisms for relating to ground, other species, and technology.
13. Tsing, 2015.
14. The gift theory by Robin Wall Kimmerer is a paradigm foregrounded in indigenous ecological philosophy, where humans view themselves in a reciprocal relationship with the natural world. The gift theory imagines a thoughtful balance between giving and receiving, akin to interspecies relations found in the dynamic of ecosystems.
15. The first-year design studios at the Rensselaer School of Architecture are coordinated by Anthony Titus. Site selection and project brief were developed by Prof. Titus, with supplemental readings, the thematic focus of the project program, and its design approach developed individually by each studio instructor.
16. Truchet patterns are modular, non-repeating field patterns. They were first described by Sebastien Truchet in 1704. Robert J. Krawczyk states, "A basic concept that one can see of Truchet tiling is that adjacent tiles can create much larger contiguous edge connecting patterns. In 1987, Cyril Smith analyzed the structure of Truchet's tiling and first abstracted them into simple diagonal lines and then into two arcs starting and ending at edge midpoints. The initial interpretation of the underlying concept of Truchet tiling was the connection of the midpoints of adjacent edges. Others have since developed tiles using two and three equal subdivisions of edges and edge points connected with arcs, straight line segments, or ribbons." Underlying principles of the Truchet pattern include demonstrating the possibilities of modular design, while exhibiting random selection and orientation to generate complex field patterns that generally do not repeat.

17. Reflections by Rebecca Gregg and Adam Huntington from the Italy Study Abroad Studio, Fall 2022.
18. Muller, 2022.
19. Ibid.
20. Rogers, 1994.
21. Muller, 2022.
22. Reflection from Nora Wright on her takeaways from the Reciprocal Systems Studio, an options-level studio for third- and fourth-year students, which was offered the Summer of 2022.
23. Reflection from Annelise Eggen-McElmurry on her takeaways from Architectural Design Studio 2, in the first year.
24. From reflections by Rebecca Gregg and Adam Huntington from the Italy Study Abroad Studio, Fall 2022.
25. Ibid.

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