Emergent Capacity

BRADFORD WATSON
Montana State University

Keywords: pedagogy, bottom up

Our environment is defined by systems, both natural / physical and human / virtual. Physical and virtual systems are interconnected and inform each other, sometimes resulting in unintended consequences. We can see the unintended consequences of Jefferson's grid as it relates to water rights and responsibilities. Comparing John Wesley Powell's map of the western states based on watersheds and the present day delineation of our country, we can see the potential conflicts created between states surrounding access to water. These grid based decisions have significant impact on our economy and political structures.

In the end any map identifies a clear agenda shaped by policy. The environment is changed because of the line and the power the policy has to radically change the physical environment and extend back into the virtual systemic network of our globally connected condition.

Only by understanding the systemic conditions that shape our environment do we have the potential to intervene and impact these authoritative systems. Through systems analysis we can subvert the traditional role of the architect as one who works for a client, and move to a role where we identify emergent capacity for shaping the built environment. Performative strategies, beyond the scale of physical architecture, must become the priority of architects to shape democratic space. Through this approach, works can be catalysts for bottom-up change.

This paper presents the pedagogical framing and student design projects that situate themselves in the world through a systems theory based design seeking mutualistic and emergent capacities of architecture. Utilizing the methodology of synthetic mapping the interconnected systems of the existing conditions, latent potential is revealed. These potentials are then utilized to create a generative performative space of varying scales. The paper evidences design proposals that range from the scale of a pavilion that amplifies public discourse and access to education, to that of engaging the complexities that are the West and how we can continue to sustainably inhabit the place. The pedagogy empowers the student to understand the implications of their existence in a larger, rapidly changing context and gives agency to the designer who can manage these complexities to create emergent capacity.

INTRODUCTION

Too often in schools of architecture we frame the studio assignments as "problems" which establish a context of response where the students' goal is to solve something. This framework has the tendency to create a dualistic view of the world resulting in a site analysis and approach to design that they are looking for something wrong that can be fixed through architecture. This mentality creates a this or that evaluation, a critique of the existing as being bad and the determination of success being "is it good, or now better?". This context for design lacks an evaluation that can be objectively substantiated. Borrowing from the logic of Rosalind Krauss's Sculpture in the Expanded Field logic, can the education of an architecture student expand the field of considerations to Problems and Not Problems? Clients and Not Clients? Sites and Not Sites? Users and Not Users? Can the evaluation of design benefit by moving away from "solutions'' and focus on engaging potential as a strategy? These questions create the framework for the pedagogy of courses taught at the beginning design, intermediate and graduate level. The pedagogy empowers the student to understand the implications of their existence in a larger, rapidly changing context and gives agency to the designer who can manage these complexities.

CONTEXT

Our environment is defined by systems, both natural and human. While nature delineates the land by the river following the path of least resistance, the urban grid is a result of a policy, or virtual system, which extends from the settlement of the West and the Jeffersonian Grid. This system of an orthogonal grid of townships, sections, quarter sections, etc. allowed the west to be platted and purchased without physically seeing the land. This policy has had a significant impact on the physical landscape and continues to shape the multivalent networks of our country, both physically and virtually.

Physical systems are ever-present and apparent in the world around us. We can see evidence of them through recognition of patterns and interconnected implications of cause and effect. The pattern of the street grid allows us to navigate through the city and becomes an indicator of property ownership and delineation in the same way two yards may be separated by a fence or a difference in landscape. However, unlike the delineation made by the river across the physical landscape, the urban grid is a result of a policy, or virtual system, which extends from the settlement of the West and the Jeffersonian Grid. Jefferson's use of the grid to subdivide the land from the Louisiana Purchase dates back to the 5th Century BC when

Hippodamus used it to organize Piraeus, Greece. This system of an orthogonal grid has resulted in a checker board of land ownership that conflicts with ecological function; a virtual system overlaid on a physical existence.

Physical and virtual systems are interconnected and inform each other, sometimes resulting in unintended consequences. We can see the unintended consequences of the grid as it relates to water rights and responsibilities. Comparing John Wesley Powell's map of the western states based on watersheds and the present day delineation of our country, we can see the potential conflicts created between states surrounding access to water. These grid based decisions also have significant impact on our economy and political structures. John Lavey, a Montana land-use planner with the Sonoran Institute, expanded Powell's map to redistrict the entire country based on watersheds and not the grid. This reorganization of the system would result in more efficient use of resources, both natural and constructed infrastructure, would reduce management efforts and would radically change the balance of political power in the country based on newly aggregated populations changing government representation. However, Lavey acknowledges that while this might have been feasible when Powell first drew his map, it would be too radical of a change to the overall system of the country.

The physical environment we inhabit is a result of all of the interconnected systems that are constantly evolving in a rhizomic manner. Deleuze and Guattari articulate in their essay Rhizome, there is "no beginning or end; it is always in the middle, between things, interbeing, intermezzo". This is the condition of our systemic environment that influences and defines our social, economic, political, natural, built, digital, etc. world.

If the dynamics of the systemic environment are always intermezzo then our evaluation and response within it should not be dualistic. Our intervention(s) must engage these complexities through a lens of pluralism, allowing for diversity and reducing or eliminating hierarchy. In doing so design can instigate latent potential and emergent capacity. Furthermore, it can establish parameters or a framework that are not determinant, allowing for adaptability within the design acknowledging unknown future permutations and systemic influences. This pedagogical approach to design education will be evaluated at three different levels of the curriculum in courses taught in the School of Architecture at Montana State University.

FIRST YEAR UNDERGRADUATE DESIGN
Critical to the introduction of design in the first year is to remove a binary evaluation of the environment students are working within and the design. This is especially important within the foundation design studios as it establishes a student's evaluation methodology for future projects. It establishes a lens of seeing the world around them as fluid and not binary. It establishes that there can be a Site and a Not Site at the same time. To do this, students are tasked to look at patterns in the environment that are a result of systems. They are asked to observe their site and document these patterns, first those formed by natural systems, and then by those formed by virtual systems. Their documentation is a re-presentation of the site through a synthetic mapping of the conditions. They are given no objective
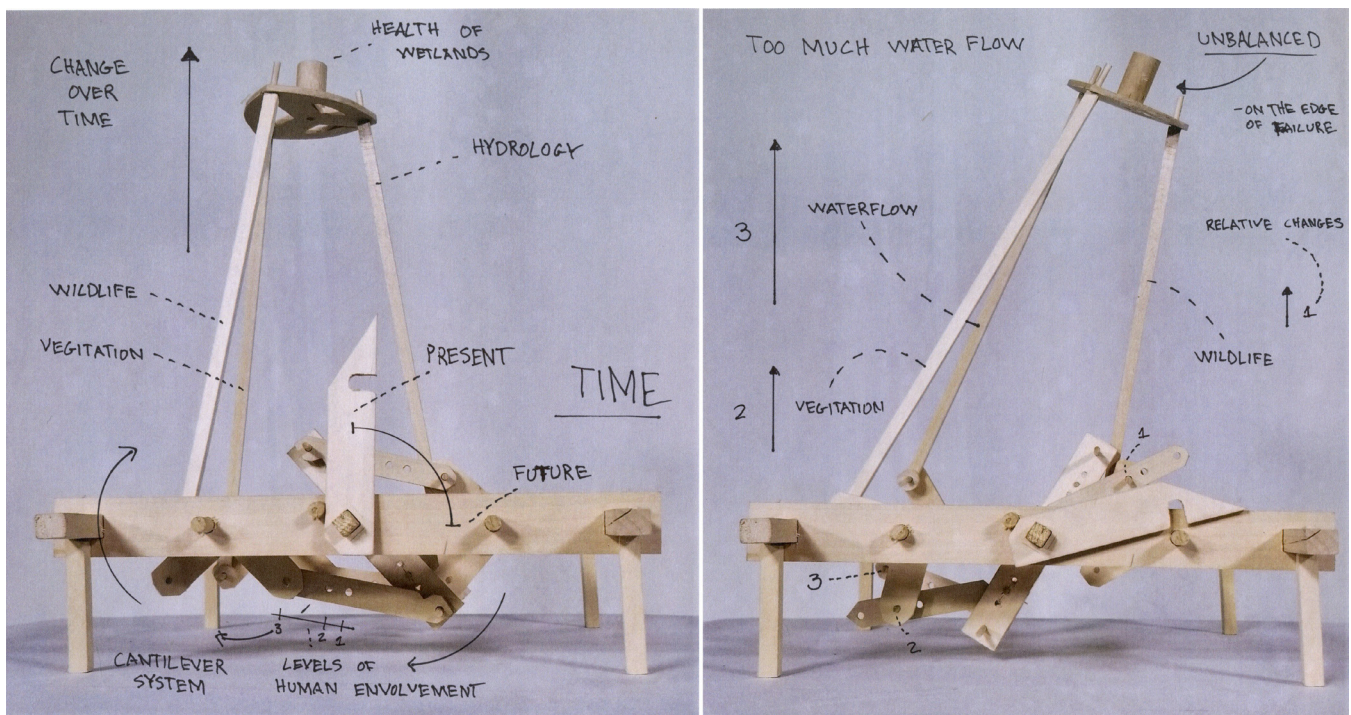

Figure 1. Parametric Model - Logan Madsen

or program beyond documenting the complexity of the site. They must identify the interconnected relationships happening on the site and causality / feedback loops. The review of their findings is purely quantitative.

Students document the sites in a variety of ways but are restricted to a single sheet of presentation quality illustration board. This single sheet is developed over a two-week period with several intermediate deadlines. The intermediate deadlines are considered complete works and then the students are instructed to add new layers of information to that finished document. This process can be frustrating to some students as they are proud of the work completed and are hesitant to continue to work on something they thought was finished.

Once students have identified the interconnected systems that inform their site, they are asked to alter the site utilizing a leverage point or points. Again, students are not given a program or goal, there is nothing for them to solve or make better. Students test the capacities of the different systems and how changes to intensities or inputs would impact the overall. To do this, they create physical parametric models utilizing materials that embody the characteristics of their systems. These models allow the students to manipulate one or more of the site parameters to reveal its influence on the rest of the

site. In this process they are determining which inputs have more influence and which require significant effort for little change. The parametric models become a tool for them to evaluate the site and their future interventions.

This process allows the students to develop their own evaluation criteria generated by their research. This is done through diagraming and writing in parallel with the mapping and parametric modeling. The diagrams articulate the systemic relationships on the site with their inputs, outputs and feedback loops. The writing synthesizes the reasoning for the systems, be they a natural phenomenon or the intent of a policy, in a quantitative capacity. They are limited in the number of diagrams and writing to prioritize the most important elements. Eventually they create a single diagram and no more than 250 words to articulate the context of the site, the systems, and their evaluation criteria. This aspect of the studio is particularly valuable in empowering students to take ownership of their work. While the mapping and modeling were new techniques for the students, the process of writing was very familiar to them. This familiarity provided a positive feedback loop for the students, in particular those that were struggling with visual communication.

Finally, the students are tasked with identifying a space of opportunity within the systems where an intervention could
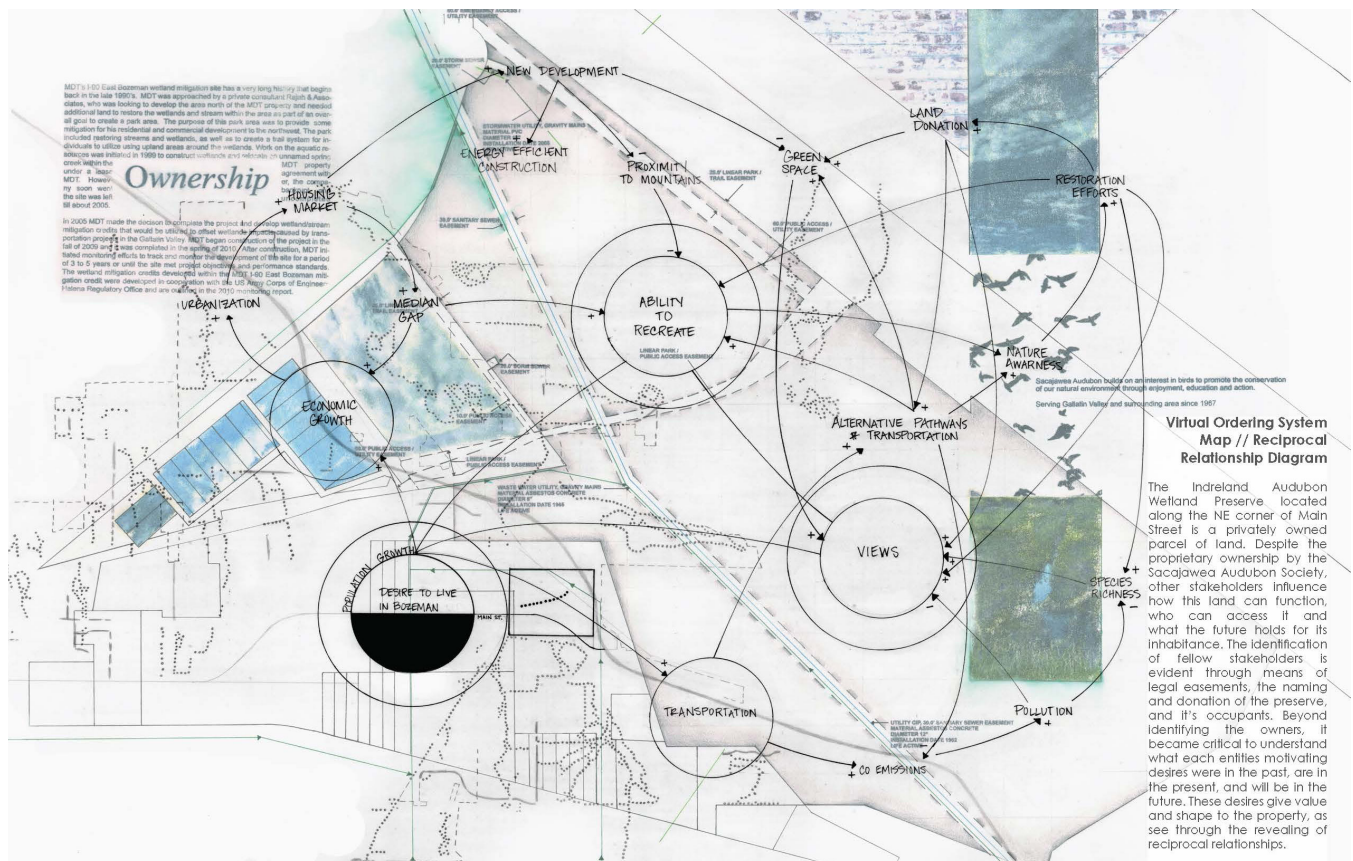

Figure 2. Mapping - Ann Domenico

leverage the latent capacities of the context. This space of opportunity and its capacity is only visible because of their categorizing and evaluation of the systems, both physical and virtual, that inform the physical site. Their intervention was not to make something better, worse or solve an issue. The intervention was to be a catalyst for larger change within the context and should inform and be transferable to other sites with similar conditions. In the end, their designs were the result of quantitative research, were performative and were evaluated on the criteria they established. Knowing that they could evaluate their work based on a set of clear criteria they had established created a peer review culture within the studio supporting their design development. This was important in giving students confidence in their formal reviews, something many first year students find intimidating.

CULTURAL MEGAPHONE

This upper level design build course was a collaboration with Clemson University and their patented Sim[PLY] framing system working with Associate Professor Dan Harding. The genesis of this framing system is the gap between traditional inline lightwood framing and modular prefabricated construction. Through the use of digital fabrication and easy to understand assembly instructions, the system allows for a safe and rapid construction without the need for skilled labor. The system utilizes CNC plywood pieces that are fit together and connected with zip ties which also allows for the disassembly of the construction for reassembly elsewhere. This particular project can be flat packed into the back of a pick up truck and assembled in less than an hour by three people using only a zip tie tool.

The technology builds capacity in community. It supports technical education, and it promotes entrepreneurship. It is inclusive. - Dan Harding

The course began with the following questions: What does it mean to have a voice? Or for that matter to give one a voice? Who is allowed to have a voice? What value is a voice in a society that continues to scream louder and louder over each other through a multitude of mediums? Can a collective voice have more (or possibly less) impact than that of an individual? And finally, what role does architecture and social space making play in this process?

Voice is a salient category in our contemporary lives. We speak of marginalized groups 'lacking voice' and celebrate their efforts at 'raising their voices'; we are advised to listen to our 'inner voice' and be 'vocal' in our opinions. Such idioms closely associate voice with individuality, agency, and authority. Anthropologists have sought to denaturalize these associations, showing them to be the product of a particular ideology of voice that is neither universal nor inevitable. At the same time, they have also studied the effects that such associations have on imaginations of subjectivity as well as public and political life. - Marlene Schafers

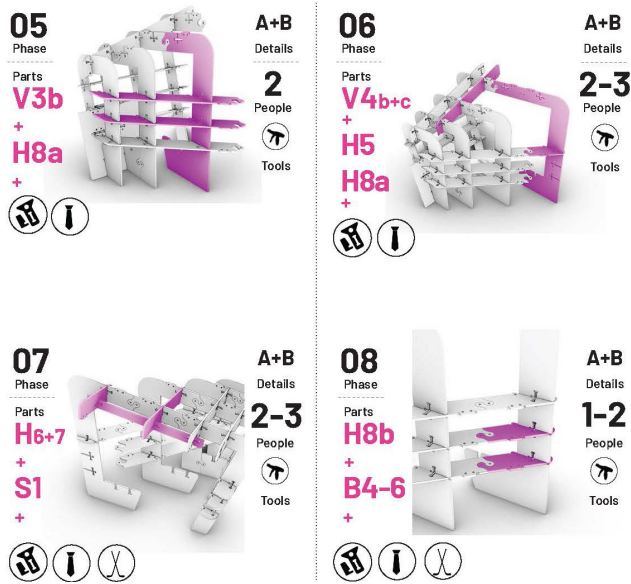Figure 3. Cultural Megaphone - Jordan Campbell, Kyle Culbertson and Dylan Kish

Figure 4.Cultural Megaphone - Jordan Campbell, Kyle Culbertson and Dylan Kish

The student team of Jordan Campbell, Kyle Culbertson and Dylan Kish interrogated these questions through the lens of access to education and the role of a Land Grant University. The growing question about the value of higher education versus the debt associated with it has been, and continues to be, examined in many ways. Procedures to reduce student costs range from access to open-source textbooks and other learning content to increases in available scholarships and reducing tuition through online learning. As we have learned from the COVID-19 pandemic, while technology is an incredible tool for increasing access to learning, there is value in the impromptu conversations of an in-person campus. The fundamental question is how does performative space making engage in this topic and how does it expand its role by engaging potential users?

By establishing an open prompt with a specific technology for implementation, the students were able to create a structure with a multiplicity of function to facilitate conversation. At a base level the structure is an obvious place to sit and its scale allows for more than one person, following the typology of the park bench. Unlike the typical bench, the structure's walls and roof define an interior that engages the exterior public realm. The expanding geometry allows for one passing by to join the conversation while being both within the structure and still outside. The geometry and acoustically reflective material also amplify voice on two levels. The voices of those talking within the structure reverberate and project beyond the normal range of a conversation held on a bench. Within the context of a university campus, that is also a public space, the discussion between a small group of people, say students discussing their research or an issue of social justice, projects to engage others. Or in the case of faculty discussing their scholarship or the content of a presentation, it offers that knowledge and potential for discourse without a monetary cost, giving a framework for a

campus forum. Finally, the overall form has the capacity to be co-opted into a large-scale megaphone to amplify one's voice to a large audience or to get the attention of the administration.

The methodology for this course iterates and expands what is learned in the first year design studio. The parameters established for the student investigation begin with the synthetic mapping of the existing conditions and identify where potential exists. The course structure requires the students dialogue with peers on campus and asks them to define the User and Not User. It also calls into question their role in defining how their design will be interpreted and used. While the design is based on specific dimensions and intended uses, there is also a constant dialogue about the benefits of interpreting or misusing the structure. Finally, the use of the Sim[PLY] framing system established the questioning of Site and Not Site. Because the structure could be easily assembled and reassembled without the involvement of the designers, the parameters of their site analysis had to go beyond their intended location(s).

GRADUATE RESEARCH PROJECTS

The culmination of a student's education at MSU is a two-semester research paper and project guided by a primary and secondary faculty member. The student projects range from material exploration, to building designs, to planning projects and to policy proposals. While the topics of the research are proposed by the student, the framing and guiding of the research development is the responsibility of the faculty member. As this will be their final project within the program, the reinforcement of the pedagogy from previous courses establishes the opportunity for students to examine this particular approach to design education in the most open way in their academic career. The research process again begins with examining and evaluating the existing systemic influences on the site. The context is expanded
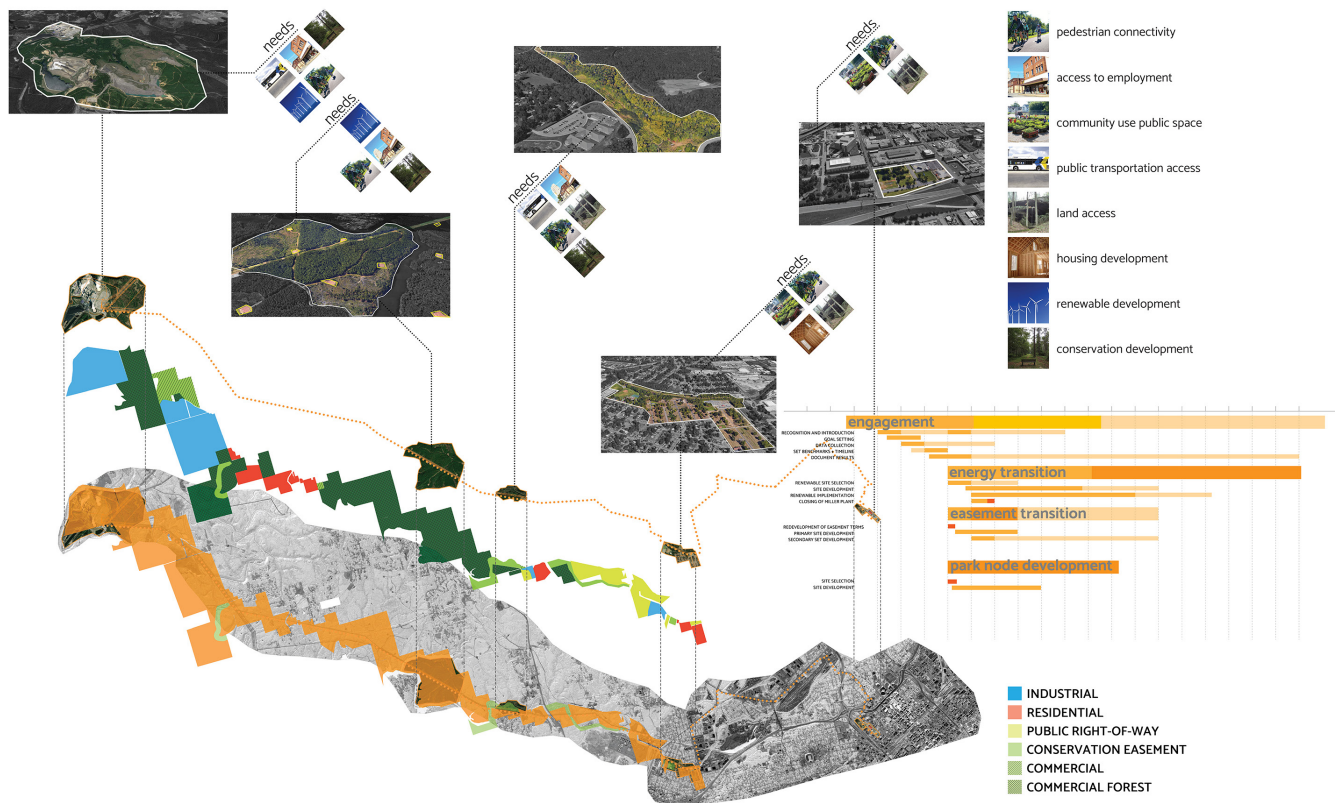
Figure 5. Energy Park - Saunders Allen

and the student is asked to identify the existing trends, desires, efforts and processes that can be leveraged. The design strategy links into these systems to create a mutualistic proposal for humans and the environment. Fundamental to the two student research projects examined here is the responsibility to design the spaces not to build.

The first project, Biophilic Potentials in the Rural U S by Saunders Allen, linked into the conversion of fossil fuel-based electricity to renewable energy strategies. The specific context for this investigation was in the state of Alabama, where 97% of the land is privately owned. The project seeks to create a sustainable infrastructure for energy that also provides access to the natural environment for all residents. By identifying the network of transmission lines and current fossil fuel extraction sites, a new public space was identified. These existing sites form a connective set of pathways between production sites and the communities they serve. By leveraging their continuity and capacity to do more than transmit energy, the existing infrastructure becomes a biophilic pathway, not dissimilar to the Rails to Trails network. Furthermore, the generation of renewable energy sites are designed to create spaces for humans and create / protect ecological sites. The project establishes a green infrastructure that creates space for people to have access to nature.

The second graduate project, Integrated Ecological Growth by Aleck Gantick, leverages the desire for amenity-based living in

the Mountain West to rethink development patterns that benefit the ecology. Paradise Valley, located just north of Yellowstone National Park in Park County Montana, has seen significant residential growth over the last 50 years. From 1970 to 2000, there was a 43% increase in population and a 293% increase in residential land development. This trend is continuing as more employees have the capacity to work remotely and are leaving urban centers. The existing trend in the valley is to convert large ranches into 40 acre residential plots without regard for ecological function. The proposal does not seek to limit this development, but re-envisions it to again provide a mutualistic benefit for humans and the environment. By reorganizing the development pattern, at the same density of housing, ecological corridors are protected and all residents have access to these protected lands. Furthermore, it allows access to the National Forests for everyone to access public lands and increases land value.

Both of these projects developed out of an analysis that identified the space of opportunity for design to intervene and to give agency to both people and the environment. By examining the Site / Not Site and the User / Not User, the programs emerged into a space of equity that shifts the role of land ownership without eliminating it.

640 Acre Section

640 Acre Section - Undeveloped
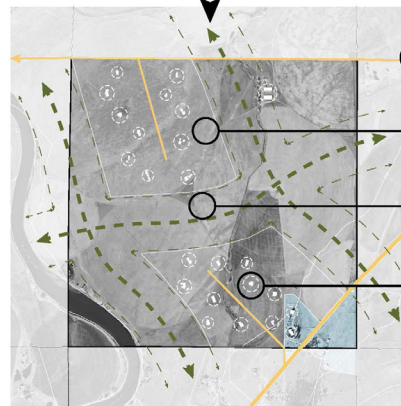High amenity value and decreasing agricultural value, suceptible to development and parceling.

Only a select few sites are valued at a premium

Sites at greater distance from amenity are less valued

Ecological connectivity is not guaranteed
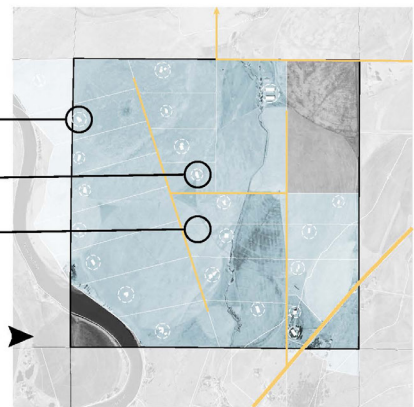
Development Trends - Unregulated

Development Principles

Cooperative ownership rather than parceling

Collective open space, protected in perpetuity

Enhanced amenity access

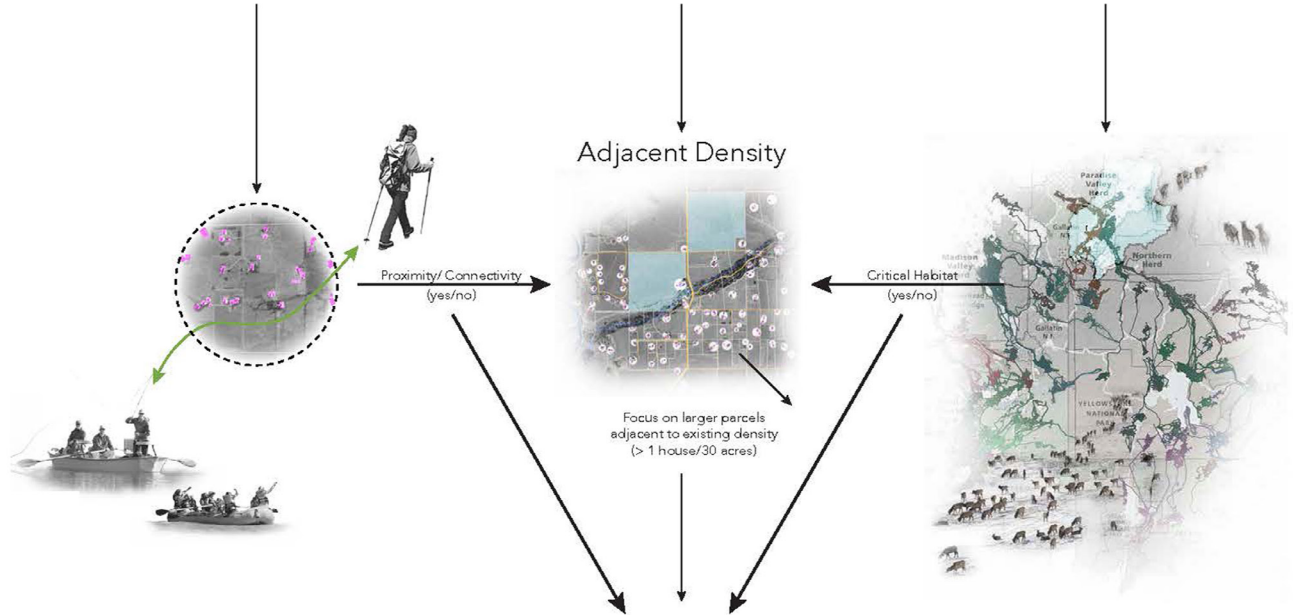Increase density adjacent to existing development while increasing protected space

Leverage adjacent development trends to provide amenity access

Cooperatively owned land, unparceled

Ecological Commons, collective conservation easements, landscape connectivity

Same ammount of build sites with a more even value distribution

Proposed Development Strategy

Amenity Access

Development Density

Ecological Function

Adjacent Density

Proximity/ Connectivity (yes/no)

Critical Habitat (yes/no)

Focus on larger parcels adjacent to existing density (> 1 house/30 acres)

Reframe ecological commons through collective ownership of open space which functions as amenity and ecologically defensible space

Figure 6. Ecological Commons - Aleck Gantick

CONCLUSION

Within the context of a school of architecture, this way of systemic thinking is an absolute necessity in our dynamic world. Projects that can understand the implications of their existence in a larger, rapidly changing context are more responsible and realistic. They are able to understand their potential impact and provide valuable space that is performative. Similar to our influence and response to global warming - sometimes proactive but more often reactive - design can overlook the small aggregate pieces that make the larger picture. By objectively examining the site and context through a systems lens, students are able to make design decisions that are proactive, not relying on a prompt from a professor or client, and even expand the role they can have as a future architect working further upstream in the process.

With so many other issues the students need to address over the course of the semester (structure, MEP, daylighting, energy, code, etc) it can be too easy to resort to knee-jerk preconceptions of the context and site as something we see rather than part of a complex and integrated system. The framing research that identifies potential for emergent capacity of the architecture established in the first part of the semester can be lost. The students are constantly asked to go back to the research criteria as a basis for evaluation of their design. Through the iterative re-examining of the context utilizing the semiotic square framework, or what Krauss referred to as the Klein group, the design evolution and resolution can be evaluated within a multiplicity of appropriateness for multiple constituencies. It also actively engages in multiple futures for the project and its impact that can simultaneously occur. By identifying and leveraging the different systems within the context of the project, the designer can accomplish more than the built work by being a catalyst for larger action. This type of thinking moves the program from a list of spaces to one that is a set of performative criteria not bound by formal critique.
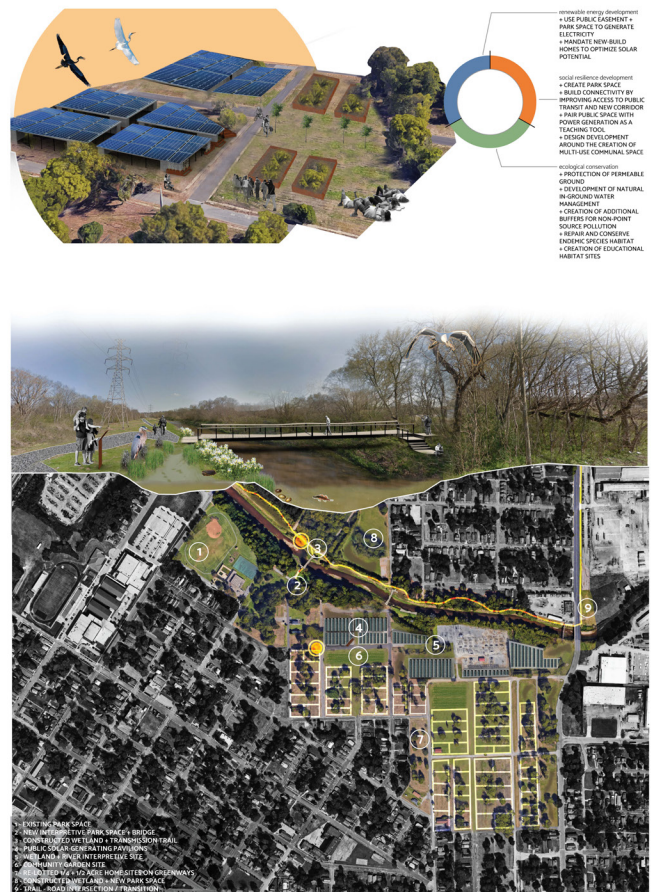

Figure 7. Energy Park - Saunders Allen

ENDNOTES

1.   Powell, John Wesel; Map Arid Region of the United States Showing Drainage Districts. U.S. Geological Survey, 1890.

2.   Deleuze, G., Guattari, F. and Deleuze, G., 1988. A Thousand Plateaus. London: Athlone, p.25.

3.   Krauss, Rosalind. "Sculpture in the Expanded Field." October 8 (1979): p. 30-44.

4.   Albright, D., V. Blouin, D.n. Harding, U. Heine, and D. Pastre. "Sim[ply]: Rapid Structural Assemblies Using Cnc-fabricated Plywood Components." International Journal of Computational Methods and Experimental Measurements 5, no. 4 (2017): 532-38.

5.   "The Term DIY Takes on New Meaning with Newly Patented Clemson-designed Technology and Building Solution: Sim[PLY] · Clemson News." Clemson News. April 19, 2021. Accessed September 19, 2021. https://news.clemson.edu/the-term-diy-takes-on-new-meaning-with-newly-patented-clemson-designed-technology-and-building-solution-simply/.

6.   Schäfers, M. Voice. In The Cambridge Encyclopedia of Anthropology (eds) F. Stein, S. Lazar, M. Candea, H. Diemberger, J. Robbins, A. Sanchez & R. Stasch. 2017