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Foreword

How much transformation can occur in a year? No one could have predicted the impact COVID-19 would make on society over the last year. While each of us has been challenged in different ways, our collective resilience is manifested in this year’s conference theme intended to recognize The CELA’s 100 + 1 years of existence and our RESILIENCE amidst a global pandemic, environmental challenges, and persistent social inequality. CELA’s resilience reflects your success in supporting the profession of landscape architecture through education, research, and service.

For the first time ever, The Council of Educators in Landscape Architecture is proud to offer The CELA 2021 conference in a virtual format. In addition to presentations on the impacts of COVID-19 on design education, this year’s conference includes presentations on social justice, health, diversity and inclusion, environmental design, art, science, communication, architecture, historic preservation, planning, sociology, design thinking, construction management, engineering, and related disciplines, in addressing global issues facing the design professions.

This year’s Keynote Speaker, Billy Fleming, will open the conference with Design in the Time of Crisis: Landscape, Climate Politics, and the Green New Deal. Throughout the conference, we’ve scheduled wellness breaks and special networking opportunities including live panels where you will have a chance to chat with the editors of Landscape Journal, the research track chairs, fellow students, an artist workshop, and participate in a special session on Diversity, Equity and Inclusion. As always, there will be an administrators’ session with the leaders of CELA, ASLA, LAAB, and LAF. The conference will come to a close on Friday, but not before celebrating our colleagues’ successes during CELA’s Annual Award and Recognition Ceremony, including an inspiring presentation from Anne Whiston Spirn, CELA’s 2021 Lifetime Achievement Award recipient.

The CELA Executive Committee is also proud to announce a new CELA Board Position, Vice President for Diversity, Equity, Inclusion and Recruitment, in addition to the new CELA Fountain Scholars Program, recognizing and supporting Black, Indigenous, and persons (students) of color in landscape architecture with exceptional design talent in generating ideas that influence, communicate, lead and advance design solutions for contemporary issues in a manner aligned with the original goals of Dr. Charles Fountain. Our first recipient will be honored during Friday’s Awards Ceremony. Additionally, The CELA will continue our
commitment to CELA’s global investiture fund by designating a portion of all registrations to support environmentally and socially equitable activities during future CELA conferences.

While significant conference and organizational transformations are occurring, I would like to encourage more women to take leadership roles in this organization. We’ve started a Women in Leadership group and look forward to empowering more women to lead in academia and The CELA organization. You can be added to the group by contacting Sarah Gillian at director@thecela.org

We look forward to your participation at The CELA 2021 Annual Conference 100 + 1 | RESILIENCE and continuing discussions on the future of the organization, academia, landscape architecture and related professions.

**Ashley Steffens**
Past President, Council of Educators in Landscape Architecture
Chair, 2021 CELA Standing Committee on Conference & Events
Associate Dean of Academic Affairs, UGA College of Environment and Design
100 + 1 | RESILIENCE
Application of Many Objective Robust Decision Making (MORDM) Method for Green Infrastructure Planning

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Keywords: Robustness, Green Infrastructure, Decision Making Under Deep Uncertainty, MORDM

Several processes, such as climate change and rapid urbanization, have made the future projections for urban landscapes deeply uncertain. Climate change will lead to increased frequency, intensity, and/or duration of extreme weather events (Revi et al., 2014), which sets an unprecedented challenge for urban landscape planners/designers. Within this context, decision makers are more than ever concerned about robustness to uncertainties (Herman et al., 2015). Meanwhile, research and practice in urban landscape planning and design are not well-equipped with methods and tools that facilitate decision making under uncertainty. Methods for Green Infrastructure, a recurrent subject in urban landscape planning and design, has evolved to support multifunctionality and adaptation capacity. However, there is an evident lack of uncertainty considerations in GI multi-objective decision-making.

To address these research problems and gaps, this research uses the Many-Objective Robust Decision Making (MORDM) framework to facilitate multi-objective green infrastructure (GI) planning under deep uncertainty. “MORDM combines concepts and methods from many objective evolutionary optimization (MOEA) and robust decision making (RDM), along with extensive use of interactive visual analytics, to facilitate the management of complex environmental systems” (Kasprzyk et al., 2013). In a complex planning setting, the multi-objective optimization component of MORDM creates alternatives that enable the discovery of tradeoffs among planning objectives. The RDM component of MORDM “determines the robustness of planning alternatives to deeply uncertain future conditions and facilitates decision makers’ selection of promising candidate solutions” (Kasprzyk et al., 2013). While this study explores the application of MORDM in green infrastructure planning, the method is powerful for any landscape planning project that requires evaluating proposed multifunctional landscape planning/design solutions that will be affected by uncertain climate and land-use changes.

The method will be manifested in a hypothetical proof of concept of GI planning. In the context of this proof of concept, the goal is to find GI solutions that are satisficing in multiple objectives related to flood control, community/experts’ spatial preferences, and cost while being robust to the main sources of uncertainty. The MORDM method helps to find robust GI solutions under deep uncertainty while identifying the most influential sources of uncertainty. The contributions of this research are twofold. First, it applies a rarely explored method (MORDM) to the context of urban landscape planning and design, which contributes to the quantitative capacity of this field. Second, it expands on green
infrastructure multi-objective optimization literature by incorporating both deep uncertainty considerations and community/expert spatial preferences objectives.
Can Resilient Design Offer Justice? Envisioning the Site for Former Klavern 101, Fort Worth, Texas

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**Keywords:** Resilience, Design Justice, Green Infrastructure, Service-Learning, Urban Design, Superstudio

The year 2020 brought unprecedented challenges to our society due to our lack of understanding and responsiveness to the Coronavirus pandemic, climate crisis, and justice concerns. Although these historic events are downplayed by some (repeating the past societal mistakes) they require scholarly exploration and resilient actions to build the cities of tomorrow. Specifically, “justice” through environment (Spirn, 2005; Chang, 2018; Wilson, 2018) is a topic design and planning scholars emphasize, however, the social complexities it presents raises the question to what level it can be achieved through design?

This presentation reviews a community-based research and studio project that seeks transformative ideas, design justice, and resilient vision for 1012 North Main Street (former Klavern 101) and its adjacent properties in Fort Worth, Texas. The dilapidated building is the only known purpose-built Ku Klux Klan hall/headquarter still standing in America (Miller, 2019). It is designated as "Demolition Delay" waiting for its destiny since 2019 (Weeks, 2019; Ranker, 2020). The site, coincidentally, lies next to the planned Trinity River bypass which is the largest stormwater project in the city (Halprin, 1970; USACE, 2020). The site is at a transition zone between the controversial Panther Island District (TRVA, 2020) and the historic North Side Neighborhood catering two drastically different socio-economic strata of the community.

The graduate studio with urban design focus, service-learning agenda (Butin, 2010), and resiliency and justice concerns started studying the community closely in 2018 to address the perils of this rapidly growing city. This controversial site is identified and became a subject for design by a multidisciplinary research team due to its catalytic location in 2019 (Ozdil et al, 2020). This presentation focuses on the review of literature and history, analysis, and goal-setting exercises followed by visionary and open-ended exercises seeking design justice and resilience by the collaborative efforts among students, faculty, and community. The proposals are assessed through design reviews, student reflections, and expert views. The project has also participated in the Superstudio (LAF, 2020).

In conclusion, the project allowed examining if the wounds of a growing city can be healed through design. The review of reflections and design outcomes illustrated that while conventional functional and aesthetic needs are addressed somewhat at ease, and critical thinking skills and commitment to the community values are developed (CC, 2003; Ozdil et al, 2012 & 2020) addressing justice and resilience issues presented significant challenges for all participants. Despite our openness for dialog in 2020 such environmental problems requiring social emphasis calls to have added sensitivity, mindfulness, and design knowhow to address the challenges of the coming decade.
CEL A Centennial Celebration Review: Examining the Past, Present and Future

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Keywords: prospect, retrospect, landscape architecture education, future, data science

The Council of Educators in Landscape Architecture (CELA) can be tracked back to 1920 when it was first established as the National Council of Instruction in Landscape Architecture (Hodges and Rutz, 1997). In 2020, CELA attempted to host its centennial conference, a significant milestone that any organization should be proud of and celebrate. Due to COVID-19, CELA2020 conference format was re-arranged and thus, we did not have the chance to hold this panel. Despite the impact of the pandemic, we should not stop celebrating CELA’s accomplishments that trace back 100 years ago. Today, CELA is an international organization with annual conferences held not only in the US but also globally. Its mission and focus have extended beyond teaching and techniques to include knowledge discovery. The purpose of this panel is to present CELA’s retrospect as an attempt to envision its prospect in the 21st Century. Our goal is threefold: (1) to provide an update on CELA’s organizational growth and major changes in the recent two decades, (2) to analyze CELA conference abstracts and papers presented in the 21st Century and provide quantitative information regarding these conference publications, and (3) lead a discussion about equity, public health, and engaged citizenship. Major accomplishments and changes include strategic planning, conference standard track system, Landscape Research Record, CELA Board standing committees, CELA Executive Committee, Vice President for Research & Creative Scholarship, Vice President for Communications, Outreach & Publications, Executive Director, Academy of CELA Fellows, Re-envisioning of Landscape Journal, etc. Our analysis of CELA annual conferences enables us to observe the trend of topics, understand the impact of the track system, overview the conference themes and discuss the future for landscape architecture education. The panel includes four speakers: three who served as CELA president, and one who is a scholar with expertise in data science.
Cultural Landscapes and Their Critical Role in Climate Change

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Keywords: climate change, resilience, cultural landscapes, disaster management

Climate change and its resulting natural disasters, civil strife, wars and ethnic cleansing will leave many communities and their cultural heritage behind (ICOMOS CCHWG 2019): disconnected from their heritage as a result of displacement or involuntary migration, loss of intangible heritage resulting from involuntary displacement and/or ethnic cleansing, and the loss of tangible heritage destroyed by natural disasters, inundation or the cultural annihilation of war and occupation (World Heritage Center 2007; ICOMOS CCHWG 2019). How people respond to disasters, and the rate at which they recover, is substantially influenced by both their culture and their cultural heritage (Shrotryia 2013; Few et al 2021).

Culture and heritage impact all aspects of society, but particularly attachments to place in the form of tangible and intangible heritage and social cohesion (Gu and Ryan 2008; Abunnasr, Hamin and Brabec 2015). While the direct effects of climate change are being studied in areas such as building conservation, archaeological resources, World Heritage sites (Blankholm 2009), and the World Heritage Convention itself (Colette 2007; Terrill 2008), what is lacking in the discussion of cultural resilience is an analysis of the impacts of cultural heritage on landscapes, both urban and rural. It is only in the revisions to the 2007 World Heritage Policy in 2019-2020 that cultural landscapes were featured in the climate change discussion (ICOMOS CCHWG 2019). Cultural landscapes are the medium of heritage: 1. as the manifestation of place and place-making in communities; and 2. the attitudes, values and practices that govern a culture and are reflected in its land and urban patterns (Rottle and Alberti 2008). They are critical to the security and identification people seek under the trauma of disasters. Incorporating an awareness of culture and the physical manifestations of cultural landscapes in the disaster planning and relief process is the key to a sustainable and adaptable relationship between humans and their natural environments (Baden and Baldwin 1995).

In 2019, ICOMOS (International Council on Monuments and Sites) presented “The Future of our Pasts” report to the UNESCO World Heritage Committee. The report was a precursor to the drafting of the 2021 World Heritage Committee’s revised Policy Document on Climate Change. This session will analyze the results of the 2019 report and the proposed 2021 UNESCO Policy Document in the context of cultural landscapes. The session will utilize the UNFCCC context for adaptation and resilience, to structure the results of a meta-analysis of the literature on cultural landscapes and climate change. on the importance of cultural landscapes in climate change adaptation and disaster management. The analysis of the literature, prepared by an international consortium of landscape and heritage researchers for ICOMOS, identifies the current state of the research and the knowledge gaps that will require additional efforts to more fully understand the nexus between climate change and cultural landscapes.
Design for Storm Surge Flooding: Prototyping Adaptive Landscapes for Timely Emergency Evacuation

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Keywords: Flood Resilience, Emergency Evacuation, Adaptive Landscape, Storm Surge, Sea Level Rise Adaptation

This study explores the potential of landscape architecture in increasing emergency evacuation efficacy despite the unfolding impacts of climate change using Seabrook, Texas, USA as a test case. Residents often underestimate the extent of storm surge flooding from hurricanes. Consequently, they tend to shelter in place initially and then evacuate after they see the actual magnitude of storm surge. Storm surge can incapacitate evacuation routes with instantaneous flooding much faster than flooding from precipitation. In such scenarios, time can be a matter of life or death for last-minute emergency evacuation from hurricane-induced storm surge flooding. Most literature has focused on improving the efficacies of emergency evacuation through providing more accurate weather forecasts and early warnings. The role of landscape architecture in facilitating timely and safe evacuation remains largely unexplored.

We develop conceptual design prototypes as performance-driven form-based codes for adaptive landscapes by benchmarking best practices to fill the solution gaps identified by comparative case studies of preexisting alternative proposals and non-local precedents. Most preexisting alternative proposals have resorted to coastal defense systems to enable flood-prone communities to adapt in situ while these systems may be compromised by more severe storm surges due to sea level rise. These large-scale infrastructure solutions are costly and time consuming to approve, plan, design, and construct in the absence of proactive financing for climate adaptation. Most of them can lead to more severe flooding due to the ponding of runoffs behind coastal defense interventions and legal complication with the Texas Open Beach Act as the sea level rises.

In response to the aforementioned challenges, the proposed codes generate market-based mechanisms for smallscale landscape interventions as components of a scalable and flexible system to be constructed immediately and upscaled incrementally in the future in a way that 1) minimizes conflicts with the Act’s rolling easement as it continues to move inland due to sea level rise; and 2) increases the amount of time for safe evacuation over a horizon of 80 years even as the effects of climate change continue to result in more severe storm surge flooding. We use evacuation time and number of people that are likely to be successfully evacuated in future flooding scenarios as performance indicators to assess the adequacy of system capacity to inform system upgrades regarding component sizing, distribution, and connectivity over time to cope with more severe storm surge flooding due to a rising sea level and more intense storms.
Discrete Choice Experiment to Elicit Preferences Between Ecological Quality and Aesthetic: An Economic Method to Study How People Make Trade-Off

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Keywords: Discrete Choice Experiment, visual preference, ecological quality, aesthetics, ecosystem services

Landscape design reflects ecological-and-aesthetic values, and trade-offs are often made between the two in practice. In arid regions, water scarcity means riparian corridors are the richest landscape typology and the only blue-green links for hundreds of miles. Pressure from urbanization and lack of ecoliteracy contribute to negative feedback loops which present dire challenges for migrating avifauna and regional wildlife. In terms of natural resources and biodiversity, where multiple deliverable ecosystem services rely on the quality and health of that ecosystem, riparian systems with high biomass are more desirable. Although this can be achieved with low or no-maintenance riparian buffers, these unmaintained ecological landscapes play an intrinsic role in sustaining the global ecosystem and providing services. Ecological landscapes are often subjected to trade-offs with aesthetic landscapes that include micro-and-macro-environmental factors such as manicured landscape. It is accepted that there is a preference for aesthetics in landscape design; however, it is unclear how laypeople prioritize aesthetics over ecological factors in landscape scenes. This study uses a Discrete Choice Experiment (DCE) to elicit people’s preferences for multiple landscape scenes. The method combines ecological landscape characteristics adopted from the QBR index and aesthetic characteristics, such as micro-and-macro environmental factors adapted from Kuper (2017). DCE is a widely used method to reveal preferences by analyzing the trade-offs people make between alternatives. Participants in this study will be exposed to a set of designs, which include various configurations of aesthetic and ecological elements. Participants’ choices are expected to show the influence of their ecological and aesthetic values. Findings in this study will equip decision-makers with operational definitions relating to riparian landscape design and a method that they can use to minimize losses in ecological value over aesthetic value. It will help researchers and landscape architects advance visual preference research further into the domain of empirical studies.
Facing Orange Skies and Brown Waters: The Aesthetics of Climate Change

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Keywords: aesthetics, climate change, sublime, picturesque, wabi-sabi

This paper stems from the position that, for designers and theorists of the built environment, climate change is not a fixable problem but a medium re-defining spatio-temporal relationships between beings and environments. This somewhat-polemical position reveals that, amongst many other issues, previous aesthetic ideas have become obsolete for describing the experience of landscapes altered by climate change. New aesthetic categories (frameworks and vocabularies) are necessary because, otherwise, we risk romanticizing the spatial qualities resulting from climate change.

For example, the category of the sublime was conceived in the 19th century to describe the intense awe experienced when facing nature’s power and vastness. Since these landscapes entailed danger, the sublime conceptualized a safe distance between viewers and phenomena. Under climate change, however, equally arresting environments are neither natural nor can they be experienced at a distance. We are now at risk inside phenomena of our manufacture. The wildfire orange skies of the US West Coast currently dominating media channels appear to be sublime, but they are not. We do not know what they are or how to call them yet, and, for this reason, we are uneasily falling under their spell. Similarly, other categories such as the picturesque or wabi-sabi can only describe landscapes of climate change and our relationships to them incompletely or inaccurately.

Aesthetic categories are always linked to a specific culture, to a particular way of seeing. However, climate change is unequally but irremediably affecting the whole planet. Thus, the task of constructing new aesthetic categories that are not linked to one culture but one planet is not a possibility. Through a review of the inadequacies of previous aesthetic categories, this article takes the form of a manifesto to propose a set of five general aesthetic mandates that can become adapted locally to different places, cultures, or circumstances.

The aesthetics of climate change must reveal a new global public that is inequitably exposed to and prepared to face climate risks. The aesthetics of climate change must distinguish the climatic from the atmospheric. The aesthetics of climate change must describe landscapes that are dangerous yet inhabitable by necessity. The aesthetics of climate change must capture what is about to disappear and differentiate it from the ruin or the castoff. Finally, the aesthetics of climate change must not describe the transformation of the planet’s climate, but its acceleration.
Federal Grants for Advancing Landscape Architecture: Realities, Challenges, and Possibilities

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Keywords: Federal Grants, External Funding, Landscape Research, Research Lab, COVID-19

Pandemic Institutions of higher education are under growing pressure to increase external research funding. The ongoing COVID-19 pandemic and consequent financial pressures have forced many academic institutions to adapt to the evolving competition of increasing research-related revenue. External funding, especially federal grants, are important indicators of rank, achievement, and research capacities of universities. External grants are instrumental for student scholarships and for securing the enrollment of high-quality students. Federal grant writing is also a determinant of faculty success and critical to the tenure and promotion processes. Design disciplines (including architecture, landscape architecture, urban design, interior design, etc.) are less accustomed to federal grant writing cultures compared to their engineering or biological sciences counterparts. Lab-based (a research entity led by a faculty comprised of researchers, postdoctoral fellows, graduate and undergraduate students) academic and research practices which are integral parts of the grant-writing process are not common in many design departments. It is true that most federal grant writing windows from the major agencies including USDA, NSF, and NIH are geared towards research and innovations in the STEM subjects and are less appropriate for design research. However, with the growing success of multidisciplinary approaches of grant writing and the advancements of technologies and research in design, design disciplines need to rethink and restructure their approaches to their federal grant writing efforts.

Landscape Architecture as a discipline is connected to many domains including health, wellbeing (both physical and mental), child development, therapeutic environments, and learning environments. Landscape architecture is also central to contemporary global issues including environmental sustainability, access to clean water, stormwater management, global warming, etc. These pressing issues demand design-research and innovations in the discipline of landscape architecture. Pandemic-enforced social distancing has shown the value of landscape design in everyday life and revealed the need for landscape research to improve living conditions during such crises. Federal grants can greatly support the advancement of landscape research in the face of these contemporary issues, and discussions. Thus, the proposed panel will address federal grant writing opportunities for landscape architecture. A group of landscape faculty members who have had considerable success in winning external funding will share their perspectives and experience and will identify effective strategies that they adopted towards successful federal grant writing and lab development. The panel will also identify key barriers in the process and share visions about innovative/unconventional approaches to overcome such barriers for federal grant writing successes in landscape architecture.
Fluid Boundary: Shenzhen River as a Third Territory

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Keywords: Fluidity, Border, River, Territory, Shenzhen

Water, a matter of both partition and connection, is often used as a natural border between countries, regions, and landscapes. The objective of this thesis is to conceptually navigate through the domain of water, especially that of the river as a site of both boundary and memory. The project speculates on the liquid materiality of the border between the Hong Kong Special Administrative Region of China and Shenzhen (Mainland China), to convey the history of this frontier and to envision its future transformation. Focusing on the Shenzhen River, a fluid boundary that separates two administrative areas, the project offers an opportunity to interrogate how water operates within its administrative function as a border, to examine the historic management of water in the area, wetness, and fluidity. Through investigation of the region’s history, the project suggests that the regulation of fluidity has been employed as colonial statecraft that constructs spatial and political orders in the territory. Based on an investigation of the urban and landscape wet patterns of both sides, the existing management of fluidity, and border control, the project chooses four locations along the Shenzhen River for design intervention. The design speculation proposes Third Space, the place that exists beyond the dichotomy of Hong Kong and Mainland; and the binary of “land” and “water.” Third Space embodies the fluid narrative and is transient; it is a space of hybrid actors and contexts, evolving under changing conditions. Four typologies of Third Space, marsh, bridge, water garden, and island, are proposed to create different scenarios that situate Shenzhen River as a third territory that changes and adapts to various uncertainties. The design investigations provide examples of how landscape design can create new space for dialectic thinking of fluidity. With further studies of ways to manage wetness, landscape architecture can break from colonial ideologies and celebrate the dynamic Third Space.
Heat & Health Maps for Decision-Making: Climate Action for Resilience to Extreme Heat in Tempe, Arizona

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Keywords: Community Resilience, Extreme Heat, Heat Vulnerability, Equity, Health, Urban Climate Change, Urban Climate Design

Extreme heat, health, and equity — the trio of 21st century climate challenges — requires urgent, people-centered approaches to community resilience. Although city officials and designers have provided some strategies to reduce extreme heat (Larsen, 2015; Stone, 2012), we claim that most infrastructure decisions have not adequately addressed heat as a critical health, equity, and experiential crisis. Hamstead and colleagues (2020) found heat mitigation centered in the experience of frontline communities is a critical missing element to most heat mitigation planning and design. This study reviews the case of a city-university partnership to support Tempe, Arizona’s Climate Action Plan for community resilience to extreme heat. The partnership seeks to understand how the City should place (city-scale) and design (site scale) cooling urban infrastructure to address climate, health, and equity. Tempe, desiring to transform individual resilience into a public obligation for community resilience, wants to leverage its role as a caretaker for its pedestrian infrastructure. The staff want to know where cooling projects are most needed (using city-level data informing placement of cooling infrastructure) and what projects will promote urban cooling for frontline communities (using micro-level data for designing site cooling infrastructures). Since 2017, the city-university partnership co-created an actionresearch agenda that resulted in several research projects, which have provided data to inform decision-making. Yet, to date much of the data has not been successfully integrated into accessible decision-making tools or what we call “desktop ready”. Our staff-researcher partnership has identified several hurdles in turning heat, health, and equity data into “desktop ready” decision-making tools including: 1) comparable decision-making benchmarks; 2) data integration; 3) stakeholder coordination; and 4) regulatory and budgetary constraints. In 2020, the partnership: 1) co-created priority maps that incorporate heat, health, and lived experience data into city decision-making; 2) co-produced educational videos and training materials for city staff and residents; and 3) shared experiential learning practices between staff, residents, and researchers about past and present Tempe heat, health, and equity realities. Collecting meteorological data and grounding these measures with people’s actual experience, allows the city to devise data-informed decisions and actions that will improve community health and wellbeing. For the session, we will discuss these hurdles and present early heat, health, and equity mapping products for decision-making in Tempe. Lessons from Tempe can help other cities that have similar decision-making deficiencies related to the intersection of heat, health, and equity challenges.
Landscape Architectural Pedagogy in a Post-Covid World: Not Bounce Back but Bounce Forward

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Keywords: Design Pedagogy, Post-COVID Design Education

Landscape architectural educators and our counterparts in allied design and planning fields faced serious challenges to adapt urgent needs created by COVID-19 during the spring 2020 during which we are suddenly forced to shift from traditional face to face teaching to online. We have learned from our rapid responses to be better prepared for fall 2020 but we are still learning as the pedagogy is going through a serious evolution. There have been numerous online webinars and a long list scholarly and popular articles for and against online teaching. The purpose of this presentation is to share a speculative discussion of evolving landscape architectural pedagogies based on the literature review as well as personal observations and learned lessons sitting through numerous task forces on how design education could be best prepared for a post-COVID World. This presentation will be based on a personal belief that as higher education establishing ways to adapt, instead of just bouncing back, perhaps our efforts and time can be used to strategize ways to bounce forward.

The presentation will be framed around the following questions:

• Is there an emerging pedagogy in design education (poststudio) which benefits from the online technologies?
• How should on campus facilities for design education be modified for future challenges in higher education?
• What are some practical considerations for resilient and optimistic future in both higher education, especially in landscape architectural education?
• How can we ensure an equitable landscape architectural education in a campus of future?
• What are some of the major paradigm in shifts in higher education that would influence design education?

These questions will provide insights toward the following questions:

• How studio teaching would be modified to take advantage of our learned experiences with the online platforms?
• How would student interaction, engagement and experience be maximized and protected as a critical component of design education?
• Would a new paradigm for interactive/simultaneous online studio plus office internship be possible and acceptable?
Landscape at the Intersection of Life and Death

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Keywords: living soils, climate futures, ecological grief, mass extinction, death as process, burial practice, multispecies collaboration, landscape matter, feminist ethics of care

Despite being the literal foundation of landscape and the living skin of the earth, soils remain relatively understudied as a critical design medium for landscape architects. Situating the biological, chemical, physical and cultural complexities of this living medium within the dire environmental projections for the next century, this paper focuses on soil-building processes by rethinking the future of burial landscapes through mortuary composting procedures.

As a complex medium, soil is composed of organic matter, minerals, water, air, and billions of organisms. As an environmental system, it is considered one of the most crucial elements of the climate, being the second largest store of carbon after the ocean. As living matter, it is host to the symbiotic collective of microbes and micro-organisms known as the soil biota which mediates a myriad of biological, chemical, and physical processes, and plays a vital role in determining how well the ecosystems it supports function above grade. Spatially, soil is where “we have long placed that which we fear and wish to lose, and that which we love and wish to save,” in the words of the British author, Robert Macfarlane, in his book Underland (2019). And temporally, soil is the visible evidence of a number of dynamic processes spanning geologic timescales otherwise imperceptible. Beyond the sciences, subterranean lifeworlds have activated the social and literary imaginary across cultures and through time. And yet, humans continue to extract, contaminate and exhaust our planetary soils for productionist gains, rather than enact the kind of care necessary to sustain it as a bedrock of life (Puig de la Bellacasa 2014, 2015, 2017).

Situating these varied and layered dimensions of soil within the looming threat of ecological collapse, this research focuses on how mortuary composting as a form of burial practice might contribute to the resilience of our landscapes while instigating new cultural rituals of care toward both human and non-human entities that go beyond exploitative and instrumentally-regimented forms of stewardship.

Using a Landscape Architecture studio conducted at the University of Southern California as the experimental means through which to develop this research, the paper focuses on the studio output, the methodology it deployed and the theoretical framework through which it was structured. Through an intensive multiscalar investigation of soil as it intersects with ecology, biology, geology, literature, theory, and cultural practice, students generated site-specific design proposals envisioning what such future burial landscapes could become and how they might function. A number of different approaches will be discussed through the student work – as each student engaged a unique set questions and sites through their work. Through these convergent research methods, students expanded both the understanding of dynamic soil processes - its interactions among plants, animals, microbes, the soil matrix, aqueous and gaseous components, and its contribution to ecological resilience - and elaborated on cultural rituals of burial practice.
Mapping the Floodplain as a Fuzzy Territory

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Keywords: floodplain, risk, uncertainty, disturbance

The architect Francesca Hughes likens error and matter: “a complex intersection of indeterminacy, difference, gender and race, existence, process, and entropy... when everything goes wrong, it’s because of matter”[i]. A flood is the episodic inundation of matter (error?)- water, sewage, sediment, oil, trash, and debris over a territory extending out from a water body. Floods are muddy and messy events, stochastic disturbances we try to explain statistically, but can never truly predict. To reveal the imprecision associated with delineating flood risk, this research enters and explores the floodplain as a fuzzy territory defined by disturbance, risk, and uncertainty. Our purpose is to recognize risk as nonbinary and uncertainty as ever present (although unacknowledged) and growing, and to cultivate our capacity to see diversity across a vibrant and varied landscape territory oversimplified when defined by one factor (risk).

Most landscape architects use FEMA’s flood insurance rate maps (FIRM’s) to delineate floodplains. FIRM flood risk zones are drawn with clear boundaries, but floodplains occupy a fuzzier territory in constant flux. Risk maps have the difficult job of balancing our desire to identify areas of risk with the need to acknowledge error and uncertainty. There is a clear tension between exposing this uncertainty and having to translate the maps for use in legal and regulatory action[iii]. Some researchers suggest that we have been going about risk mapping all wrong and that rather than concealing uncertainty and using maps for “discursive closure”[iii], we might open the mapping process to incorporate community knowledge (the ‘lived experience of risk’[iv]) and to “generate valuable opportunities to engage with communities in more creative policy making”[v] toward imagining and building resilient futures.

We develop a floodplain mapping method that combines surface, artifact, ecology, inundation event, hydrological model, time, lived experience, and speculation to explore the fuzziness of this misunderstood and often maligned landscape. Thickening datasets and embedding time allows us to experience the floodplain from the inside, as a subject, rather than object of study. We experiment with languages of representation that help communicate levels of imprecision and engage uncertainty, the only things we can count on in a climatechanged future.
New Studio Learning Modules for Bridging Design and the Science of Resilience

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Keywords: Resilience, Studio learning modules, Science and Design, Smart Landscape

Urban systems evolve as the result of nonlinear, heterogeneous, and multiscale processes, which call for ever more sophisticated, creative solutions in order to achieve some semblance of resilient places (Alberti, 2017; Milburn and Brown, 2003; Woodward, 2008). Pedagogical responses require equipping landscape architects with an ability to understand complex analytic methodologies that go beyond traditional design approaches (Cerra, 2016; Klemm et al., 2017). Most landscape architects however make their design decisions based on a body of tacit knowledge, such as experiences, artistic sense, and inspiration (Chen, 2013; Milburn and Brown, 2003), making the integration of scientific knowledge into design processes an arduous task (Backhaus et al., 2012; Klemm et al., 2017). We argue that landscape architecture programs should put more effort into growing young designers who can understand and strategically respond to the complex and evolving environments in which they will work. This suggests that the unity of resilience science and design must become one of the backbones of landscape architecture education. To do this in a studio environment, we developed and tested learning modules where design ideas are created with multi-scale evidence and tested with scientific methods. Based on Geodesign process, our framework for unification attempt several additional steps that include physical applications and analysis that are contextually scaled to site design problems. The modules introduce: 1) comprehensive resilience theories that bring students into a common frame of understanding; 2) science-based analytic techniques and models for assessing socio-ecological processes, 3) regional context analyses and model adaption; 4) scaling processes and local schematic design application; and 5) resilient design creations in real-world settings. The learning modules aim to instruct scenario-based, analysis-based, and evidence-based designs that function at cross-scales to deal with multivariate resilience issues. In this work, we present our most recent studio example at the University of Illinois (UIUC) to illustrate student responses and outcomes. We use a short survey to find student perceptions and evaluation of the process. Final design evaluations are conducted by juries from different disciplines. We find that theories of resilience and uncertainty were relatively new to the graduate LA design students and many of the more advanced modeling and analysis tools were equally unfamiliar. Once equipped with theoretical underpinnings, geospatial (modeling) and analytic skills however, the students began employing their own analytic applications in support of their design goals. Their perceptions and evaluations of the process were positive and their final work well received by the juries.
Pedagogies for Engagement; Changing the Who, What, Where and How

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Keywords: Pedagogy, Resilience, Community Engagement, Environmental Justice, Advocacy

While landscape architecture has great potential to generate resilience for communities vulnerable to climate change, the profession’s slow path towards public recognition (Baird & Szczygiel, 2007) and the limitations surrounding current citizen participation (Juarez & Brown 2008), pose a significant challenge to garnering necessary support. The lack of awareness of landscape architecture’s capacity to significantly address environmental and social challenges faced by our communities today requires the profession to support alternative practices of outreach and pedagogy, to expand our impact in confronting environmental injustice. These practices may not only engage future professionals but could also foster deeper knowledge, understanding and advocacy for landscape architecture.

Among the various strategies aimed at increasing the connection between the public, the profession and its impact on communities, lies design thinking. Through design, visualization, and social learning processes, design thinking has been recognized as a valuable part of community development (Moomaw, 2016). However, it may be important to question the value of these processes when participants may lack basic design skills and understanding of the conditions affecting their communities.

In this paper, we explore novel methodologies by which academics can contribute to increasing the public’s understanding of the profession, especially in underserved communities. Case studies of (4) community engagement and youth education projects developed by the authors in Boston, MA, will explore access to, and methods of, education in landscape architecture, reframing the Who, the What, the Where and the How of landscape architecture pedagogy. The case studies evaluate methodologies for: engaging with K-12 students from marginalized communities (who); focusing on local issues affecting communities and how landscape architecture may address local challenges (what); working in underserved communities and public spaces (where); developing participatory art projects and youth programs (how), as alternative forms of engagement led by academics that differ from traditional academic settings and methodologies of dissemination. These works demonstrate overlap in pedagogical strategies, but also point to challenges rising from significant gaps in the knowledge and understanding of environmental justice issues and design literacy. In engaging with youth communities, this work has aimed to introduce the discipline of landscape architecture, while exposing K-12 students to design thinking and design process, as applicable and influential to the totality of their learning experiences.

The outcome of this engagement has suggested the introduction of landscape architecture and environmental education pedagogical methods offers K-12 students recognition of the multiple paths in which science, art and design interests could be fostered and curated toward the development of
meaningful careers, incorporating design literacy as a critical foundation. In focusing on local issues affecting communities, and how landscape architecture may address local challenges, this work reveals the potential for empowerment through community engagement, creating capacity for advocacy efforts to land in tangible ways in underserved communities. Additionally, directing this work at public space has allowed for design practice and outreach initiatives to reach atypical audiences, meeting people where they are, and addressing the issues that matter most to communities that have been left out of the public discourse. By creating community art projects and youth engagement opportunities, the ability to generate connections with the public has proven to be more fruitful, as participatory projects form deeper bonds between citizens and the places and spaces they inhabit. The engagement methods and pedagogical practices employed in the presented case studies reveal the power of design literacy, when made available to a broader cohort through varied tactical models that aim to reach the most underserved and underrecognized. The authors utilized qualitative, ethnographic research methods in the above case studies, providing a narrative dissemination of the proposed pedagogical frameworks for community and youth engagement.

In conclusion, this paper introduces opportunities for landscape architects and designers to broaden their practice as a means to better expose and prepare future decision-makers to become active citizens supportive of Landscape Architecture practices, playing a significant role in re-drawing the boundary line of what landscape architecture is.
The Post-Herbicide Landscape Era: An Ethical Framework for Future Practice

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Keywords: herbicide, landscape design, landscape architecture, landscape resilience, ethical responsibility

Introduction: If landscape architects ascribe to a land ethic (Leopold 1966, Taylor 1981), do they have an ethical obligation to design landscapes that don’t require synthetic herbicides for installation or maintenance? And what about human labor: do landscape architects’ have an ethical obligation to those people who endure the greatest exposure to herbicides, the landscape installation and maintenance laborers? This paper explores an ethical framework for considering these questions.

Background: In defining sustainable landscapes, a common thread is reduction fossil fuel dependence and preservation or improvement of ecosystem function (Thompson and Sorvig 2008, GBCI 2014). In the field of landscape architecture these two criterion lead to recommendations for reduced use of synthetic herbicides, but in practice, chemical herbicides are still widespread in landscape installation and maintenance. The American Society of Landscape Architects (ASLA) has taken a stand on herbicide use by collaborating on development of the SITES rating system for sustainable landscapes. The SITES system specifies that landscape architects should (GBCI 2014, Section 8: Operations + Maintenance, 107): “Ban the use of all pesticides for cosmetic purposes” and “Ban the use of all pre-emergent herbicides.”

Yet annually, more than 45 million pounds of herbicide are applied to industry, commercial and government landscapes—for a total of about one-fifth of all herbicide used in the United States (data from EPA report by Grube et al. 2011, 12). Prominent thinkers in landscape architecture have implied the problem of misalignment between our vision and our practice lies in a lack of ethical and aesthetic commitment to the reality of herbicide free landscapes. “Just how beautiful is a green residential lawn maintained by pesticides and herbicides that are harmful to children, pets, and songbirds?” wrote Elizabeth K. Meyer (2008).

Methods and Aim: This paper uses a framework of intrinsic land ethics (Leopold 1966, Taylor 1981), principles for stewardship of commons (Ostrom 1999), and environmental justice theory (2007) to build an argument for landscape architects’ ethical duties in relationship to the use of herbicides in designed landscapes.

Importance: The SITES herbicide recommendations are grounded in growing evidence that even the most common and accepted synthetic herbicide may pose health risks and be environmentally persistent, and yet herbicide use remains a common part of landscape installation and maintenance (USGS 2011; King and Wagner 2010; Rochfort , Ezernieks, and Yen 2009; Marc, Mullner-Lorillon, and Belle 2004; Richard et al. 2005; Relyea 2005; Kjer et al. 2002; Reynolds et al. 1993). A clear understanding of the landscape architect’s ethical duties, and of the economic and aesthetic context of the herbicide status quo, is needed if landscape architects are to move into a post-herbicide future.
Resilience-Focused Design Pedagogy: Integrating Knowledge and Well-Being

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Keywords: resilience, pedagogy, well-being, systems

The pandemic has demonstrated increasing need within higher education for strategies that enhance resilience in our communities and the environments upon which they rely. Given emerging social and ecological crises, we need to equip design students and ourselves with relevant knowledge and skills to build resilience. Our pedagogical proposition stems from Walker and Salt’s framing that: “Resilience thinking is systems thinking.” Priorities expressed in the Green New Deal, as well as the New Landscape Declaration3 and climate initiatives in our discipline, embody systems-based approaches toward more just, resilient futures. As educators, we are in a position to integrate environmental resilience with collective and individual resilience, by fostering well-being skills while teaching landscape architecture curriculum.

Well-being is improved at individual and collective levels through shared experiences of our humanity, including vulnerability, diversity, and purpose. The Well-Being for Life and Learning Initiative (WBLL) at the University of Washington formed a community of practice--faculty, staff and students--to develop practices supporting well-being on campus. Collectively, this group contributed to creation of a guidebook addressing student well-being. While participating in WBLL, the authors received a 2019 Resilience Seed Grant to initiate a community of practice within the UW College of Built Environments (CBE) for faculty interested in resilience and well-being. Colleagues in landscape architecture, architecture, and planning responded. As a group, we co-created a retreat to learn from and discover common ground in our respective framings of resilience and well-being, systems thinking, and biophilic design. Drawing from these insights and other resources, the faculty group identified approaches to integrate well-being practices into courses. Follow-up meetings afforded reflection of experiences that will become part of a summary of findings and resources.

This session presents findings from well-being and resilience initiatives in our institution, college, and landscape architecture courses to inform resilience-focused design pedagogy. We share highlights of the WBLL initiative, our CBE faculty endeavor, our own studios and related courses, and how well-being practices are being used in our current online courses due to the pandemic. As these practices are evolving in real-time, we look forward to sharing what we are learning through these contexts. We ask that session participants contribute their insights to advance our collective understandings and means to support student well-being and resilience through pedagogy, during this pandemic and beyond.
Resilient and Multifunctional Energy Landscapes for A Green New Deal

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Keywords: Green New Deal, energy landscapes, multifunctional landscapes, energy transition, decarbonization, social justice, climate change

There are growing calls for accelerating the decarbonization of America’s economy, including its energy sector. The U.S. is looking to include clean energy infrastructure as part of an infrastructure green jobs package as part of the new Biden administration’s strategy of mitigating climate change. Regardless of whether or not a “Green New Deal” led by the U.S. federal government officially comes to pass, we can reasonably expect an explosion of new renewable energy projects in the coming years, both on public land in response to national climate commitments, and on private land as the private sector, through mechanisms such as Power Purchase Agreements (PPAs), drives up demand for clean energy throughout the country. Some U.S. states are similarly ramping up their decarbonization commitments, pushing past the federal government in terms of scale and speed. But to decarbonize effectively there needs to be a landscape agenda that preserves and facilitates placemaking within the energy transition, incorporating clean energy infrastructure as a well-integrated layer of the cultural landscape—one that reduces local opposition to renewable energy projects and brings traditionally opposing actors together through well-designed public engagement processes.

How can we promote a rapid energy transition that can support a cleaner and more just economy? The answer to this question is complex and requires spatial thinking. Already, renewable energy development has been the largest driver of land-use change in the United States in the past decade (Trainor et al., 2016). There have been numerous land-use conflicts in rural communities and wildlife habitats (Brunette et al., 2013). It is critical to assess the spatial impact of energy policy and how to achieve our energy goals, while not sacrificing social, cultural, and ecological values.

As landscape architects, we can contribute to resolving these conflicts by designing and planning multifunctional energy landscapes. Drawing lessons from the case studies of “green-on-green” conflicts and the best practices of co-locating energy infrastructure, we propose a set of principles that landscape architects can adopt to support a rapid energy transition to renewables.

The renewable energy transition could face headwinds at this current critical moment of inflection if it is not thoroughly planned or if it ignores an adequate placemaking process. We argue for proactively deploying landscape design work that integrates energy into a multifunctional landscape, paving the way for a just transition.
Temporal Mediation: The Synthetic Coastal Ecologies of Cape May

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Keywords: Resilience, Engineering, Tourism, Ecology, Manufactured Landscapes

Colonial settler history attributes the discovery of Cape May to Captain Cornelius Jacobese Mey in 1623, though the Kechemeche, a subtribe of Lenni Lenape, had long frequented the coastal plain peninsula. Mey’s discovery set in motion centuries of grandiose infrastructural projects in the domestication and commodification of the peninsula. The 20th century saw the U.S. Army Corps of Engineers’ Beach Nourishment Program widen eroded beaches through offshore dredging, reconfiguring Cape May at a geographic scale. Dredge deposition, land reclamation, harbor jetties and recycled Christmas tree dunes disrupted natural sand flow to protect a tourism industry and wildlife habitats from coastal erosion, sea-level rise and increasing storm events. Beyond the shores of Cape May lies another synthetic landscape in a network of artificial reefs dedicated to the enhancement of recreation and ecology. The Artificial Reef Program, a subset of the NJDEP, is overseen by the Army Corps in material specification and siting. The program reuses decommissioned military paraphernalia, barges, ships, concrete debris, reef-balls, and subway cars as structure for habitat creation, tourism, fishing and diving.

Through case studies of the Army Corps of Engineers’ beach nourishment and artificial reef programs, this paper examines their relationship with entropy to maintain a static landscape condition. Programs are compared by examining project goals, implementation methods, and inherent ideologies in relation to natural processes in which the programs operate. The paper argues for a decentralized approach to landscape management that works within natural processes in the creation, protection, modification and preservation of terrestrial and aquatic parkland. While Army Corps programs have ensured continuity in programmatic use, I argue the future of Cape May’s landscape management regime in relation to environmentalism localism and climate activism merits further investigation.
Texcoco Living Landscape School

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Keywords: Cultural Landscape; Living Landscape School; Lake Texcoco; Mexico City; Performative Research

Texcoco Living Landscape School research is a journey to the volcanic lacustrine landscape of Mexico City, the third-largest city in Latin America. The city developed overtime covering the lakes Chalco, Xochimilco, Zumpango, Xaltocan, and Texcoco. Texcoco is the largest lake remnant. Biologically and culturally, it has a complex story of disruption that stretches from hosting Tenochtitlan, the Aztec City center of Mexico's life destroyed during the colonial period, to the Texcoco Airport's cancellation in 2019. The airport was partially constructed, requiring the drainage of Texcoco and approximately 30 million cubic meters of volcanic rock violently extracted from over 180 regional mines.[1] Such were the expressions of concern that a national referendum halted the project.

This paper presents the research findings as part of a Landscape Design Studio during Fall 2019. It questions the possibility of environmental and cultural justice projects, not as physical operations with definitive, but rather as long-lasting educational processes.[2] Texcoco Living Landscape School occurs in the field, where all living beings are the protagonists. The presentation contains three parts:

I. Texcoco is Ancestral. It observes the ancestral morphological, biological, and programmatic characteristics of Texcoco and how they communicate knowledge through memory and emotions. It includes three ideas: a) Texcoco’s biogeographical structure as an urban-learning adventure; b) Texcoco as a fragmented relic of the larger regional water armature and an experiential device to connect the native forests, and; c) Texcoco’s network of outdoor classrooms as living schools.II. Texcoco is Alive. It touches on the lake’s biological history to articulate successional landscapes through three explorations: a) the relevance of diverse sources of knowledge coming from in-situ and ex-situ experiences; b) the role of flexible representation and ex-profeso methods not to achieve prescribed results but rather to continually search for new balances, and; c) the performative coalitions to allow the collective neverending construction.III. Texcoco is Didactic. It explores the expansion of performative research. Preservation efforts would not aim to recover an impossible past but rather behave as an ever-evolving pedagogical landscape system. The systematic disruptions are also the opportunity for long-lasting change.

Finally, this circles back to the Texcoco Living Landscape School, a pedagogical system where scientific and artistic knowledge production co-occurs. The findings include theoretical speculations as well as a public institutional call for action. Ancestral, alive, and didactic Texcoco can deliver a message of resilience, resurgence, and freedom towards alternative transdisciplinary approaches.
Uncovering the Embedded Knowledge in Low-Tech and Historic Infrastructures

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Keywords: Water, infrastructure, low-tech, design intervention, taxonomy

Throughout history, low tech and land-based infrastructures have conveyed and captured water, organized settlement, moved people and goods, and established large-scale landscape transformation. Civilizations, such as those inhabiting Chaco Canyon in the 9th-13th centuries, organized complex urban, infrastructural, and economic armatures throughout the arid and water-scarce Colorado Plateau. These interventions are highly relevant and are continued to be used today by ecologists, landscape architects, designers, and land managers to modify and intervene at a variety of landscape scales.

This presentation will describe past research and design work by the author on a taxonomy of low-tech water infrastructures, which includes both historic and modern typologies. The taxonomy collected a wide range of water infrastructures for arid environments, and focused on typologies that slow water, reduce erosion, capture runoff water, and collect organic material. By organizing the interventions in terms of scale, performance, and existing site conditions, and utilizing simple graphics and organizational structure, this research work aimed to provide a decision-making framework for community members and land managers to intervene at a variety of scales.

Ongoing research catalogs, analyzes and organizes other infrastructures through drawing and digital modeling, encompassing a broad wide range of typologies and conditions, including materiality, socio-political implications, ecological generation, and spatial organization. This expanded catalog includes temporary, ephemeral, and informal infrastructures that modify land for agriculture, ecological generation, and fire management. The underpinning hypothesis, “How can we use embedded information in these infrastructures to create new typologies that are adaptive and embrace uncertain futures?” positions urbanism as impermanent, emergent, and adaptable, rather than fixed and permanent.
Urban Agriculture and Community Resilience: The Vietnamese Village in Post-Katrina New Orleans

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Keywords: urban agriculture, resilience, community planning, social-ecological system

Urban agriculture has the capacity to support urban social-ecological systems, yet little is known about how it is integrated into the urban design and planning processes and how it creates resilience for local communities. Meerow, Newell, and Stults (2016, p.39) define Urban resilience as “the ability of an urban system—and all its constituent social-ecological and socio-technical networks across temporal and spatial scales—to maintain or rapidly return to desired functions in the face of a disturbance, to adapt to change, and to quickly transform systems that limit current or future adaptive capacity.” This definition emphasizes the general adaptability of an urban system that undergoes constant change and interdependence across spatial and temporal scales.

This research focuses on post-Katrina urban agriculture development of the Vietnamese village in New Orleans, LA, by examining how urban agriculture becomes an integral part of the community rebuilding schemes and contributes to improving resilience. There is a clear link between social and ecological resilience, especially for communities that rely on natural resources for their living (Adger, 2000, p. 347). In the Vietnamese village in New Orleans, urban agriculture projects not only help to rebuild the ecology but also to rehabilitate the social networks and connectivity of the community, which promotes both its physical and social resilience. This article also discusses the potential contribution of urban agriculture for future adaptive planning and design that could provide a new “civic ecology” framework for building community resilience. It is based on a review of the planning efforts for the Vietnamese village after Hurricane Katrina and draws from archives and websites about the urban agricultural projects conducted in the village. The data are supplemented with interviews and field observations the author conducted during the research, between 2014 and 2020. The results of this research indicate that the development of urban agriculture has been essential to the community’s long-term resilience strategies, while the sociocultural and economic values associated with urban agriculture promote community empowerment and enhance food security and resilience.
Urban Gardens and Resiliency in Post-Earthquake Pompeii 62-79 CE

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Keywords: earthquake, resilience, Pompeii, urban gardens, landscape history

The ancient Roman city of Pompeii is famous for the preservation of urban life by the eruption of Mt. Vesuvius in 79 CE. This was not the inhabitants’ first encounter with disaster. 17 years earlier, they confronted the terrifying aftermath of an earthquake and aftershocks that destroyed the city on February 62 CE. The disaster was described by the ancient writer Seneca and is evident in the archaeological remains, based on which scientists have estimated a magnitude 5.2-6.1 quake centered on a fault line along the flank of Mt. Vesuvius, where the city of Pompeii lay. The subsequent eruption of Mt. Vesuvius, effectively sealing off Pompeii, Herculaneum, and adjacent villages from further inhabitation, provides a record of the resilient strategies the inhabitants deployed to recover from natural disaster over a period of twelve years. This paper demonstrates how increasing the construction of urban gardens exhibited key aspects of resiliency theory, as defined by Meerow et al. 2015: use of existing socio-ecological and socio-technical networks in the aftermath of acute disturbance to rapidly return to desired functions in the face of disturbance. This paper explores the possibility that the creation of urban gardens after the earthquake was as much a strategic as a spontaneous response.

Four elements stand out:

1) The effective use of traditional water collection methods in the face of failure of the city’s aqueduct.

2) The use of rubble from the earthquake to bury ruins and level the sites for gardens. Roman gardens throughout the Mediterranean were built on leveled terraces that controlled run off for storage of the water in cisterns and created well-built and drained beaten earth paths for the Roman social practice of strolling (incessus). It was a common practice to lay down a layer of leveling fill prior to constructing a garden on imported fill. This practice was exploited systematically in the aftermath of the earthquake.

3) Use of gardens and garden shrines to sustain the system of religious practices that supported Roman daily life in a place with ongoing tremors and plumes that animated the earth around the volcano.

4) The volcanic soils and climate permitted, as it does today, intensive urban agriculture and intercropping, rapidly providing economic support for residents who could rebuild and even expand. Why and how did Pompeii’s inhabitants choose gardens, rather than immediate reconstruction of the damaged architecture, as is so often the case in the history of earthquake recovery? This talk surveys the archaeological evidence for how land owners converted their destroyed properties in the city to gardens and vineyards, focusing on the results of new excavations at the Casa della Regina Carolina.
(VIII.14.3), one of the largest of the private residential gardens in the city, together with other comparative garden sites in the city and the Roman Empire. The detailed archaeological stratigraphy of these gardens, particularly layers of fills, is examined in this study from the disciplinary perspective of landscape architecture. The results reveal a resilient approach to remaking the ground of the city, drawing upon traditional methods of water management and terrace construction to accommodate the loss of the aqueduct. Through this process, Pompeians created 540 gardens and parks that played no small role in restoring prosperity to Pompeii’s citizens, a resilient response to chronic earthquakes, albeit one terminated with grim finality by the volcanic eruption of Mt. Vesuvius.
Projected sea level rise and storm surge are predicted for landscapes in Waikīkī - a strip of widely imaged and imagined beachfront on the southern shores of O'ahu. The myth of Waikīkī as a tropical pleasure ground is a meticulously managed construct reliant on extensive dredging, beach renourishment, and aggregation of seawalls and jetties. These often-reactive management strategies suppress the ramifications of hydrological forces and continue an inherited narrative initially established in the early 20th century: that land must be reclaimed from water by any means. Because the majority of Waikīkī is built on a thin layer of excavated dredged fill, it is expected to experience more frequent flooding from king tides for the next 15 to 20 years and complete inundation by 2100. Prior to the 1927 ‘Waikiki Reclamation Project,’ Waikiki estuary was a system of 'auwai, irrigation channels formed by volcanic rock walls, that gravity-fed a series of terraced lo'i ponds planted with taro (kalo) and loko (fishponds). The cultivated basins were designed along a gradient of water and salinity and acted as sediment filtration mechanisms that helped to regulate flood events, enhance habitat, and retain water in times of drought. Abutting this estuary was an extensive and thriving reef known as the Kālia fishery. Kālia's shallow shelf provided some of the most celebrated loko kuapā (coastal fishponds), canoeing, and surf breaks in O'ahu. This method for inhabiting and cultivating the islands’ water systems was organized by the ahupua'a, a resource that respected the topographic attributes of a given watershed.

The purpose of this paper is to use the literature of this history and practice to inform future methods of designing and inhabiting the water’s margin. Using the Ala Wai Boat Harbor as a case study testing ground, this paper applies the principles derived from a literature review to expand the ecological, social, and cultural role of the Ala Wai Small Boat Harbor as a coastal infrastructure and public space. Located at the mouth of the Ala Wai Canal, between Waikīkī and downtown Honolulu, the Ala Wai Boat Harbor is the largest small boat and yacht harbor in Hawaii. The results of the case study suggest that the hydrological values for cultivating the ahupua'a stewardship system and the methods employed would be helpful for landscape architects and designers to provide a more equitable and ecologically-additive assembly of 'Waikīkī.'
Communication & Visualization
By the Numbers: Representing the Working Landscape

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Keywords: Landscape Painting, Representation, Art History, Agriculture

The influence of 19th-century picturesque landscape painting has had a lasting influence on landscape architecture in America. Just as the Hudson Valley inspired the first native school of painting in the United States, it supported the founders of the first distinctly American landscape architecture tradition. The framed perspective was central to Hudson River School landscape painting and, as such, picturesque landscape architectural traditions. Such perspectives depend on topography that can support a vista—this is impossible in the flat landscapes that support the Nation’s highest rates of agricultural production. In the flat working landscape there is no foreground, middleground, or background. The landscape is compressed onto a single plane—accentuated by linear systems of roads, mechanically tilled earth, and crops planted in rows—patterns shift in and out of an unforgiving perspectival limitless.

The highly standardized and commodified spaces of contemporary agricultural production require an alternative form of landscape representation. Many landscape architects working within this arena have turned away from pictorial representations altogether. Julia Czerniak writes that the “synpotic” aerial imaging and mapping techniques used in Taking Measures Across the American Landscape “challenge the tyranny of the pictorial embedded in landscape production.” But need the representation of the landscape as a framed picture necessarily preclude its understanding as a process? While mapping and aerial imagery can convey the scale and territory of the hinterlands, they fail to capture an experience of the working landscape from within. The shift in scale required for territorial mappings others the working landscape as a space to be experienced and understood from afar. This has a tendency to homogenize local space and identity, defining the rural landscape as ecological repository or urban-industrial staging ground. Moreover, mappings often lack the narrative potential of perspective drawings that place the viewer at the center of the image.

Could an alternative form of landscape painting offer an alternative to both the romanticizing tendencies of the picturesque and homogenizing tendencies of mapping? In describing an interactive landscape painting exhibit in the Corn Belt, this paper suggests that the paint-by-numbers (PBN) tradition should be considered within the current evolution of landscape architectural representation of the working landscape. Numbered painting kits embrace dual principals of standardization and commodification, defining characteristics of 20th and 21st century agriculture. By breaking down a landscape into an elaborate mosaic of shapes and numbers, the PBN canvas draws the painter into the spatial complexity latent in the productive landscape.
The Case for Non-Digital Visualizations: Materializing Climate Change

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Keywords: climate change, art installations, communication, engagement

While traditional forms of visualization such as graphs, charts, and maps have made some of the science behind climate change more accessible, these forms of communication may not be the best way to engage the general public. Tailored for the scientific community, many climate visualizations may not be easily understood, as they require basic numeric skills which the general public may not have (Kain and Covi, 2013; Nocke et al. 2008). Landscape architects have contributed to climate change communication through digital models and virtual reality environments, which have greatly increased the public’s understanding of the effects of climate change in specific communities (Sheppard, 2015; Dulic, Angel, & Sheppard, 2016). However, these digital forms of visualization may not be accessible to all members of the public, and are detached from the physical, every-day experience of the landscape (Aragón, et al., 2019).

This paper will present (4) case studies of recent public art installations designed by the author that explore novel forms of non-digital visualization about climate change. The case studies contrast and compare materiality, form, and site can be used to increase access to information about future flooding due to sea level rise. Results reveal the importance of dynamic materials (whether traditional or smart materials) to call attention to the installations, create interactive experiences, and opportunities for real-time visualizations. However, the projects also present challenges: such as technical issues regarding the material performance in outdoor settings, the limited ability of analog visualizations to present complex and changing data, and the reliance of signage to interpret their message. Despite this, the case studies point to the opportunities for art in public landscapes, as a form of non-digital visualization available to landscape architects, to serve as a catalyst for education, community building, and public engagement around issues of climate change, especially among marginalized and vulnerable populations.
A City of Contradictions: Critiquing Neoliberal Planning Using a Photographic Essay.

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Keywords: neoliberal planning, photo essay, privatization in planning, gated communities, urban villages, India

In the past decade, the city of Gurgaon neighboring New Delhi has been described in popular media and scholarly articles as the land of paupers and princes, of crorepatis (millionaires) and cowherds, of contradictions and paradoxes, of dynamism and dysfunction; a private city; and a failure in planning. Dysfunctional urban infrastructure, water crisis, hazardous levels of air pollution, power outages, crime, and traffic congestion are commonplace in Gurgaon (Cowan 2015, 2018; Gururani 2013; Kalyan 2017; Narain 2009; Rajagopalan & Tabarrok 2014). Yet the city attracts many, ranging from top global real estate and IT companies to daily wage laborers. Its urban form resembles an archipelago of gated enclaves built by private companies and older village settlements. Following the liberalization of the Indian economy in the 1990s and the further opening up of foreign direct investments into real estate projects in 2005, new urban projects in Gurgaon rapidly engulfed the existing agricultural fields and transformed the land substantially into one of the sought-after global destinations for property investments and IT/ITeS industry in India (Gururani 2013; Searle 2016).

Arguably a herald of neoliberal planning, Gurgaon partially managed to manufacture the image of a ‘successful’ city built by private developers and spreading the mantra of urban entrepreneurialism (Baeten 2017, Cremaschi 2017; Sager 2011). The city is now known for corporate parks housing Nokia, Genpact, Citibank, Microsoft, and many other brand names. It has 43 shopping malls, several golf courses, and gated communities claiming to offer international standards and ambiance of a typical lush green American housing development (Searle 2016). However, as Searle (2016) has argued, the high-rise buildings in India and specifically in Gurgaon are speculative gambles based on forecasted social and economic changes. The glossy architectural renderings of urban enclaves do not materialize into neatly envisioned globalized landscapes (Shatkin 2017).

This study explores ways in which planning has transformed to serve speculative capitalists while putting the “right to the city” at risk (Brenner et al., 2012). Using a combination of photographs and text (Sutherland 2016), this poster illustrates and interprets the collisions and contradictions between the renderings and the reality, rural and urban, old settlements and new urban forms, luxury and poverty, and manicured landscapes within the gated enclaves and neglected spaces outside. It chronicles the city’s transformation process and serves as a critique of the divergence between the vision of developers and the actually existing conditions in the city.
A Computational Workflow for Visualization and Analysis of Camera Trap Data in Suburban Woodlands

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Keywords: Citizen science, machine learning, deep learning, camera traps, design participation

Wild Winnipeg is a citizen science and participatory design project focused on the cohabitation of people and wildlife in urban and suburban woodlands. The goal of the project is to identify urban design strategies informed by data that enhance opportunities for interaction between people and wildlife in cities. In the data-gathering phase of the project we aim to study two complementary dimensions of animal encounters: activity patterns of urban wildlife and the attitudes and values associated with animal encounters by people inhabiting and exploring Winnipeg’s urban and suburban woodlands.

This paper describes the computational workflow used to document activity patterns of urban wildlife. The visualizations and data produced in this phase of the project will be used in future to propose urban design strategies informed by an understanding of the interaction between people and urban wildlife.

Camera traps are widely used by ecologists to study the behavior, spatial distribution and characteristics of animal species in the wild [1,2,3]. In our project camera traps have been used to gather photographic evidence of the temporal and spatial distribution of animal activity in the suburban environment. Ten cameras have been placed in urban and suburban woodlands within a riparian corridor south of downtown Winnipeg. We have employed a machine learning algorithm to automate the identification of images with animals, avoiding a time-consuming process of manual sorting. The use of deep learning methods to identify animals in camera trap images has seen rapid advances in recent years [4,5,6]. We achieved between 80% and 95% accuracy in identifying animals using the ‘MegaDetector’, a pre-trained generic model with classes for animals, people and vehicles [7]. We then identified species and associated metadata with each sighting (time, place, number of adults, number of juveniles, sex, activity type).

Using the database of sightings we produced a series of visualizations documenting patterns in animal activity over time. We have been particularly interested in the proportion of diurnal, nocturnal and crepuscular sightings for each species at each location. In certain cases distinctive markings allow the identification of individual animals and activity can be tracked between camera locations. In the next stage of the project we will use the camera trap images and data as a starting point for engaging the public in a participatory design process focused on envisioning environments for the interaction and cohabitation of animals and people in urban woodlands.
Forensic Hydrology: The Case of Iuka Run

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Keywords: Representation, Hydrology, Infrastructure, History

Forensic hydrology, in simplest terms, is the study of the movement of water to determine the cause of a given incident or the potential outcome of a future event. It is a possible tool for landscape architects to address the complexities of designing with water? The practice of forensic hydrology rarely includes illustrations, instead graphs, tables, and calculations convey complex data. Appropriately, the information remains siloed in discrete professions. This shortcoming is also true for landscape architecture. In theory, drawings are layered and can be challenging to interpret outside the field. In practice, site analysis drawings are rarely shared with a broader public audience, they may be integral to presentations during the design phase, but become erased and replaced by photographs and renderings on websites. How may we develop new visualizations with a lasting legacy?

Visualizations like the Sanitary and Topographical Map of the City and Island of New York by Egbert Viele overlaid the city grid over the historic topographic and hydrologic conditions. Upon close inspection, this map reveals the erasure of topography, wetlands, streams, ponds, and meadows throughout Manhattan. The Fisk map of The Alluvial Valley of the Lower Mississippi is an example of a map that reveals complex conditions. A result of a series of investigations including overlays of historic maps onto aerial photos, site visits, sectional drawings, narrative descriptions, and geologic timelines all catalogued in the report produced for the U.S. Army Corps of Engineers called the Geologic Investigation of the Alluvial Valley of the Lower Mississippi River. These iconic visualizations provide a framework for of forensic hydrologic drawings.

Iuka Run served as a testbed for students to develop new representational techniques based in forensic hydrology. Iuka Run is a hidden hydrology in Columbus, Ohio. Iuka Run's natural flow was impacted by the construction of a sewer pipe in 1891, parts of the run dried up, while others were culverted, filled in, and straightened. Students began by looking for evidence in historic documents, mapping current conditions to look for clues, and exploring the former footprint of the run for clues such as shale outcrops, sycamore and bald Cyprus trees, man hole covers, and shifts in topography. The clues were leveraged to develop narrative visualizations of the run. This included graphic novels, illustrations, animations, and prints.
Hyperecology: Aesthetic Hyperbole in Landscape Representation

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Keywords: landscape representation; ecology; Adobe Photoshop; perspective drawing; rendering

Perspective rendering has been a fundamental component of landscape representation since the establishment of the landscape architecture profession. This paper explores not only how the history of perspective drawing in landscape is grounded in white supremacist and colonial attitudes, which have shaped contemporary landscape architectural representation, but also how contemporary technologies, particularly Adobe Photoshop, Lumion, and other rendering software, have fundamentally changed the way in which landscape and environmental processes are represented, understood, and perceived. Many of these techniques have led to hyperecology: the over-exaggeration of ecological conditions in landscape representation. Additionally, landscapes are consistently represented in a finished and static state, and intentionally remove the work, labor, management, and processes that underlie the human making of landscape. The paper takes a critical lens to current praxis in perspective drawing and landscape representation, and highlights both the importance of and cautions for hyperecology and other aesthetic hyperboles.

The paper is organized into three sections. First, a literature review of the historical evolution of perspective drawing in representing landscapes—from Humphry Repton’s Red Books to the Hudson River School’s paintings to Charles Knight’s dinosaur depictions—provides the theoretical basis for long-lasting influences in how landscapes are represented through a white, colonial gaze. The intentional erasure of humans and labor from idyllic landscape representation combined with exaggerative qualities of landscape persist and have evolved in perspective drawing within the discipline through technological influences. This is followed by a discussion of representational strategies in perspective drawing, grounded in speculation within this historical context that continue in contemporary practice. Referencing the work of firms such as Field Operations and Gross MAX that utilize hyperecology in their drawings to communicate imaginative project outcomes, direct comparisons are made between projective drawings and photographs of the actualized projects. By evaluating current praxis in perspective drawing and landscape representation, this paper highlights both the importance of and cautions for hyperecology and other aesthetic hyperboles. In projecting forward, the paper closes with an exploration into how the profession might strategically leverage the abstraction of reality as fantasy to communicate future speculations in design research, sharing student work as examples that emphasize not only the aesthetics but also the work, labor, and management required in creating, maintaining, and belonging to landscapes.
**Immersive Visualization Tools for an Inclusive Public Engagement Process during Social Distancing Restrictions. The Case of Calgary’s Chinatown Sense of Place/Urban Design Strategy.**

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**Keywords:** immersive visualization, urban design, sense of place, public engagement

**Purpose:** The objectives of this project were: to identifying the key elements of the built environment that contribute the most to the sense of place of Chinatown based on the public opinion from members of the community; to design and develop a public engagement process that would be visual, highly immersive, user friendly and online-based to would complying with social distancing restrictions; and to develop a series of urban design guidelines and recommendation based on the community’s input that would help guide new development that can strengthen and contribute to Chinatown’s sense of place.

**Background:** Cities are made up of multiple diverse areas with diverse heritage. Calgary’s Chinatown is one of such areas with strong historic roots and a long-lasting culture. Nevertheless no area of the city is frozen in time. There are constant forces and pressures for change and redevelopment. The key question is how to accommodate change while retaining the character and sense of place of the historic areas that contribute to our cultural diversity.

The City of Calgary has endeavoured in an innovative planning approach with the intent to develop a two-plan strategy that addresses the cultural and the land use and development challenges. This project was a University-Municipal Government collaboration.

**Methods:** We designed a visual preference survey using 360 degree immersive and photorealistic environments with 3D sound to create a rich experience for the respondents. The intent was to provide an accessible visualization that could reach a broad audience including residents and visitors of different age groups. The 360 degree environments were hosted online and where accompanied by a series of survey questions. To adhere to social distancing restrictions online focus groups were hosted. Participants were guided through the immersive experience by the research team in order to facilitate the interaction with the online platforms.

**Findings:** Based on public input we identified and weighted the key built form elements of our Chinatown’s sense of place and we created an immersive visual experience that helped the public to better imagine change. The use of this immersive experience helped participants to better visualize otherwise complex and abstract design proposals, and allowed for a more clear communication between the public and the City. The current pandemic limitations and social distancing present challenges on public engagement, this methodology is a good alternative for online public engagement allowing the public to actively participate during the design process.
Introducing Conceptual Parametric Modeling as Design Visualization in Landscape Architecture

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Keywords: Parametric Modeling, Visualization, Grasshopper, Rhino, Digital Fabrication

This paper presents work from the Advanced Design Communication course, which was newly added into the undergraduate core curriculum in Landscape Architecture at University of Florida. Students are introduced to conceptual parametric modeling (Grasshopper/Rhino combo), and explore this tool in their design studio projects for design visualization and representation. The Grasshopper, a graphical script editor, has made parametric modeling much easier to grasp and deploy for Landscape Architects, when they search dynamic patterns, sophisticated and complex geometrics to support their design concepts. The survey results in 2019 show that parametric modeling is currently adopted in 20% professional offices; 18% of them intend to adopt (George & Summerlin 78). 20% seems little. But considering that the Grasshopper was just beta software in 2012 (Herlitz 79), the growth of parametric modeling is immense in Landscape Architecture practice. Expanding students' skill set is to better prepare them for future careers. Secondly, Grasshopper/Rhino combo demonstrates explicitly the idea of parametric modeling, which is, by changing values/parameters at the beginning of a linear workflow, it reshapes the whole. It offers a powerful means to identify and establish relationships between design concepts and design elements (shapes, colors and scales, etc), and to create forms/patterns from the many complexities of landscape systems. This paper reviews the teaching-learning process of conceptual parametric modeling; demonstrates a hand-on approach to learning; identifies successes and challenges of using parametric modeling as a design visualization tool. The author also found that the responsive characteristics of Grasshopper/Rhino combo and its seamless transition to digital fabrication radically change students’ perspective on design visualization and communication.
The Objects of Design: Making BIM Work for Landscape Architecture

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Keywords: BIM, workflow, model, intelligent, object

The benefits of Building Information Modeling (BIM) to landscape architecture (LA) are compelling. At its core, BIM emphasizes multi-disciplinary team workflows and intelligent 3-D modeling. There are multiple software tools for executing the BIM process, but one that may well be the most widely recognized of all. It allows design teams to manage an entire project in a single 3-D model, generate quantity scheduling and material take-offs, automate the construction documentation process, and perform building and site analyses. There is another, less obvious, way landscape architects should use this software tool to make a positive impact on the advancement of BIM – create innovative, data-rich, and customizable landscape objects (e.g., furnishings, structures) that help expand the knowledge base and digital resources available to landscape architects engaged in BIM processes. This proactive approach could be the best way to help make BIM more immediately relevant to landscape architects and eventually inspire truly landscape-friendly BIM software.

Successful BIM use depends on sharing data in a common format. Not only does the unnamed software above allow a design team to share data in a common format, it is considered by many to be the industry standard BIM technology. While BIM instruction is standard in many architecture, engineering, and construction management curricula, it is less common in LA education. Without some BIM exposure and practice in school, LA graduates will be at a distinct disadvantage when seeking employment with many planning and design firms now invested in BIM. Furthermore, the lack of attention to BIM in academia may put LA in danger of being a non-factor in, or completely left out of, significant multi-disciplinary project collaborations. Our profession cannot afford to let this happen.

This session will highlight what LA students learned through applying BIM theories, workflows, and technologies in a six-week unit of a LA engineering course. The primary goals were to confront the promise of unique software tools, immerse students in a BIM-like process, and explore smart and innovative ways (discovered largely through conversations with practicing professionals) of effectively using those tools for landscape analysis and design. Pedagogic goals, execution strategies, and outcomes will be shared, along with strengths, areas for improvement, and ways BIM can become meaningful in LA education. This session will make a compelling argument that LA educators should use the inevitability of BIM as motivation to move away from static 2-D design methods, toward intelligent 3-D workflows.
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**Perspectives on Communication Standards in Design Education: A Strategic Approach to AutoCAD Implementation**

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**Keywords:** Communication, Design Standards, CAD, Documentation

Landscape architecture is currently inundated with software options for graphic output. A recent survey of nearly 500 ASLA members found that 82 percent of respondents use AutoCAD on a daily or weekly basis (George & Summerlin, 2019). Despite its widespread use, many landscape architectural graduates rely upon on-job training to achieve program proficiency. There are several threats to students learning this fundamental program in a landscape architecture program; for example, instructors may lack basic program proficiency preventing them from effectively communicating how to use AutoCAD for graphic and documentation workflows, or not have the ability to provide students with critical feedback on program output. Students often must implement a trial-and-error approach to meet the graphic standards of their curricula while attempting to learn a skill typically necessary in the industry.

In light of these challenges, a large and highly ranked Landscape Architecture program implemented a college-wide CAD graphic standard. The standard creates a common language which can be utilized by both student and instructor to collaborate on the production of quality graphic output. Borrowing from standards used in professional practice, this college-wide standard familiarizes students with basic AutoCAD concepts used in the industry. Naming conventions for layers, consistent line weight standards, and drawing sheet setup teach students how to utilize AutoCAD for interdisciplinary design collaboration and production of construction documents. This panel will discuss the foundational principles behind this standard and its application to design studio pedagogy. Additionally, discussion will include the challenges and benefits of implementing clear guidance and expectations for computer drafting output.

Among the panel, a college administrator will discuss their perceptions of four areas where the standard has impacted the college’s overall instruction, including its effectiveness in improving quality of teaching for creating design documents; elimination of competing AutoCAD workflows across the curriculum; impact on the consistency and quality of student work; and, its effect in eliminating common frustrations faculty and students expressed when using various AutoCAD commands for graphic output. Additionally, a recently hired faculty member will discuss how the CAD standard has affected their teaching experience in light of their experiences as practitioner and instructor. Two other panelists who created the standard will share results from a post-graduation survey of the college’s students which was used to confirm many of the pedogeological and design communication objectives. From this panel, participants will leave with knowledge on how to successfully implement college-wide graphic documentation standards.
Seeing Double: Self-Portrait Narratives of Quarantine and Isolation

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Keywords: Self-portrait, narratives, stacking, isolation, lockdown

Landscape and photography share historical (the invention of photography arose from an interest in landscape), and social practice backgrounds (a desire for connection with the world as well as a wish for separateness). Photography “constitutes modern society’s fundamental investment in images as a connective tissue between humanity and world” (1). In 2018 I explored these connections through a “stacking” technique presented at the CELA Annual Conference. Stacking is a post-production technique that integrates multiple shots into a single image; the presentation showed how a second-year undergraduate class in Landscape Architecture used it to document connections between humans and the world.

On March 4, 2020, the Governor of California proclaimed a State of Emergency as a result of the threat of COVID-19 (2). The stay-at-home and social distancing orders helped slow down the spread of the virus; however, the Centers for Disease Control and Prevention (CDC) warned that “social distancing can make people feel isolated and lonely, and can increase stress and anxiety” (3). These unprecedented changes could cause individuals to experience feelings of anxiety, sadness, uncertainty and loneliness - young people aged 18-24 were almost three times more likely to have experienced loneliness since the lockdown(4).

How do university students have coped with the Covid-19 pandemic? If their emotional and social well-being have been impacted by the lockdown, can photography document these settings? This presentation seeks to answer these questions by using stacking to document lockdown scenarios. Undergraduate students were asked to illustrate personal narratives related to the challenges and feelings result of the stay-at home order through self-portraits. The self-portrait became a narrative of a split mind in a shared body and multiplicity of times. The scenarios included real situations that communicated individual emotions and moods, and fictitious scenarios that revealed a utopic vision of students.
Signalfied Landscapes: Representations of Environmentalists in 1960s and 70s Television.

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Keywords: Stay Tuned to the Place. Environmentalists and Urbanists as Public Intellectuals in the 1960s and 70s

The use of media like film in design disciplines in the United States became notable during the 1950s-70s. Charles and Ray Eames were notable for their use of film from the 1950s to the 70s to explore ideas about design, culture, and science. The short films were designed to communicate ideas to the broadest population possible and had the effect of demonstrating the viability of the medium to designers at large.

Following the groundbreaking work of the Eames, environmentalists, urbanists, and landscape architects took advantage of the medium of television to further their presence in the public sphere. Rachel Carson is noted for her book “Silent Spring,” which outlined the impacts of pesticide use the United States and was feature in a Columbia Broadcasting System (CBS) feature. Jane Jacobs is celebrated for her book “The Death and Life of Great American Cities,” and was recognized as a unique voice in a short interview for the Canadian Broadcasting Corporation.

One of the most aggressive users of the medium was Ian McHarg. Recognized for championing the use of GIS in Landscape Architecture, McHarg was also interested in using popular media. His interest in media is widely understood in the success of his book “Design with Nature,” but he was also involved in two television projects. In the early ’60s McHarg created the interview series “The House We Live In,” and the documentary “Multiply and Subdue the Earth,” film in 1969.

Each of these individuals is recognized for their impact on landscape architecture and for their use of popular press platforms to disseminate their work. What is frequently not considered is how they also used the medium of television and how that in return impacted their work. This paper will examine the role of television in presenting their work to the general public as an active agent in forming a public image of these individuals, in addition to how the medium affected their images as public intellectuals capable of conveying issues that were impactful to environments.
Visualizing Wildfire Management Scenarios: The Use of Parametric Modeling to Test the Mechanical Thinning of Upland Vegetation at the McDonald Observatory

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Keywords: wildfire guidelines, landscape visualization, parametric modeling, land management

Firewise USA® wildfire prevention standards guide how municipalities, institutions, and landowners manage landscapes to minimize fire risk. The guidelines specify vegetation spacing to mitigate fuels, ignition, and flame spread. However, the lack of calibration between the universal guidelines and the distribution of vegetation within specific, fire adapted ecosystems disregard relationships among the landscape’s spatial pattern, ecological performance, and visual character.

This presentation tests parametric modeling techniques to compare Firewise vegetation spacing guidelines to historical fire conditions at the McDonald Observatory and the Davis Mountains. Using ArcGIS, the study 1) visualizes how the recommended tree spacing and distribution guidelines, as applied to the Observatory, align with natural spatial patterns in a fire-adapted ecosystem; and 2) advances ecological algorithms as viable tools for evaluating the spatial patterns of landscape management choices. The study’s methods include content analysis of literature from forest management, landscape visualization, and national fire guidelines; geospatial analysis to digitize, geolocate, and verify the site’s shrubs and trees; comparison of random removal techniques; and comparison of analog sites to removal scenarios.

The study’s three primary scenarios simulated mechanical thinning utilizing randomized selection of the site’s trees. Each successive scenario layered additional variables to direct the removal process according to slope and aspect; tree size, canopy spacing, or percentage of trees per acre; or a combination of site factors and management practices. Preliminary findings are threefold. First, national guidelines require modulation according to specific ecosystems. Second, parametric techniques approximate needed removal, but need modulation to account for canopy clusters and densities that reduce flame spread. Last, the techniques are most applicable to meso scale landscapes for which tree locations and size have been digitized.

The study’s intellectual merits and broader impacts are threefold. First, the proposal spatializes previous research of the case, notably the Community Wildfire Protection Plan’s proposed adoption of Firewise guidelines to the site’s management (O’Toole 2018). Second, the study compares the guideline’s universal recommendations to a specific ecosystem. Third, the study advances the landscape architecture discipline’s use of parametric computation to test land management choice.
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7 Points for Virtual Fieldwork

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Keywords: COVID-19, Education, Fieldwork, Participation, Virtual

Fieldwork brings the researcher to unfamiliar sites, peoples, topics, and themes. The experiential learning from the field can transcend and expand other forms of knowledge about a site and its users. COVID-19 has placed restrictions on the ability to go to the field, forcing fieldworkers online. Done online, the ‘embodied engagement’ of fieldwork is inevitably different. Through the experiences of a fieldwork-based taught course in spring 2020, this paper will outline seven points to ensure that virtual fieldwork can be as successful as possible. The course’s focus was on Afro-Brazilian religious spaces in Salvador da Bahia, Brazil. The seven points include: 1. Prepare for virtual fieldwork as you would for non-virtual fieldwork. Read deeply about the site and its users. Consult archives, libraries; 2. Design your engagement: you might plan a Google Street View walk, randomly choose sites by throwing beans on a map, whichever method you use to select a route, be open to methods changing depending on your encounters; 3. Participate in virtual engagement with those who inhabit the field site through social media, Facebook, Instagram, WhatsApp, YouTube, newspapers, emails; Talk with people who might not live in the site but know the approximate site and its inhabitants; 4. Record your interactions through fieldnotes, draw in a sketchbook, take screenshots, compile videos, sound recordings, and collect written observations from the virtual site; 5. Interpret every hour in the field by spending four hours analyzing it, through writing, diagramming, drawing, or other means. Read over previous notes, and look for patterns; 6. Remember the limitations of online engagement: the virtual world can exclude those who don’t have access to the internet. Find ways to reach these populations; Respect the privacy of your interlocutors: the same ethics also hold for virtual fieldwork as for non-virtual fieldwork; 7. Prescribe as much as describe. Fieldwork does not lead directly to a design intervention but provides the landscape architect with data that can lead to more successful propositions. Being in the field is a multi-layered experience. The contrast between the field and the virtual is akin to that between the thousand layers of a mille-feuille pastry versus the single layer of a pancake. Non-virtual fieldwork is a multi-sensational experience that engages all the senses and produces an experiential knowledge that cannot, at least yet, be easily replaced with a virtual experience. Recognizing the limitations of remote fieldwork, we can see how it may complement on-site fieldwork, but not replace it. Combining remote and on-site fieldwork can potentially transform landscape architects' ability to engage with the field.
Analysis of Subset Measures of the Figural Torrance Test of Creative Thinking in Beginning Design Students

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Keywords: Creativity, cognitive measures, Torrance Test of Creativity, beginning design

Designers think differently. The design processes that we employ to solve design problems is a unique approach that has been co-opted by other disciplines but finds its home in the allied arts of environmental design. A critical component of this design process according to Dorst and Cross is creativity (2001). The way designers think is a topic which has been explored by architectural researchers like Lawson (2006) and Dorst (2010) and debated between faculty members, yet the discrete cognitive functions of creativity deserve detailed scrutiny. Researchers have shown design educators can influence the creativity of design students by exposing students to creative thinking techniques paired with short creativity exercises (Hargroves 2007, Merrill & Rolley 2012). Typically, student participants enrolled in a one-hour weekly seminar class wherein they were presented several different creative thinking techniques, which included but were not limited to: design process, divergent thinking, convergent thinking, metacognition, attitudes, motivation, and the importance of the physical environment. Presentation of the techniques was followed by student completion of related creativity exercises and creativity tests. Merrill & Rolley previously showed that the treatment group, on average, scored significantly higher than the control group on the post-test administration of the Torrance Test of Creative Thinking-Figural, (TTCT-F). The TTCT-F was utilized due to a body of research analyzing the test, few limitations and cautions, a large norming sample, longitudinal validity, and no statistical differences based on socioeconomic markers (Kim, 2006). This make it an effective measure of creative thinking. The TTCT-F measures five subsets of cognitive creativity: fluency, elaboration, originality, resistance to premature closure, and abstractness of titles. These subsets are combined for a Creativity Index Score. Bart, Hokanson & Can argue that the TTCT measures two factors of creativity: an Innovative domain and an Adaptive domain (2017). This paper explores this level of granularity in analyzing the TTCT-F in beginning design students. This paper will show which subset(s) statistically are significantly more heavily represented in beginning design students compared with national averages. Preliminary analysis shows differences between several factors. For example, in a two-tailed, paired t-test, students measured significantly higher in elaboration (M=109.22 SD=11.40) than originality (M=95.27 SD=12.60), t(36) = 6.41, p < .001. This presentation will present the results of further analysis through the lens of landscape architecture and discuss which factors are most beneficial for fostering creativity in our classrooms and studios.
Assessing the Impacts of the Nation-Wide Transition to Online Education in Landscape Architecture

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Keywords: Online education, Design education, Pedagogy, Technology

When COVID-19 upended higher education, landscape architecture programs across the nation faced the tremendous challenge of rapidly converting course delivery methods from traditional studios to online learning. This accelerated existing online education trends in higher education as universities have responded to changing financial realities and market pressure (Christensen & Eyring, 2011; Yuan & Powell, 2013). Previously, innovations in communication and technology have made online education increasingly effective and enabled institutions to expand access to larger numbers of students irrespective of geography. Despite these improvements, landscape architecture faculty’s attitude towards online design education has remained cautious and major concerns remained about the ability to transition studio courses to an online format (George, Shelton, & Walker 2017).

The importance of online education became evident in spring of 2020 when landscape architecture programs were forced to shift nearly all learning activities to an online format. Identifying and applying best practices for online design education has thus become critical for landscape architecture programs. In collaboration with the Landscape Architectural Accreditation Board (LAAB), a national survey of landscape architecture faculty was conducted during the summer of 2020 to assess faculty’s experience with online education. This presentation shares the results of these findings The survey confirms that faculty are wary of online studios, primarily over concerns about effective social interactions. However, several results indicate positive outcomes, such as faculty satisfaction with submitted student work and changes in attitudes towards online design education. Overall, these results suggest that online design education may be nearing a point where it will be a viable method of instruction that could see more widespread adoption following a return to normal instructional methods.

Furthermore, from the results of this survey several pedagogical and technological best practices for online design education are proposed based on the collective experiences of faculty from across the nation. In the short term, universities will continue to offer an increased number of landscape architecture courses in an online format out of necessity. But the shift may portend a future scenario, which faculty need to be prepared for, where an increased number of landscape architecture courses may be offered online out of efficiency, convenience, or experience.
Somewhere deep in the Southern Appalachians feral hogs are degrading an extant bog that may be restored in the coming years. Students from large land grant institution’s sustainability studio and ecology courses addressed stakeholders’ desires to reintroduce rare plant and animal species while reducing impacts from a sounder's forging and wallowing. Students also created designs for other projects in the Piedmont and Coastal Plain and articulated their learning at the end of the semester.

Specific to the bog project, students listened to stakeholders’ present information on bog formation, hydrology, and accompanying flora and fauna found in an intact and functioning system. Students studied an existing bog restoration and characterized an extant bog by responding to site inventory prompts and surveying multiple transects across the site to help determine hydrology of existing conditions. Information on ecological restoration, stream function, and bog restoration precedent studies informed students’ design responses who conceptualized design interventions and responses.

Design was informed by group inventory, programming and analysis to explore the pros and cons of several alternatives that included assessments of no build or hybrid solutions to modify the incised stream's pattern, dimension and profile to reassociate groundwater with the surface based on site conditions and limited monitoring well data. Students individually designed their preferred alternative and communicated findings through an illustrative design supported by grading plans with six-inch contour intervals, staking, sections and planting plans, which collectively informed NEPA bog restoration alternatives.

Although only a few students voluntarily reported their experiences on a university-wide survey instrument that tracked self-reported students' attitudes after completing a service-learning project, they did respond to prompts from the DEAL model (Ash et al, 2009). Results, such as quantitative text analysis, from the DEAL Model’s Articulation of Learning prompts provided insights on student learning via service-learning that will be reported.
Bridging the Divide: Lessons from a Three-Year Studio Collaboration between Landscape Architecture and Architecture at Penn State

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Keywords: collaboration, interdisciplinary, studio education, design pedagogy

In the fall of 2018, the Stuckeman School of Architecture and Landscape Architecture at the Pennsylvania State University embarked on an interdisciplinary urban density studio to consider city form. The studio was the result of a winning proposal prepared by architecture professor Dan Willis—and supported with a generous grant from the school. For the joint architecture-landscape architecture studio experiment, he invited associate landscape architecture professor Dan Marriott to help design the studio. The studio is based on a project site in Cleveland, which a former student of Willis’ identified as location meeting many of the goals identified for the experiment. A two-day field trip to Cleveland was organized at the start of the semester—and Marriott and Willis quickly realized both the opportunities and challenges of collaborative education. They met after each studio to debrief; they kept the syllabus flexible—making changes and accommodations as they observed student interactions and behavior. As an elective studio, the professors were fortunate to have a cohort of students who were interested in working across the aisle. Nevertheless, with a group project, with an aggressive program, there were moments of tension and frustration among the student teams. Now, in its third year, the studio has proved highly popular—and was featured in an article in CONTEXT, the Journal of the Philadelphia AIA, for a special issue on collaboration.

This CELA presentation proposal will document the first three years of the ‘Cleveland’ studio—affectionately called the “Dans Studio” by the students (especially after the addition of Emeritus Professor of Landscape Architecture, Dan Jones, to teach real estate). It will present observations and share best practices to establish successful interdisciplinary studios and identify the unexpected complications, such as effective recruiting and communicating with students via the software and protocols of two independent departments within the school. It will showcase successful exercises and engagements designed to help the two disciplines learn to work together (before and during Covid), and how to address conflicts among students—both interdisciplinary and intradisciplinary. Most importantly, it will showcase the importance of faculty collaboration through examples of how Willis and Marriott collaborated in the form and structure (and subsequent changes) of the studio program—and the diversity of their professional and academic backgrounds, and design interests, to “bridge the divide” between landscape architecture and architecture.
Challenging Current Interdisciplinary Education Approaches in Landscape Architecture

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Keywords: interdisciplinary, education approaches, teaching and learning, challenging curricula

There is an increased need in the professional practice of landscape architecture for interdisciplinary knowledge, skills, and collaboration. Are current landscape architecture pedagogies supportive of this? This study reviews the current literature and approaches related to interdisciplinary teaching methods and their application to landscape architecture education, curriculum, and course structure. Through an investigation of current curriculum in MLA programs, this study addresses whether fundamental changes in landscape architecture curricular and course structure are necessary to better prepare students for the complex issues that they will confront in practice. Approaches and methods are proposed to increase the breadth and depth of interdisciplinary discussion and interaction in the classroom beyond the traditional lecture, studio, and charrette approach. Landscape architecture curricula commonly address interdisciplinary topics in lecture courses with application and integration occurring in the studio. Although this method introduces landscape architecture students to basic interdisciplinary knowledge and design approaches, it does not, however, bring the perspectives of the non-design disciplines (e.g., the social sciences, business, education, criminal justice, public health, public policy, etc.) into the classroom on a consistent basis to discuss comprehensive approaches to solving complex problems. Landscape architecture courses are primarily open only to students registered in that major (with the majority requiring prerequisite courses), making it difficult to facilitate a true interdisciplinary discussion of relevant topics among students on an ongoing basis within the classroom. Could introducing students from diverse disciplines into the landscape architecture classroom and learning process achieve this objective and become a catalyst and forum for interdisciplinary learning and collaboration? Findings from the Morgan State University Sustainable Urban Communities Program, which provides a mechanism for promoting and supporting interdisciplinary learning within its MLA Program, are evaluated in this study. The results of this study include proposed methods for changing curricular structure and course format (primarily the restructuring of elective and lecture / core knowledge courses) in order to promote greater interdisciplinary learning and interaction with, and among, students and faculty in the classroom. The objective is to challenge current thinking about the teaching of landscape architecture and propose possible curricular futures.

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Keywords: Education and Pedagogy, teaching methods, planting design, virtual reality

Teaching planting design normally requires three steps: naming and describing the plants, learning the environmental conditions, such as functions and climate of that plant, and actively use plants as design materials and adaptively group them in site conditions. The whole process of selecting and arranging plants need constant placing, removing, relocating, and regrouping, thus traditionally, hand drawing and paper collages are the frequently used methods in a process like this. Today, most sophomores and juniors in landscape architecture program are the Z generation (or Gen Z). Generation Z are born between the late 1990s to the early 2010s, and they were mostly digital natives, but not necessarily digital literate (ICILS, 2018). So, what will be the best strategy to teach planting design under the current times? In this paper, four different teaching methods are explored in a junior level landscape architecture course, planting design namely, hand drawing and sketching, paper-collage, digital drawing, and virtual reality. Student feedback and comments are solicited and analyzed, and suggestions to future landscape architecture educators are offered.
Concept Mapping: Assessing Concept Development in Design Learners

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Keywords: Design Learning, Pedagogy, Assessment, Concept Map

Design educators often find it challenging to evaluate what an individual has actually learned from a studio project. This is because design learning is a complex and largely cognitive process consisting of a reciprocal, triadic relationship between (a) project, (b) studio, and (c) learner (Powers 2016). The multilayered nature of design learning makes traditional evaluation methods like critique, desk review, pin-up, and jury seem insufficient. Moreover, many scholars have criticized traditional evaluation as unfair, time consuming, passive, unclear, and failing to measure learning outcomes sufficiently (Anthony 1991; Frederickson 1991; Dinham 1989). This study explores concept mapping as a useful complement to traditional methods.

A concept map is a knowledge drawing or diagram that documents how effectively a learner organizes, represents, and understands a concept (Novak 1991). Concept maps help students articulate their knowledge while fostering an understanding of relationships. Concept maps provide students with a structured, visual format for expressing what they know and connecting it with what they’re learning. This can increase student self-efficacy by allowing students to see their own cognitive growth. Concept mapping is particularly appropriate for designers and visual thinkers.

Three research questions guide this study. How does the concept “design learning” change over time? How does prior experience shape concept development? And, how do changes in a concept map relate to a student’s overall performance in studio? To answer these questions, a multi-method study of over 200 beginning architecture and landscape architecture students was used. Students created a “design learning” concept map at the beginning, middle, and end of their initial semester. Students also completed a survey about design learning. Concept mapping and data collection continued over multiple semesters. Data was analyzed using content analysis and a concept mapping evaluation tool created by Novak (1991).

The study’s results show a strong relationship between studio performance and design learning concept development. After the initial map, instruction and socialization shaped concept development more than prior experience. Interestingly, after one year, student concept maps revealed an increasingly thorough understanding of how to design even as surveys suggested that students had diminishing confidence in their actual ability to design. Overall, the study’s results provide a basis for discussing the implications of concept mapping related to assessment, design learning, and pedagogy. The study provides an innovative complement to traditional design studio evaluation methods that allows design educators a new way to track student learning so that they can create increasingly targeted interventions aimed at remediation and enrichment.
Developing New Pedagogies for Remote Learning Environments: A Comparative Assessment of Techniques and Approaches for Various Student Groups

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Keywords: virtual learning, design education, pedagogy, remote instruction

The ongoing disruption caused by COVID-19 has forced many educators to rethink models of teaching that are highly reliant on frequent face-to-face interactions. This presentation evaluates the shared experiences and documented outcomes of instructors from two different universities that simultaneously deployed similar tools and techniques to conduct their classes in a virtual, online format. Synthesis of instructor observations and codified student evaluations across multiple semesters illustrate a general embracing of the efficiencies and multi-sensory documentation provided through online platforms, however, further development of instructional approaches is needed to address a void of communal interaction and emotional connectedness that is inherent within virtual modes of engagement.

Central to this line of inquiry is the question: Which teaching and learning strategies exist, or need to be further developed, that embrace a fluid adaptation to physically-distanced design education? This presentation outlines a series of pedagogical responses and adaptations that have been co-created during the assimilation of virtual courses, and organizes the range of methods used by the instructors to fit three distinct approaches: i) modeling a sense of order; which operationalizes new methods for one-on-one meetings within a transparent and structured environment, ii) tightening feedback loops; which uses online platforms to increase the frequency, ease, and equity at which ideas can be shared and critiqued, and iii) developing a digital footprint; which leverages the ability to easily document one’s process in a digital space as a mode of placing greater emphasis on reflection and metacognition. These strategies have been, and are currently being, utilized by the presenters with graduate- and undergraduate-level student groups at various phases of their educational experience as a means to achieve learning outcomes in remote and hybrid instructional environments.

While design educators continue to face a tremendous challenge in developing effective models of teaching and learning using online mediums, the rapid shift to remote instruction has challenged many traditional presumptions of design pedagogy and, in turn, enabled the development of new techniques to support student learning. This presentation highlights challenges faced, lessons learned, and offers a critique of long-held norms in design education that have been exposed during the transition to remote instruction. Collectively, the presenters aim to outline areas for potential pedagogical growth, development, and innovation in design education through the articulation of shared experiences and documented students’ outcomes.
Expanding the Virtual Classroom

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Keywords: Remote Learning, Shared Teaching, Interdisciplinary Practice

With the current semester taking place in a virtual environment, two professors, one in landscape architecture and one in ecology, hailing from different universities came together with an experimental scenario. With the location of courses being remote, this study explores how the research seminar can take on a new form of collaboration, building on the two disciplines of the academics, and providing the students with the opportunity to gain knowledge and establish a broader network outside of their current institutions of study. One course focuses on the principles of landscape design elements, investigating their formal and cultural histories, while the other investigates the principles of urban restoration ecology. Contemporarily, these two disciplines struggle to understand one another, and professional settings collaborations can be challenging without a previous relationship. Overlapping the disciplines in academia more frequently is one approach to strengthen the relationship between ecologist and designer. The plan is to merge the students at specific moments during the semester exposing them to discussion and engagement with another, observing design work, and listening to case studies that demonstrate ecological design to inform each other’s projects. The students from the two courses are a mix from graduate landscape architecture, urban planning, and ecology. At the end of the semester, each of the faculty will perform a survey of their students, inquiring about their perceived benefits of the overlap, and if it has changed their thinking regarding other institutions and disciplines or their research methods. Through an anonymous survey, students will be prompted on topics presented in each course, and their new understanding of the respective discipline. The presentation will focus on the opportunities and outcomes from the semester, and how this overlap could engage more productive and novel remote learning in the subsequent semesters.
Exploratory Building: A Makers Approach to Landscape Architectural Education

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Keywords: design-build, exploratory building, pedagogy, community service, landscape architecture curriculum

Abstract: Professor Karl Linn a professor and early proponent of design-build noted that it “celebrates the physical accomplishment of” barn raising, while “nurturing of a growing sense of community and the experience of interdependence.” NY Times, 2005 Professor/practitioner John Collin’s believed it nurtured “the value of hard work” and “best achieved an integration of various bodies of knowledge.” ASLA, 2009 This legacy flourishes in several LA academic programs offering an alternative teaching model that effectively connects design and construction. The model brings an expansive approach that leads “to innovation and expansion of theory, due to the physical implementation and testing of ideas and concepts …… posing questions, investigating, experimenting, ….. solving problems, assuming responsibility, being creative and constructing meaning.” Ware, 2015

The design-build studio model, despite the proven success, remains at the fringes as a teaching modality. ASLA, 2019 Why? Is design-build problematic for department chairs, budgets, time constraints, and liability? In many D/B programs community participation is a critical component how does it complement the design-build process and other service-learning efforts in Landscape Architecture curriculum? Are the learning goals balanced with the production of a tangible product in a design-build studio? The D/B model offers opportunities to address gender inequities in the building trades and strengthen critical knowledge for those excluded from the landscape construction profession. Do students see the d/B studio as a beneficial component of their education and if so how? Using data derived from surveys and interviews these questions will be addressed in the presentations. As the design-build approach evolves, it offers both promise and challenges. The following questions will be the foci of the panel discussion:

• What are the most effective design-build learning techniques? How do they differ from other teaching models?
• Are learning outcomes balanced with production? How is this achieved?
• What are the greatest challenges faced by LA D/B programs? How can they be surmounted, adopted into the existing curriculum, and offered more effectively?
• Is community engagement informative, not romanticized? Can it become a more robust and meaningful component of design-build studios?
• How can the D/B model be used to address gender and/or other inequities in the learning process and communities served?

Session Learning Outcomes
1. Understand differing approaches to developing a design-build curriculum
2. Understand the challenges in developing and sustaining a design-build program or studio
3. Identify the successful methods used in differing design-build teaching models
4. Understand how students value the D/B learning model.
The Green New Deal Superstudio: Policy, Design, and Pedagogy

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A group of faculty reflect on the challenges and opportunities of working with students to translate policy into design through studios focused on the Green New Deal (GND) as part of the GND Superstudio, a national conversation about translating the core goals of the GND—decarbonization, justice, and jobs—into design and planning projects for their respective regions.

The Superstudio represents an invitation to faculty to innovate and embrace transdisciplinary and regional collaboration to give form and visual clarity to the scale, scope, and pace of transformation that the Green New Deal, or any large-scale infrastructural investment, implies. The panel will describe the process by which the effort to translate the core goals of the GND into design projects—from a pilot effort at the University of Pennsylvania/McHarg Center, Florida International University, and the University of California, Berkeley, to the national scale of the Superstudio. By scaling up and enabling inter-institutional and cross-disciplinary collaboration, an individual studio is part of a larger whole and a dialogue that will roll up to influence policy at various levels.

Panelists will share reasons why they chose to pursue the Superstudio, as well as its relevance to issues in their regions and the broader profession. They will discuss approaches to their courses that integrate policy and design, insights from panelist courses, including opportunities and challenges.
Grounding the Green New Deal: A Multi-Scale Approach

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Keywords: Superstudio, Green New Deal, Climate Change, Great Plains, Multi-Scale

The Green New Deal (GND) Superstudio, organized by the Landscape Architecture Foundation, challenged instructors and students alike to employ design expertise to the resolution of environmental, social, and economic challenges of climate change (LAF 2020). This panel of instructors, from three universities in the Great Plains, will discuss planning and integration of the GND Superstudio into existing curriculum with the goal of exposing students to the pressing issues of the next few decades. Sharing our pedagogical approach, centered on introducing students to issues of climate change and social justice at multiple-scales, provides points of reference for future courses, beyond the Superstudio. Our approach included examining predictions of climate change for our regions; identifying opportunities for interventions within the GND; and, exploring those opportunities across scales: region, state, neighborhood, and site, while addressing ecological challenges and urban and social issues tied to climate change but unique to this geographical area.

At one University, students from landscape architecture and regional and city planning collaborated with community partners to formulate a food systems plan for Oklahoma City that refocused historical economic systems built on resource extraction and ranching to address disproportionate rates of food insecurity among low-income neighborhoods and communities of color.

At the second University, three scale-specific studios were offered to final year MLA students, set within the Kansas City Metro Region. To address the three major goals of the GND: decarbonization, jobs, and justice, students investigated a range of influential systems inextricably tied to climate change, and proposed catalytic landscape-based solutions appropriate to the scale of focus: regional, neighborhood, and site.

At the third University, undergraduate landscape architecture students investigated the governance and budgeting structures to identify deficiencies and disparities in how and where public investments were delivered. Subsequent design efforts continued with a focus on the role of public space in providing an urban framework to deliver services, such as green infrastructure. This is paired with legislative, policy, and organizational recommendations to articulate the connection between GND vision and grounded operations.

The studios are currently in progress, with the instructors continually engaging in an open exchange of ideas across our courses and serving as guest reviewers. We will present common themes that resulted
from our multi-scale approaches and highlight learning objectives useful for informing future coursework.
Highlighting Design in Online Regional Design Studios

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Keywords: regional design, creative act, design studio, environmental planning

The shift to online instruction has dramatically impacted studio teaching the fall semester 2020. Direct interaction with students about their iterative design process was replaced by remote instruction via zoom and other tools, student work groups also had to shist into the remote modus. Trace paper was replaced by screen annotation. This does not seem to be a problem for the value driven process of regional environmental planning, that compares existing environmental conditions with a desirable future and outlines actions how to achieve that future. In planning, individual creativity is not a driving force, rational assessments of existing conditions and political constraints are more important instead. This rational planning in the tradition of Ian McHarg and Frederick Steiner was driven by the environmental impacts of late industrialization and the desire to integrate integrated a community engagement process into the environmental planning methodology, very much aligned with democratic design approaches on a site and neighborhood scale. Indicating a paradigm change, the UPenn Exhibition “Design with Nature Now” celebrated 25 trail blazing regional design projects, marking the return of the creative design focus of early regional scape landscape architecture developed by Olmsted and his successors. Of course, picturesque landscape designs are not anymore the answer for a diverse society facing unprecedented sustainability and resiliency challenges. However, this is the time to reexamine design as creative act that imagines a positive future. Through the iterative design process the landscape architect (or a design team) develops that abstract idea of a good future into a shape, a concrete solution for a specific place. When that form is completed, an implementation process identifies actions that are required to reach that future. The creative moment of generating a design is producing forms that may not be feasible at once, but these forms expand the range of possibilities. This is still common practice on the site or urban design scale This is the time to revisit the role of creative design in landscape architecture on a regional scale with a focus on design education. Remote teaching has taught as that supporting the creative student design process is not limited to trace paper or suggestions for more successful graphics. This paper will explore how the creative aspect of design can lead to more innovative solutions, for a better and more meaningful physical environment.
How the #@%^ do I Teach Design to Neurodivergent College Students?

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Keywords: Neurodiversity, pedagogy

The term “neurodiversity” was coined by Judy Singer in the late 1990’s. This definition has come to include a wide variety of atypical behaviors, including Asperger’s Syndrome and all autism spectrum disorders (ASDs). Neurodivergent students think, interact, learn and behave in distinctive ways which can affect their problem-solving and communication skills. The Center for Disease Control data from 2016 states that, one in 54 children aged 8 years have been identified with autism (Maenner et al., 2016). Instructors likely already have neurodivergent students in their classrooms of whom they are unaware (Shatuck et al., 2012). Some of these students may not even know themselves. Females particularly often remain undiagnosed and therefore would benefit from education practices responsive to their specific needs (Goldman, 2013). The design community recognizes that neurodivergent students have a set of specific environmental needs that differ from the neurotypical population. This is evidenced by the growing body of literature on how to design (primarily children’s) educational environments for promoting success in neurodivergent students (McCallister, 2012). These needs necessarily remains true at the college level. Literature in secondary education for neurodivergent students centers on success in general university courses (Littlefield, 2010; Lorain et al., 2009; Hughes, 2009). However, design education is altogether different, and Landscape Architecture is especially unique. This evokes the question: What accommodations are necessary to better teach neurodivergent design students? Research is lacking on how to specifically accommodate neurodivergent design students. As design educators we need to understand both the challenges facing neurodivergent students and the challenges design educators experience in cultivating neurodivergent students. This paper presents a review of relevant literature on teaching neurodivergent students in post-secondary design education. This presentation will outline relevant challenges and give an analysis of some typical characteristics of neurodivergent students that may prove beneficial in adapting design education. A potential framework will be presented for design classes and studio experiences that engage the neurodivergent student in ways that ought to allow a larger selection of these students to thrive within design education.
I'm a Model, You Know What I Mean: Model-Making and Rhetoric in Landscape Education

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Keywords: model-making, landscape teaching

Physical models occupy shaky territory in landscape architecture education; despite their utility and popularity, models are not strictly needed to make a landscape. Moreover, models tend to be time-consuming and expensive to create. Over time, accordingly, the making of models has come in and out of currency in landscape design practice and landscape education. In addition to arguing for the ability of such models to develop the student’s own sense of design in three dimensions, educators using the physical model have consistently made arguments for its power to communicate. These arguments reflect more general claims about how landscape architects can and should communicate.

This paper focuses on the evolution of the rhetorical dimension of the model. Originally presented in the design literature primarily as a tool for accurately communicating design ideas to the client, the model has also been variously argued for as a means of sharing ideas among designers, a vehicle for building community consensus, and an opportunity for defining the brand of the designer. The progression of models in teaching materials and student work from the narrowly representational (the so-called “train model”) to the dynamic and abstract (contemporary dynamic models of water systems) not only reflects broad advances in technological capability, but demonstrates that changes in technique are bound up in practice with concerns over the landscape architect’s duty as communicator.

Through examination of the archives of a typical land-grant program and cross-comparison to contemporaneous guidebooks and professional literature, this paper puts forward one representative history of the changing fortunes of model-making in landscape architecture education. This history categorizes the explicit claims made for the model-making process in teaching materials, and the implicit attitudes toward design communication conveyed by the model-making techniques used, defining four distinct historical eras of teaching with models. As designers today apply new digital techniques to redefine the uses of the physical model, a retrospective look clarifies the relationship between techniques used to make models and the arguments we hope to make with them.
The Impact of VR on Student Design Decisions: Assessing Density and Proximity When Designing in VR Versus Traditional Analog Methods

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Keywords: Virtual Reality, Pedagogy, Density, Proximity, Design Process

Current research that intersects virtual reality (VR) with landscape architecture is wide-ranging. Certain studies focus on practice-oriented applications (Atwa et al., 2019) or explore the experience and effects of using VR to assess landscapes (Sanchez et al., 2017). Others are more academic-focused, providing an overview for incorporating VR into design education (Li et al. 2017, George et al. 2017) or the research implications for VR in landscape-related fields (Bishop, 2011). A gap, however, exists in comparing the impacts of VR technologies in the landscape design process against more traditional processes involving printed base maps, tracing paper, and analog media. This study seeks to address that gap by specifically examining how designing in virtual reality affects student design decisions in terms of spatial density of objects when compared to a traditional analog process using two-dimensional plan and section.

The study, conducted at three universities with more than 90 students, involved the design of a tree bosque in an urban pocket park. Unbeknownst to students, the subject park was Paley Park in Mid-town Manhattan in New York City. Many of the design variables were articulated and controlled to isolate the spatial density of trees in the courtyard. For example, the site context was discussed, a specific type of tree (Honey Locust) was prescribed with plan and section symbols and a 3d model (for VR) provided. Additionally, the design goal of “an urban oasis with the goal of a green canopy in response to the multi-story buildings that surround the site” was stipulated. The quantity and arrangement of trees to form the bosque that meets the design goal were at the discretion of each student. The study was conducted in two parts with students executing the design task using traditional plan and section methods and again using the VR Sketch application in SketchUp. To limit one method from having an impact on the other, students were not told they would repeat the exercise and multiple weeks separated the two exercises.

The results of the study were compared, looking specifically at variances in number and arrangement of trees between the two methods. Results were mapped and overlaid both individually and collectively revealing the impacts that the method had on the tree bosque design. The results were also compared to the actual proposal for Paley Park. The findings provide data that furthers an understanding of the impacts of using virtual reality on student design proposals.
Impacts of the COVID-19 Induced Rapid Shift to Online Teaching and Learning

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Keywords: SOTL, COVID-19, online learning, distance education, outcomes and assessment

When most universities shut down in-person classroom learning in March of 2020 due to COVID-19, students and faculty were forced to transition to online modes of instruction. This rapid shift, with both expected and unforeseen issues, also presented opportunities to study how landscape architectural design theory, technology, and process can be taught through virtual digital means. For both synchronous and asynchronous teaching, the computer became a translational frame through which all content, discussion, and product was filtered.

Purdue’s landscape architecture program was uniquely situated to study the impacts of a transition to online teaching and learning on student knowledge and skills due to its existing yearly outcomes and assessment survey. The data collected will be used to show longitudinal and inter-class trends impacted by the admittedly rushed and haphazard shift in learning mode in March 2020.

The study will continue to collect data through the fall 2020 semester, also affected by COVID-19, through matriculation of COVID-19 affected students to determine if there are any lasting impacts in both student and faculty populations. Areas to be evaluated include a holistic curriculum snapshot to measure at-graduation competency compared across the previous 5 years of graduation data, course by course progress comparing COVID-affected and non-affected matriculation groups within courses and progressing to future courses, and topic and learning outcome-based analysis to determine if specific areas of curriculum are affected more than others due to the shift to distance education and related COVID anxieties and issues.

For a more generalized approach to understanding how online education impacts perceptions of knowledge and skills, course styles (using Purdue landscape architecture’s in-major curriculum) are combined into four categories for analysis including; traditional lecture (history & theory, research methods, general survey courses, etc.), field work (planting design courses, community service projects, on-site off-campus learning), technical labs (computer technologies, grading, stormwater, and hydrology, construction materials and methods, etc.), and project based student-led courses (design studios, capstone projects, etc.).

As online education and purely online degrees become more prevalent and desirable by University administrators, a study of how digital modes of teaching impact the unique styles and content of design education must be developed if we are to purposefully incorporate it as an accepted educational standard into accredited programs. This must be coupled with some level of standardization of expectations and comparison with traditional face-to-face methods.
Impression, Process, Systems, Application: A Four Step Framework for Teaching Design Thinking at Introductory Level

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Keywords: Framework; Evaluation; Reflection; Six categories; Design thinking; Systems thinking; Studio-based learning; Progressive learning

Design Thinking is an introductory, multi-disciplinary, experiment-based course offered to students in the first year of their program of landscape architecture, architecture, and interior design, under the College of Architecture. It is developed to equip students with the processes, thinking and skills required to be successful design students and designers through subsequent years of their academic programs and beyond. It focuses the key gap from standardized test and linear and precise questions of their prior years of studies, to build towards the level of context awareness, responsiveness, and systemic and iterative thinking that is required responding to imprecise (Fricke, 1999) design problems. Based on previous years’ lessons and experience (Brown et al, 2015), a new four-step approach of “impression, process, systems, application” is developed this year as a progressive framework of points, lines, networks and synthetize, respectively. This framework is set up to address the key gap comprehensively and in a way that progresses well in the transition of thinking with freshmen level students. These four steps are coupled with necessary skills for design representation, reading and research, and collaboration to further its effectiveness in delivering integrated learning outcomes that leads up to future design studio sequence. A hybrid of lecture and studio format is used throughout all phases to provide rigorous and effective reflection (Ash and Patti, 2004) and iteration. In the “impression, process, systems, application” process, students work from defining overall impression (point) to process of environment and time (line) to subject-centric network analysis (systems), and finally apply(synthetize) in intervention proposals. In the third step of the sequence, an architecture theoretical framework of “six categories”, or “function, form, meaning, context, construction, and spirit” (Capon, 1999) is adopted, developed and simplified, and re-sequenced by the order of scope as “form, structure, function, meaning, context, and motivation”. This new set of six categories are introduced to as the analytical framework to apply as they evaluate the research subject to understand the systems behind a chosen design outcome at different scales of reference. Students are surveyed at various points throughout the semester to gauge the relative progress and effectiveness of the method. It is hoped that this framework offers a progressive and innovative learning structure to deliver key transition in thinking useful in a multi-disciplinary introductory level design education.
Integrating Indigenous Land-Based Learning into the Architectural Curriculum-Forms of Conduct and Local TEK (Traditional Ecological Knowledge) as Embodied Ways of Learning and Knowing

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Keywords: Land-based learning education, Traditional Ecological Knowledge (TEK); interdisciplinary collaborations in beginning design (between architecture, landscape ecology and Indigenous studies, reconciliation in Architecture, vernacular and Indigenous design

"It's really good to be in another environment other than school. When we were outside harvesting spruce gum, it was nice to be with my peers out in nature." “It’s really great seeing it from my perspective as an Indigenous student. I take pride in my identity and working on an Indigenous project, and so when I walk through the studios and see students struggling with their work, I tell them that it (the birchbark) is an animate material that we’re working and that we should treat our material like our grandmothers…” This paper investigates the transformative potentials and paradigmatic shift inherent within the integration of land-based learning and traditional indigenous knowledge into the architectural curriculum. It uses the architectural design studio led at the McEwen School of Architecture (MSoA) at Laurentian University during the Second-Year Architecture-Landscape Studio as a vehicle for design research. Situated within an extreme Northern landscape in Canada, the School has a tri-cultural mandate (English, French and Indigenous). Students engaged in the cladding of a wigwam, an existing bent-wood structure located on the main University campus, and used as a year-round class space. The project began as a collaboration between MSoA and the Laurentian Indigenous Studies program. The collaboration also extended into the Indigenous community in a continuum of an already established reciprocal relationship. Indigenous Elders and Knowledge Carriers are on staff at MSoA. The project was the next iteration of the design-build. Birch bark was harvested at the end of June. Panels were distributed to students the first day of class. Students then harvested spruce gum, clarifying its sap into a pitch, used as a natural water-proof caulking for the wigwam. Students then clad the wigwam, translating oral knowledge, imbued with embodied understandings of the landscape ecology and its latent qualities of site, into an architectural intervention. The boundaries of the integration of landscape and ecology into architecture are pushed with direct land-based learning. Students harvest building materials, while learning about their inherent properties and latent potentials, as well as serving new models of teaching and pedagogy for the architectural curriculum. This has significant implications for the future of architecture practice. Students are introduced to different methodological frameworks and ways of knowing, outside of the usual paradigm of scientific knowledge, by their engagement with embodied experiences through traditional ways of knowledge and learning. This further establishes more grounded connections -and groundings-to landscapes and communities. Reflections on the results from the first year studio informed the designing of the curriculum for the Fall 2020 studio, taught 100% remote. A survey of students capturing responses to the process which were overall positive experiences of working within an Indigenous framework with an Indigenous Elder. The Fall studio further carried the learnings into the major architectural project of the semester, to design a sauna on Bennett Lake, connected to the University Campus. Finally, the paper will conclude on the findings by
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examining the unique outcomes on the rest of the semester and the architectural interventions resulting from a basis and foundation in land-based learning as an instructive and transformative design teaching pedagogy in the architectural curriculum.
Interactive Virtual Tours: An Inclusive Alternative Solution for Site Visits in Landscape Education during the Time of Social Distancing

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Keywords: Virtual Tours, Site Visits, Interactive Technologies, 3D and 360 Cameras, Social Distancing.

The Coronavirus (SARS-COV-2) pandemic and resulting social distancing needs have forced the global education system to rapidly transition to a distance-learning-only arrangement for most learning and training activities. Due to the potential threat of recurrences and the need for continued social distancing, innovations related to creating engaging and interactive learning experiences in online platforms have become critical for learning success. While many course activities successfully transitioned to fully-online platforms, learning activities that require study-tours or site-visits are severely constrained. Instructors of landscape architecture courses, who often depend on site-visits for many educational activities, need to find an effective alternative solution to address this challenge during the time of social distancing. The proposed research aims to show how using cutting-edge interactive virtual tours (IVTs) may provide landscape architecture students with interactive and engaging virtual experiences to meet their learning needs. The advent of technologies related to capturing and aligning panoramic image and depth data using 3D and 360 cameras in the last few years have transformed the marketing strategies of the real estate industry, property developers, vacation rentals, and many other enterprises by offering customers an in-depth look into their facilities through information-rich IVTs with high-resolution imagery. It is expected that these technologies would be as effective in distance education where site/facility visits are integral to the educational experience. High-quality IVTs have become more relevant due to the ongoing Coronavirus (SARS-COV-2) pandemic and consequent lockdowns/shelter-in-place/stay home orders. The proposed project offers a purposeful application of this existing technology to explore a novel and innovative application for education activities in landscape courses and design studios. The IVTs allow embedding media (videos, images, links, etc.) and can be accessed in cell phones, tablets, laptops, and computers; making it an all-in-one platform for storytelling and story sharing – encouraging high levels of student engagement and interactivity. Two IVTS were recently used in a sophomore landscape studio during Fall 2020 in a landscape architecture program. Each IVT was created as an alternative of site visits for two design studio projects. Students’ in-depth feedback will be collected during the end of the semester to understand how using those IVTs compared with real site visits in terms of site-based learning. Student data, coupled with instructors’ feedback will be used to analyze the effectiveness of using IVTs as a potential new tool for knowledge-sharing for advancing landscape distance education during the time of social distancing and beyond.
Islands as Operative Device for Littoral Speculations in Practice and Studio

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Keywords: water landscapes, edge, design device, metaphor, material realism

In the design of water landscapes, default project protocols such as waterfront designs are often applied, subordinating existing spatial conditions and their material affordances to actions that mainly trigger ecosystem services, recreation, recently aiming to climate change adaptation, through mainly defensive strategies.

In this type of setting, the authors explored the creative agency of a concrete spatial entity and metaphor, such as the island, when introduced as a conceptual framework in design. They developed a reflection on the potential of the island as a theoretical and speculative device for process-oriented design in Landscape Architecture Education. They tested the instrumentality of the insular conditions in design thinking through specific littoral projects as well as through design iterations within studio and research by design experiences.

The island is a productive metaphor in addressing complex design issues because – since there are metaphors concerned with abstract knowledge and others concerned with visual knowledge (Gerber & Patterson, 2013) – the island as metaphor encompasses both the cognitive and the visual aspects. The role of metaphors in architecture and urbanism is understood as threefold: design generator, speculative device, and rhetoric expedient (Caballero, 2013) and the notion of island embeds meanings that span a wide range of domains for design thinking, both cognitive and operational. They have been extensively used for interpretative, speculative, and design purposes (Ungers et al. 1977; Lee 2011; Callejas 2013; Clément 1990; Cribier 1999; Fokstrot 2018; among others) demonstrating that, as designers, we not only “think about islands”, we also “think by means of them” (Daou & Pérez-Ramos, 2016, p. 7).

In the presentation, the authors will describe the design lexicon they derived from the interpretation of several precedents which use the island metaphor in various forms. They will then illustrate how similar approaches have been implemented by students in their design exercise deploying the island as a device to both examine liminal conditions of landscapes at various scales as well as reimagine them. On one hand, the island’s contribution has been analytical; as part of the memory of water flow changes, it helped to frame the history and evolution of waterscapes through a dynamic perspective; hence it became a material testimony of the hydrological processes in floodable landscapes. On the other hand, the island worked as an inspiration for process-oriented landscape designs. For example, as a landscape archetype, the island became the ideal vehicle to discuss issues of isolation versus connectivity.
Learning, Sensing, and Observing: Why Landscape Architects Draw Landscapes and Why Veterinarians Draw Binturongs?

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Keywords: Observation, Seeing, Adult Learning, Cognitive Skills, Visual Knowing

Two professors, one of landscape architecture and the other of veterinary medicine, discuss their approaches to developing their students’ drawing skills and applying drawing and observational practice in their work. Both disciplines teach drawing in order to develop a higher level of perception and rigorous visual attention. Their methods in teaching drawing suggest an alterity to the currently dominated technological bent of our disciplines. The need for drawing resides in its importance for seeing complex relationships and communicating complex ideas to other professionals and scientific collaborators. Perceptions of truths developed from observation and drawing are critical to success in the practice of each discipline and making students capable of confronting the challenges of our era. The authors examine differences and similarities in their approaches for providing beginning students a useful and revelatory skill set.

Humanist theory has dominated design, design thinking, and decision making that negatively affects the balance between the human and nonhuman relationship found in Nature. Posthumanist theory on the other hand, encourages a much wider concern for subjects beyond the traditional anthropocentric view of the world. (Gomez-Luque & Jafari, p.9). Posthumanist retooling suggested by Niklas Luhmann is achieved by integrating what is in principle incommunicable, namely perception- into the communication network of society.” (Wolfe, p. xxxvi). This essay will explore the adage that the student must first learn to observe. (Sullivan, p. 138). It will also add that teaching drawing is a combination of the technical and mechanical aspects of drawing with rigor around observation and communication.
Making in the Void: How Changing to Online Delivery Shifts the Focus of Teaching and Learning for Landscape Studio

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Keywords: Design process, interaction, participation, design communication

This paper explores some of the changes to landscape design-based studio teaching that have developed from transitioning to online delivery. While there are obvious shifts in the way content is delivered, the move to remote learning has impacted the way students produce work in a studio and further exposes very different student attitudes towards learning. The change to the studio learning environment has revealed a clear distinction in the outcomes from autonomous learning and collective learning approaches. The differences range from material choices to the application of design techniques but further the approaches and attitudes of students towards different tasks. In effect, the environment of the studio (either physical or digital) and the independent or collective nature of how students are asked to work, greatly influences the outcomes of teaching design techniques and methods. This research draws on our collective experience in four discrete landscape architecture design studios across two institutions, which were taught online during the COVID19 pandemic of 2020. Some factors of landscape design studio remain pillars of both online and face-to-face design studio. For example, designing outdoor environments, responding to a site, and engaging with design theory and methods. However, the altered means of interaction in remote learning fundamentally affects the learning environment and the extended methods of learning in a studio (Plates, 2020). For example, demonstrating tools becomes difficult and models cannot be touched. In-class design charrettes come with chatter, incidental collaboration, and feedback, whereas the online experience can lack interaction (Crolla, Hodgson, & Ho, 2019; Jørgensen, Karadeniz, Mertens, & Stiles, 2019). In the online studio, the two most distinct changes are the role of facilitating interaction and the range of studio outcomes. The online mode of teaching demands instructors more directly enable ideation and mediate the process. Empowering students to ‘make’ in the online studio requires a teaching strategy that can bring the haptic qualities of the studio into the online world. This includes new modes for demonstrating technique, expanded and sometimes forces methods of interaction and feedback. In addition, there is a necessary expansion of design production and communication conventions. Although presentation techniques have long been valued as a design skill, the digital studio more acutely necessitates the clear articulation of the narrative of the creative process. Without the immediate presence of a designed object, students must more carefully compose the story of their design, often through the making of additional communication elements. Some of these changes can be seen developing before the events of COVID19, specifically with the increasing use of digital design techniques (Gazvoda, 2019; Kerr & Lawson, 2020; Walliss & Rahmann, 2013). However, the large-scale transition to completely online learning has more precisely revealed the learning and teaching methods required to enable different outcomes from an online studio. These include new forms of feedback and interaction, alongside the complex modalities of design communication in support of conventional studio artifacts. Specifically,
how modes of isolation and connectivity greatly influence student interactions, attitudes, and outcomes of the design studio (Dreamson, 2020). Across these examples, the successes and failures of the rapid shift to online studio delivery offer some insight into reviewing the pedagogical approach of design studio learning and the lessons for the future of face to face and online studios.
Making Space for Emotion: Gardens of Pain and Joy (An Experimental Studio)

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Keywords: pedagogy, emotion, empathy, garden, memorial

"Making Space for Emotion: Gardens of Pain and Joy" is the title of an MLA option studio piloted in fall 2020. Eleven students (five second-year and six third-year) selected this class.

This studio is an outgrowth of my research and creative practice - where I have learned that there is a tremendous need and opportunity for new kinds of spaces and encounters to address our emotional lives. This is even more important in this time of massive upheaval, characterized by an interrelated set of crises: ecological, racial, social, and spiritual. (As I was planning this course, Covid-19 lockdowns hit, and George Floyd was murdered.) The studio had two overarching goals: 1) To create a process oriented, experimental, nonhierarchical studio environment where students have agency and 2) To create a curriculum that focuses on the human relationship with the earth, challenges the taboo on speaking of emotions in the classroom, and values emotion in the design process. "The garden" was chosen as a space between the earth/cosmos and the human realm. Gardens visited included a Dakota Medicine Garden (joined by the native designers), a Memorial to the Survivors of Sexual Violence (hosted by the designer), and other sites. Garden definitions, concepts, and precedents were semester-long discussions.

Speaking to goal 1: The class learned from a plurality of perspectives (Indigenous and Black voices in particular): readings and media, guest speakers, site visits, and nontraditional reviews (using Liz Lerman’s “Critical Response Method”). “Knowledge Sharing” presentations were offered by each class member and “Body/Space” were activities that focused on the nonverbal.

Speaking to goal 2: The studio used Glenn Albrecht’s Earth Emotions book’s discussions of the negative and positive emotions related to our experience with the earth in the Anthropocene. The Studio was structured in four parts. In Part One, Students created an illustrated sumbiography (Albrecht’s “autobiography of your relationship with the earth/nature”). In Part Two: Students worked their interpretation of the emotional terms/states Albrecht discussed to create Four Gardens (two negative, two positive), then select one of each, then considering the paradox of embodying negative and positive emotions in the same garden. In Part Three: The studio moved between the local and the global, and from site-less to sited investigations, where each student selected their site and approach to a garden, and a garden for emotion. In Part Four: Each student created a book of their semester-long process.
Multimedia Presentations: Effective Presentation Design in Times of Covid-19

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Keywords: Virtual presentations, design studio, final reviews, video presentation

Covid-19 forced design schools and studios to replace real-world interactions with virtual alternatives. The switch to digital learning presents challenges like a passive learning approach (students sit and quietly watch videos), a short notice for instructors to adapt to new materials and products for online learning, and disparities in availability of technology. Zoom is an essential tool for online teaching for its ability to handle for screen sharing, breakout sessions, waiting rooms, no registration login for participants, etc.

Traditionally, the assessment of design studios (final review) has the character of ceremony or ritual in the design studio, with some students dressing up in formal or special attire (1). Students present their drawings and physical models to a ‘jury’ of critics, including instructors from other studios, professionals, or the client. With the switch to online learning platforms, it became impossible to gather critics and students at a gallery or exhibition space. Zoom limits the opportunities to discuss and critique individual work, and decreases the engagement of the whole studio in professional dialog to contribute to didactic conversations.

This paper will share findings of final video presentations from two combined second-year undergraduate Landscape Architecture design studios. Multimedia presentations were setup as asynchronous reviews that used pre-recorded videos (YouTube) watched by instructors, guests, the client and the public. By using a video-sharing website, video presentations allow reviewers to comment on student projects at their own time and pace; students have the ability to reproduce the presentations to multiple audiences, and gather public feedback. Students considered features for a ‘good presentation’ such as content tailored to a specific audience, relevant visuals, connection to an audience and practiced performance. The paper will present learnings, evaluate the presentations according to Robin Williams’ “Four Principles of Conceptual Presentation Design” (clarity, relevance, animation, plot) (2), and will outline recommendations for formatting and structuring video presentations, a stepping stone in the dynamic world of virtual reviews.
Reinventing the Site Visit: Application and Student Assessment of Innovative Online Approaches

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**Keywords:** pedagogy, online teaching, virtual reality, social media data, visualization

The current global pandemic is changing the way higher education classes are delivered. In landscape architecture education, hands-on studios and interactive lectures are commonplace which can make a shift to hybridized, hyflex, and online models a particular challenge. Dreamson (2020) argues that the pandemic has accelerated the integration of design education with educational technology, with studio education often taking a resistant stance to the online format. However, sources such as recent ASLA online education webinars reveal proactive and innovative approaches being taken to evolve the design education landscape (Foster, George, & Hayek, 2020; George, Summerlin, Goldberg, & Goldberg, 2020), and recent research in VR and landscape architecture reveal the multifaceted nature of emerging technologies in education and beyond (Wei, Xie, & Feng, 2020). This study will share multiple novel methods successfully implemented in a fully online summer studio, specifically exploring ways to replace the traditional site visit when it is not possible and to supplement it after the pandemic.

The studio implemented virtual reality technologies from home with the help of affordable personal Google Cardboard headsets. This method allowed students to experience a VR video bike ride through their site, providing an impression of the energy and commotion of the area as well as hear the sounds of wind, people, birds, and city noises. Students were also provided with VR Hotspots of the project site so that they could access various locations from different vantage points. Furthermore, to recognize the site users’ perspectives of the site, students examined and sorted Instagram and Tripadvisor social media data tagged under the site location. Students used this approach to see what site users believe are the positives and negatives of the site and its immediate surrounds, how they presently interact with it, and what time of day site users occupy the space. While comprehension of site scale and materiality were a challenge for this fully online class, the combination of various digital site experiences combined to help students construct a new form of site understanding.

Overall the students found the technological approaches interesting, intuitive, and an excellent way to experience a site from afar. Qualitative student feedback was provided after the use of each approach through class survey assignments. Survey questions inquired about experience and comfort levels with the technologies, perceived potential applications in the field, the senses during each exercise, and how the assignments affected students’ understanding of the site. The analysis of this information reveals the strengths and weaknesses of each method as well as its potential use beyond the time of social distancing. Primary challenges were associated with student preparedness and physical limitations, for example, not ordering headsets on time or the inability to visually focus in VR. While this course was fully online, students highlighted that the VR methods would be a more effective way to re-visit a site than looking at site photos, and that social media data reveals potentially more personal feelings and
perceptions of a site than more traditional data-collection methods like survey or observation. This exploration has implications for both online design education as well as the practice of landscape architecture during and after a global pandemic.
Stop Preaching to the Choir — Exploring the Potential for Introductory Landscape Architecture Courses to Grow Landscape Architecture Department Enrollment

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Keywords: recruitment, introductory course, enrollment, growth

This presentation reviews the current national status of introductory landscape architecture courses and identifies the potential enrollment implications and pedagogical lessons learned from over a decade of teaching LAEP 1030 as a general education course. Across the United States landscape architecture programs struggle to grow their student body numbers. In some cases, programs are even experiencing a decline in enrollment, especially within their undergraduate programs. (LAAB 2017). This challenge, coupled with the discipline’s general lack of widespread recognition threatens the ability of accredited programs to recruit, retain, and graduate sufficient numbers of students to replace retiring professionals. The Landscape Architecture and Environmental Planning (LAEP) department at Utah State University is using the largest introductory landscape architecture course in the U.S. to raise awareness of the profession, highlight career opportunities, and recruit new students into the LAEP program.

Established in 1939, Utah State University hosts one of the oldest Landscape Architecture programs in the intermountain west and the only accredited landscape architecture program in the state of Utah. However, like many other landscape architecture programs it competes with degree programs across campus to attract students into studios. To make matters worse, stagnant degree-granting postsecondary institution enrollment projections point to a future of aggressive completion within and between universities for high performing students (NCES, 2020). For many years Utah State University’s LAEP 1030 - Introduction to Landscape Architecture course has been designated as an option for students seeking to fulfill their breadth creative arts general education requirement. This designation makes the class attractive beyond the LAEP department and the course captures a broad, typically first or second year undergraduate student audience. Enrollment in this course has increased dramatically over the past decade. During the fall 2020 semester the course is being taught in three hybrid face-to-face sections and one online section, serving a total of 730 students. This represents an opportunity to introduce the profession and raise interest in landscape architecture as a degree to students often undecided or in the early stages of their degrees - a desirable target recruiting audience. A comparative analysis of similar introductory courses nationwide indicates that most other universities with accredited landscape architecture programs offer an introductory landscape architecture course to a limited number of students, most of them already declared as landscape architecture majors. This structure represents a missed opportunity to reach students who may otherwise never hear about landscape architecture.
Strategic Landscape: Adaptation of Scenario and Spatial Planning Tools to Teach Landscape Planning and Design in Studio

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Keywords: Landscape architecture education, Landscape vision, Projective design, Hybrid methods, Transfer of knowledge, Scenario Planning, Design process

Landscape architects are playing an increasingly visible role in the deepening integration of disciplines to effectively define the future of cities and communities. Public landscape has proven to be important in providing a coherent urban structure, framing and energizing developments, and addressing urban risks. However, conventionally, landscape architecture education tends to focus on the design of space and places, which is better suited to define spatial and programmatic aspects on a site-and-scope-specific basis, than the projective aspects of defining the future itself. To address this key gap, a studio framework is developed where knowledge is transferred and adapted from spatial planning (Harris et al, 2002) to teach strategic and projective thinking and design in a more defined and structured process using tools like scenario planning and spatial strategy making. With the adaptation, the framework connects a structured approach to visioning for the future with the qualitative, space, place and scale conscious aspect of landscape design. This is applied in LARC310 Advanced Studio in Landscape Architecture, offered to students in their third year of the undergraduate program, where they are tasked with proposing a 10-year Landscape Vision for an urban district in Omaha, Nebraska.

Scenario planning is a framework used in planning to understand the present-day situation, and to set up a contextual discovery process to better manage the complexity and uncertainty of strategic planning, and to reduce the chance of poor outcomes. (Dammers et al, 2019). From this tool, two aspects in “achieving new insight” are identified as being most relevant and adapted. First, to evaluate options for future developments, their interactions and impacts. This is used to develop desirable future and to map pathways and identify key capacities and services. And second, to discuss possible discontinuities, their cause, and their impacts. This is used to address risks such as climate change as a basis for building preparedness. A multi-step process is adapted to develop the scenarios (Ringland and Schwartz, 1998). The outcome of this process is a vision and a series of objectives and strategies, which are plugged into the next phase of design. This next phase discusses connections between it and design options in the four categories of public space structure, infrastructure, and building footprint, density and programs, in order to spatialize the scenarios.

This framework is designed with inputs from Dr. Neil Harris, Senior Lecturer in Statutory Planning at Cardiff University School of Geography and Planning.
Tactics for the Post-COVID Landscape Architecture Studio

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Keywords: Landscape Design Studio, Site Drawing, Perceptualism, Place-theory

Commonly, landscape architecture studio praxis focuses on encouraging student creative thought and design intuition, and nurturing confidence. Central to these endeavors, my own studios are founded in perceptual (sense-first and rationality second) understanding of place through drawing. Currently, the author – like many design educators – is reflecting on the role of creative practice and education in the shadow of the global novel-coronavirus pandemic. This deliberation was recently encouraged by Jeff Adams in the International Journal of Art and Design Education and specifically the statement that “perhaps now is the moment for us to galvanize art in the service of nature” (Adams, 2020, p 275). Here I build upon Adams’ charge, and offer some further thoughts on design education paradigms, that are currently highly useful and relevant within the current context of social distancing, and reliance on online learning and reduced access to collaborative face-to-face discussion; and during a moratorium on group site-visits and discussions. The tactics I present here stem from the pedagogical possibilities of solitary and intuitive reflection; a reunion with nature and drawing outdoors; and a sharpened sense of wonder as we begin to re-discover our estranged post-COVID landscapes. I believe that in a time of social distancing, limits on student group-thought, removal from and then reconciliation with the landscape, and an increased self-reliance on design-intuition, there are proven and useful tactics to encourage and inculcate valuable landscape architectural skills and dispositions. The four tactics outlined in this paper; illustrated with case-studies from the author's own studio; and compared with "traditional" practice that may be more difficult during the pandemic, are: revolt against the bifurcation of the world into facts and values; embrace of place and the ecological conscience; acceptance of betrayal in the belief in beauty; and drawing the unsee-able.
Teaching the Superstudio: Designing for the Green New Deal in South Florida

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Keywords: Green New Deal, Green Infrastructure, Superstudio

In 2020 the Landscape Architecture Foundation (LAF) invited professors to take part in a national effort in translating the essential objectives of the Green New Deal (GND) via design studio instruction. During its inaugural semester of fall 2020, 75+ design studios participated in this effort from across the US. This research reports on the integration of the GND into a remotely-taught second year first semester master of landscape architecture regional design studio at Florida International University in Miami, Florida. It discusses new perspectives explored, challenges experienced, and insights gained. To better align with the goals of the GND, the studio focused on region-specific opportunities and limitations, and worked to identify landscape solutions in three GND focus areas: decarbonization, justice, and jobs. Students studied south Florida’s infrastructure, and envisioned its future role. Investigated topics included transportation infrastructure, water infrastructure, and agriculture. LAF’s Superstudio Kickoff Webinar and reading resources were utilized during instruction. “Ecological systems thinking” (Gu et al. 2018) and “scaled system thinking” (Chen & Lee 2015) approaches were explored. Monthly visitation and critic sessions by three partners from local government and small/medium size design firms brought students into contact with regional professionals during the development of their projects. Individual or team proposals were allowed. Multiple students/teams experienced difficulty with addressing all three tenants of the GND within a single proposal, job creation being the most challenging tenant. The environmental tenant was comprehended by the students most easily and played the defining role in concepts developed. Justice was often an afterthought, strengthening the proposal, rather than being the initiating concern for the design. Placing more focus on justice and job creation earlier in the semester may create a more balanced outcome in future studios.
Using Padlet and Conceptboard for Learner Engagement and Collaboration: A Case Study of an Online GIS Course

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Keywords: virtual collaboration, design education, pedagogy, problem-based learning

1. PURPOSE: The purpose of this study is to evaluate two online visual collaboration tools, Padlet and Conceptboard, in enhancing learner engagement and collaboration in an online GIS course. 2. BACKGROUND: Geographic information system (GIS) becomes more suitable for online delivery given a growing body of online resources and data. But challenges also exist because students may merely follow tutorials and complete assignments without understanding processes and how they can do it differently. While the conventional content management system have limited collaboration functionality, there are several online tools for visual communication and collaboration among students, such as Padlet and Conceptboard. 3. METHODS: Two online visual collaboration tools, Padlet and Conceptboard, are employed in an online introductory GIS course for upper division landscape architecture students. Students first learn GIS concepts and acquire necessary skills through live lectures and lab tutorials. Then, Padlet is used for students to post weekly lab outputs, comment on peers’ works, and share ideas for specific GIS concepts or projects. Conceptboard is primarily used for the final project in which different topic groups share ideas and challenges (e.g., data source, analysis tools) on a visual collaboration workspace. We examine the effectiveness of both tools through analyzing 1) usage patterns for different collaboration purposes (e.g., submitting works, leaving comments, asking questions), 2) the relationship between usage patterns and learning outcomes, 3) students’ opinion on the added values of the tools compared with lecture-based online delivery and face-to-face lectures, and 4) qualitative feedback from students on their experience. 4. FINDINGS: We expect to find that active uses of the two collaboration tools lead to improved scores on assignments and improved levels of student satisfaction. Also, we expect positive feedback on the use of collaborative tools in learning GIS remotely, in particular for the sharing and application of knowledge. Usage patterns and qualitative feedback will further provide areas of improvement for learner engagement and collaboration in a technology-based course. 5. IMPORTANCE: The evaluative findings of this study could demonstrate the role of visual communication and collaboration tools in improving learning outcomes in online education. Also, the course design incorporating innovative technologies described in this paper could provide practical strategies to instructors who teach GIS or other similar software online.
Diversity, Equity, & Inclusion
Diversity, Equity, and Inclusion

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Decolonizing Landscape Architecture Education (Session 1): Curricular and Pedagogical Transformation

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Keywords: Decolonizing, design education, curricular transformation, diversity equity inclusion, landscape architecture

With the reawakening of racial consciousness following the events of 2020, namely the murder of George Floyd and many others in the Black community, as well as the disproportionate impact of COVID-19 on racial minorities, calls for justice and efforts to address longstanding disparities have been permeating through our political, social, economic systems, including design education. Amid the recent discussions concerning design education, “decolonizing design” has become a rallying cry among many students and faculty. But what does decolonizing mean in design? More specifically, what does decolonizing design mean for transforming landscape architecture and landscape architecture education?

This first session in a sequence of two panels brings together a group of faculty from multiple universities in the United States and Europe to address issues of curricular and pedagogical transformation. The speakers will reflect on what “decolonizing design” means in this work by highlighting their recent engagement with specific subject areas and opportunities at the program and department level. They will share their experiences and perspectives based on their current involvement and address more specifically: (1) transformation in the history curriculum, (2) service-learning and public engagement, (3) online courses in the context of multi-institutional partnerships, and (4) modes of research, knowledge production, learning, and practice.

The series of short presentations collectively address ways to shift the longstanding narrative of landscape architecture to embody multiple histories and identities, how design and landscape architecture curriculum can begin to challenge the power structure that produces and reproduces inequalities in society and exploitation of the environment, and how we can build on the current literature and knowledge (e.g., Boone, 2017; Freire, 1968; Hall, 1997; Tuhiwai Smith, 1999). During the short presentations, the audience will be invited to share their own reflections on what “decolonizing design” means in their work through the chatbox. Following the presentations, they will be invited to share their experiences, perspectives, and feedback in breakout rooms (if such function is available through the conference).
The inputs in the chatbox and the discussion from each breakout room will be recorded and transcribed with permission from the audience. The outcomes will contribute to a series of working documents, available on a document sharing and collaboration platform, to support emerging and ongoing efforts in different landscape architecture programs. Participants in the session will also be able to join a network of peers with opportunities for further exchanges and collaboration following the conference.
Decolonizing Landscape Architecture Education (Session 2): Cultural and Institutional Transformation

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Keywords: Decolonizing, design education, institutional transformation, diversity equity inclusion, landscape architecture

With the reawakening of racial consciousness following the events of 2020, namely the murder of George Floyd and many others in the Black community, as well as the disproportionate impact of COVID-19 on racial minorities, calls for justice and efforts to address longstanding disparities have been permeating through our political, social, economic systems, including design education. Amid the recent discussions concerning design education, “decolonizing design” has become a rallying cry among students and faculty. But what does decolonizing mean in design, and more specifically in landscape architecture and landscape architecture education?

What are the existing structures of higher education that pose barriers to decolonizing design education? How can we challenge these deeply entrenched institutional structures to begin the process of decolonizing design education? What can we learn from the recent efforts taking place in schools around the United States? And how can we build on the current literature and knowledge (e.g., Boone, 2017; Freire, 1968; Hall, 1997; Tuhiwai Smith, 1999)?

This second session in a sequence of two panels brings together a group of faculty members who are currently working on cultural and institutional transformation focusing on changes at the school/college and university levels. The speakers will share their experiences, perspectives and lessons learned based on their current work and involvement in their respective institutions. Specifically, the speakers will address: 1) the development of DEI (diversity, equity, and inclusion) practices at different levels at institutions of higher learning, 2) the role of student activism in transforming institutional practices, 3) relationship between DEI and faculty hiring, tenure and promotion practices, 4) frameworks of accountability and cross/trans-disciplinary opportunities at the college/school level brought to the forefront due to Covid 19, and 5) specific initiatives such as the Design Justice Initiative at the Arizona State University. Since the speakers are positioned at different levels of the university (faculty, Associate Dean, Vice Provost), this will allow for a robust discussion of the issues at every level of the university and.

Building on a series of short presentations, the audience will be invited to share their experiences, perspectives, and feedback through group discussions. The dialogue will be documented and contribute to a working document to share with a broader audience following the conference to support emerging and ongoing efforts in different landscape architecture programs. Participants in the session will have an opportunity to join a network of peers with the potential for further exchanges and collaboration.
Environmental Racism and Participatory Equity of Environmental Risks and Benefits in Alabama Counties: Analyzing Racial Equity in the Distribution of Protected Areas and Toxic Releases

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Keywords: Alabama, environmental racism, cultural landscape, racial equity, social justice

Alabama’s cultural landscape is a unique living document shaped by geological, ecological, economic, and political processes. One thread of this history, the legacy of exploiting humans and the environment, generates present-day inequities that impact landscape architecture, human geography, planning, and public health. This paper seeks to 1) synthesize a theoretical framework for understanding processes of environmental racism in the regional landscape, 2) test this framework against the current picture of Alabama counties with respect to the proportion of the black population, acres of protected areas (environmental benefits), releases of toxic chemicals (environmental risks), and the proportion of black congresspeople (participatory equity). The results of this study reveal environmental injustices. There is a lingering legacy of physical barriers between African Americans and natural areas; greater proportions of black populations are correlated positively with closed-access protected areas, and negatively with open-access protected areas. Despite this, state-managed protected areas are positively correlated with a greater proportion of the black population. The environmental risks are also distributed inequitably. The proportion of the black population has a strong and positive correlation with toxic chemical releases. Finally, participatory injustices point to challenges against improving the situation. The disparity ratio of Alabama’s black senators and representatives (.4343) denotes more than half of the black populations are underrepresented. These data show significant inequities in the distribution of environmental risks, benefits, and representation. The complex entanglement of race and regional ecology necessitate action in landscape architecture and beyond, enabling legislation for criminal and civil liability for unjust siting of toxic release facilities, data visualization for community awareness and environmental literacy, and practicing landscape architecture as advocates of antiracism.
Growing Resistance: Guerrilla Gardening inside Seattle's Capitol Hill Occupied Protest

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Keywords: Guerrilla gardening, urban gardens, occupy protest, resistance

The Capitol Hill Occupied Protest (CHOP) took over a six-block area in Seattle’s Capitol Hill neighborhood in June of 2020. The occupation took place as the police retreated from a local precinct after a week of intense confrontations with protestors in the wake of the murder of George Floyd in Minneapolis. Besides tents, medical aid stations, food and donation stands, conversation circles, protest art, and community kitchens, a guerrilla garden also emerged in Cal Anderson Park, inside the occupied zone. Started by Marcus Henderson, an urban sustainability professional and urban farmer, other protesters and volunteers soon joined to grow the garden. The guerrilla intervention quickly evolved into a functioning urban farm serving not only the protesters but also the unhoused populations at the park.

Urban gardening has long been associated with community organizing and self-help in North America historically and through the 1970s (Lawson, 2005; Mare and Peña, 2010; Warner, 1987). The CHOP guerrilla garden seemed to have taken it further. Following three weeks of occupation, although CHOP protesters were eventually evicted from the occupied zone, the garden remained and even served as a springboard for other efforts. They include a broader conversation led by the Seattle Parks and Recreation about how parks and open spaces need to be planned and designed differently to address issues of social disparities and concerns of the BIPOC communities. The group of organizers, Black Star Farmers, formed through the garden, has also partnered with grassroots organizations outside Capitol Hill and engaged in fundraising to support land access, food security, and alternative economies in Seattle’s Black communities.

Based on interviews with key organizers, volunteers, nearby residents, and Parks staff, as well as site observations, this study examines the different roles that the CHOP garden has played in the occupied protest and the different phases the project has gone through. Based on the fieldwork, the findings suggest the importance of the garden in mobilizing diverse support within and beyond the occupy protesters. Specifically, the garden allowed for sustained engagement of a wider range of stakeholders, including government staff. What began as a guerrilla act has experienced a sustained momentum with implications for park planning and community development to address longstanding disparities in society and structural challenges facing the BIPOC communities in Seattle. The study offers lessons on the role of guerrilla gardens and landscape architecture in social activism and political movements.
DIVERSITY, EQUITY, AND INCLUSION

Investigate the Impacts of Landscape Characteristics on the Disparity of Children and the Elderly Presence and Behavior in Urban Central Waterfront Using the Mixed Method

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Keywords: Mix-method Research; Urban Central Waterfront Space; Landscape Characteristics; Child and Elderly; Behavior Pattern; Design Guideline

The urban central waterfront is an important public place in high-density cities that promote public health and well-being. The outdated design of many urban waterfront spaces failed to meet citizens’ current needs, particularly for vulnerable populations such as children and the elderly, whose physical capability, psychological need, and way of recreation varied largely from adult users. The challenge is global but might be extremely pressing in China, where unprecedentedly swift urbanization happened over the past forty years. Quick and coarse urban waterfront regeneration and renewal projects insufficiently considered the needs of children and the elderly. Previous studies cannot provide a solid answer to the question: What landscape characteristics contributed to the disparity of the presence and behavior of children and elderlies in the central urban waterfront? To address this critical knowledge gap, we used a representative waterfront area in Ningbo, China as the study site.

This research combined on-site observation, quantitative GIS spatial analysis, and qualitative photo analysis to investigate the association between landscape characteristics and distribution of children and elderly activities. A spatial-behavior inventory based on on-site observation containing 8,901 detailed activity data including an individual’s gender, age group, group size, landscape setting, and behaviors was analyzed with landscape characteristics using ArcGIS. Photo analysis was conducted to investigate the relationships in a qualitative way. The findings found that inadequate provision and uneven distribution of child and elderly-friendly facilities, poor sub-area edge definition, low land use mix diversity, lack of spatial variation in size and function, poor microclimates, incompatible resting facilities, coarse and uneven walkway surface, and concentrated adult-exclusive land use are negatively associated with the presence of children and elderlies’ activity. Design guidelines were presented based on these findings. This study contributed to the mixed-method research that investigates critical landscape characteristics for the minority populations in central urban waterfront space, and the process of establishing child and age-friendly public space in high-density cities.
Landscapes and Invisible Labor

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Keywords: Labor, representation, construction, maintenance, erasure

Where are the photographs of landscape architecture under construction? Likewise, where are the drawings or documents that evidence a worker’s agency in the ongoing form— and ecological—making of landscape architecture? As a discipline that prides itself on process, it is exceedingly rare to encounter representations that speak to the interdependent nature of the design professional and the laborer who makes the design project a material reality.

Through a survey of the public-facing representation of design projects by landscape firms, this paper evidences the rarity with which the presence of labor, and laborers, exist in our visual and philosophical discourse. Investigating the reasons for this long-standing absence, the research draws upon the social and class stratification concretized through professionalization, and the precarious labor regimes contemporary landscape architecture is dependent upon. Attention is drawn to the embeddedness of undocumented, migrant labor in both the construction and maintenance of landscapes, and the difficulties inherent in disciplinary accountability for these ethical sinkholes.

Finally, the paper examines image-based practices in landscape architecture that work to re-establish design’s social connection to labor. Working discursively and practically, the examples deconstruct norms of exclusionary authorship and create novel mechanisms for design to develop in a system of mutual knowledge between professional and laborer. In acknowledging labor’s embodied participation in design, the designer may begin to address the laborer’s social and spatial experience in the process of creating landscapes—consequently expanding the discipline’s approach to inclusion and justice.
A National Survey of LGBTQ Students’ Experience and Behavior in Queer Spaces of Chinese Colleges and Universities

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Keywords: Queer space; LGBTQ student; University campus; Experience and behavior; Inclusiveness.

Background: In China, LGBT is over 70 million, estimated to account for 5% of the population. About 30% of LGBT are students. Discrimination on LGBTQ occurred very frequently on university campus. Queer space is crucial for the gender identity development and social interaction of LGBTQ individuals on campus. However, we know little about the current state of queer space on university campuses in China. Thus, this study aims to survey LGBTQ students’ experiences and behaviors in the queer spaces on university campus in China, and what influences their experience and behaviors.

Method: This study focuses on the five spaces in universities of China: gendered queer space: 1) Restroom, 2) Bathhouse, 3) Dormitory, and non-gendered queer space: 1) Activity space used by LGBTQ organizations, 2) Green spaces gathered by LGBTQ students. A sample of 1013 (response ratio was 7.24%) Chinese LGBTQ individuals who are or used to be university students participated in an online survey (N=1013). Each participant was asked to report their tolerance levels, trouble levels, trouble reasons, and behaviors, wills, preference, as well as social-demographic information, including gender identity, sexual orientation, age, education level, household income, ethnicity, and religious.

Result: We found that only 2.87% of respondents state that they have gender-neutral restrooms. Over 30% feel different levels of trouble in using the public restroom on campus. For dormitory, 95.95% of students live in the dormitory with roommates on campus. Only 0.61% of respondents have the gender-inclusive dorms for LGBT students. Different sexual identity groups have a different will on coming out and bringing partners to the dorm. Third, among 56.37% of respondents who use the bathhouse, 45.95% of them feel troubled at different levels, which is significantly associated with their gender identity. Further, only 36.72% of participants state that there are LGBT organizations in their universities, less than one-third of which are authorized. The authorized organization have significant influence on the inclusiveness of campus. Only 6.71% of participants indicate that there is greenspace gathered by LGBT in their university. They suggest that the attractions of greenspace to LGBTQ are mainly owing to ruleless schedule (91.18%), quiet (89.71%), with public facilities like benches (70.59%), convenient transportation (69.12%), private (surrounded by trees or shrubs) (57.35%). Finally, we also collect the reasons why they feel troubled in some queer spaces and the recommendation for promotion.

Conclusion: This study rich our knowledge of the current situation of queer spaces and LGBTQ students’ experience and behaviors in universities. These findings provide policy-makers, administrators, and design practitioners with suggestions on creating more inclusive campus environments for sexual minority people to reduce the environment inequity.
Shorty Lawson Museum of the Black Tenant Farmer

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Keywords: African-American tenant farmer, landscape museum, daily life

Within the context of national events attention is increasingly directed towards the lessons embodied in landscapes of ordinary African Americans. The Shorty Lawson Museum depicts the daily life of one tobacco farmer through the reconstructed farm, oral histories and illustrated stories about his family, giving a human face to caste, racism, social class inequities and manhood. Lawson (1938-1974), tenant farmed his entire life. He was recognized as the hardest working man in the community, widely known for his capacity to make do with dignity, his sense of good and bad, and the way he raised his children. Although Jim Crow racial distinctions confined his family, he didn’t allow those to dominate him. In the only ways he could Lawson debunked racial stereotypes. The purpose of the museum’s intimate history is to impel informed and nuanced anti-racist action.

This paper describes the collaboration between the Lawson family, the author and a film maker, beginning with family story-telling from which the author created landscape-based narratives, illustrated by outsider art. This led to reshaping Lawson’s home to heighten the visitor experience of the discrimination that tenant farmers faced but also the pleasures they conjured. The landscape is reinterpreted to show how careful placement made daily chores bearable. Family memories are recreated through the outhouse, tobacco barns, hog lot, smoke house, chicken coop, garden, and basketball court.

Findings about the museum-making process and the success in meeting the museum purpose are discussed. First, although the process of story-telling created an agreed-upon description of everyday life, its interpretation exposed dramatic differences (where the author saw environmental injustices, the Lawson family remembered “the best times of our lives”. ) Second, visitors note the power of the “museum-in-the-farm” compared to museums without landscape context; the most compelling aspects to the Lawson family, County residents, researchers and designers are detailed. Third, the museum educates with nuanced and contradictory information, increases empathy and cultural understanding but thus far has modest impacts on anti-racist actions.
A Spatial Analysis of Gender in the Landscape Architecture Academy

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Keywords: gender, equity, women, academia

The early 1970s marked several significant moments for women in landscape architecture education; the first woman was elected to the National Council of Instructors in Landscape Architecture board, the Women in Landscape Architectural Education task force was formed, and the 1967 Executive Order 11375—banning discrimination on the basis of sex—required more women to be hired in landscape architecture programs throughout the country (Hodges & Rutz, 1997). Since then, there has been a handful of studies (Neal, 1973; Rutz, 1975; Nassauer & Arnold 1983; Browne, 1994; Hennigan & Carpenter, 1998) documenting women's careers in both the academy and the profession.

It has been over twenty years since the last significant study on women in the profession was reported (Hennigan & Carpenter, 1998). With the resurgence of women-based initiatives and research populating mainstream discourse channels, the timeliness of “where we stand” as women in landscape architecture today is imperative. Currently, the Visualizing Equity in Landscape Architecture (VELA) project has begun collecting data to answer these questions and to fill the gaps found throughout existing data. The work is being organized into what we call the “Three Pillars of Practice”—(1) academia, (2) professional practice, and (3) professional organizations and leadership.

This paper will focus on the first pillar of practice, gender in the landscape architecture academy. Currently, thirty-six percent of academic faculty in landscape architecture—from lecturer to emeritus—are women. The research presents the results extracted from available public data found on the sixty-nine LAAB accredited programs in the United States. From the data collected, we are able to map the spatial distribution of position and rank, compensation, recognition, and leadership. The work is presented through a series of data driven cartographic visualizations and infographics. Through representing the raw data, we can start to formulate a lens of focus that informs us of the disparities that are present throughout the landscape architecture academy. The next stage of research that emerges from these presented results will be to host a nationwide survey. The goal of presenting this preliminary analysis is to start a conversation. A conversation that leads to a larger commitment from our national organizations to support further research and action in remedying these disparities.
Take a Stand, Hold Your Ground: Roles and Responsibilities for Today’s Citizen-Designer

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Keywords: climate change, design equity, placemaking, social injustice, urban regeneration

This particular year has challenged and altered each and every one of us. To recollect the innumerable racial and social injustices, impacts of climate change, coronavirus pandemic and ensuing economic recession is to recognize how much we – as a collective society – have endured and continue to endure in daily struggles and hardships. Cities have taken the brunt of these transformations, with episodes continually exploding in municipalities across the country and around the world. Whether one lives in a booming metropolis or a small town, it is evident that cities that implement flexible, creative, and light design interventions can catalyze profound changes to the urban context and human experience. To begin, undergraduate students in a foundation design studio were asked to take a stand – a stand on their work and position of manifesting ideas from concept development to design proposal; from position to proposition. The studio asked students to answer what is the value of design and what is the role of the designer? Alongside conversations on climate change, racial and social justice, and design equity, how does conjuring the unknown, speculating upon possibilities, and imagining designed futures all occur without a voice? How can you hold onto your values and your design position, while engaging others through the design and construction process? During the semester, students considered these questions and demonstrated their knowledge through a design process that enabled flexible, and more importantly, confident positions that allowed for independent creativity and a declaration of intent or a call to action. As active participants and citizens of this world, students were encouraged to advocate for positive change; to reinforce what is seen as good and what needed to be preserved; to rally against what threatens one's rights and beliefs. At the heart of humanity, as much as design democracy, the studio encouraged students to actively engage in the equitable design of urban spaces – squarely with their own hometowns and in the eyes of its people, while most importantly learning how to take a stand and hold one’s own ground.
Time’s a Mess! Virtual Community Participation during Pandemic

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Keywords: Inclusive design, virtual participation, African-American neighborhood

For over fifty years there have been critical questions about how inclusive participatory design can be (Davidoff, 1965; Linn, 1968; Friedmann, 1973). Some argue that the poor have had no power except through disruption (Piven, 1970). Recent events and pandemic conditions have presented even greater challenges to include excluded publics and develop effective political action.

This paper evaluates a participatory community process to give spatial voice to Walltown, an African-American neighborhood in Durham, North Carolina confronting displacement, large-scale private redevelopment, and gentrification. It addresses the effectiveness of virtual participatory techniques and methods as the community leaders continue to address development efforts during pandemic.

After several years of successful organizing, members of the historically Black Walltown neighborhood organization began talking with the Coalition for Affordable Housing and Transit, a local advocacy group. The two groups had shared goals for the reuse of an abandoned mall adjacent to Walltown including affordable housing, a transit hub, affordable grocery, and retail suited to the community. The Coalition formed a design team, involving students and faculty from NC State University’s Department of Landscape Architecture and Environmental Planning and the Center for Ecological Democracy to spatialize these goals in order to counter the developer’s plans. The design team began the process with interviewing experts about how to negotiate with developers. The team then created a series of virtual design workshops to gather community input, develop alternatives, adapting free and publicly accessible online tools to create spatially precise alternatives. These were consolidated into three alternatives, which were evaluated in outdoor community events, an on-line survey, and at Zoom city council work session.

The virtual participatory techniques have gone a long way to overcome what seemed like the impossibility of face-to-face community discussion during the COVID-19 pandemic. The process enabled spatial gaming and participatory strategies to be effective in virtual group decision-making in setting priorities, locating uses while recognizing the topographic reality on the site. Some issues that arose included how to make the virtual sessions accessible to all and when to hold events when working people worked multiple shifts at all hours. Overall, the process prepared the Walltown community for informed negotiation with the developer, which is currently underway. While significant progress has been made, the group will need to be creative to form alliances with other organizations remotely so as to build political power.
Vernacular Landscape Infrastructure and Women’s Water Issues, India

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Keywords: vernacular water infrastructure, water, domestic water use, women, gender, India

While water is a fundamentally available resource in various regions, water collection is still a significant burden in many developing countries. In 8 out of 10 households where water is found off-premises, women and girls are responsible for water collection. Meanwhile, because of a severe water crisis, an Indian woman could spend six hours and ten miles a day fetching water in some desert regions (Sagers, 2012). In total, women and girls spend 200 million hours every day collecting water, which is a severe waste of time and energy (WHO, 2017). This study aims to explore how traditional water infrastructures in India improve gender inequality. This study’s primary method is through literature review and case study analysis to revalue traditional water infrastructures. The literature review addresses the causes of women's aggravated situation in India's water crisis, issues women have when they manage water, and evaluation of the built environment related to domestic water use. This study examines three different kinds of traditional infrastructures in the Thar desert, the naadis, the stepwells, and the tankas, and discusses their relationship with women and their potential to be used as a solution.

With the lack of sustainable water management, water availability, stability, and quality have been facing formidable challenges. (Mitra, A., & Rao, 2019) Women are facing issues to collect water in different scenarios. In this case, exploring water infrastructure which could provide stable and clean water is essential. Naadis are natural rainwater collections and could provide communities sufficient water all year round, while tankas are drinking water storage tanks built underground. Stepwells and naadis are functional and social communal spaces, while tanka is individual or private strategies for water management. The stepwells were viewed as 'women's space', where women came to collect water, although they also evolved into space where they could converse with other women. One tanka can support a family of four for eight months out of the year. (Sharma, 2017). These traditional systems are low cost, sustainable, and suitable to the local ecology and culture. Not only can these infrastructures address the issues of water management but also provide ecological benefits and offer recreational and social opportunities to women.

The time of water collection can be cut down significantly because of stable water resources and better location. These systems can benefit women by diverting their time and energy from fetching water, obtaining leisure moments, educational opportunities, incomes, and deeper involvement in social and political life. The study of Stepwell, naadi, and tanka demonstrates that there is a deep relation between solving problems of fetching water and traditional landscape infrastructure.
The statement “I can’t breathe,” has come to represent the violence of police brutality against Black citizens in the last decade. The cry is also emblematic of decades and centuries of waste injustice: urban planning policies and practices that concentrate toxicities and waste in communities of color. Understood as a form of slow violence, this presentation explores waste injustice and environmental racism as instances of systemic racism. This injustice is evidenced by the concentration of both hazardous and non-hazardous waste materials and sites in communities of color, as well as by the lack of green, ecologically-rich open spaces in these same communities.

This presentation highlights how systemic environmental racism leads to spatial marginalization and the concentration of objects, sites, and communities deemed “undesirable” and “worthless”, with an emphasis on toxicities and reduced remediation located in communities of color. A critical reading of national policies and their execution related to brownfield remediation across the US, and how it has influenced practices and approaches to brownfield reclamation since the 1970s, reveals landscape architecture’s role in perpetuating institutionalized racist, neoliberal, and market-driven practices by ‘greening’ waste landscapes.

Environmental racism occurs when built environments are planned and designed with a white supremacist, neoliberal lens. Marginalized communities need advocates, including landscape architects, who see the potentials for waste landscapes like brownfields to become active contributors to local economies once again. In addition to providing ecologically and recreationally valuable open space, many of these sites have existing infrastructure that can be reused for 21st century economic and cultural programming specific to community needs. To dismantle white supremacist approaches to producing and remediating waste landscapes, it is critical to look to community-based grassroots initiatives and revitalization efforts by designers, planners, and urbanists of color. The narratives and practices of two women of color, Majora Carter and Katherine Darnstadt, which have been shared through public lectures, provide examples of these efforts. Contrasting their work with conventional approaches toward waste landscapes reveals two different outcomes: one results in displacement and dispossession, while the other in community development and wellbeing.
Which Neighborhood Has Street Greenery? Evidence from Western US Urban Areas

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Keywords: Urban Green Space, Street Greenery, Street Tree, Environmental Justice

Urban green space is a critical public amenity that promotes physical activity, mental health and well-being, and social interactions (Astell-Burt, Mitchell, and Hartig, 2014; Lee and Maheswaran, 2011; Sugiyama and Thomson, 2008; Thompson Coon et al., 2011). Easily accessible street greenery, including trees, grass, and shrubs, might have a higher potential to support active transportation, regular physical activity, and outdoor social engagement than distant public parks, especially for groups with limited mobility (e.g., low-income households, seniors, children, and people with disabilities). The U.S. Environmental Protection Agency (EPA) emphasizes fair treatment of all people regardless of race, color, national origin, or income in order to achieve environmental justice in urban development and policy implementation. Nevertheless, only a few recent studies have analyzed whether street greenery is equitably distributed across socioeconomic, racial/ethnic, and age groups (Choi et al., 2020; Nesbitt et al., 2019; Schwarz et al., 2015), and this is in part due to the lack of secondary datasets describing street greenery.

This study (1) presents a novel method of measuring street greenery that represents important design qualities for physical activity, such as accessibility, connectivity, and a sense of enclosure, and (2) examine whether street greenery distribution is related to neighborhood sociodemographics. We hypothesize that ample greenery along neighborhood streets is more likely to be available for privileged neighborhoods that have the ability to invest in front-yard gardening and community designs or to choose an already greener neighborhood as their home.

The study areas are six large urban areas in the lower U.S. West. The major source of street greenery is aerial images generated by the U.S. National Agriculture Imagery Program (NAIP). We use locally-identified Normalized Difference Vegetation Index (NDVI) values and road buffers to extract vegetation along the streets. Street greenery is measured in four different ways: Street Greenery Coverage (total street greenery per unit area), Street Tree Coverage (total street tree cover per unit area), Street Tree Enclosure (total length of street links enclosed by 40% tree shade density), and Street Tree Connectivity (total number of intersecting points between street links enclosed by 40% tree shade density). While the first two measures quantify overall street greenery availability in a neighborhood, the third and fourth measures capture the street greenery qualities (enclosure and connectivity) that might promote physical activity. Finally, we use regression analyses to examine whether street greenery is distributed disproportionately according to socioeconomic and racial/ethnic status and different age groups. In the models, control variables that might correlate with street greenery availability and qualities include population density, land use diversity, street connectivity, park area density, and neighborhood age.
Environmental justice studies of urban green space have focused on urban parks and their spatial distribution. Therefore, our understanding of the distribution of easily accessible street greenery is limited. This study will add to the environmental justice discussion in landscape planning and design. Further, our analyses will help practitioners better understand the availability of the existing street greenery across a city and contribute to finding areas for greenery improvements.
FILM
The inspiration for 'A Book of Days' was the chance discovery of my mother's diary from 1938-42, when she was a young woman living in New York City. While, on the one hand, the text itself was captivating in its own right, equally compelling was the structure of the actual journal; which juxtaposed five year-long narratives, conveyed in days, horizontally across 365 vertical ones, spanning years.

The film, an original durational work, explores this distinction—between singularity and iteration, specifically, between calendar dates, that repeat, and lived days, that do not (Leopold 1966; Wang 1995; Grant 2005). In both content and structure, the work contributes to scholarship on landscape, film, and slow cinema (Helphand 1986; de Luca 2016).

It was created over the course of six months in the spring of 2018 during a Fulbright fellowship at The Glasgow School of Art (Scotland). During this time, Glasgow experienced a dramatic increase in daylight of ten and a half hours, but did so gradually through increasing and decreasing daily increments from one to five minutes.

'A Book of Days' analogs this change—pairing a 'calendar' (a collection of 180 video observations of increasing and diminishing length, shot daily and assembled in sequence) with a 'clock' (180 cinema clips of equivalent duration, drawn from films screened at the Glasgow Film Theatre during the same six-month period).

The results, a 10.5 hour looped mp4 video, was constructed and synchronized such that the 'calendar' and 'clock' tracks play simultaneously side-by-side, with one important modification: the cinema clips (on the left) are muted in favor of recorded ambient sounds originating in the street photography (on the right).

The film explores several themes: how we sense time and struggle to record lived experience; the significance of increments and the power in their accumulation; relationships between the tangible and the implied; and use of physical or temporal datums against which change can be perceived (Leopold 1966; Calvino 1988; Eco 1989).

Its overarching intention, however, is to reflect on both the fullness and emptiness of lived as well as constructed time (Warhol 1964; Akerman 1975; Gordon 1993; Marclay 2010; de Luca & Jorge 2016).

In 2019, 'A Book of Days' premiered in full-length as part of a larger exhibition of my work mounted at
the University of Pennsylvania’s Arthur Ross Gallery. A special 15-minute 'reel' drawn from this master work would be produced for conference screening.

*This film was submitted under the People–Environment Relationships track.*
Landscape Architectural Approach toward Battlefield Landscape Preservation

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Keywords: historic landscape, preservation, battlefield, threats, comprehensive preservation plan

Palmito Ranch Battlefield is an open landscape where the last land-based Civil War battle took place in 1865, located on the Texas-Mexico border near Brownsville, Texas, along the Rio Grande river. The battlefield has long been identified as a national priority area for protection due to its historic integrity and cultural resources. The core of the battlefield was listed to the National Register of Historic Places in 1993 and then elevated to National Historic Landmark (NHL) status in 1997 with the total size of 5,991 acres.

In 2015, authors and project partners set out to update the NHL nomination by including an additional 3,400 acres to the Palmito Ranch boundary to safeguard the historic landscape against emerging development pressure. In 2017, we initiated the development of a comprehensive preservation plan including an overarching vision, seven preservation goals and 21 strategies to achieve these goals. With the intent to raise public awareness about the importance of the historic landscape, this film tells the story of the Palmito Ranch battle and presents the collaborative work we had undertaken over the past five years with the support of the U.S. National Park Service. The video highlights critical landscapes in the battlefield, as contrasted with an increasing level of threats, ranging from urbanization and border walls to LNG pipelines and commercial spacecraft launch facilities. The video captures key moments from project activities, interviews with land owners and local stakeholders. In addition to traditional military analysis that archeologists and historians use for battlefield preservation research, we approached the project from a landscape architectural perspective employing common design methods including landscape system inventory, SWOT analysis, and case studies to understand the broader context of the historic landscape and its heritage. The film conveys core messages for long-term preservation and calls for urgent and collaborative actions through community engagement. It highlights how battlefield preservation can become an area of concentration in the landscape architecture profession by expanding the scope of historic landscape research, practice, and advocacy.

The 9-minute video begins with onsite scenes of landscape features, key natural and cultural resources, and environmental/visual disturbances in the battlefield site with voices of prerecorded audio narrative, followed by a series of images and snippets of videos from public meetings and field trips to showcase our preservation efforts. The film’s target audience is landscape historians, landscape preservationists, and anyone interested in cultural landscapes and American battlefields. The video is available at https://youtu.be/zcG5Ez2xmcA.

This film was submitted under the History, Theory, & Culture track.
New River: Film and Undocumented Design

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Keywords: Film, Narrative, Invisibility, Immigration, Standards

In the speculative design project "New River: Thompson's Crossing Remediation Wetlands," film is used as a critical counterpoint to the technical documents landscape is constructed from. The impact of the project, which is atypically emotive for a work of landscape architecture, depends upon the human connection made through the telling of a story. Through an exploration of the film and its role in the larger design project, this paper will position film as a powerful medium to explore narrative, informality, and the social implications of design drawings.

The project "New River" uses the techniques, visual language, and funding mechanisms of the ecological and irrigation projects governing the terrain of the Imperial Valley (California, US/Sonora, MX). Within the technical rigor and ecological function of this wetland project exists another construction: a fountain of freshwater for undocumented immigrants crossing the California desert through the New River. Challenging the landscape architect to examine the political role of “the standard,” the project reveals the very basic fact that each pipe, each channel, and each detail of our designed terrain is saturated with politics and directly affects human lives.

The film "New River: La Vereda de Lupe" tells a story of invisible uses and undocumented designs in the landscape. Using the power of an underrepresented medium in landscape architecture as a fulcrum, the project reveals the often invisible social relationships hidden by normative forms of landscape representation, and projects a means of designing for the invisible.

*This film was submitted under the Diversity, Equity, and Inclusion track.*
Geo-Spatial & Digital Analytics
Geo-Spatial and Digital Analytics

Analyzing the Transformation of Pre and Post-Urban Wetland Areas in Purbachal New Town, Bangladesh

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Keywords: Land transformation, Remote sensing, GIS, Geodesign, Resilient cities

Dhaka, the capital city of Bangladesh is one of the fastest-growing metropolitan regions in the world. The physical and environmental features largely contributed to the growth of the city (Khan, 2000). But due to the rapid urbanization, human-induced changes have transformed the natural landscape of the city adversely (Dewan et al., 2009). To solve the ever-increasing need for housing and to reduce the pressure of the population from the capital city, the Purbachal satellite city was planned. It is the largest planned township in Bangladesh with an area of over 25 square kilometers (Dhaka Structure Plan, 2015). Purbachal is situated at the confluence of the Shitalakhya and Balu rivers. Historically a low-lying wetland, Purbachal has gone through a rapid transformation in past decades. The water bodies around the area have been filled in to create new developable land which drastically altered the existing hydrological patterns making the satellite city susceptible to flooding.

Through remote sensing and GIS analysis, this study investigates the transformation of wetland areas in Purbachal New Town. By combining geospatial modeling with impact simulation, the study created a feedback process that facilitates the development of sustainable design strategies. The study is divided into three main phases. In the first phase, the changing urban land use and land cover (LULC) conditions of the region were analyzed to understand the geospatial structure of the region. In the second phase, the performance of the existing master plan of Purbachal was evaluated, and the potential consequences of the intervention were discussed. Finally, new design guidelines were developed based on Geodesign principles (Steinitz, 2012) to adapt development to ecological patterns to minimize flood risks while still maximizing density.

The goal of the study is to explore the complex interrelation of different factors responsible for the growth of a city and develop a framework for future resilient cities in the region. As the urban population is expected to grow in the upcoming years, nearly 7 of 10 people in the world will live in cities (Cohen, 2003). It is important to develop sustainable development strategies to make future cities an environment-friendly setting (Calthorpe, 2010). The outcomes of the study include the formulation of an alternative city planning process aided by Geodesign tools and the establishment of a systematic urban planning approach guided by the natural land transformation analysis to create cities where people will be able to live in harmony with nature.
Determining Impacts of Changes in 3D Urban Morphologies on Land Surface Temperature Using Bi-Temporal Airborne Laser Scanning

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Keywords: Surface Urban Heat Island, Airborne LiDAR, Land surface temperature, 3D urban morphologies, Urban green space

Increases in impervious surfaces accelerate the urban heat island (UHI) effect in urban areas. Many studies have been conducted to determine the relations between urban morphologies and land surface temperature (LST). To date, with the advancement of laser scanning technologies, several studies have attempted to explain the effect of 3D urban morphologies on LST. However, to the best of our knowledge, few studies have examined the temporal changes in LST with 3D urban morphologies. Therefore, this study aims to illuminate the association between 3D urban morphologies and LST using bi-temporal airborne laser scanning data and Landsat imagery. We answer three research questions for this study: 1) Which 3D morphological variables affect the changes in LST? 2) Which 3D morphological variables explain LST most? 3) How much urban green space would be required to reduce the UHI? The study area was a neighborhood in the city of Cheonan, Republic of Korea, recently developed from barren land (2013) to a high-rise residential and commercial area (2018). The airborne laser scanning data were collected in 2013 and 2018. First, LST derived from Landsat was calculated each year. Then, we classified the LiDAR data into buildings, vegetation, and ground. We then calculated the 3D morphological variables (e.g., building and vegetation volume, building and vegetation height, leaf area index) each year. Lastly, we conducted year-to-year comparisons of these variables. Anticipated results could be verified by examining the Pearson coefficient (r) between the changes of 3D urban morphologies and LST. We assumed that LST would be most affected by building height, area, and volume, since tall buildings create more shade in areas adjacent to buildings than vegetation. Moreover, we expected vegetation structures (including green areas, canopy volumes, and leaf area index) would be negatively correlated with LST. However, since the areas shaded by the vegetation could be smaller than those shaded by the tall buildings (building height >= 8 m), their changes could explain little of LST. We thought that our results would show that LST changes could be related to the changes in the 3D structures of both buildings and vegetation. In particular, areas near the compact low-rise areas (building height < 8 m, fraction of building area >= 0.4) could be vulnerable to UHI effects. In that case, we inferred that well-structured vegetation (i.e., tall trees and high leaf area index) could help reduce the UHI near compact low-rise areas.

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Developing Best Management Practices for Trail Spurs along the North Country Trail in North Dakota with GIS Data

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Keywords: Trail spurs, North Country Trail, North Dakota, ecotourism, GIS, analysis, Common Ecological Regions CER

The North Country National Scenic Trail (NCNST) is the longest in the National Trails System, stretching 4,600 miles across eight states from North Dakota to Vermont. The study area is focused on North Dakota. Locating spurs off NCNST will enable unique cultural and environmental opportunities along with recreational opportunities. The trail spurs do not currently exist. Successful trail design requires an understanding of hydrology, geology, soil science, engineering, and trail construction and maintenance. The application of best conservation practices will boost ecotourism within the state. This study uses Common Ecological Regions (CERs) as a mapped ecological framework to guide comparative analysis of differences in maximum trail incision and trail width at varying slope levels for hiking trails in four CERs in the North Dakota region. The Northwestern Glaciated Plains ecoregion marks the westernmost extent of continental glaciation ecoregions developed by the USFS (Bailey and others, 1994), the USEPA (Omernik, 1987, 1995), and the NRCS (United States Department of Agriculture - Soil Conservation Service, 1981). A point-measurement trail assessment procedure was utilized to measure maximum incision and width for 480 miles of trails. Results show a significant effect of CER on trail width and maximum incision and a significant effect of trail slope on maximum trail incision. Maximum trail width and incision were greatest in the grassland region, perhaps due to environmental features such as erodible soils, and sparse trails, de-vegetation, higher use, and/or user behavior. Maximum incision increased consistently with slope for three of the four CERs. Relative to other trail impact research, the sites assessed in this study were in similar condition to other trails on the specific parameters measured. The findings from this study reinforce results from previous research that certain impacts to hiking trails, especially width, are comparable or less than hiking or multiple-use trails, and significantly less than impacts to equestrian or off-highway vehicle trails. Studies on exiting features within a 30-miles buffer of the North Country Trail such as landcover, various water bodies, and nearby suburban population densities will allow a set of criteria to be formed and ranked. Suitability analysis of existing feature classes are reclassified and weighted by criterion importance to compute a surface raster that will be further examined to pinpoint site selection most suitable for trail expansions The study was used to create a fixed set of best management practices to include a comprehensive list of program suggestions to aid trail builders in identification and design of best-fit trail spurs for trail incision along the NCNST.
The Development of BIM Tree: The Parameter Set and Data Template with LoD

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Keywords: BIM for landscape architecture; parametric tree model; LoD

The purpose of the study is to test on the methods and to evaluate the effects of a proposed parametric modeling approach to develop the individual BIM tree.

The current BIM tools are not sufficient to fulfil the requirements of landscape architecture professional practice, especially in terms of the function of tree modeling. The maturity and quality of BIM solutions for Landscape Architecture are far behind the architecture profession’s solution. Early efforts to adapt landscape specific tools into Autodesk products failed, as supposed by Lindhurst and Sipes in the project Olmsted.[1] There is no BIM software on the market that covers all core requirements (e.g. planting, grading, irrigation, lighting) in the landscape design field[2], despite certain BIM orientated functions have been developed in VectorWorks or LandFX.

The tree models currently developed with BIM applications come in 3D CAD format, either as simple volume based models, image based RPC models or visualization software originated highly detailed 3D models. Such models, coming without representation of the root system, focus on aesthetic or illustrative purposes. They can contain some attached attributes, but be limited in their ability to represent the trees' growing and space requirements. Therefore, many benefits of BIM, such as clash detection, scheduling and quantity take off, can't be utilized.

For the success and acceptance of BIM as design tool for our profession and to facilitate the full capacity of practicing with information, it is crucial to develop BIM tree to deal with the shortage of 3D CAD tree models and meet the daily practical requirements of landscape architects in terms of software implementation and dendrological expertise.

We experiment on a parametric approach for the shape and growth of trees in a BIM environment with different levels of LoD (Level of Detail).

We firstly select an envelope that allows to describe the asymmetric forms for the existing trees and the one for a wide range of different species for the planned trees. The envelope is the hull model originally proposed by Horn [3] and Koop [4] and then extended by Cescatti [5], which is defined using six control points in six directions and two shape factors that control its convexity.

Then, we select and define a number of growth functions for calculating the shapes and volumes in time (age) describing the morphological traits of a tree specific to its inherent species characteristics. Amongst others, the growth function of Chapman-Richards’ is selected[6-8].

Besides the geometric body of the model, we define the information required in each design stage, known as LoD, based on our proposed modelling approach and undergoing efforts of standards for landscape BIM elements.
The proposed developing methods are proven to be effective, because the algorithm and parameters are successfully tested in Autodesk Dynamo visual programming environment. A group of Revit family of specific tree species are implemented with full BIM function, including real time visualization, quantity take off as well as clash detecting among roots, pipes and structures.

The parametric tree object is an important element to the development of BIM for landscape architects and contractors. It ensures that designers, contractors, suppliers and clients can use the same object across the whole life cycle for the project. The proposed tree models will make the professional work more efficiently and improve the collaboration with architects and engineers. Parametric trees will create a better link between the BIM model and the building environment, and give us the possibility to create intelligent facility management models, also known as digital twins.
The Impacts of World Heritage Designation and Management Improvements: A Big Data Study of San Antonio Missions, Texas, USA

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Keywords: World heritage; Impact; Management; Topic modeling; Sentiment analysis; TripAdvisor

UNESCO has identified well over 1,000 World Heritage global sites through 2020. While World Heritage designations aim to identify, protect, and preserve the most significant cultural and natural sites, they are also believed to attract attention to the sites’ historical or environmental importance, increase their prestige, and promote tourism. The actual public awareness of the World Heritage designation is, however, lacking in research and probably varies between locations. To recognize the impacts of World Heritage status on people and enhance the future management of World Heritages, we analyzed 21,000 TripAdvisor reviews of the San Antonio Missions published prior to and after their 2015 inscription on the World Heritage List, through topic modeling, sentiment analysis, and manual identification. Our research goals consist of investigating the changes of review numbers, topics, and attitudes pre- and post-2015, as well as visitors’ recognition of the World Heritage status and their dissatisfaction causes after the designation. We found that: a) the World Heritage impacts may be over-estimated due to a diminishing visitation number over time, visitors’ low references to the World Heritage status, and the inconspicuous effect of designation on visitors’ sentiments; b) the less-visited suburban and rural locations have higher recognition of their World Heritage status and higher visitors’ satisfaction than those in the prime urban locations (the Alamo); c) the factors that influenced visitors’ attitudes include onsite features such as activities and services, preservation and maintenance, historical references, regulations, and others, in addition to some external and subjective variables such as discrepancies with expectations, perceived historical bias, and comparisons with other visited spots; d) service improvement, maintenance, and clear signposting are expected in all missions, while the Alamo specifically needs to restore a better sense of history by addressing the over-crowding, over-commercialized, and city encroachment issues. The discovered topical and attitudinal patterns provide references for analysis of the impact of world heritage applications and direct site management.
Integrating Machine Learning Urban Prediction and Landscape Performance Models to Assess Resilient Grown Scenarios

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Keywords: Land transformation model, urban prediction, resilience, landscape performance; design scenarios

Globally, more than 600 million people live in coastal regions lower than 10 meters above sea level, and 2.4 billion people live within 100 km of a coastline (United Nations, 2017). Eight percent of U.S counties are located on the coast with 39% of the total population living in coastal counties (Wilson & Fischetti, 2010). Tampa, Florida is ranked in the top five of U.S. cities most vulnerable to flooding and is expected to grow by over 100,000 people by 2040 (Climate Central, 2012). Sea level rise due to climate change (in both Tampa and globally) makes coastal populations more susceptible to flood impacts. The capability to accurately predict both future floodplain changes and future urban growth allows for the ability to better prepare coastal communities for the effects of future climate change supports flood risk mitigation (Batty, 2008).

In this research, a series of tools are used on multi-scalar spatial datasets to increasing resilience and decrease pollutant loads in a flood prone, contaminated neighborhood. The Land Transformation Model, a Geographic Information Systems-based neural network, is used to predict potential future urban growth in Tampa using three different scenarios: 1) Business as usual – predicted urban growth based on current growth patterns; 2) Growth as planned – predicted urban growth based on the current land use plan; and 3) Resilient growth – predicted urban growth based on all future development occurring outside of the floodplain.

This research asks, how effective is the current comprehensive plan in adapting urban growth to decreasing flood risk and pollutant load? The site is a coastal neighborhood heavily affected by flooding and characterized by industrial land uses, brown fields, and US Environmental Protection Agency’s Toxic Release Inventory sites. Three master plans are developed based on each scenario’s prediction outputs. Then, landscape performance models are ran on each scenario to project impact (Newman et al. 2019). The Long-Term Hydrologic Impact Assessment Low Impact Development Spreadsheet is used to estimate long-term average annual runoff and nonpoint source pollution resulting from each design’s land use configurations. Results suggest that the business as usual scenario increases impervious surfaces, decreases green infrastructure, increases high flood risk area, and increases public exposure to contaminants in surface runoff; the resilient growth scenario reduces runoff depth and volume and significantly decreases all 14 pollutants monitored by 30% lower than the business as usual scenario.
Landscapes and Their Relationship to Surface Urban Heat Islands

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Keywords: land cover, urban heat islands, landscape ecology

In the United States, heat is responsible for the highest number of fatalities among weather-related events (NOAA 2019). As landscape architects, we strive to design, manage, and conserve landscapes to ensure healthy socio-ecological environments. Studies in fields such as urban climatology and geography indicate that land-cover and land-use changes are linked to the occurrence and intensification of urban heat islands (Goward 1998; Voogt and Oke 2003). Our study focuses on the understanding of the role of landscapes in changes to surface temperature. We use Fairfield and New Haven counties, in Connecticut, USA, as a case study to understand how changes to land-cover over time have affected the occurrence of urban heat islands in the region. Our presentation will focus on preliminary data produced that indicates the relationship between land cover changes and urban heat island occurrence and intensification. We use a combination of GIS-based systems to interpret and analyze how these landscapes have changed over time. To do so we compiled LANDSAT 5 and 8 satellite imagery for the periods of 1999 to 2019. We use Google Earth and SAGA GIS to catalog different land-cover types and classify them into local climate zones (LCZ), analyzing both the morphology and permeability of the land surfaces (Stewart and Oke 2012). We then use land surface temperature retrieved form the thermal bands of the satellite images using Google Earth Engine, as a proxy to understand the occurrence of urban heat islands (Ermida et al. 2020). Point data from both the land classification and land surface temperature images created were extracted to enable a statistical analysis of the correlations between land cover changes and urban heat islands. This data is complimented by in-situ sensor measurements taken in the city of New Haven, recording data in different land-cover classification types between August 2020 to February 2021. Finally, we suggest the use of principles of landscape ecology (Dramstad, Olson, and Forman 1996; Ahern 1999) to further investigate our findings and alignments with other studies (Debbage and Shepherd 2015; Fu and Weng 2016) to evaluate how landscape contiguity and form could play a role in exacerbating or mitigating urban heating.
Mapping the Wildland-Urban Interface and Historical Fire Perimeters to Inform Design and Planning Efforts in Growing Californian Communities

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Keywords: Mapping, wildland-urban interface, WUI, wildfire, urban design, resilience, climate change adaptation

A century of wildfire suppression, a rapidly changing climate, and growing development at the edge of wildland is increasing the risk of catastrophic fires in the American West. This study is a part of a larger project that seeks to understand how designers might modify the built environment or advocate for policies to lessen the impact of wildland fires on communities. It is premised on the idea that the liminal space between wildland and the built environment, where landscape systems inform community structure and where the presence of humans disrupts the ecological processes that define these systems, is a place where design and planning ideas can make a profound impact and where landscape architects can employ their expertise and become stewards of change. Acknowledging that wildland fire is a wicked problem, the project examines a range of multi-scalar tactics to reduce risk and bolster resilience – from the scale of watersheds down to individual plants.

The purpose of this particular study is to unpack how descriptive geospatial mapping techniques might inform community-level wildland fire risk reduction tactics. In particular, it explores how the mapping of the wildland-urban interface (WUI) and historical fire perimeters might help communities grow and develop with wildland fire in mind. The study positions landscape architects as advocates for land use planning strategies that have the potential to bolster community resiliency. The study began by identifying 55 California cities with an above average population growth rate from 2010-2018, to isolate communities with potential development needs. These communities were then mapped to better understand their spatial relationship to the WUI and historical fire patterns. Two key findings from the study were that, within three miles of their municipal boundaries, 96% of the cities surveyed had wildland-urban interface areas and 84% had at least one historical fire perimeter.

This information was then used to formulate a new urban design studio at the University of California, Davis to explore future development patterns for one of the 55 cities surveyed, Vacaville. To determine sites for the studio, the instructors first looked for potential development sites that were outside of the WUI and had not been impacted by historical fire perimeters; in the end, two centrally-located infill sites were selected. The students spent five weeks exploring a new paradigm of “wild urbanism” for the city, one that brought aspects of wildland into urban sites rather than bringing aspects of urbanism into peripheral wildlands.
Multispectral Drone Data Analytics: Estimating the Carbon Stock of a Designed Meadow through Time Series Analysis

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Keywords: Drones, unmanned aerial systems, photogrammetry, multispectral imagery, time series

Drones with multispectral sensors that capture visible and nonvisible wavelengths of light can map the presence and health of vegetation. Given the ease and efficiency of surveying with drones, landscapes can be surveyed monthly to create time series that map changes in vegetation with unprecedented detail. Time series of drone data can be analyzed to quantitatively map spatiotemporal phenomena such as photosynthetic activity, the growth and decay of biomass, carbon cycling, and the flowering of plants. Drone data analytics can also be used to map and quantify the environmental performance of landscapes and the provisioning of ecosystem services. Louisiana State University’s Hilltop Arboretum in Baton Rouge is restoring 4 fields as coastal tallgrass prairie, a highly endangered ecosystem of which only 1% remains intact (Grace et al. 2000). We conducted a series of monthly aerial surveys of the Cajun Prairie Wildflower Meadow at the arboretum to monitor the development of this newly established meadow and estimate its ecosystem services. After establishing 9 permanent ground control points, we flew monthly missions with a fixed wing drone with a multispectral sensor to capture a time series of red, green, blue, near infrared, and red edge imagery at centimeter resolution. We also collected field samples of soil and above and below ground biomass for laboratory analysis in order to calibrate our data from the drones and determine the carbon stock of the meadow. Data analytics from the surveys – including vegetation indices, above and below ground biomass, carbon stocks, and flower counts – inform the ongoing management and valuation of the meadow. While laboratory analysis is still underway, based on preliminary results we estimate that the meadow had a peak carbon pool of 1310.90 g·C·m-2 in its first year. Over the coming years we will continue to survey the meadow in order to chart seasonal fluxes in carbon and quantify how its carbon stock evolves as it matures.
Multispectral Sensing for Evaluating the Landscape Impacts of Microfarms

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Keywords: Geospatial Analysis, Remote Sensing, Unmanned Aerial Vehicles, Landscape Analysis, Agriculture

Small UAV, or drones, are affordable platforms for remote-sensing activities. UAVs offer accurate and robust data to depict and analyze urban and rural landscapes. For these reasons, they are becoming increasingly common in the design sciences, specifically urban planning and landscape architecture. Landscape researcher Karl Kullman notes that the imaging capabilities of UAVs is particularly well suited to the scale of landscape architectural design. He writes “Given that existing satellite derived mapping technologies and techniques poorly serve this scale, the drone’s eye exhibits significant transformative potential in landscape architectural practice and theory.” (Kullman, 2017) Indeed, UAVs provide designers and planners with the ability to aerially image and map the landscape at a resolution comparable to on-the-ground experiential imagery.

Research on the utility of UAVs to landscape architectural and urban planning analysis has largely been limited to visible light (RGB) photo and video sensors. However, drones can be equipped with sensors capable of detecting both visible and invisible changes to the land. Multispectral cameras, for example, can employ Green, Red, Red-Edge and Near Infrared wavebands to monitor plant health. Analysis of these wavebands can be used to generate maps of vegetation indices, the most common of which is the Normalized Difference Vegetation Index (NDVI). NDVI quantifies vegetation by measuring near-infrared (which living plants reflect) and red light (which plants absorb). NDVI can differentiate bare soil from grass or forest, detect plants under stress, and can differentiate both between crops, and the same crop at different growing stages.

This paper will present preliminary findings from a study evaluating the utility of unmanned aerial vehicles equipped with multispectral sensors as tools for monitoring the landscape impacts of newly constructed high-tunnel micro farms. For this study, high-resolution multi-spectral imagery is being collected from two urban and one rural micro-farm sites in Central Ohio. Each UAV pass includes Normalized Difference Vegetation Index (NDVI), Green NDVI, Normalized Difference Red Edge (NDRE), and high-resolution color capture that is being analyzed to reveal spatial changes in plant composition, density and distribution over the growing season. UAV data is being analyzed to determine how site conditions (like elevation and soil type) and changes in management practices impact vegetation health and plant diversity. Long term changes in land cover are being assessed by comparing UAV data to historic satellite images. The findings will shed light on the potential of multispectral sensing for landscape architectural research.
Predicting Community Approval of Green Stormwater Infrastructure Using Random Forest Classification Model

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Keywords: Green stormwater infrastructure, machine learning, random forest algorithm, landscape perception, landscape preference

Overview:

Community support is often necessary in the implementation of green stormwater management solutions, be it on private yards or shared neighborhood landscapes. A number of variables may affect whether green stormwater infrastructure is well-received by a community – for instance, the practice’s physical characteristics, the landscape context in which it is placed and the observer’s own aesthetic preferences. Numerous studies in the literature have sought to understand public perceptions of these practices and assess the degree of public support. However, results from such studies are mixed, likely reflecting differences in methodology, context, and appearance of the specific practices studied. Nevertheless, the literature suggest that there are discernible characteristics of L-SWMPs that tend to elicit approving or disapproving sentiments. By constructing a dataset of case studies that have been published in the literature, we seek to understand which characteristics of L-SWMPs may be most critical in influencing community support.

Method:

A dataset of 80 L-SWMP case studies with 34 variables relevant to perception was extracted from a review of 71 publications. These variables included physical characteristics of the practice (e.g. size, shape, vegetation), context (e.g. climate, adjacent land use), respondent characteristics (e.g. if respondents were visitors or neighbors), among others. As documentation varies across studies, missing variables were augmented with satellite data and public databases. Random forest, a classification algorithm based on decision trees, is used to identify variables that are most influential in predicting if a practice would receive approval or disapproval from an observer.

Key findings:

We created two Random Forest models, one to predict practices that received high levels of approval and another predicting clear disapproval. A model that included size, observation of wildlife, the presence of water, practice aesthetic, urban density and practice shape as predictor variables was most accurate in classifying practices that received high approval. Under this model, a large practice that maintained either no visible water or a permanent body of water, with a picturesque aesthetic, located in a high-density area, and attracted wildlife would be most likely to be classified as one that received high levels of public approval. On the other hand, a model that included proximity to home, the
presence of water, land use context, observation of wildlife and the presence of trees as predictor variables was most accurate in classifying practices that received high disapproval. Under this model, a practice located in single-family residential context that had visible water fluctuating with storm events, no observable wildlife, implemented close to private property and had no trees within / nearby would most likely be classified as one that received high levels of disapproval.
Progress of an Artificial Intelligence System for Continuous Site Inventory and Assessment

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Keywords: post-occupancy assessment, site analysis, behavioral mapping, artificial intelligence

Landscape architects and designers often use case study as a method towards understanding the built environment. Understanding opportunities and constraints of past projects is critical towards moving the profession forward while generating actionable and quantitative data for use in future projects. Firms rarely have the opportunity to learn from their own work as performing post-occupancy evaluation using traditional methods is costly and time consuming due to limited contracts and business repercussions of excessive non-billable time.

Taking advantage of current artificial intelligence and deep learning technologies, a system is under development to automate data collection typical of post-occupancy evaluation and inventory. Using multiple cameras and (admittedly high end) consumer grade hardware, the system is capable of accurately identifying people within a defined area without recording personally identifying information or maintaining a log of people’s images. The unique ID codes assigned to an individual are then used in projecting the real-world location of people in two-dimensional space to generate a map of usage and movement within site boundaries.

This system differs from existing processes by using permanent fixed cameras and lightweight processing algorithms to capture data throughout the entirety of a day regardless of time, weather, or schedule. This methodology avoids the time cost, limited time of assessment, and possible observational and individual biases (whether intentional or unconscious) inherent in sending designers on site to record site usage through traditional manual methods while mitigating issues with occlusion, lighting, or perspective distortion typical of single camera automated systems.

This demonstration builds on the previously work published in CELA 2020’s proceedings, with improvements made in processing speed and bandwidth, testing exterior conditions, and more accurate geolocation and tracking. Additionally, output from the re-ID and mapping systems include confidence scores and frame-by-frame tracking for data validity testing and documentation. Results from the system in progress will be presented and associated opportunities and constraints will be discussed.
Tough Clients/Complex Sites: A University-Led Community Conversation Strategy to Build Public Trust

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Keywords: landscape architecture, geodesign, geodesignhub, arcgis, community engagement, community outreach, collaboration

Planning for land use change can quickly become contentious when protection of water resources are at risk and when previous planning projects have already led to concerns over public trust. This paper highlights how Penn State University developed a hybrid 'community conversation' strategy for future plans for a sensitive, 356-acre University-owned property. Through a tightly structured design and community input process, an interdisciplinary team of faculty and students worked with a non-profit organization, community-group leaders and municipal officials, the general public, university leaders, and faculty and students to provide a range of viable management strategies for the property in question. Using Gedesign’s transparent planning process to give community members a strong voice, this paper highlights a unique community engagement process where traditional community engagement tools (presentation, charette) are augmented by digital tools – including ArcGIS Pro as a source of data and systems mapping, Geodesignhub to allow stakeholders to create their own design scenarios and StoryMap as a presentation tool to convey outcomes – together to help stakeholder and land owners make hard decisions and reach consensus regarding complex land use and development issues in an engaging, collaborative way.
Urban Flood Risk Assessment for Sponge Cities Based on the Urban Landscape Pattern: A Case Study in Fuzhou, China

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Keywords: urban flood risk assessment; urban landscape pattern; sponge city

Floods are one of the most threatening natural hazards affecting human life and property. A flood risk assessment is essential for the development of a sponge city. For the city environment, many studies have focused on the urban river system, urban vegetation cover, and topography. However, while urban flood risk assessments are employed in the planning of cities, few scholars have analyzed them from the perspective of urban landscape patterns in sponge cities.

This paper presents an urban rainwater sensitivity evaluation model to analyze flood risk based on the urban landscape pattern in Fuzhou, a sponge city in China. The objective of this study was to develop a GIS-aided urban flood risk assessment. Research data include land use data, Landsat 8 satellite imagery, DEM data, and rainwater system maps. The assessment model incorporates five parameters: urban green space landscape patterns (class area, patch density, landscape division index, connectance index, and patch cohesion index), urban land use, topography (undulation and roughness), urban vegetation cover, and urban impervious surface rate. Based on different weighting sets, a flood risk map can show the areas where flood risks are high. This flood risk map can be used to plan the sponge city. Finally, the assessment model will be compared with the real waterlogged points to validate its accuracy.
Aesthetics in Landscape Architecture Discourse: The Beautiful, Meaningful, and Particular

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Keywords: design theory, aesthetics, philosophy, phenomenology

Aesthetics is one of landscape architecture’s core defining concepts (Hubbard and Hubbard 1938; Murphy 2016; Herrington 2017). However, because of a lack of clarity surrounding the term, aesthetic considerations are frequently left out of design discourse (Weller 2018; Meyer 2008; Moore 2010). A renewed interest in redefining aesthetics within the field indicates that the discipline is not ready to give up on the concept (van Etteger, Thompson, and Vicenzotti 2016; Meyer 2015; Blanchon-Caillot et al. 2012). With the hopes of reinvigorating aesthetic discussions within landscape architecture, this paper describes how aesthetics has been used within landscape architecture discourse. I argue that these uses share a common aim: they all create a space within landscape architecture for the consideration of the particular and immediate experience of a landscape.

Aesthetics as a concept in landscape architecture discourse can be classified into three general definitions: (1) Aesthetic as “the beautiful” draws from the philosophies of Kant (2007) and Burke (2008), and suggests that the aesthetic experience is about pleasure, particularly the pleasure that arises from viewing beautiful arrangements of form; (2) Aesthetics as “the meaningful,” inspired by Hegel (2004), Gadamer (2004), and Danto (2014), places cultural meaning as the central aesthetic aim; and (3) Aesthetics as experience, based Dewey’s pragmatism (1980) as well as phenomenology, shifts focus from the aesthetic object to the aesthetic experience – the interaction between a subject and its environment. While the beautiful and meaningful are often pitted against each other in war of binaries (form vs. content, feeling vs. thought, image vs. text) (for example: Treib 2011; Gustavsson 2012), all three conceptions all describe an aspect of landscape architecture - be it pleasing compositions, cultural meanings, or personal experiences - that cannot be reduced to scientific or instrumental approaches to landscape architecture. I suggest that, then, the concept of aesthetics in landscape architecture serves as a placeholder for what is in landscape architecture that lies outside of scientific, instrumental methods and solutions: the particular, immediate, entangled, and unpredictable experience of a landscape. To paraphrase Merle Flannery’s conception of aesthetic consciousness (1974), perhaps aesthetics in landscape architecture is about “this [landscape], experienced by ourself at this time of day in this place” (4) rather than any abstracted conceptualizations generated from the experience. This raises challenging questions for designers: How can we teach or evaluate aesthetics, if we are aiming for the experience is subjective? Perhaps the aesthetic aim of the design should not be a perfect arrangement of forms or a symbolic shared meaning, but, instead, the creation of an invitation for a deeper sensory engagement with place. This invitation can be accomplished through beautiful form or meaningful symbols, but there are many additional possibilities yet to be explored.
After the “Plantationocene”: Redefining the Productive Landscape

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Keywords: anthropocene, working landscape, labor, pastoral

In 2014, a group of anthropologists collectively coined the term “Plantationocene” to join the scene of the “cenes”—Anthropocene, Capitalocene—that attempt to define the indelible human mark on the geological record. The Plantationocene, as a concept, indicts a particular ethos of transforming the land through institutions of slavery and indentured servitude, calling attention to “the historical relocations of the substances of living and dying around the Earth as a necessary prerequisite to their extraction . . . [it] depends on the relocation of the generative units: plants, animals, microbes, people.” This paper will work from this provocation to redefine productive landscapes as socially productive landscapes. These landscapes are not only places, but a scale that elicits social roles (individual, community, institution) by supporting the material reproduction of everyday life.

The western pastoral landscape has its origins in paintings of animal husbandry and agriculture, and was later transposed to American landscape design. The direct connection to rural life receded in this migration but the cultural value of the pastoral still lies in restrained patterns of productivity; reference to the “meanness of a shepherd’s life” is never on display. In contrast, other productive landscapes can be defined by the inversion of these values; constructed wetlands, which provide “ecosystem services,” are often as didactic as they are functional.

In these productive landscapes—the pastoral and the functional—human labor is unobtrusive or intermittent, and patterns of planting, species selection, and formal geometry suggest aesthetic exchanges between the two types. Recent work by Jay Cephas and Jane Hutton seeks to recover labor in the landscape as a historical investigation. These narratives not only assign proper credit to the physical work of landscape construction, but also acknowledge forms of knowledge and invention amidst exploitative practices. This paper will synthesize these precedents to explore present-day possibilities of the design of a landscape as a workplace, with particular attention to calls for a Green New Deal and a COVID-19 induced need to reconsider the range of activities that could happen outdoors.
“American Beauty” and Other Ideas Fit for the Scrap Heap: A Lesson from the 1960s

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Keywords: junkyards beautification

This paper visits what The Architectural Review in December 1950 called the “mess that is man-made America.” In response to the provocation of the British magazine, Life posed the question: “America—The Beautiful?” (1957). What was this beauty? Where was it to found? To what or to whom was it being lost? One signal response to these questions was articulated by President Kennedy’s Secretary of the Interior, Stewart Udall, in his The Quiet Crisis (1963), a Marshian study of man’s changing relationship to nature, and man’s role in changing nature. Our focus shall be upon the first paragraph of the book, where Udall ominously and anecdotally lays out the terrain: “One week last fall two events came to my attention which seemed to sum up the plight of modern man: the first was a press report which indicated that T.S. Eliot, the poet, was a victim of London’s latest ‘killer fog’ and lay gravely ill [Dec. 6, 1962]; the second was a call from a preservation-minded citizen of New Hampshire who informed me that Robert Frost’s old farm, ‘West-Running Brook,’ was now an auto junk yard.” The expatriate Eliot’s victimage to London’s air requires separate analysis, as does Frost’s time in London, writing about remembered scenes from New Hampshire. What matters here is that Frost’s old farm—become-junkyard—tells of a plight, a form of visual pollution, as pervasive to America as fog to London, and certainly not to be contained by mended walls (pace Frost). What was required to make moral and aesthetic sense of the junkyard was an amended sense of picturesque America. This paper examines the extensive debate over junkyards and auto-graveyards in the 1960s, especially in light of President Johnson’s Highway Beautification Act; Udall stayed on as Johnson’s Secretary of the Interior and was instrumental in overseeing many of its provisions. While much attention has been given to billboards as the principle blight of the roadside landscape, it was discarded cars that were the source of anxiety about consumer culture, pollution, and social disorder. One solution, to be discussed in the paper, was to erect “green screens” to surround and disguise junkyards. In a sort of neo-Reptonian gesture, the blight would be made to disappear behind an elusive green foreground. And indeed, the term “yard” in junkyard and graveyard—from the OE geard, a fenced enclosure, a closed garden—should point to questions about the possibility and/or advisability of visual containment. America might or might not have ever been beautiful, but ever green have been laments over its lost beauty and attempts to make it beautiful once again.
Contemporary Indigenous Public Art: Urban Sites of Resilience and Reconciliation in Winnipeg, Manitoba

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Keywords: Public Art, Land, Indigenous, Métis, Colonial, Settler, Resurgence, Reconciliation, Placemaking

“We call upon the federal government, in collaboration with Survivors, Aboriginal organizations, and the arts community, to develop a reconciliation framework for Canadian heritage and commemoration”. 1

This is the 79th call to action from the Truth and Reconciliation Commission of Canada, (2015). A call that is being answered in Winnipeg through an influx of urban public art. Funding from arts organizations have begun to designate commissions to Indigenous and Métis artists, giving them space to (re)write and (re)map the urban landscape through acts of creative placemaking. Artists have begun to shift the narrative, to contest settler colonial myths and to decolonize public places. Works of public art are enacting place-based methods of storytelling to (re)claim the land and to illustrate that Winnipeg is very much an resilient Indigenous city.

By investigating three key sites: The Forks, Air Canada Park and The Rapid Transit Line, and specifically the works Niimaamaa (2019), by Jaimie Isaac, K.C. Adams and ValVint; Electrical Currents (2018), by Julie Nagam; O-ween du muh waun (We Were Told (2018), by Rebecca Belmore and Osvaldo Yero; and Rooster Town Kettle and Fetching Water (2019), by Ian August, I aim to expound that a visible Indigenous resurgence has increased in Winnipeg/Treaty One.

Storytelling is often applied to public designs as a conduit for expressing worldviews and land-based knowledge. In a methodology called storywork developed by Sto:lo First Nation scholar Jo-Ann Archibald, artists can transcend notions of space and place. “Storywork” works in opposition to the Western exclusive and dominant “story” that has emerged from “scientific”, ideologies of imperialism/colonialism.2 It is my belief that through stories, Indigenous artists can engage the non-Indigenous and settler public to confront their city’s problematic history. My research operates through multiple theoretical and knowledge-based approaches to create a polyvocal framework. I will extract distinct “tools” when needed for questioning and analysis. Approaching each work of art as an individual case study and through abductive methods, I have curated a praxis, that is rooted in intersectional critical social theory. From this foundation, a dialogical framework materializes that is critically reflexive, insurgent, transdisciplinary and feminist, involving Indigenous land-based and storywork knowledge. Practical strategies applied to each case will use creative ethnography and settler colonialism to deconstruct and decolonize. This new system of inquiry works through a transformative lens where I will function in a space between the epistemology and ontology, of both Western and Indigenous worldviews, to see with two eyes.3
A Cultural Landscape Archive: Digitizing the Prairie States Forestry Project

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Keywords: Cultural Landscapes, New Deal, Conservation

This paper addresses how digital humanities methods can advance the documentation and interpretation of a rural cultural landscape in the United States. Due to the size and scope of rural landscapes, innovative methods for collecting and analyzing data are critical for advancing landscape preservation initiatives. One such project, the Marnas Digital Archive, documents the evolution of the Scandinavian landscape architect and designer/theorist Sven-Ingvar Andersson’s (1927-2007) personal garden while exploring “what the digital humanities, a field at the intersection of digital technology and humanistic disciplines, has to offer landscape architecture and landscape history” (Whiston Spirn, 2020, p. 125).

Another cultural landscape that can benefit from digital humanities methods is the New Deal’s Prairie States Forestry Project (PSFP), a dynamic landscape intervention that continues to shape and sustain the Great Plains region. To date, the PSFP is one of the largest afforestation projects in the history of the United States: the United States Forest Service and thousands of landowners undertook cooperative planting agreements to plant over 200 million trees in approximately 33,000 shelterbelts from Texas to North Dakota.

Due to a lack of coordinated monitoring, historic shelterbelt location and status was unknown, and the original archival material remained unpreserved. Using an in-progress online project, the authors show how the process for digitizing and disseminating thousands of previously inaccessible primary source documents is an act of preservation that creates new opportunities for documenting and managing both tangible and intangible cultural resources. The archive incorporates geospatial, landowner, and plant species as metadata, allowing search functions to correlate diverse primary source materials, including photography and planting records, to landowners in different geographic locations. This allows stakeholders, including landowners, the Forest Service, the State Historic Preservation Office, and historical researchers, to not only identify a baseline inventory of historical plantings, but to connect the shelterbelts to those who planted and/or still maintain them.

The collaborative curation of source material for the digital archive not only provides immediate access to thousands of primary source documents, but digital features and organization of the archive itself expand the questions that landscape architects practicing in the fields of historic preservation and forestry can ask when evaluating this large-scale cultural landscape. This shows how digital humanities tools can portray a massive planting project in both space and time and ultimately lead to the preservation of shelterbelts and other rural cultural landscapes.
Design Like a Nomad: Playing Dwelling Thinking

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Keywords: philosophy, phenomenology, aesthetics, design thinking, site analysis, resiliency, myth

“People throughout the world are beginning to give serious thought to nomads” (Flusser 2003, 38). Perhaps we romanticize the nomad because we have grown wary of borders and boundaries, and we feel unsettled rising sea levels and cracks in the earth. But, perhaps also, the nomad as a metaphor and thought experiment can lead us to new ways of thinking in landscape architecture. If landscape architecture, ultimately, is a statement of how we live in the world, what can the perspective of the nomad, who lives in direct engagement with the land, teach us?

This paper develops a conceptualization of nomadic thinking from four primary perspectives: Paul Shepard’s “Pleistocene paradigm” from human ecology (1967; Shepard and Shepard 1998), Tim Ingold’s anthropological reflections on hunter-gatherer societies (Ingold 2011), Villem Flusser’s and Giles Deleuze and Felix Guattari’s musings on the nomad as a philosophical metaphor (Flusser 2003; Deleuze and Guattari 2004), and Teshome Gabriel’s “Thoughts on Nomadic Aesthetic” in film theory (1988). Nomadic thinking provides an alternative to modern Western thought that struggles with the conceptual divisions between subject/object, mind/body, nature/culture, and art/science. The nomad does not separate her scientific experiences from her aesthetic or ethical responses to the world. She does not separate culture from nature, but she does recognize that she has a responsibility within the world of which she is a part.

This paper primarily presents the theory behind the nomadic approach to designing. However, it is illustrated by a studio exercise undertaken by second-year undergraduate and second-year graduate students in landscape architecture. Before creating a neighborhood design on an undeveloped site, students were asked to design as if they were a nomad living on the site. No permanent structures were allowed; they had to designate where they would get food, shelter, and water, as well as where they would leave their waste and how they would find joy and pleasure in the environment. The hypothesis is that designing like a nomad can reconnect us to landscape as an immediate, lived experience, which can then open us up to more responsive, responsible, and meaningful design solutions. Concepts such as sustainability and resiliency will become more personal. Site knowledge will become more than objective map; it can be imagined as a direct response to human needs. The most unexpected outcome from the exercise, though, was how students had fun with the assignment; imaginary friends, animal companions, and unusual mythologies sprang up within their designs, suggesting that myth and meaning are as fundamental to human life as food, water, and shelter. Observations from the students’ work was anecdotal and should be studied more methodically in the future.
Ephemeral Landscapes: Making the Invisible Visible

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Keywords: Observation, Ephemeral, Landscape, Systems, Transience, Invisible, Visible, Art

Under normal circumstances, observation of our surroundings is often lost in the hustle and bustle of work and play, commuting and getting to the gym. The moon goes through its stages without notice, spring bulbs pop up, birds build nests, trees leaf out. Spring of 2020 was far from normal, however; suddenly time slowed, with one day blending into the next, and we found ourselves with more time to look around and notice the ephemeral of the surrounding landscape. Two artists, Christo and Richard Long, and one landscape architect, Georges Descombes, use wrapping, walking and recovering, respectively, to highlight a site’s natural systems and reveal the ephemeral nature of its setting. Through detailed project analysis and exploration of relevant landscape theory, this paper will reveal the strategies and means these artists have applied to the realization of their art.

Landscape artists have been harnessing this ephemeral quality of the landscape for decades. This transience is what lends seasonality and timeliness to our environment. “Landscape symphonies evolve continually in time... responding to process and to human purpose, and, in landscape symphonies, all dwellers are composers and players.” (Spirn, 1998, p.22) These three artists help to draw attention to these symphonies that might otherwise go unnoticed. Wrapping an object is one technique to make the often-invisible visible. This seemingly simple act of covering an object draws one’s attention to its absence, and therefore its presence, in the landscape. A simple walk recorded by listing sounds experienced along the way brings the invisible into sight. What we take for granted and walk by without seeing, again and again, when wrapped or organized or recovered, becomes a visual void that makes us take notice and question its meaning.

This ephemerality requires the notice of the viewer in order to wield its true power. In Space and Place, Yi-Fu Tuan notes: “A scene may be of a place but the scene itself is not a place. It lacks stability: it is in the nature of a scene to shift with every change of perspective....” (p. 236) In this way, the landscape assumes the role of background stage set to our daily performances and it is the ephemerality of this stage set that lends richness and meaning to our everyday lives.
History and Ecology in Redesigned Forest Edges of the Baltimore-Washington Parkway

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Keywords: Forest edges, Cultural landscape, Baltimore Washington Parkway, Historic preservation

Introduction: This paper presents a proposal for the forest edges along the Baltimore-Washington Parkway. It is part of a Cultural Landscape Report for the parkway and draws upon historical precedence as a means of responding to issues of traffic safety and vulnerability of the forest edge to colonization by invasive plant species.

Background: The Baltimore-Washington Parkway was constructed in the 1950s and is considered a hybrid of earlier scenic parkways and later modern highways. It is historically significant for its role in regional forest conservation, and forests comprise the dominant vegetation of the parkway landscape. They noticeably shape the experience of driving the parkway which can feel like a long corridor between adjoining forests.

Management Problem: In 2017, the National Park Service began cutting forest edges back farther from the roadways to increase driver safety, and this has had important impacts on the adjoining forests. Removing the existing edge vegetation exposed the interior of the forest to increased sunlight and competition from invasive species, but it also opened the forest interior to the view of passing drivers, giving them a more appealing view into the woods. This resulted in an intriguing challenge: is it possible to protect the forest from colonization by invasive species but maintain the more engaging spatial experience created by the cleared edge?

Historical precedence: The goal of a Cultural Landscape Report is preservation of historic character of the cultural landscape, and therefore management of the forest edge must be grounded in the history of this particular landscape as well as more general ecological principles. Historic photographs of the parkway offered evidence of the conditions of the forests at different times and in different segments of the parkway. Previous planting plans also gave evidence of designers’ intentions for the vegetation and experience of the parkway and helped establish a planting palette. Other edge planting strategies were studied along parkways of the Washington capital region and in a general proposal for National Park Service roads.

Proposal: The proposed design draws the forest edge back from the front line of trees, creating a new zone of seasonally mowed grasses where ample sunshine would favor invasive plant species. Behind this zone, where shade predominates, a new line of shade tolerant forest species is proposed where they can more effectively compete against the invasives. This composite edge is more spatially diverse and consistent with the picturesque traditions of the region’s parkways.
Informal Alberta: Formalizing the Documentation of Historic Rural Roadside Vernacular Landscapes

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Keywords: regionalism; roadside attractions; vernacular landscapes; local history; site documentation; leisure theory; semiotics / markers; Alberta

Roadside attractions are permanent fixtures of Canada’s small-town cultural landscape. As physical manifestations of both the eccentricity and banality of small-town life, these phenomena highlight an alternative side of Canadian culture that is not as well recognized as conventional landmarks and parks. They are even more poorly documented when compared to the United States, which seems to feature endless books on roads and roadside vernacular architecture (Heimann and Georges, 2001). Although forgetting small-town history is a possible nation-wide concern, this initial study focusses on eight counties in southern Alberta as a pilot area to investigate how one might formalize the informal landscape in order to combat the threat posed to the endurance of Canada’s vernacular landscape. Southern Alberta is emblematic of this, as its largest repositories of documentation to date are hobbyist webpages and locally published books with insufficient, inconsistent, and incomplete records of the histories and backgrounds of these places (Isitt, 2006; Michaelides, 2006). This paper explores the ways that informal local histories can be formally documented to address the current gap in literature regarding this unrecognized, yet abundant, aspect of Canada’s vernacular landscape.

The lack of a formal documentation method is evident in the few existing books and websites focusing on “roadside Alberta”. While they seek to tell the story of these “attractions” (usually in the form of "statues"), they do so primarily through brief written passages (replete with forced humor) accompanied by cartoon sketches, and occasionally photographs. They are frequently organized by general themes related to the attractions, such as “greatest ever…", "world’s largest", “animals”, “wacky and weird”, with tremendous variation from source to source. Rarely, if ever, are these sites formally mapped or documented through the lens of regional geographies and temporal mapping. Our study draws upon the historical, critical visual studies and descriptive approaches established in the work of Geddes, Litton, Swailes, MacCannell (semiotics / markers), and Jackson (specifically “odology”) and merges them with methods proposed by Becher and Becher (typology), Venturi (space, scale, speed, symbol), and Desimini and Waldheim (temporal cartography), to develop a methodology which synthesizes the “attraction” with time and the scale of the landscape to form an understandable and comprehensive physical history.

Without proper documentation, rural roadside histories can easily be forgotten due to their informal nature. By properly recognizing roadside attractions that are emblematic of southern Alberta, this study will contribute to a more comprehensive understanding of Canadian cultural landscapes.
Inscribing Landscape Architectural History into the Digital Humanities. Transforming a Reference Text into a Digital Platform for Exploring Designed Landscapes and Their Complex Contexts

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Keywords: digital humanities; landscape architecture; cultural landscapes; landscape architectural history

ISLAND (Interactive Studies in Landscape Architecture iNterface And Database) is a new, unique open-source digital humanities database and interface for historical landscape studies. ISLAND chronicles the global history of designed landscapes. This digital platform transcends the linear history of individual designers and their “works”, the common format of most landscape architecture history textbooks. Instead, it affords tools and methods for discovering spatial patterns, social and material exchanges and networks between sites and across scales. ISLAND’s narrative structure, immersive environment and customizable format reflects our transdisciplinary approach that locates landscape studies at the intersection of design history, the environmental humanities, historical geography, historical anthropology, critical race studies, and the history of science and technology (STS). ISLAND is a project of the Landscape Studies Initiative (LSI), a research initiative of the UVA Center for Cultural Landscapes.

Our panel, experts in design, theory, history, cultural landscape methods and digital visualization, will introduce ISLAND’s digital architecture and discuss its intellectual framework organized around four analytical lenses: 1). social encounters and networks; 2). scientific discourse and technological innovations; 3). thick sites; and 4). spatial sequences and sensorial experience. Each lens aligns with recent innovative historical methods for interpreting designed landscapes, organizes our extensive hyperlinked historic resources (maps, drawings, prints, photographs and manuscripts) and connects them to specific designed landscapes. We will focus on two of our pilot projects, Central Park and Park Muskau, that allowed us to design and test how enrich the content of Landscape Design with new scholarship, archival material and field data. These two projects were chosen as pilots because of their influence on the emergence of landscape architecture as a profession in the 19th c. Our team is deeply knowledgeable about these projects which are important designed landscapes in their own right. They also exemplify how designers and their works are connected to larger social, political and intellectual networks of their time. In brief, they were chosen because of their capacity to be interpreted beyond the intentions of their designers. These pilot projects are prototypes and models for future research on other designed landscapes within ISLAND, our interactive resource for teaching landscape history, that aspires to reveal the relationships between designed landscapes and their social, scientific, and technological milieus.

Why is this immersive digital platform significant? Its lenses and associated methods and resources
transform ISLAND’s chronological scaffold, Landscape Design, A Cultural and Architectural History (Rogers 2001, out of print) from a global survey of designed landscapes into a springboard for deploying cultural landscape methods across the humanities. Through its digital platform and user interface ISLAND expands Landscape Design with new content from archival materials, fieldwork and innovative data visualizations. This pedagogical resource will be continually updated; its open-source format will be a resource for the landscape architecture programs around the world as well as university level courses in the environmental humanities.

This session situates designed landscape history firmly within broader socio-ecological trends and connects discrete designed landscapes to social, material, technological and discursive networks. It provides a framework for experiential learning across fieldwork, archival research, data visualizations and writing. The presentation ends with a call for collaborators as we move from our “proof of concept” planning phase to our public launch. We will outline modes of collaboration from developing pilot projects, writing commissioned literature reviews, and contributing images and archival documents. We invite all who are interested in how the digital humanities and cultural landscape methods can infuse the teaching of landscape architectural history with contemporary agency and urgency.
The Latino Arroyo and the Dream Place: Emerging Perspectives about Latino Identity

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Keywords: Landscape anthropology, Latino environments, Latino landscapes, Culture and landscape, Latino History

Understanding identities of ethnic groups who inhabit our cities requires consideration in design of public spaces. The Latino population continues to grow in the United States and yet there is a lack of representation in the mainstream understanding of what composes their identity and influence. Latino values and heritage regarding landscape are not included in the traditional historic literature of landscape architecture or urban design. (Newton, 1971; Clifford, 1962; Jellicoe, 1995; Pregill & Volkman, 1993; Rogers, 2001; Thacker, 1979).

There are three scenarios that negatively impact Latinos and the formulation of Landscape Architecture designs and considerations. Firstly, Latinos can influence design through community meetings and representation but if recent immigrants do not yet have a voice, then the designer does not hear the needs of Latinos (Rios, et al, 2012). Secondly, if the designer is a non-Latino and is not engaged in Latino culture, then it is more difficult to be empathetic to Latinos. Thirdly, the underrepresentation of Latinos within landscape architecture, means non-Latino designers must “meet up with new, unheard-of, unthought-of ways of organizing human behavior,” (Mead, 1972, p.150). Add to this the growth scenarios of Latino populations and you have a complex need for further study, reflection, and knowledge of Latino culture.

Landscapes are culturally influenced and constructed. To fill the gap of missing Latino literature within the canon of landscape architecture history and design we must look to a variety of contributions in different sources. Literature, science, and the humanities can enlighten designers about the Latino arroyo, dream places, and other cultural references about landscape from research in geography, anthropology, sociology, history, and Latino fiction writers (de Certeau, 1984; Appleton, 1990; Guillermoprieto, 2001; Hondagneu-Sotelo, 2014; Lynch, 1993; Sodikoff, 2012; Vivanco & Gordon, 2006). Looking beyond existing stereotypes expands the knowledge of Latino culture and thereby adds an objective structure for enriching diversity in urban public spaces.
Lucio Costa’s “Essential Documentation”: Tradition, Landscape, and Modernity in Brazil

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Keywords: Historic preservation, landscape, modernity, Brazil

The architect Lucio Costa (1902–1998) is well-known as the author of the master plan for Brasília, the modernist federal capital of Brazil, initiated by President Juscelino Kubitschek in 1956. Inaugurated just four years later on the high central plateau of Brazil, Brasília fulfilled the utopian nineteenth-century dream to move the nation’s capital from the coastal city of Rio de Janeiro to the interior. Costa’s 1956 typewritten competition entry for the Plano Piloto of Brasília is an influential text of the modernist period, and he concludes this text by affirming the importance of the landscape: “On the one hand, the technique of the highway; on the other, the technique of the landscape, of parks and gardens. Brasília, capital of the airways and the highways. City park.”

Less well known, however, is Costa’s work on historic preservation, and his broader body of critical writing on national patrimony, architectural pedagogy, and the colonial baroque architecture of Brazil. This writing reflects Costa’s positioning of the Brazilian landscape as a key aspect of cultural heritage. For thirty-three years, Costa was a member of SPHAN (Serviço do Patrimônio Histórico e Artístico Nacional), Brazil’s national agency for historic patrimony and preservation established in 1937. From 1939 through 1972, Costa was a public servant of this agency, housed within the Ministry of Education and Culture (MEC), the very building he designed in 1937 with a group of young Brazilian architects. Indeed, it was the MEC that would launch the career of the landscape architect Roberto Burle Marx, invited by Costa to design the landscapes of the building’s public plaza and private roof terraces.

SPHAN’s first preservation initiative dispatched Costa to Brazil’s Rio Grande do Sul to analyze the remnants of the Sete Povos das Missões, a complex of seventeenth-century Jesuit missions, and suggest conservation measures for both the ruins and the landscape surrounding these sites. This research produced not only Costa’s authoritative 1937 text “Documentação Necessária,” but also his design for the Museu Rústico das Missões de São Miguel, completed in 1940—an elegant glass museum emerging from the grasslands and the ruined shell of the former mission. For Costa, Brazilian patrimony required the capture of both buildings and landscapes, an examination of the colonial past and a vision for the future—two equally weighted pursuits in search of culture and the modern, intrinsically connected to the landscape, but worthy of reexamination with a post-colonial lens today.
Marginal Horizons: Speculating on the Waikiki Natatorium 'Living Memorial'

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Keywords: Landscape and Memory, Living Memorial, Memorialize, Indeterminacy

The Waikiki War Memorial Natatorium was designed and built in 1927 as the first ‘Living Memorial’ in the territorial United States, erected to commemorate those from the territory of Hawai‘i who served during World War I. Prior to the 1920s, commemorative objects such as busts, statues, and obelisks were often equated with memorials. This tradition was called into question by cultural and architectural critics at the end of World War I. These critics argued that traditional memorials were “tawdry ‘monumental’ monstrosities” that promoted a homogenous identity and means of remembering for a nation that was anything but homogenous. The solution to this dilemma was the “living memorial,” which advocates argued could manifest itself as an inhabited civic space that both kept the memory of past sacrifices alive while also recognizing the unique cultural identity of the community within which it was sited. The hope was for these spaces to weave together memory and the present, lived experience of equitable and democratic public space.

The Waikiki Natatorium was the first constructed example of such a memorial. Straddling the margin between land and sea, the Natatorium was designed to capture the unique relationship of Hawaiian culture to the ocean. The complex consisted of a series of pools framed by a grand Beaux-Arts arcade that demarcated the ‘line’ between the two elements. On either side of the central entryway were two large saltwater reflecting pools – spaces that were meant to allow for solitary reflection and remembrance. On the ocean-side of the arches was a monumental Olympic-sized saltwater swimming pool, framed by a concrete pool deck and bleachers. More serendipitously, the erection of the Natatorium created another public space – Kaimana Beach, whose formation resulted from the collision of the currents with the Natatorium’s deck. Connecting these two spaces was a memorial park planted with allées of coconut palms to emphasize the primary axes and to provide a space for memorial events. At its height, the complex hosted international swimming competitions, public swimming lessons and local clubs.

Unfortunately, an inconsistent and underfunded management strategy and a design flaw in the Natatorium’s deck resulted in the closure of the complex in 1979. Presently, the Natatorium is in an obvious state of disrepair and poses a health and safety risk to beach-goers due to the pool's water quality and the facility's deteriorated structure.

Using the Waikiki Natatorium as a case study, this paper seeks to clarify what it means to memorialize in landscape architecture, to revisit the principals of equity, health, and memory promoted by the Living Memorial movement, and to use these principals to speculate on the future design possibilities of the Natatorium, particularly given projected sea level rise and other hydrological risks. The broader desired outcomes of this investigation are to establish the importance of impermanence, indeterminacy, and site in the commemorative process and to understand how these elements might assist landscape architects in designing more pluralistic memorials now and in the future.
The Material Culture of American Chestnut Stumps

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Keywords: material culture, cultural history, Jefferson National Forest, American chestnut

The historian Thomas Schlereth (1980) argued that vegetation is an important aspect of material culture. His work followed the robust European tradition of landscape observation as well as American landscape writings on historical planting by scholars including J.B. Jackson, John Stilgoe, Carl Sauer, John Fraser Hart and Fred Kniffen (Schlereth, 1980, 21). Another important example of this type of inquiry is May Theilgaard Watts’ Reading the Landscape (1957).

While reading landscape vegetation is a well-established practice scientifically and culturally, it is an ongoing challenge to record and interpret plants as material culture. Archaeological techniques such as dendrochronology and pollen dating can provide evidence of past plantings, but the above ground record of plants and specific cultural associations with them eventually vanish. Furthermore, the ephemeral nature of plants is not the only challenge—human perspectives on plants vary and change over time as do the contexts in which they grow. Therefore, material culture studies of plants invite examinations from multiple-time-sensitive perspectives in situ.

This study examines the remnants of an American chestnut (Castanea dentata) grove in the Jefferson National Forest as material culture. While many have told the story of the decimation of the chestnut due to the fungus (Cryphonectria parasitica) introduced to the United States in 1904, few have considered the cultural value of the remaining stumps in native woods, stumps left after the final harvest of these exceptionally rot-resistant trees. Exceptions include those using live stump sprouts as genetic material to develop blight resident chestnuts and the use of residual chestnut wood in buildings, crafts and art. Through landscape architectural field studies and archival research, the paper tells the story of a grove from four perspectives: indigenous, colonizer, preservationist and co-inhabitant. These perspectives were chosen to examine the shifting values and role of the chestnut over time from pre-European settlement to the present. The paper argues that the slowly decomposing stumps are significant and fragile remnants of material culture with deep histories, and that shedding light on these century old fragments can help future generations understand our evolving relationships to this important species before it disappears from the forest floor.
Mauerpark Berlin – Gustav Lange and the Role of Form and Space in an Urban Park

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Keywords: Design Theory, Park Design, Form in Landscape Architecture, Spatial Perception, Aesthetics

The Mauerpark Berlin is one of the most vibrant contemporary parks in Berlin (GER) and known for addressing the changing needs of a diverse urban population. The park was designed by German landscape architect Gustav Lange on the void of the former Death Strip of the Berlin Wall. Spatially, Lange preserved the openness of the urban void in his concept and concentrated his design work to carefully placed, form-based interventions on the edges of the park. Lange’s careful attention to form and his sensitivity to create spaces for randomness and non-determined activities are remarkable as they are both fundamental and crucial elements for Lange’s dialectic design philosophy. This philosophy can be best understood at Mauerpark Berlin where a staged planning and design process took almost 30 years. Lange stated in several conversations with the author, that form provides a robust and tangible spatial framework for the variety of activities that can take place at the Mauerpark. In his view, this formal framework is not prescriptive or prohibitive for human activities and programmatic functions. This paper investigates how formal-spatial design elements can accommodate and stimulate flexible and random programming for a diverse contemporary urban park. It provides a design analysis at various scales including revisiting historic and current design plans, and personal conversations with the designer and stakeholders of the park. Prevailing geometrical forms of design interventions are categorized including the palette of materials. In a second step it is described where formal elements define focal points in the park and what portions of the park are kept free. Findings from the categorization of forms reveal that while there is a close attention to bold, formal, geometric execution of Lange’s design, there are also moments of variations and exceptions within these legible interventions. This phenomenon is increasing gradually from the larger scales to the smaller design scales. This is also applicable to the use of design media. The palette of design materials is restricted to a minimum to create a high degree of unity and coherence. From a more close-up perspective this sensation changes as geometries and lines are broken up to reveal gaps and thus increase diversity in the design. Findings from the spatial analysis of Mauerpark reveal that the design of Mauerpark offers a large portion of voided spaces that are kept free while the smaller spaces create rooms with a high degree of intricacy.
(Re)presenting the Miller Garden: Translating Dan Kiley’s Design Plans from Analog to Digital Formats

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Keywords: Miller Garden, Dan Kiley, translation, analog, digital

The Miller House and Garden (Columbus, Indiana) is widely regarded as one of the most iconic modernist residential projects of the 20th century, and was designed by Eero Saarinen (with Kevin Roche, architecture), Dan Kiley (landscape architecture), and Alexander Girard (interiors). The landscape has largely been understood and interpreted in scholarly and professional literature through the aid of photographs and site visits, and presented as a complete and finished design. However, very little scholarship has acknowledged the development of the garden’s design over time, and no scholarship has presented nor examined that development. As revealed through extensive archival research, there are at least 35 design iterations for the landscape, from Kiley’s first plan in 1955 up to the installation of Henry Moore’s Draped Reclining Woman (1958) in 1971, the final major element to be documented in design plans and installed in what is conventionally considered the finished version of the garden. The numerous design iterations not only reflect the normal back-and-forth between designer and client for the initial installation in the mid to late 1950s, but also changing client needs after the Millers moved into their house in 1957. Close study and (re)presentation of the original plans affords a comparison between early designs and the design that visitors encounter today, identifies the areas of the garden that had been resolved at the earliest stages and the areas of the garden that required repeated design revision, and reveals the designs of the Miller Garden that never came to be. As part of a larger project to understand the design history of Dan Kiley’s Miller Garden, the authors have begun to redraft the plans that document these design iterations. Originally drawn by hand in varying media, scales, and scopes, the project redrafts Kiley’s plans using AutoCAD in a consistent format for ease of comparing different design iterations. This presentation offers a theoretical framing and critical reflection of the redrafting process: as a cross-medial translation from the original analog drawings to digital images. Translation theory, adopted from the field of translation studies, is used to characterize the process not merely as an aspect of redocumentation, but as an act of interpretation. Additionally, translation theory helps to identify how information about the design embedded in the original plans is retained or lost through the process of redrafting, and that the same process also reveals new information about the character of the original drawings and the design itself.
Rereading St. Ann’s Hill and St. Ann’s Court, Chertsey, Surrey (1935-1937)

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Keywords: History, Gender, Design, Domesticity

Among the earliest and most celebrated examples of modern landscape architecture is the eight-acre estate, St Ann’s Hill, and its three-story cylindrical house, St. Ann’s Court (1935-1937). Christopher Tunnard (1910-1970) designed the landscape and worked closely with the architect Raymond McGrath on siting and designing the house and garden. The project graced the pages of numerous architectural magazines in the 1930s and 40s and it made several appearances in Tunnard’s highly influential book, Gardens in the Modern Landscape (1938/1948). The project has also been studied by present-day historians as an example of modern design successfully unifying structure with land. McGrath’s architecture, too, has received acclaim. Writing on the project in Twentieth Century Architecture, the historian Alan Power noted that, “It is unlike any other modern house in Europe.”

However, there has been no rigorous analysis of St. Ann’s architecture, interior design, or landscape architecture, and the role that sexual subjectivity played in its design. St. Ann’s Hill and Court were designed exclusively for the banker Gerald L. Schlesinger and his lover, Tunnard. Through an analysis of plans, historic photos, sketches, the built project, Tunnard’s writings, and interviews with the current owner, we provide a rereading of this project through the lens of queer theories in architecture and gay and lesbian studies. Two theories in particular frame our rereading of the project from its interior design to its garden and landscape. The first is the simultaneity of architectural exposure, display, and secrecy. The second involves the blurring of boundaries and thresholds among spaces. By rereading this seminal project, we hope to contribute to the history of purpose-built domestic designs and the unique contributions made by sexual subjectivity.
Revealing the Southern West Virginia Coalfields Landscape through Literature

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Keywords: content analysis; Cultural Values Model; novel; cultural landscape

There is a gap in knowledge of the landscape of southern West Virginia coalfields, which can be easily captured by quick bibliographic research. The lack of information is particularly concerning given that some of the cultural landscapes of the region are at risk of vanishing under the threat of mountaintop removal coal mining (MTR) and depopulation mainly due to job scarcity and environmental degradation. Although several facets of the region have been studied, the landscape and the cultural, social, and perceptual values embedded within it, have not been fully addressed.

The aim of the research I conducted and will present is to bridge the knowledge gap by describing the contemporary landscape of the area using a work of fiction. One can mention several precedents, above all in cultural geography, that investigate literary works to better understand geographic data and perceptions of places. However, I could not find precedents in landscape studies. I implemented a directed qualitative content analysis (Hsieh and Shannon 2005) of a novel adopting the Cultural Values Model (Stephenson 2008) for determining the categories for coding the text. The model takes into account the physical forms of the landscape together with its affordance and the relationships that people establish with and within the environment. According to the model, an integrated understanding of the landscape can only occur by considering all three components: forms, relationships, and practices.

The literary work I selected for deriving a comprehensive landscape description of the southern West Virginia coalfields is Ann Pancake's 2007 novel Strange As This Weather Has Been. Although this is a work of fiction, it is based on real events and factual information collected from archives, newspaper articles, nonfiction books, and interviews. The story’s setting is a contemporary West Virginia coalfield town located in a narrow valley at the bottom of an MTR site. The landscape emerging from the analysis is one of endangered low forested mountains and narrow valleys heavily altered by industrial activities made vulnerable to man-made disasters whose inhabitants grieve its material disappearance and the simultaneous vanishing of a mountain culture.

The systematic description and interpretation of the landscape through Pancake’s novel offered an accurate and well-rounded picture of the southern West Virginia coalfields. The research also showed that literature is a valuable second-hand data source for inferring information concerning the landscape; it provides a vivid representation of its tangible qualities along with glimpses into more intangible attributes such as affordance, sense of place, and place attachment.
The "Sacred" and "Profane": Gaze of South Carolina's Contemporary Vernacular Landscape

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Keywords: Everyday, vernacular landscapes, American studies

This paper presents preliminary findings from the author’s ongoing research project: investigating the American Experiment (AE) through the lens of South Carolina’s (SC) cultural landscape. It draws from social theory and utopian notions linked to Jefferson’s 1776 Declaration of Independence and AE when the colonies defied Britain. It is part of a larger spatial-temporal project on American cultural development that critically analyses SC’s cultural landscape and related spatial settlement patterns including slave heritage and human need. Instead of beginning with First Nation settlements and subsequent slave heritage, this paper “fast forwards” to the contemporary vernacular landscape. Through case studies, it illuminates the unique cultivation of SC’s contemporary vernacular built environment within the broader context of the American South’s capitalist and, industrial and agricultural complex. This paper theoretically “blurs” SC’s religious space and related memory of this phenomenon (sacred) and the secular (profane) in the sacred-profane dichotomy espoused by Durkheim (1912 translated 1995). This preliminary discursive narrative unveils the complexity of SC’s contemporary vernacular landscape as one crucible for navigating the AE. Preliminary findings and typology of SC’s cultural landscapes navigates beyond the normative classification (i.e., slave heritage–a vast topic on its own; and USNPS’ notion of sites or places where natural, cultural and historic resources combine to form a cohesive, nationally important landscape), and reveals the cultivation of SC’s everyday landscape. It also traverses beyond Sauer’s (1925), Lewis’ (1979), Jackson’s (1979, 1984) notions of cultural landscapes as places touched by human impact and interpreted by the trained and discerning gaze. SC’s complex vernacular landscape is represented as a social and spatial construct (Jackson 1979; Cosgrove 1984; Schein 1997; Cresswell, T. 2003; Merriman, et al 2008) . Case study investigations of contemporary Bowman and Hamer, so-called “UFO Center” and “South of the Border”, respectively, reveal the "profane" as capitalist and sometimes tourism-oriented, and represent SC’s everyday visual imaginary. It also speculates on a reimagined notion of “sacred” through a preliminary analysis of SC’s Christian churches, especially its signage containing biblical references. It frames these sacred built environments as an evolution of SC’s 18th and 19th century religious campgrounds and as both a social and religious practice. This preliminary interpretive narrative illuminates the convergence of social theory, socio-cultural phenomenon, spatial-temporal dimensions and reveals SC’s contemporary vernacular landscape as evolutionary and experimental – an expansion of the broader AE as portrayed in the capitalist and, industrial and agricultural complex of the American South.
The Struggle of Statuary: Kelly Ingram Park as Counter-Memorial.

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Keywords: Counter-Memorial, Park, Statuary, Police, Violence

This paper and presentation introduce Kelly Ingram Park in Birmingham, Alabama, an example of how a site once known for bloodshed and police violence can transform into a place of community healing and civic engagement. Through the strategic placement of statuary representing a lived narrative of oppression, conflict, and power, the park provides a unique record that serves as a counter-memorial to the times’ dominant political structure and offers significant lessons on how such perspectives may be utilities in other contentious locations.

While tranquil today, the park was a site nationally known as a place of social conflict and police violence through the widespread distribution of Bill Hudson’s famous photograph of Walter Gadsden being viciously attacked by a police dog in May 1963. It was only through the sustained political will of Birmingham’s two mayors who wished to recognize the violence inflicted upon the community and the recognition of how that wounding was understood as an essential “civic myth” of resistance and resilience to the community understanding of themselves today. The park now houses eleven monuments that provide a powerful counter-narrative to the once-dominant expression of white supremacy.

Attendees will gain insights into how a historically suppressed and disenfranchised populace could have their collective voice heard and represented within the built environment.
Thinking Like Designers: Implications for Procedural Theory in the Discipline

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Keywords: landscape architecture, design education, design thinking skills, cognition, procedural theory, staged process modeling, tacit learning.

For the past several decades, design thinking, creativity, and innovation have been a popular subject in the academic and popular press. During that time, the Hasso Plattner Institute of Design at Stanford—the d.school—has co-opted the term ‘design thinking’ as something new and revolutionary. In fact, it is not; design thinking has been a subject of interest and research in other design fields throughout the 20th century. This prompts a further line of inquiry into the past century of teaching and learning the skill sets necessary to be a designer in the domain of landscape architecture. Unlike the current popular definition of design thinking as a process or methodology to follow when solving problems, this paper uses the following provisional definition: a metacognitive activity that uses a large cluster of thinking skills to solve problems—in this case, within the domain of landscape architecture. Bloom’s Revised Taxonomy of Learning (Anderson, et. al. 2001) and Sparks of Genius (Root-Bernstein 2001) were used to select the cognitive skill set. The skills were corroborated by analyzing project briefs form the first year BLA studios at UGA’s College of Environment & Design, in which the author teaches. The draft cluster of cognitive skills includes: abstract, analytical and evaluative (critical), analogical, creative, body or kinesthetic, dimensional, empathic, synthetic, verbal and visual thinking. Using various phrases with the words ‘design’ and ‘thinking,’ and the above cognitive skill set, a content analysis of the landscape design literature was undertaken beginning with the first landscape design textbook (Hubbard and Kimball 1917) and editions of the Landscape Architecture Quarterly and including introduction to landscape architecture text and theory books, Landscape Architecture Magazine and Landscape Journal. Findings: The phrase ‘design thinking’ is rarely used until the 1990s, all the cognitive skills were found—some frequently such as analytical, critical, visual and creative thinking; some rarely used such as empathetic thinking. As the post-WWII era introduces rationalism and deductive logic, landscape architects begin to model the design process. Some of the cognitive skills become embedded in these staged process models (Swaffield 2001). It isn’t until the late 1970s and 80s that landscape architects begin questioning the veracity of the staged process model, particularly how creativity is addressed in education (Halprin 1970, Kvashney 1982, Krog 1983, Lyle 1985). The paper concludes with a look at possible implications for procedural theory in the discipline.
Underrepresented Landscapes: Nineteenth-Century Kansas Pleasure Grounds

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Keywords: Kansas; Kansans; Park; Pleasure Ground.

Though nineteenth-century parks, also known as “pleasure grounds,” were seen at the time as an antidote to unhealthy high-density urban living in large cities such as New York City, they were embraced by small towns and communities that experienced none of the issues associated with big city living. Instead, this study argues that parks were seen as a sophisticated sign of modernity. For example, when the state of Kansas was founded in 1861, despite its politically eventful years of the mid-nineteenth century, its settlers felt a strong sense of responsibility and made great efforts to improve their home by creating pleasure grounds for their communities. This study investigates the story of shaping and developing the pleasure grounds of Kansas by gathering data from more than 3700 articles and advertisements containing the word “pleasure ground” that were published in Kansas historical newspapers between 1850 to 1920. Results show that it was not only major cities of the state like Topeka and Wichita that developed public parks for their citizens; many smaller Kansas towns also embraced the idea of creating pleasure grounds. Their residents were motivated by a sense of competition and believed that by beautifying their living environments, they could stand out in the region and attract newcomers. Local newspapers, city officials, businesses, property owners and public-spirited citizens were the main advocates for creating and improving parks in Kansas. Leisure activities, playing sports, and community gatherings were the principal activities in the pleasure grounds of Kansas. Though smaller in size, the design features of the rural pastoral landscapes of Kansas pleasure grounds were very similar to their east-coast peers and included alternating clusters of trees and meadows, meandering paths, and free-form lakes. This study aimed to highlight Kansans’ extraordinary effort in shaping their living environment and bring attention to the rich but often neglected history of man-made landscapes in Kansas. It is hoped that this research will be the start of a shift in attitudes toward our less represented landscapes. Every landscape matters. As academics and professionals, we should act upon the concept of inclusion and promote underrepresented landscapes through design, research, and community engagement. Such efforts can help stimulate a change in our stereotypical images of underrepresented places, making them prized locations for travel and living, boosting local people’s sense of attachment, and making small towns and cities again a source of pride for their residents.
Unsettling Sedimentation: Embodied Toxicities, Expertise, and Care at the Port of Tacoma

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Keywords: environmental history, settler-colonialism, care practices, resiliency, infrastructure

Practices of care often form as collective resistance to harm or disturbance caused by state and institutional violence. As environmental disturbances destabilize how the edges of water and land are known, care practices offer hopeful possibilities for resisting asymmetrical ways of knowing land. Through a biopolitical framing of care — how life is regulated and managed through various forms of power — I explore how polluted soil and muck at the Port of Tacoma in Washington State forms a site of sedimentation that contains various forms of life capable of unsettling conventional ecological design approaches to resiliency. Over time and through space, the Port of Tacoma has become a site of sedimentation where the inequities of Indigenous dispossession and the dehumanizing effects of policed immigration are accumulated. Located on the traditional lands and waters of the Puyallup people, and partially on the current Puyallup tribal reservation, much of the Port is a heavily polluted Superfund site that requires ongoing dredging to limit further seeping of industrial toxins into soil and water. While dredging and soil remediation projects work to maintain economic and infrastructural life, the Port also houses the Northwest Detention Center, an Immigration and Customs Enforcement (ICE) facility. The Northwest Detention Center remains hidden by the same movements of soil and sediment that work to build ecological resilience, creating a layered site where the struggles of devalued people are linked with that of devalued land. Ongoing restoration projects at the Port give life to herons, salmon, and eelgrass, while the Detention Center marks other bodies as foreign, illegal and largely disposable. As such, current environmental practices at the Port focus on creating a less polluted environment while overlooking how people actually live — willingly or not — in such spaces.

The life of the polluted sediment of the Port of Tacoma suggests the various ways that normative infrastructural expertise shapes environmental violence through the stability of land, and the unspectacular ways that environmental violence moves and is reconstituted unevenly. Combining archival research, discourse analysis, and site work, I ask how challenging these modes of resilience through an ecological politics of care can shift what counts as life at the Port to bring about collective responses to sites of sedimented settler land based violence. In response, I offer a series of care practices that center historical and embodied experiences to work toward socioecological resiliency that can resist landscape practices dependent on Indigenous dispossession, xenophobia, and uneven global economic production. I suggest that landscape practices must commit to imagining, designing, and enacting lively sites of care that are capable of resisting environmental violence and supporting hopeful exchanges between environmental and social life.
The Use of Site-Specific Temporary Artworks to Actualize History in Communities

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Keywords: public art, community, cultural landscape, history

Worldwide, cultural landscapes are being erased to make space for modern development, while their preservation oftentimes acknowledges symbols and rituals that represent only certain cultures or ethnicities, leaving many stories and communities at the margin. Literature relates the disconnection resulting from loss of history and identity in the physical environment to a decline in the social sustainability of places (Hunt, 2014). However, while the 2000 European Landscape Convention stresses the definition of "landscape" as “an area, as perceived by people”, there is an ethical dimension in the shaping of people’s perceptions. How can we read the past in the present and involve the community in writing/deciphering a communal story of place? Since the 1980s, this challenge has been addressed by public art (an art installed by public agencies in public places, and at public expense) (Hall and Robertson; 2001; Hein, 1996). However, works of landscape architecture that explore that field of action are few. The disconnection seems to be a visual stance taken by landscape architects (integrating local stories in design through form, aesthetics and representation) as opposed to a holistic exploration of social and cultural processes by artists (Brown, 1991). Public artworks have morphed from sculptures to whole environments, oftentimes temporary, which involve communities in the making of the work and defining its meanings. Key to these endeavors is designing time – to thread works into life as it happens now, in the moment (Brown, 1991). The authors reflect on several site-specific temporary projects (murals, dioramas, models and projections) they have conceptualized with communities and with students in Italy, Singapore and the United States. The artworks explore a methodology to connect people with the place they inhabit. This entails actualizing history in the present, therefore raising awareness and starting a first process of recognition of cultural landscapes. An evaluation of these artworks is made in the light of three factors: whether and how the works involved the community and/or represented a range of voices; what was their connection to the temporal realm. Projects involved a phase of recollection spanning from archival research to oral histories and on-site analysis. The artworks analyze and showcase information so that facts, places and events are perceived at the same time and all together, thus eliminating the concept of time as unidirectional (from the past to the present). As the methodology was refined, works evolved from ‘forms’ and ‘representations’ into ‘processes’ where people participate first as spectators, then as creators, and eventually as integral part of the works, whose meanings amplify as the users begin to interact with it. Ultimately, all projects consist of a creative site analysis (which belongs to the landscape architecture praxis); however, this creative site analysis progressively contemplates the user as an active part of the process (as in the tradition of public art): they are experiments that hybridize the two disciplines.
Water in Indian Landscape Architecture Practice

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Keywords: India, Water Landscape Practice

For over a billion in India, the acute water crisis impacts daily life as much as the socio-spiritual meaning ascribed to water in Indian culture. In response, a rich vocabulary of water in contemporary landscape architecture built works in India has emerged over the past few decades. Water has shaped remediation of basalt quarries, been collected in temporal landscapes, and being harvested through contemporary step-wells for new housing, providing innovative solutions to critical issues facing developing countries such as minefield restoration, water scarcity, monsoonal flooding, and more. This study documents progressive manifestations and aspects of designed water in contemporary Indian landscape to expand disciplinary knowledge in the context of a developing country, while simultaneously identifying gaps for future design inquiries, and substantiate as well as clarify opportunities for the design fields to take leadership roles in the face of the country’s water woes.

While architects and landscape architects have shaped the multidisciplinary ground of water in the designed contemporary Indian landscape, no studies document the various understanding gained from these design explorations. This study describes fifteen landscape architecture projects categorized based on how water manifests in the projects through surveys and interviews with designers and clients. These projects can be organized in distinct categories such as those in which the aesthetics of water are embedded in functional aspects, water is managed on-site to meet sustainability benchmarks, water becomes the catalyst for restoring degraded ecologies, water-bodies are revitalized and restored, and lastly to, where water becomes the basis for critical consciousness and alternative culture.

The projects described in this study were chosen because they were built and had either won awards, been featured in the only magazine of landscape architecture in India, or had been recommended through an initial survey of designers. While many project-specific lessons can be observed from this study, several broad lessons can also be drawn, such as the fact that non-landscape architects deliver many of these projects that can be classified as landscape architecture projects, and there is a dearth of built projects at the regional scale. These lessons, among others, point to a greater need for landscape architecture professionals in countries such as India to engage with contemporary water issues and develop a landscape design culture with a more critical agency.
You Can Cut All the Flowers, But You Can't Stop Spring

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Keywords: Amazon, tropical plants, Abel Rodriguez

The drawings by Mogaje Guihu (adopted name, Abel Rodriguez) of the rainforest ecosystem of the Nonuya region are executed with intricate details of the flora and fauna and are the subject of this research presentation which will discuss the representation of Amazonian indigenous plant knowledge and its integration into Landscape Architecture plants and design curricula. He is an elder from the Nonuya ethnic group, native to the Cahuinarí River in the Colombian Amazon, who preserves his knowledge of native lands in drawings, paintings, and video. He and his family were driven from their home during the armed conflicts in Colombia in the 1990s and his work is now dedicated to recording his ancestral knowledge of indigenous plants of the region.

His work, such as the Monte Firme series, is integrated into the core Plants and Design graduate (MLA) course, in which his work exemplifies, and is the primary precedent, for the 21st Century Botanical Drawing assignment. This four-week sequence explores botanical drawing across cultures and time and concludes with students challenged to draw a botanical drawing with political and environmental criticism around topics of deforestation, global pathogens, climate change, and indigeneity.
Landscape Architecture for Health
Blue Matters: Using EEG Technology to Measure Impacts of Various Bluescapes on Human’s Psycho-Physiological Restoration

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Keywords: bluescape; cityscape; landscape type; exposure duration; brain wave; perceived restorative potential

Water is an essential ecological and landscape element. Bluescape in this study refers to all visible, outdoor, naturalistic environments that prominently feature surface water, including rivers, canals, lakes, streams, ponds, and wetlands. We exclude outdoor swimming pools and fountains. A growing body of literature suggests that bluescapes are potentially beneficial to human health and well-being. While current studies mostly use coarse categories of bluescapes and focus on the method and frequency of exposure, we do not know whether and to what extent landscape type and exposure duration impact the restoration effects of bluescapes. This study examined peoples’ psycho-physiological responses (N=30) to diverse types of bluescapes. We selected three common types of bluescapes found in inland natural open spaces: Falling bluescapes (e.g., waterfalls), Flowing bluescapes (e.g., rivers, streams, and canals), and Static bluescapes (e.g., lakes, basins and ponds). We also included a completely human-made, unnatural urban street setting (Cityscape). Participants experienced four conditions, Falling, Flowing, Static bluescape, and Cityscape (control), by viewing a four-minute slideshow for each landscape, consisting of a one-minute white blank slide (baseline) and three-minute landscape images, in random order. We applied portable Electroencephalograms technology to record participants’ brainwaves continuously as they viewed the slides and adopted the Restorative Components Scale to measure restoration potential. Alpha and beta waves are strongly relevant to the present study. Increased alpha waves are associated with calmness, relaxation and a meditate state. Lower beta is associated with recovery from stress and mental fatigue. There are three main findings in this within-subject experimental study. First, results show that all three bluescape conditions evoked significantly physiological restoration compared to cityscapes. We argue that visual exposure to bluescapes does offer significant psycho-physiological restoration compared to the cityscape. Second, results show that different bluescapes elicit significantly different psycho-physiological restorativeness, with the Falling eliciting the highest restorative effects. We suggest that the restorative effects are different among different types of bluescapes, and the Falling was the most restorative. Third, results show that landscape type produced significant effects on α1, α2, and β2 waves, exposure time was only significant for β1 waves. So we suggest that the differences between restorative benefits among the four landscapes might mainly resulted from differences in landscape type, and less from exposure time.
These results can offer guidance for designers and citizens in terms of bluescape types and exposure duration to achieve optimal restoration effects.
The Connection Between Urban Nature and the Neuro Networks of Attention

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Keywords: mental health, attention restoration, fMRI

As urbanization increases across the world, hundreds of millions of individuals lack regular contact with nearby nature. One consequence of this lack of exposure is that these individuals are deprived of the restorative qualities that nature bestows on attentionally fatigued individuals. According to Kaplan’s Attention Restoration Theory (ART), contact with nature boosts our capacity to recover from mental fatigue and thus improves our ability to pay attention. There is an extensive body of empirical evidence in support of ART, showing that exposure to urban nature allows people to more quickly recover from mental fatigue. This faster recovery improves attentional functioning. ART was initially based on observational research and experimental work (Kaplan and Talbot, 1983), and while it has been supported by considerable empirical research, we do not have a clear understanding of the neurological pathways of this restorative process. In this study, we provide behavioral neural evidence to shed light in the mechanism underlying attention restoration from exposure to nature. For the behavioral data, we used the Attentional Functioning Index (AFI) and to observe the neurological functioning we used functional Magnetic Resonance Imaging (fMRI) of 50 participant’s brains before and after being exposed to varying levels of urban nature.

We conducted an experiment consisting of three phases. These phases took place during one week. We have pre and post phases and an intervention between pre and post. We collected data from two resting state fMRI procedures and two AFI surveys involving the participants. We randomly assigned participants' to an urban group and a nature group. Each participant in each group walked three times for 40 minutes in one of the assigned environments (park or urban area with no vegetation) during the week.

Analysis reveals significant differences in brain connectivity and AFI results between the two groups before and after the intervention. We observed more connectivity among brain regions and higher scores in the post-AFI which represents better attentional functioning among the group who were exposed to a higher level of vegetation density. Results suggest that even short contact with nature in an urban setting can promote recovery from mental fatigue. These results create a higher demand for the works that landscape architects accomplish today.
The Effect of Green Space Biodiversity on Psychological Restoration by the Visual and Auditory Exposure

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Keywords: Restorative environments; Biodiversity; Sound; Student's mental health; Green space

There is a growing interest in the relationship between green space biodiversity and psychological wellbeing (Southon et al., 2018, Fuller et al., 2007, Sandifer et al., 2015, Carrus et al., 2015). While most works have been focused on the visual perception of biodiversity as a facilitator of restorative effect, its auditory perception has been largely neglected. The purpose of this study is to investigate whether, and how differently, visual and auditory exposures to green space biodiversity are associated with psychological restoration. In the pilot study phase, this study used the online survey method for collecting data among college students. The 2 x 2 factorial interventions were designed to study (a) high vs low green space biodiversity, and (b) visual exposure only vs. visual exposure with sound. A total forty subjects were recruited and randomly assigned to each group. Using 360-degree view videos on two adjacent similar-sized outdoor environments (high biodiversity with native tall grasses and meadow plants and low biodiversity with plain lawn), subjects were asked to rate their levels of restorative status (RS) (Van den Berg et al., 2014), and the psychological status such as tension (TEN), fatigue (FAT), and depression (DEP) in the short form of the Profile of Mood States (Curran et al., 1995) before and after the interventions. A two-way ANOVA analysis was performed for a multiple comparison test (between high vs low biodiversity, and visual vs. visual/sound) the psychological status (RS, TEN, FAT, and DEP). Although the statistical significance was not found in the pilot study phase due to the small sample size, the higher mean value of RS, and the lower mean value of TEN, DEP were found in the environment with the presence of sound regardless of the level of biodiversity. The result highlights the importance of auditory exposure with visual stimuli in improving psychological restoration. Along with the full study results, this study may contribute to the literature of expanding the evidence-based knowledge of psychological wellbeing and biodiversity, guiding landscape professionals and researchers to explore a biodiverse green environment by considering the broader sensory.
Health-Based Axioms: Postulating Adaptive Strategies for Universal 21st Century Outdoor Environments

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Keywords: Healthy outdoor environments, 21st century urbanism

This transdisciplinary and praxis-based research derives a set of axioms for adapting 21st century urban settlements into healthy, human-centered environments. It focuses on the importance of incorporating sensory and restorative experiences into everyday practice. In this work “urban” covers the range of settlement patterns including urban, suburban and ex-urbia in urbanism studies, particularly the notion that inhabitants interact with the built environment. This paper recognizes humans are part of and have always interacted with their physical environment and nature (Sauer 1925; Appleton 1975; Wilson 1984, 1996; Kellert & Wilson 1993; Ulrich 1993; Nordh et al 2013). Axiom in this research trajectory expands from Merriam-Webster’s definition: “a statement accepted as true as the basis for argument or inference”. The health-based qualifier for this study’s axioms is drawn from both praxis-based studies (Marcus & Sachs 2014) and the varied scholarly works on the need for healthy and active living, reduction of stress and management of stress in the constantly shifting everyday life super-saturated by media and variety of communication modes in a technology-driven 21st society. It amplifies universal stress and anxiety from the current pandemic surrounding the impact of covid-19 and constantly shifting socio-cultural and political milieu, especially in the USA. It touches on the importance of culture and communities, and related different publics (Hall 1991, 1996). In large part as transdisciplinary and praxis-based research, the healthy-based axioms are preliminary and speculative, and represents the convergence of theories, applications and best practices from scholarly and evidence-based literature including: outdoor immersive sensory and multi-sensory experiences (“real” not virtual or augmented); mindfulness, public health and the need for daily sensory experiences (Forge 2005); Kaplan’s (1992) notion of the “restorative environment”; intersection of cultural studies and active design (Hall 1991, 1996; NYC 2010); cognitive research and the nature of perception (Farina et al 2007; Nordh, et al 2013; Thompson 2013) and “salutogenesis”, a model for promoting human-centered health that posits life experiences for shaping one’s sense of coherence (Antonovsky 1979, 1987, 1996). The research objective is to bring to light a preliminary and re-imagined set of health-based and action-oriented axioms for adapting urban environments that represent the convergence of ideas for consideration by designers, planners and policy-makers engaged in human-centered healthy strategies for adapting built environments in the 21st century.
Immersive Virtual Environment: An Emerging Tool to Examine the Restorative Quality of Natural Green Elements

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**Keywords:** Virtual Reality (VR), Immersive Environment, Gaze Tracking, Attention Restoration Theory, Sustained, Attention, Natural Green Elements

Attention Restoration Theory (ART) indicates that interaction with natural green elements in indoor spaces can foster attention restoration, rehabilitation from mental fatigue, and improve cognitive functions (Keniger, 2013). Researchers have used different methods of assessing one’s interaction with natural elements to measure the effect on people’s attention level (Stevenson et al., 2018). However, studies have not established a causal relationship between the existence of natural green elements and a higher attention level due to the potential impact of other variables and the difficulty in determining the precise nature of an individual’s interaction with the environment. This study is exploratory research and aims to examine if the existence of natural green elements in indoor environments affects people’s attention level. Also, do those elements receive more visual attention, or do they cause other elements to stand out more visually? Thirty residents, two groups of fifteen, of a high-rise residential building were randomly assigned to experience one of two versions of their building’s threshold in a 3D virtual reality (VR) environment, via VR goggles for less than a minute. One version contained natural green elements and one version did not. To assess a possible improvement in attention level, participants completed the Sustained Attention to Response Task (SART) (Jung et al., 2017) twice. Once before experiencing the threshold, to establish a baseline of attention, and once after. Also, the amount of visual attention that each element received in the environment was calculated through gaze tracking. Using VR technology allowed researchers to keep some of the intervening variables such as ambient noise, temperature, and lighting consistent to help to draw a stronger causal relationship between the dependent and the independent variable. The results of the study indicated that participants who experienced the threshold with natural green elements showed significant improvement in the SART score. The visual attention diagram, based on gaze tracking, of this group, revealed that natural green elements received a significantly higher amount of attention than all other elements in the space. The analysis of the data obtained from this group demonstrated those who scored the highest paid the highest amount of visual attention to natural green elements. This suggests a positive relationship between the duration of visual attention and attention restoration level. This research indicates that green elements capturing non-voluntary attention may be one of the major factors impacting attention restoration, and this factor may be key to recover from mental fatigue.
The Importance of Both: Competing Factors That Impacts Attention Level Restoration and Mental Health

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Keywords: Attention Restoration, Restorative Environments, Virtual Reality, Direct Attention, Natural Green Elements, Residential High-rise Threshold

Attention Restoration Theory (ART) puts forward that being in nature and/or interacting with natural green elements has a restorative impact on direct attention level (Kaplan, 2001). Following this theory, studies have utilized different methods to measure the extent and impact of the interaction. Some have tried to measure the perceptual implications of the four characteristics suggested by ART of a restorative environment (being away, fascination, compatibility, and extent) (Korpela et al., 2010), and others have attempted to measure the cognitive consequences of immersion in a natural environment (Ohly et al., 2016). What has been examined far less is the interrelationship of perception and cognition and how they indicate the restorative impact. Thus, measurements of the effect of interaction with natural green elements on perception do not necessarily reflect the impact on cognition and vice versa. This paper reports on an experiment that aimed to measure both perceptual and cognitive impacts of a visual immersive interaction with natural green elements. One hundred and eighty-two students were randomly assigned to walk through, via VR goggles, one of two versions of a building’s threshold modeled as a 3D virtual reality (VR) environment. One version was with, and the other was without natural green elements consisting of two types of indoor plants. To measure the two environments' perceptual impact, participants filled out a Perceived Restorative Scale (PRS) questionnaire (Hartig et al., 1997) after experiencing the environment. To assess possible improvement in attention level through cognitive processes, participants completed, before and after experiencing the environment, a Sustained Attention to Response Task (SART) (Jung et al., 2017). The results demonstrated that those who interacted with natural green elements in the building threshold showed significant improvement in the SART score. In contrast, no meaningful differences were detected between the two groups’ perceptions by the (PRS) of the environment’s restorative characteristics. The results of this research seem to indicate that measuring one influencing factor may not be sufficient to evaluate the impact of an environment on attention level and may lead to misleading conclusions. The outcome also reveals the necessity of a more holistic framework for measuring the competing factors in the environment, resulting in a restorative impact on an individual’s attention level.
Influence of Landscapes in Different Biodiversity Levels on Human Health

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Keywords: Nature; Landscapes; Biodiversity; Psychological health; Physical health

Previous empirical research has found that natural landscapes containing high levels of biodiversity provide a wide variety of ecosystem services (Bratman et al., 2019; Sandifer, Sutton-Grier, & Ward, 2015). Studies have also shown positive relationships between flora and fauna biodiversity and human psychological and physiological health (Dallimer et al., 2012; Fuller, Irvine, Devine-Wright, Warren, & Gaston, 2007). The health benefits associated with exposure to biodiverse settings, however, are likely available to fewer and fewer people. That’s because urbanization and climate change have combined to dramatically reduce biodiversity near human settlements (United Nations, 2015).

Our research examines the extent to which exposure to varying levels of biodiversity in urban settings impact human health and wellbeing. At this moment, we do not know the shape of the dose-response curve that describes this relationship. For instance, does a small amount of biodiversity experienced on a daily or near daily basis impact human health? Or do humans need to reach a minimum level of exposure to biodiverse landscapes in order to reap measurable health benefits? Lack of this knowledge is an important problem because it hinders the capacity of landscape architects to make empirically-based arguments regarding the potential health-inducing benefits of biodiversity. Answers to these questions might also stimulate demand for the kind of rich, biodiverse design that landscape architects create as a matter of standard practice. We explore these questions through a multi-method approach in which we test the impact of different levels of vegetation biodiversity in urban settings. Participants are exposed to three-dimensional videos of multiple settings. Each video presents a particular level of biodiversity. We measure health outcomes associated with stress, attention, mood, and brain connectivity using functional Magnetic Resonance Imaging.

This is a multi-year project. For CELA, 2021, we will share the theoretical underpinnings of this work and our research design. We will seek CELA member feedback on the research design at the meeting. Next year, we will report on some of our findings.
Investigating Smart Neighborhood Design for Physical Activities: Case Study of South Atlanta Neighborhood, Georgia.

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Keywords: Public health, Physical Activity, Smart Growth Principles

Public health is directly related to the built environment. Design of public space encourages or discourages the ability to be physically active (Frank et. al., 2003). The vast majority of low and middle-income neighborhoods within big cities lack basic amenities including: sidewalk, bike lane, open space that stimulate physical activities such as walking, biking, and running (Huang, 2014). Safety concerns, (Boslaugh et. al., 2004 and Bennett et. al., 2007) and lack of social destinations (McCormack et. al., 2008) discourage residents' engagements in physical activities. Studies by healthcare experts underscore the relevance of physical activity towards improving population health and wellbeing (Lee & Paffenbarger, 2000). Despite an increased awareness of the importance of physical activity and its associated health benefits, minority neighborhoods of color fare poorly in access to outdoor spaces conducive to a healthy lifestyle. Literature shows that residents in such neighborhoods are amongst the most predisposed to chronic diseases such as, depression, type-two diabetes, heart disease, strokes, cancer and obesity (Wang et. al., 2008). Few research studies pointed out correlations between smart growth principles and health benefits, economic development, and sustainable living (Daniels, 2001). South Atlanta neighborhood is a low to middle-income neighborhood, primarily of people of color, south of downtown Atlanta that lacks basic amenities and designed outdoor social destinations. This research sought to investigate the condition of South Atlanta neighborhood and its impact on residents’ level of physical activity. Specifically, the research examines habits and patterns of physical activities of the residents, as well as their preference of designed outdoor spaces that align with smart growth principles. Neighborhood observation and behavioral mapping were conducted in February 2020. Using quantitative and qualitative questions, an online survey was posted to the neighborhood Facebook page requesting residents’ response. The survey was sent several times for a duration of one week in April 2020 to elicit more participation. According to 21 respondents who participated in the study, more people are willing to lead physically active lives if their neighborhood design encourages it. Additionally, safety and social destinations were identified as primary factors determining how residents engage in physical activities in the outdoor space. Findings suggest that given the neighborhood residents’ concern about lack of safety and designed social destinations, landscape design of South Atlanta neighborhood should provide residents with more accessibility to safe open public space and incorporate smart growth principles conducive to higher levels of physical activities.
The Korea Forest Welfare Institute (FoWI) and Forest Kindergarten Children’s Outdoor Learning Areas in Korea

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Keywords: health, nature, exercise, play, children

This presentation highlights a case study of forest kindergarten play areas established by the Korea Forest Welfare Institute (FoWI), formed in 2016 as a division of the Korea Forest Service, in addition to forest-based healing facilities for people of all ages across the country (3). Forest kindergartens originating in Northern Europe are among the cutting-edge domestic practices in active child development that are being increasingly promoted both in research and in practice (1). A substantial amount of complimentary research has been conducted in Japan in the stress-relieving value of being in forests, often referred to as forest bathing or “shinrin-yoku” (2). During its three-year presence, FoWI contributed to establishing 163 forest kindergartens across Korea. We reviewed 81 facilities and visited six including two in Sejong, one in Daejeon, one in Daegu, and two in Seoul. Interviews with FoWI researchers and officials together with field observations revealed a strong commitment through the national government by establishing these facilities and accompanying educational programs. This commitment has seen strong support from parents to further the success of the system of forest kindergartens. Policies and practices such as forest kindergartens that are being promoted domestically and employed in Korea offer an opportunity for the study of best practices and research that can be applied to domestic implementation. They also offer an opportunity to evaluate safety records on built facilities to weigh some of the US playground safety policies/practices, which are being questioned in the context of natural play environments (4). With Landscape Architecture being at the juncture between the built and natural worlds, this international research offers an opportunity to build collaborative relationships between our international peers while generating new knowledge for international benefit. FoWI and its forest kindergarten program are examples of national/local policy initiatives aimed at promoting physical activity (PA) while simultaneously bringing mental health benefits from forest bathing. They appear to serve effectively as places for children to engage in both free play and structured play programs offered by local school districts, park departments, and private entities. These facilities can make a positive contribution toward attracting families (parents and children) to being outdoors and active in public parks with the benefits of attitude improvement, stress relief, and PA (5, 6). The outcome and completion of this study are anticipated to contribute to guiding practice/policy towards the promotion of forest kindergarten outdoor learning areas for health and wellness across society.
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Natural Experiments in Landscape Architecture for Health Research

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Keywords: natural experiment, active living, healthy community

Creating healthy communities has long been at the center of many research, design and policy objectives in Landscape Architecture and beyond. Despite the continued growth in empirical studies that aim to solidify the cross-sectional link between community environment and health, the causal relationship between the two is still largely unknown. Natural Experiments (NEs) have become increasingly popular as ways to evaluate the causal impacts of various environmental and policy interventions on health that are not suitable for controlled experimentation.

First, this presentation provides an overview of two on-going NE projects funded by the National Institutes of Health: Active Living Austin (ALA) and Active El Paso (AEP). These longitudinal, case-comparison studies represent two common yet different types of NE interventions: “relocation” in ALA (i.e. people moving to a walkable community) and “exposure” in AEP (i.e. new transit services in the neighborhood). Using self-administered surveys and objective measures (GPS and accelerometer), these projects examine short- and long-term casual effects of the two interventions on people’s physical and social activity levels and travel behavior. They also explore spatial and temporal patterns of outdoor activities to identify specific design features and policy elements associated with increased activities.

Second, it shares lessons learned from these projects, including the unique challenges and strategies in implementing NEs. It then discusses a combination of methodological approaches (e.g. propensity score matching, multiple comparison groups, multi-channel marketing, and machine learning algorithms) that can help design and execute NEs. The two projects offer insights on ways to overcome frequently encountered challenges in environment-health research involving complex spatial and human data/measurements.

Third, discussions will be provided on the importance of interdisciplinary teams and partnerships to design and execute NE projects. The ALA and AEP project teams include principal investigators from Landscape Architecture, Architecture, Urban Planning/Transportation, and Public Health, and investigators from Computer Science, Statistics, Kinesiology, Health Promotion, and Community Outreach. The teams also collaborate closely with community stakeholders (e.g. developer, transit agency).
This research presentation demonstrates the strong promise for NEs and interdisciplinary approaches to advance the Landscape Architecture for Health research.
Nature and Gardens May Improve Hospital Wayfinding: An Experimental Study through Immersive Virtual Environment (IVE) Techniques

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**Keywords:** Healing garden, environmental aesthetics, preference, mood, virtual reality

Large hospitals are often complex, sophisticated environments due to their functional complexity and how they evolve [1]. These result in wayfinding difficulties and spatial disorientation among patients, visitors, and staff members [2]. Wayfinding issues can increase people’s stress and anxiety and negatively impact their overall healthcare experience. Previous studies about hospital wayfinding issues have been primarily focused on signage systems and interior decorations. However, very few emphasized the spatial layout and design of healthcare circulation space [3-4]. Integrating nature and healing gardens in healthcare environments have been proven therapeutic in many ways, including relieving distress and pain, stress reduction, mood change, and increased healthcare satisfaction [5-7].

The hypotheses of the study were: visual access to nature from within hospital circulation spaces could serve as identifiable and memorable landmarks and facilitate people’s spatial cognition and wayfinding performances in a diagnostic and treatment health care environment [8]. A survey-embedded experimental study through immersive Virtual Reality techniques was conducted to explore the hospital circulation spaces with transparent connections and views to nature (treatment group) with people’s wayfinding performances as compared to hospital corridors with no window views (control group). The research design phase of the study was presented at the CELA 2019 conference [9]. The data collection phase was conducted during September 2018 and April 2019. Seventy-four college students were randomly recruited and assigned to either the treatment or control group to complete various wayfinding tasks; their heart rate changes were tracked, and a series of variables were measured to compare their wayfinding strategies and performance, such as time consumption, route selection, frequency of stops and sign-viewing, and so on. After the wayfinding tasks, participants reported their mood status, perceived level of attractiveness of the hospital environment, and the level of presence in virtual reality. Massive data were collected from participants, including heart rate data, questionnaire responses, verbalization data, and over 40,000 seconds of wayfinding data through screen recording. Preliminary results indicated that integrating nature and gardens in hospital environments could impact people's route selection and wayfinding strategy. Compared to the control group, participants in the treatment group performed better in wayfinding, experienced less stress during wayfinding, and perceived higher quality in the design of the hospital environment. This study also indicated that immersive virtual environment (IVE) techniques could be flexible, reliable, and applicable tools in the realm of healthcare design and research.
Nature as Restorative Resource for Pre-School Children: A Comparative Case Study in Childcare Centers

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Keywords: Design for children’s health, biophilic design, children’s play environment, restorative experience, nature play

Current research emphasizes the benefits of contacting with nature on children’s health and well-being. Kaplan’s Attention Restoration Theory suggested that nature with its rich characters provides individual restorative experience and helps individual recovery from stress and mental fatigue. Specifically, there are four components of restorative experience—being away, fascination, extent, and compatibility (Kaplan, 1995). Most empirical research focused on the positive relationship between nature volume and children’s restorative experience. Limited studies have examined the design of natural settings in the play environment and its’ impact on children’s play experience, interaction with natural elements, and their restorative experience. This research pushed boundaries to not only the green volume but the actual interaction between children and natural elements and to promote well-being of children as well as community resilience through nature-based design approach. This inter-disciplinary research examined the interrelationship between the designed outdoor play environment and pre-school children’s interaction with natural elements and their perceived restorative experience at licensed childcare centers in South Carolina. This comparative case study (Yin, 2014) compared nature-based and standardized or conventional outdoor play environments and their impact on children’s restorative experience. Data were collected through 1) field observation of children’s play behaviors and children-nature interactions during their outdoor play and 2) interviews with teachers and children regarding children’s restorative experience (being away, fascination, extent, and compatibility). Data were analyzed through functional based site condition analysis, GIS hot spot analysis, and content analysis. Research findings indicate the contribution of designed nature-based outdoor play environments on children’s interaction with natural elements as well as their perceived restorative experience. The empirical evidence of this research also indicates the potential positive impact of biophilic design on children’s health and well-being. This research contributes to the understanding of attention restoration theory and outdoor play environment as well as the significance of nature-based designed outdoor play environments and children’s health and well-being.
Nearby Nature and Post-Traumatic Stress Disorder: Evidence from Hurricane-Affected Communities

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Keywords: nature, mental health, post-traumatic stress disorder (PTSD), hurricane-affected community

Exposure to a severe natural disaster such as a hurricane or flood can lead to mental health issues such as increased risks of stress, anxiety disorders, and post-traumatic stress disorder (PTSD). Exposure to nearby nature has consistently been demonstrated to help vulnerable or disadvantaged populations cope with stress (Wells et al., 2003). However, the effects of nearby nature on mitigating post-traumatic distress has not been discussed much. This study aims to understand the associations between nearby nature and levels of PTSD in Houston communities that were affected by Hurricane Harvey using a cross-sectional survey.

We sampled 30 Houston neighborhoods that endured severe loss during Hurricane Harvey, and then employed an address-based sampling of households within the block groups in 2019. We had a total of 272 participants, among whom 62.3% were females, and 28.5% were Hispanic. Self-reported neighborhood green space was measured using an adapted NOS scale. PTSD was measured using the Posttraumatic Stress Disorder Checklist for DSM-5 (PCL-5) as a dichotomous outcome, and hurricane-related distress was measured using the subscales of the Impact of Event Scale (IES-R). Generalized linear mixed models were used to test the relationships. In the models, neighborhood- and individual-level confounding variables were controlled.

Results showed significant associations between nearby nature and lower levels of PTSD, as well as the avoidance domain of hurricane-related distress. As the first study that links salutogenic environmental factors to post-hurricane mental disorders, this study contributes to the literature by identifying the mental health effects of green space in the aftermath of the most severe hurricane in recent years. The findings from this study can provide policy implications in establishing a holistic disaster planning and adaptation framework that incorporates mental health promotion.
Significance of Oppressiveness: A Pathways Model to Interpret Impacts of Streetscapes on Mental Stress in the High-Density City

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Keywords: High-density city, Streetscape; Mental stress; Perceived oppressiveness; Pathways model

Mental stress is a significant threat to public health in high-density cities. As more and more people are moving to the city, the increasing density of urban environments is a common trend worldwide. High-density streetscapes are more often perceived as oppressive than streetscapes in low or moderate-density cities. The term "perceived oppressiveness" in this study refers to the negative psychological pressure caused by compactness cityscapes that feature high-rise buildings, crowded car and people traffic, many visual noise such as billboards and etc.. Streetscapes are one of the most common settings that urban residents experience. Many studies have examined the general relationship between streetscape and stress, while little attention has been paid to the underlying pathways of this relationship, especially in high-density cities. Perceived oppressiveness might be a possible pathway linking the streetscapes and stress, while little attention has been paid to the underlying pathways of this relationship, especially in high-density cities. Perceived oppressiveness might be a possible pathway linking the streetscapes and stress. Thus, this study aims at examining the underlying pathways linking urban streetscape in the high-density city and stress, as well as the perceived oppressiveness’s contribution to explaining the impact of urban environments on stress. Thus, this study applies SRT to develop a hypothesized pathways model to explain the relationship between streetscapes and stress:  
Hypothesis 1: Specific urban streetscape elements are significantly associated with stress.  
Hypothesis 2: Urban streetscape elements impact stress through serial mediators (pathway1): streetscape to environment quality to oppressiveness to stress.  

We used Google Earth Pro and ArcGIS to identify 90 street locations in Hong Kong and created 90 GIF images with nine images for each location, including four horizontal angle images, four 45 oblique angle images, and one vertical angle image. Then we measured the density of each streetscape element. We recruited 2600 HK residents participated in a web-based experiment, and 1446 participants complete this experiment. Each participant randomly viewed three of the 90 images, and was asked to report perceived environment quality, perceived oppressiveness, and acute stress response after viewing each image. Participants also reported personal chronic stress status and social-demographic information. We used Structure Equation Modeling to examine the hypothesized model and identified three pathways by which streetscapes impact mental stress. We found that perceived oppressiveness serves as a major mediator between streetscape and mental stress, and perceived environment quality serves as a supportive mediator. Further, we identified tree canopy and sky as the elements most associated with stress relief, while vehicles and billboards are most associated with stress arousal in streetscapes. We also identified pathways through which specific streetscape elements impact mental stress. These findings can not only enrich our understanding of
Stress Reduction Theory but provide evidence to support the creation of stress relieving urban environments.
Street Environments and Crime around Low-Income and Minority Schools: Adopting an Environmental Audit Tool to Assess CPTED

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Keywords: CPTED, Defensible Space Theory, street environments, environmental audit, crime

Background: Crime prevention through environmental design (CPTED) suggests an association between micro-scale conditions and crime, but little empirical research exists on the detailed street-level environmental features associated with children’s crime-related safety. Purpose: This study focuses on the neighborhood around 14 low-income elementary schools in Seattle, WA to assess if the distribution of crime incidences (2013-2017) is linked with the street-level environmental features that reflect CPTED principles. Methods: Street environments of 656 street segments located within a ¼ mile buffer from each study school were captured using an environmental audit instrument. Crime records from the Seattle Police Department (2013-2017) including violent crime and property crimes, were analyzed at the street segment level. A multilevel negative binomial regression model was used to test associations of various crime types at the street segment level nested with census block groups with the following four key domains of CPTED variables: (a) geographical juxtaposition, (b) image maintenance, (c) territoriality, and (d) natural surveillance. Results: As a geographical juxtaposition, almost all street segments (96.6%) in our study had one or more single-family homes; 21.9% had one or more multifamily homes; 9.9% had bus stops; and 83% of the street segments had sidewalks. In terms of the image maintenance domain, almost all (98.7%) street segments had one or more unattractive items such as graffiti, abandoned cars, or buildings with broken windows. Specifically, most crime variables showed positive associations with the presence of multifamily housing, factory/parking lots, bus stops, playgrounds, and vacant land or buildings in terms of the geographical juxtaposition. Regarding image maintenance, certain unattractive items (e.g., graffiti, cigarette, buildings with broken) and certain sidewalk obstructions (e.g., poles or signs, litter, and noise from factories) were positively correlated with increased crime incidents. In terms of territoriality, bicycle-friendly signs and community signs were positively associated with various crime types while crime watch and beware of dog signs were negatively associated with crime, especially violent crime. After adjusting for covariates, certain variables in the four environmental domains were associated with increased crime incidents. Findings: The findings suggest that environmental interventions such as removing signs of physical disorders, improving maintenance conditions, and increasing territorial control can improve crime safety in neighborhoods near low-income and minority-serving schools. These street-level, micro-scale environmental problems are relatively easy to address and can serve as promising targets for CPTED research and initiatives.
Teaching and Pedagogical Strategies on Landscape for Health-Design

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Keywords: teaching, health, pedagogical strategy, evidence-based design

Responding to the growing interest in health-related topics and issues in landscape architecture, a new track on “Landscape Architecture (LA) for Health”, has been introduced at CELA 2021. To establish the track, two-series of panel discussions were conducted. The first panel was presented at the 2017 CELA conference, which focused on putting forward LA for Health as a unique, timely, and interdisciplinary area of scholarship and education in LA. The second panel at the 2019 CELA conference focused on various research topics on the LA for Health initiative.

Each 2017 and 2019 CELA attendees was invited to complete a short survey (n=43 at year 2017 and n=32 at year 2019) designed to gauge their level of interest in various topics and applications related to LA for Health. Among the broad areas of LA for Health applications, education/teaching was selected within the top 3 in 2017 survey and was highly expressed as their interest (74.2%), followed by research (90.3%) in 2019 survey.

Responding to the results from the above survey and the panel-audience discussions during the 2017 and 2019 CELA conference, the 2021 panel takes the next step by focusing on the “teaching” and “pedagogical strategies” discussions on the LA for Health initiative.

This panel brings experts in LA for Health education, who are currently teaching design studio or delivering a lecture on health-related topic. They will address a wide range of pedagogical issues and strategies including (a) underpinning theories and design projects (e.g., therapeutic landscape, walkability, active living, post-COVID 19), (b) teaching methods (e.g., cases of evidence-based approach, multidisciplinary studio, lecture, lab works), and (c) innovative tools (e.g., GIS, drone, audit tool).

Part one of this panel session will feature presentations by the panelists showcasing their recent/current pedagogical approach on LA for health, followed by an introduction and current address of the LA for Health education. During part two of the panel session, the moderators will facilitate the panel-audience discussions on strategies to enhance LA for Health education, which may include understanding a unique set of knowledge skills, identifying challenges and opportunities of evidence-based design or multidisciplinary studio; and sharing tips for effective teaching methods.

Attendees will hear the unique set of knowledge skills required for teaching health-related courses and
tips for effective teaching methods; and be engaged in evolving discussion around various topics on LA for Health education.
Towards a Clearer Resolution on the Restorative Quality of an Environment

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Keywords: Attention Restoration, Restorative Environments, Virtual Reality, Direct Attention, Natural Green Elements, Residential High-rise Threshold

Attention Restoration Theory (ART) suggests that interaction with natural green elements positively affects voluntary attention level through engaging non-voluntary attention and allow voluntary attention to replenish. To measure the effectiveness of that interaction, researchers have employed various approaches. Some have tried to measure the perceptual implications of the four characteristics that ART suggests for a restorative environment, namely being away, fascination, compatibility, and extent. Others have measured the response of the senses to an encounter with nature. What seems to be less addressed is that perception and sensation are parts of the same psychological process and occur at about the same time. Thus, measuring the effect of interaction with natural green elements on perception does not necessarily capture the impact on sensation, and sensation measurements do not completely capture perception. This paper reports on experimental research that measures both the sensational and perceptual impacts of the interaction with natural green elements. One hundred and eighty-two test subjects were randomly assigned to experience one of two versions of a building's threshold as a 3D model through an immersive virtual environment using VR goggles. One version was with, and the other one was without natural green elements. Researchers recorded blink rate, fixation duration, and eye travel distance to assess the physical (sensational) responses that demonstrate improvement in participants' attention levels. To evaluate the two environments' impact on participants' perception, participants filled out the Perceived Restorative Scale (PRS) questionnaire after experiencing each threshold. For those who experienced the threshold with natural green elements, the three physical attributes of eye movement patterns were consistent with verified patterns of eye movements in restorative environments. For the other group, patterns of eye movement were consistent with findings related to nonrestorative environments. Regarding the two building thresholds' restorative characteristics that could impact individuals' perception, the study results suggest no meaningful difference between the two groups. These outcomes suggest that in evaluating the impact of an environment on attention level, measuring one influencing factor may not be sufficient and may lead to inaccurate conclusions. The outcomes also reveal the need for a more multi-faceted framework that takes all the competing factors that may affect one's attention level into account.
Landscape Performance
Landscape Performance (LA CES Track)

1017

All About That Base(line Data): Collecting, Assessing, and Comparing Pre- and Post-Project Data

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Keywords: existing conditions, landscape performance, research, post-occupancy evaluation, case study, design implementation

Quantifying performing landscapes’ environmental, economic, and social benefits requires the acquisition of baseline data to compare pre- and post-project conditions and impacts. Unless data is collected in pre-project conditions, assessing projects’ impacts through comparative studies leads to less rigorous evaluations due to a high level of assumptions and limitations. This panel will focus on collecting baseline data as a critical step in a credible landscape performance evaluation process.

Panelists will share approaches for collecting baseline data and provide examples of 1) a design firm’s capture of existing conditions prior to design or before construction, 2) an academic’s partnership with a designer for pre-project data collection and analysis, and 3) an academic team’s data collection after the project has been built when no pre-project data was documented. Insights from these methods, including opportunities and challenges, will be discussed.

Each panelist is engaged in evaluating landscape performance and skilled at collecting baseline data. The Landscape Architecture Foundation’s (LAF) is a leader in landscape performance evaluation with the Landscape Performance Series and Case Study Investigation (CSI) and has extensive experience working with researchers and firms in using baseline data and predictive methods to evaluate exemplary projects. The LAF Program Manager will share high-level lessons learned from baseline data collection (and lack thereof) in LAF’s ten years of landscape performance evaluation. Also featured on the panel are two faculty members whose expertise regarding baseline data collection methods stems from their participation as LAF CSI Fellows and case study authors, as well as their independent research on the performance of landscape projects and materials. One presentation will highlight findings and recommendations for the simultaneous collection of pre- and post-project data using user surveys to quantify social benefits when documenting changes in user perceptions. The other will share experiences and lessons learned from a pre-teaming effort to collect baseline data before implementation. Finally, a practitioner from a landscape architecture firm that has participated in over a dozen LAF case studies will share strategies and methods for baseline data collection and analysis, and how it was applied to the design process and post-occupancy evaluation for two projects.

The panel will advocate for baseline data collection as a critical step in the design process, incorporated
into the site analysis and inventory stages of project efforts. Panelists will share replicable strategies, techniques and tools for collecting pre- and post-project data to build landscape performance expertise in the profession.
Assessing Urban Park Visits Using Big Data: What Role Can Spatial Planning and Design Play?

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Keywords: Sonoran Desert, urban green infrastructure, landscape features, park visit, performance evaluation

Urban parks provide essential services to urban dwellers by offering copious amounts of recreational opportunities (Gobster, 2001), enhanced social interactions (Liao, 2019), and health and well-being benefits (Lee and Maheswaran, 2011; Canfield et al., 2018). The traditional methods such as surveys, observations, and interviews that analyze park use and park benefits become resource-intensive and time-consuming when the number of park samples increases (Chen et al., 2020). Previous studies have been focusing on selected parks examples. Few have evaluated a city’s park system’s performance or have explored ways to elevate the park system’s performance from spatial planning and design. Using Tucson, Arizona, a medium-sized city as a case study, we analyze the spatial distributions of visits to 141 parks using cellphone geolocation data, high-resolution landscape features data, and census population data, and through the negative binomial regression analysis. Principal results include: (1) there are 1102,621 visits to parks in Tucson in 2019 (on average, 2.02 visits/resident); (2) for each 100-m² park area, river/linear parks, and other types of parks can attract 9.8 and 2.6 visits, respectively, on an annual basis; (3) smaller parks are popular during the weekdays, while larger parks attract more visits over the weekends; and (4) park-perimeter is another critical design variable in addition to park-size in explaining park visits. There are several limitations associated with the new dataset. The first is that we excluded 24 parks (15.48%) in Tucson’s Park and Recreation system that miss compatible park visits data. Also, since the number of visits is based on cellphone devices, the actual visits would be higher if younger children accompany the adults or the adults do not bring their cellphone devices. In the same vein, for parks catering to youth populations, the visits count would be underestimated. Last, contextual land-use conditions may affect data accuracy. We conclude that a creative combination of different big data sources can provide a comprehensive evaluation of a city’s park system performance and elevate performance through targeted planning and design interventions. The assessment framework presented in this study can be instrumental in guiding park management decisions, including resource allocation and making connections to public health and economic development goals and initiatives.
Augmented Performance: A Remote Process and Engagement between Metrics and Outcomes

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Keywords: augmented reality, parametric modeling, landscape performance, community engagement, remote environment

Augmented reality is not only gaining traction as an innovative representation tool but with the integration of parametric modeling and performance metrics, it can also serve as a decision-making process (Duenser et al., 2008). Students, community members, and stakeholder groups can rapidly generate scenarios that align with design program objectives that relate to social, economic, and environmental benefits for measurable outcomes. With the augmented interface, information and data becomes perceptual and responsive to real-time data, performance parameters, and user decision making. With the influx of real-time quantitative data that updates during this process, there is a profound opportunity to fundamentally shift design thinking and action based on these augmented outcomes. By embedding measurables and metrics, a new design process and methodology can potentially emerge that enables the respective parties to generate scenarios for accessing and evaluating their goals and objectives.

Through this augmented interface, decision-making, scenario modeling, and tradeoff assessments were documented into the computational modeling software, Rhino + Grasshopper, to provide various spatial-based qualitative and metric-based quantified design outcomes for a hypothetical community park setting. This platform and process can be understood as a digital game set. This hypothetical or designated piece of land or terrain serves as the foundational game board in which different user pieces that serve as trees, water features, amenities, and weather variables interact in measurable ways to output scenarios that fluctuate with every new move and decision. This gameboard can be abstracted as a micro-version of itself or shifted to an immersive and perceptual model overlayed amongst our living environment.

This mixed reality provides an advanced learning experience for the user to engage with innovative technology, create robust analytical modeling and assessments, and create a participatory decision-making experience to advocate for healthy sustainable cities (Wang et al., 2013). The hybridization between malleable model making with augmented data reveals a symbiotic connection of instrumental tools in design thinking. It correlates with many STEM-related principles of evidenced-based strategies where design can act as a healing response to problematic issues of urban heat island, water scarcity, public health, and equitable resources within the built environment. The inclusion of quantifiable data seamlessly integrates with performance metrics and methods as it operates as a real-time assessment tool to measure and evaluate defined project goals and objectives.
The primary purpose of this study is to measure the efficacy of a fog harvesting system in addressing the social, ecological, and economic needs of and improving human and ecological health in a marginalized urban community, Eliseo Collazos, in Lima, Peru. A secondary purpose of the study is to highlight the participatory design-build and research methods employed to empower community members and foster resiliency.

Located in the northern reaches of Lima, Peru, the community of Eliseo Collazos is home to approximately 380 people living in 90 households. Community members face complex challenges familiar to the roughly one third of people living in the Lima metropolitan area who live in informal communities. Among systemic challenges are those stemming from socioeconomic inequality, a lack of public investment, and continued rapid urbanization which, combined with climate change and degradation of the delicate lomas (fog oasis) ecosystem, pose disproportionate health risks and burdens of infectious and chronic diseases for people living in Lima’s informal communities.

When Eliseo Collazos and the transdisciplinary design-action-research non-profit Traction held their first collaborative community meeting in 2011, community members identified access to green space and food and water security among top needs and priorities. The lomas ecosystem receives less than 10 mm of rain per year but is blanketed in thick fog throughout a six- to nine-month winter [1]. The community and project team developed a gravity-fed fog harvesting, storage, and distribution system that collects an average 90,000 liters of water per month during the foggy season [2] and provides Eliseo Collazos with water to sustain 60 home gardens, a terraced farm-park, and a pocket playground throughout the year.

Measuring landscape performance was integral to the Fog Water Farm-Park + Gardens project’s participatory design-build methodology. Research methods, which spanned six years of phased landscape interventions, include 1) quantitative fog collection materials testing by the research team (pre-project), 2) quantitative community participatory impact assessments (PIAs) (pre- and post-project) 3) quantitative mental and social health surveys and physical measures by nurses (throughout project), 4) qualitative home garden photo documentation (throughout project), 5) quantitative plant counts (throughout project), 6) quantitative illustrated garden diaries by community members (mid-project).

Among findings are improved mental and social health [3], improved access to green space, water, and food, increased biodiversity, and enhanced community security, beauty, stewardship, and resiliency.
The Fog Water Farm-Park and Gardens case study provides evidence to inform best practices for similar projects.
The Economic Effect of Community Managed Open Spaces and Parks on Residential House Prices in the City of Baltimore, MD

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Keywords: Community Managed Open Spaces, Parks, Economic Impact, Urban Land Planning, Environmental Justice, Hierarchical Hedonic Regression Model

The value of open space is a fundamental issue in landscape architecture. In post-industrial cities, population decline and low land demand have led to a large amount of vacant land. A small percentage of this land is being transformed by community groups into Community Managed Open Spaces (CMOSs). These landscapes, which include many typologies such as community gardens, pocket parks, and playlots, are typically not part of the municipal park system and are designed, developed and managed communities. This research is the first study to include all CMOSs regardless of typology as well as parks of a large, urban city. The literature has focused primarily on the economic impact of the community garden typology of CMOSs and reveals a positive economic impact on house sale prices (Voicu and Been, 2008). Considering parks, the literature reveals a positive relationship between the distance to parks and home price but the economic impact varies widely based on parks size and local crime rate (Crompton, 2004; Espey and Owusu-Edusei, 2001; and Troy and Grove, 2008). This study investigated the effect of CMOSs and parks on residential house sale prices in Baltimore, MD using a hierarchical hedonic regression model framework after controlling for property features and neighborhood social and economic indicators. The study included 21,116 houses sold during the 2016-17 study time period. Using publicly available data sets, the distances to the nearest CMOS and park and the size of these amenities were calculated using ArcGIS and statistical calculations were performed using R.

We found that CMOSs less than 0.25 and parks less than 0.50 miles from sold houses contributed positively to house price. In terms of size, when CMOSs and parks were below the median sizes of 0.24 acres and 9.65 acres, respectively, these amenities also positively impacted house prices. These results provide evidence to support CMOSs as an alternative path for communities and planners to manage vacant urban land and of the importance of public investment in these types of spaces. These landscapes bring environmental justice to communities and landscape architects have an important role to place in assisting communities with the development of CMOSs. The results also suggest park size is an important factor to consider in park planning and management.
The Effects on Raingardens on Water Quality

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Keywords: low impact development, raingarden performance, landscape performance, seasonal change, water pollutants

Because floods and extreme weather have become more frequent and increasingly severe in recent years, research on the effects of low impact development (LID) on stormwater runoff has significantly increased. While much research related to LID and green infrastructure (GI) on flooding has concentrated on the amount of runoff reduction, current research related to LID and GI have comparatively less examined their effects on water quality, especially at the individual site scale. Water quality and the pollutant loads created by transportation facilities and related to land use configurations have gained comparatively less attention from the literature. Pollutants such as vehicle exhaust, oil, and dirt, fertilizers, and deicing chemicals on roadways and parking lots are normally flushed into the untreated drainage systems, which can cause numerous environmental issues. Pollutant loads directly leaked to the water system can be filtered and cleared through proper LID facilities, such as raingardens, detention ponds, retention ponds, or other related GI. This paper examines the performance of a recently designed and implemented raingarden on purifying direct runoff. Using a site on the Texas A&M University (TAMU) campus, the project team designed and implemented a rain garden, which serves as a living GI lab, which captures runoff from an adjacent parking lot and series of surrounding buildings. To compare the pre-construction condition and post-construction condition, a program to monitor the water quality and quantity of runoff into and out of the site was installed. In addition, the water testing results were compared to the International Stormwater Best Management Practices (BMP) Database as well to see its comparative performance. Using ISCO water samplers to collect rainwater and H-flumes to test runoff speed, the water samples were sent to the TAMU AgriLife Extension Service Soil, Water and Forage Testing Laboratory. We installed 2 ISCO water samplers located at the inlet of the raingarden to collect the rainwater running from the parking lot (before treatment) and the filtered rainwater running away from the raingarden (after treatment). In the year of the construction completion of the raingarden, nitrate, phosphorus, fluoride, and barium significantly decreased. In the next year when the plants in the raingarden established, calcium, magnesium, potassium, bicarbonate, sulfate, nitrate, phosphorus, and many other attributes decreased. The results of this study suggest a systematic way of conducting raingarden performance testing and quantifying the effects of small-scaled raingardens on water quality.
The Emergence of the Sites Rating System for Enhancing Public Places

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**Keywords**: Sustainable Sites, Ecosystem Services, Site Design, Landscape Governance, Green Infrastructure, Resilience

This paper addresses the results of the Sustainable SITES Initiative, which created the SITES rating system, and its emergence as a tool for landscape governance. The method used is reflective analysis from two individuals intimately involved in the design of a unique rating system specifically geared toward landscapes and other outdoor spaces. The purpose is to create more understanding of the process of developing the SITES system to demonstrate its interdisciplinary nature and extensive research. A key finding is that SITES is proving valuable for landscape governance. This is important because it empowers landscape and site design in the development decision-making process ensuring essential ecosystem services are protected and restored in our communities.

In the early 2000s, several well-established interest groups with overlapping agendas were engaged in parallel discussions about a LEED-like rating system for the outdoors. The American Society of Landscape Architecture (ASLA) and the Lady Bird Johnson Wildflower Center (LBJWC) were two groups engaged in these discussions and they convened a gathering to explore the creation of a LEED-like rating system for the outdoors in Austin, Texas in 2004. The event attracted several allied organizations.

The Sustainable SITES Initiative was launched as a result. A committed team of environmental scientists, botanists, landscape architects, engineers and others contributed their knowledge and expertise. The team quickly adopted the ecosystem services concept as the background theory for the rating system. This placed the rating system more firmly aligned with environmental science than other green-building rating systems grounded in best practices. The first iteration of the new rating system was published in 2009 and a call was issued for pilot projects to test the system. Over 300 projects from across the United States and beyond responded.

The pilot projects were essential for the development of the second iteration of SITES, called SITES v2. In 2015, the LBJWC and ASLA transferred the ownership of SITES to Green Business Certification Inc., which oversees LEED and other environmental rating systems. Since then, the system has been adopted by government agencies in the United States at the federal, state, and local levels as well as by private entities. SITES is still relatively new in the market. Additionally, as it is designed for project undergoing new construction projects or major renovation, there is work ahead to evaluate and understand its efficacy. Attention is necessary to demonstrate value and impact as a high-performance landscape after the project is built. Its adoption by private and public entities in North America and beyond indicates the appeal and need for the rating system. Further research is needed to assess how the ecosystem services basis of the system contributes to more sustainably designed landscapes.
Establishing the Vegetative Lab at Exit 6: Lessons from Meadow Trials Year One

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Keywords: Meadow, green infrastructure, seed, perception

Federal, State, and local governments need regionally appropriate native seen mixes and installation techniques which successfully address issues of beauty and functionality for green infrastructure in public spaces. A growing body of work lies at this intersection of ecology, landscape architecture, horticulture, and planning and points to the need for economically viable, low maintenance planting solutions that meet human aesthetic needs and provide greater ecosystem services. This paper outlines the methods and results of year one of a five-year research study of designed seed mixes for the southeastern Piedmont of North America. Following protocols for in situ seeding methods developed by Hitchmough et al, this study utilizes three designed seed mixes featuring native forbs. The approach is novel in that the conventional grass dominance has been reversed with forbs comprising 80% of the seed mix to meet public aesthetic goals. Three seed mixes are trialed on two soil types: Mix A on clay, Mix B on clay plus sand blanket, Mix B on clay; Mix B on clay plus sand blanket, Mix B on clay; Mix C on clay plus sand blanket, and Mix C on clay. Research plots are located along interstate 85, at exit 6, near LaGrange, Georgia and a Kia Motors manufacturing plant. All plots are managed by mowing 1-3 times per year. This first phase of the study will report seedling emergence and success rates by quadrat sampling, as well as competitiveness with locally aggressive weed species. The results of this study are significant in building a set of successful protocols for establishment of low meadow like plantings for use in public green infrastructure projects. Significant benefits are possible including reduced mowing costs for state and local governments, reduced fossil fuel consumption, reduced air pollution, increase in pollinator habitat, increase in soil carbon storage capacity, benefits to overall ecosystem services. Early results of field collected data show superior weed control and greater forb diversity with use of sand blanket versus native soil only. This project is made possible with generous funding and partnership with The Ray, and the Georgia Department of Transportation.
LAF CSI 2020: ASU Orange Mall Green Infrastructure Project Landscape Performance Study

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Keywords: green infrastructure, landscape performance, hot and arid climate, bioretention, LAF CSI, SITES initiatives, sustainable campus design

Green infrastructure (GI) design used for stormwater control has been widely studied in temperate and wet climates in cities such as Seattle for decades yet little research has been done in a hot and arid environment. Cities in the Phoenix metro area in recent years have recognized the potential multiple benefits of GI and developed design guidelines. However, one of the challenges for implementation is due to a lack of supporting evidence for alternative practices (McPhilips and Matsler 2018). The Hydro-GI Lab at The Design School at Arizona State University (ASU) was established with the primary goal to understand GI’s landscape performance. When ASU’s Orange Mall GI Project was undergoing the SITES certification process, Hydro-GI Lab contributed to the research and monitoring efforts and documented ecological benefits with a series of measures for water quantity, water quality, and plant transpiration (Sanchez 2019). In addition, on-site user observations were conducted by undergraduate students and analyzed by graduate students for monitoring mental restoration and social interaction activities that the GI design provides. The authors were awarded LAF CSI 2020 to document this project. This presentation will provide an overview of the design strategies, monitoring methods, and measured social-ecological benefits. The key findings included the extent of how soil and plants improved the designed stormwater event from 10-year to 25-year, the TP improvement in water quality, the implications of water conservation, heat reduction, education, and health benefits that this GI project has provided for ASU community and beyond. This research was challenged by the restrictions of collecting further field data during the COVID-19 pandemic and much of the ecological data was synthesized based on previous research conducted by Hydro-GI Lab and Central Arizona Project Long Term Ecological Research (CAP LTER) (Sanchez 2019). The Hydro-GI Lab analyzed additional site observation for measuring social interaction and mental restoration health benefits. This project plays a critical role in promoting sustainable campus landscape design to be integrated into the university’s sustainability practices and using the campus as a lab for education, research, and community outreach. The findings can help to inform urban design and GI policy-making to allow alternative stormwater design using nature-based solutions in hot arid regions.
Looking Back – and Ahead: A Ten-Year Review of Landscape Performance in the Landscape Architecture Discipline

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Keywords: landscape performance, metrics, evaluation, monitoring, research, education, practice

Landscape performance can be defined as a measure of the effectiveness with which landscape solutions fulfill their intended purpose and contribute to sustainability. It involves assessment of progress toward environmental, social, and economic goals based on measurable outcomes (LAF, 2019). Landscape performance draws upon research and knowledge from a wide range of disciplines including landscape architecture, horticulture, ecology, civil engineering, architecture, public health, urban planning and economics, and other social sciences.

Although project evaluation has long been emphasized in the design literature (Hall, 1966; Preiser et. al., 1988), the focus on project performance started finding its place in landscape architecture in the early 1990s (Bookout et al., 1994; Francis, 1999; Marcus et al., 1998). Perhaps the critical turning point for the disciplinary emphasis was when the Landscape Architecture Foundation (LAF) launched its Landscape Performance Series in 2010, establishing landscape performance as a priority and opportunity for landscape architectural research, education, and practice. In 2013, the Council of Educators in Landscape Architecture (CELA) followed suit by adding a “Landscape Performance Track” to the content area categories at its annual conference. In 2016, the Landscape Architectural Accreditation Board (LAAB) included landscape performance as one of the “Assessment and Evaluation” topics to be covered in the Professional Curriculum section of the revised 2016 LAAB Accreditation Standards (LAAB, 2016).

This panel session reflects on 10 years of this significant focus on landscape performance within the landscape architecture discipline. Panelists will provide an overview of the evolution and current state of landscape performance scholarship, teaching, and use in professional practice with emphasis on the products and outcomes from LAF’s Landscape Performance Series and CELA’s Landscape Performance Track. Results will be presented from an open survey conducted by LAF in the spring of 2020 to understand how landscape performance has played a role in respondents’ work and influenced the landscape architecture discipline. Panelists will also examine the impact of LAF’s Case Study Investigation (CSI) research collaboration and training program on participants, including its role in developing research skills among junior faculty. The panel will conclude by speculating about what is next for landscape performance within the context of landscape architecture discipline.

The panel includes a practitioner, nonprofit program director, and two researchers/CELA Track Chairs who are intimately familiar with the original development of landscape performance as an area of focus and who have been highly involved with its integration into landscape architecture research, teaching,
and practice. Each panelist will provide short opening remarks on the advancement of landscape performance in their area, followed by a robust panel discussion about achievements, shortcomings, and the role of landscape performance in the future. Audience interaction will be encouraged and actively solicited.
Measuring the Landscape Performance of a Beloved Urban Park in Gainesville, Florida

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Keywords: metrics; goal-driven; dissimilarity and entropy; integration and connectivity; space syntax; quality of life; Depot Park

Depot Park is a 32-acre urban park adjacent to downtown Gainesville, Florida. Formerly an industrial brownfield, the site was polluted with coal tar and arsenic. Following 20+ years of site remediation, the newly-constructed park drives redevelopment within the industrial corridor and promotes downtown community rejuvenation. In an effort led by the Landscape Architecture Foundation (LAF), we worked with the Gainesville Community Redevelopment Agency and the City of Gainesville to evaluate Depot Park’s performance.

Landscape performance advocates evaluating built landscape projects and collecting evidence to guide future practice. However, in the first few years of landscape performance research, various case studies, although quantified plenty of desirable outcomes, failed to evaluate projects’ performance against their original goals. Therefore, they did not establish strong relationships among goals, design solutions, and performance. This study aims at emphasizing the need for goal-driven performance evaluation through a case study of Depot Park.

Depot Park’s original design goals include “increasing access to recreational space,” “improving quality of life and strengthening community bonds for Gainesville citizens,” “promoting downtown redevelopment and fostering the city’s economic vitality,” and “helping to create a pedestrian-friendly environment in downtown Gainesville and enhancing the interconnection and walkability of streets for neighbors.” To assess Depot Park’s accomplishments of these goals, we selected a series of metrics such as visit frequency, time spent in the park, acquaintances made, pedestrian network connectivity, entropy, and business growth rate. Additionally, we employed various methods/tools to quantify these metrics, such as i-Tree, eBird, and previous studies for environmental benefits, ArcGIS based analysis for economic benefits, and Space Syntax and survey for social benefits.

The purpose of this presentation is to 1) share the findings from the Depot Park performance evaluation, 2) introduce new metrics/methods for future landscape performance study research, and 3) share the experience obtained and lessons learned through this project.

The results show Depot Park is achieving its goals to some degree, e.g., increasing the public’s access to recreational spaces, moderately improving people’s quality of life, strengthening community bonds, and enhancing the pedestrian network connectivity within ½ of the Park. However, its current influence on downtown redevelopment and economic vitality is not significant, and the pollutant removal efficiency
is not as good as expected. Long-term analyses are necessary. We believe the goal-driven performance analysis is a valid framework to test design proposals; however, one difficulty is determining the level of accomplishments, indicating the need for performance benchmarks.

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Keywords: post occupancy evaluation, landscape performance, pandemic, affordances

This paper will discuss the importance of introducing landscape architecture students to a Post Occupancy Evaluation process on an urban park before and during the pandemic. Students were instructed to “measure, understand, and integrate considerations of landscape performance in landscape architectural applications.” (Emily McCoy, Landscape Performance and Metrics) During the Fall 2019 semester, landscape architecture students measured the landscape performance of the urban park by using ArcGIS Collector, site observations, and surveys. During the Fall 2020 semester, students were asked to re-evaluate the same urban park during the pandemic, while wearing masks and practicing social distancing. Findings revealed multiple affordances in user experiences pre COVID-19 and during COVID-19, based on the flexibility of places in the urban park. Data collected during the past two years will be re-evaluated post COVID-19 as a comparative summary. Landscape architecture students need to embrace the relevance of a reflective practice within the design profession.
Sustainability has become an essential theme in the contemporary framing of landscape architecture practice (LAF, 2019) and education, with Sustainable SITES Initiative® and Landscape Architecture Foundation’s Landscape Performance program providing guidance and metrics to quantify and qualify sustainability goals for landscape works (GBCI, 2019; LAF, 2018). Academia strives to promote this contemporary framing as a means of preparing students for anticipated responsibilities and leadership in the professional realm.

Champions of landscape architecture promote creation of sustainable and resilient landscapes, providing metrics for design decision accountability. The trend has created a movement which supports the profession’s leadership role in designing for the future, touting the accomplishments of sustainable-certified landscapes. However, a void has emerged displaying regions with a noticeable lack of certified sustainable outdoor designs. One such region, West Texas, encompasses a large portion (over 79 million-acres) of the state (TxASLA, 2015; GLO, 2017). Despite depletion of natural resources throughout this region, there is a single 11-acre project that has achieved notable sustainable outcomes and been awarded sustainable site certification as defined by available metrics. This poses multiple questions. What are the key attitudes and opinions of practicing professionals toward sustainability within the area? Is there a negative mindset toward sustainable landscape design that correlates to the perceived lack of sustainable design within the region?

Using an anonymous sampling instrument to analyze attitudes, adoption, and implementation, practicing professionals were surveyed to determine their views on current concepts of sustainability, resilience, and sustainability metrics with three specific goals in mind: 1) determine the level of ecosystem services and sustainable practices knowledge among professionals, 2) assess if the regional location of professional offices has a correlation with interest and knowledge of sustainability measure practices, 3) determine the level of interest of professionals to focus on sustainability in future projects.

Initial data indicates that real and imagined costs associated with sustainability metrics programs are hindering implementation in the sample region, as is a lack of awareness and understanding of available metrics. Future studies aim to correlate larger regions with beliefs and agendas to provide a more in-depth view that helps determine if there are other regional pockets that lack sustainable focus within the profession.
Rethinking Landscapes: LID Facilities as a New Form of a Natural Garden?

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Keywords: LID, Landscape Typology, Native Landscape, Ecosystem Services

Since antiquity, designers of landscapes have engaged in two categorical areas, 1) the design of cultivated landscapes (e.g. gardens, parks) (Newton 1971; Pearson and Nasby 2008), and 2) works intended to preserve or conserve landscapes such as national parks (Newton 1971). A third order of landscape design is often recognized as agrarian landscapes (orchards/plantations/crops) (Pearson and Nasby 2008), and a fourth order includes successional landscapes within urban boundaries where little or no active planting or maintenance may take place such as vacant lots, abandoned lots (Kowarik 2011), or where design interventions can be introduced such as at Duisburg-Nord, Germany (Rosenberg 2009).

Since the turn of the twentieth century, the term “natural garden” evolved as a new order of landscape design as initiated by Olmstead, Jensen and now many contemporaries (Olmsted and Roper 1952; Jensen 1990; Tishler 2012; Eisenman 2013). Natural gardens have evolved to consist of designed landscapes (e.g. gardens, parks) that are composed of native landscape materials, native plant species, and a range of aesthetic and maintenance potentials (Grese 1992; Wolschke-Bulmahn 1997). However, there has been a development of new technologies (LID), which can be designed to appear natural, but the vegetation may not be directly connected to the soil or ground.

Since the late 1990s, landscape architects have begun to use low impact design (LID) technologies that are intended to improve ecosystem services such as green roofs, rain gardens, biofiltration swales, living walls, and constructed wetlands. These technologies typically make use of an engineered growth media and have various maintenance requirements (Ahern 2013; Fletcher et al. 2015). Although a range of planting design approaches has been explored with LID (Dunnett and Clayden; Shi et al. 2017), the purposeful establishment of native vegetation in naturalistic or formal plantings are also used (Dunnett and Kingsbury 2004; Wang et al. 2012). In line with the concept of “natural gardens” LID strategies can include common, threatened, and rare or endangered native plant communities (Brenneisen 2006). These new forms of plantings (LID) expand the potential for “natural gardens”. This study examines how LID facilities and their range of maintenance strategies can expand the scope of “natural gardens” to include LID projects where native vegetation is targeted. This study employs a review of case studies as a way to articulate a richer context for LID and demonstrate how green roofs, constructed wetlands, rain gardens, and living walls exemplify new forms of natural gardens.
Landscape Planning & Ecology
21st Century Best Management Practices: Evaluating the Variables and Stackability of BMPs for Increased Water Quality, Ecological Benefits, and Aesthetic Design Considerations

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Keywords: Stormwater, stacked BMP, green infrastructure, water quality, climate change, design, landscape architecture.

As water management and design embarks on a new journey of resource allocation and disparity, a new generation of designers seeks an innovative approach to address these growing demands on freshwater resources. Best management practices (BMPs) are often the first solution employed, however, stacked BMPs are making their way into the discussion of stormwater management for the first time. This research examines stacked BMPs as an alternative approach to singular BMPs in landscape application in order to better evaluate the current methods and practices for stormwater design and ultimately, proposing alternative methods to better suit the coming needs of future generations. This short communication explores the current literature around stacked BMPs and examines the water quality, ecological benefits, and aesthetic values of a stacked BMP as a design approach.
Beyond Place-Based Policies: An Approach to Modeling Compound and Interconnected Climate Risk Landscapes

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Keywords: intra- and inter- connectivity, complex environmental systems, network analysis, sociotechnical and socioecological processes, climate change, flooding and wildfires.

Advances in complex systems theories indicate clearly that the components and processes in social, technical and environmental systems cannot be conceptualized as individual entities but as interrelated “wholes”. This follows directly from their inherent evolving cyclic interrelationships rather than linear causalities [1,2] and, their panarchical (non-hierarchically nested adaptive) cycles of resilience rather than a single state of equilibrium [3,4]. On an applied level, the field of Landscape and Environmental Planning has yet to catch up with these theoretical developments by pushing against disciplinary silos, by improving our landscape modeling techniques to reflect these inherent intra- and inter- connectivities, and finally, by figuring out how to include the complexity of landscape processes into environmental planning policies. We believe the future of landscape design methods should stretch beyond static geographic boundaries of overlay mapping techniques [5] (“vertical modeling”) to integrate a network of sociotechnical and socioecological processes (“horizontal modeling”) through uprising tendencies of adaptive management in our field. This paper is an ex-post discussion of the results of distinct research efforts from the past four years, seeking to understand California’s climate risk landscape from two case studies: the state’s contemporary fuel supply network exposure to wildfire and coastal flooding and the 2018 post-fire triggered debris-flow disaster in Montecito. Environmental modeling, spatial analysis and stakeholder interviews were used in these two case studies. Findings from both case studies are combined to illustrate the intricate interdependencies of California’s wildfire-and-flood-prone regions, and problems associated with siloed management of these landscape processes at the regional and local scales. Exposure and vulnerability of the fuel sector to current and projected flooding and wildfires is also useful to expand our understanding of multiplex infrastructure networks cascading risk from a sociotechnical perspective instead of a purely technical and hardware perspective. Finally, our two case studies allow us to revisit McHarg’s contributions to landscape design [5], suitability analysis and stakeholder engagement techniques as the current paradigm for placed-based environmental planning and policy which accommodates “vertical modeling” techniques but should also push for including “horizontal modelling” of landscape processes.
Carbon Sequestration and Greenhouse Gas Emissions in Urban Green Infrastructure

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Keywords: Carbon, Land Use, Greenhouse Gases, Green Infrastructure, Carbon Sequestration, Urban Ecology

Urban green infrastructure (GI) provides many social, economic, and environmental benefits, one of which is the ability to capture and store carbon (C) from the atmosphere through sequestration. Growing urban environments and subsequent increases in greenhouse gas emissions (GHG) require solutions that assess the potential of our landscapes to act as effective C sinks. With the current GI, there is much that can be done to improve upon these human-harnessed ecological systems to maximize their C sequestration and limit the emission of biologically-generated GHGs. There have been studies conducted on the dynamics of these pools and fluxes in different GI; however, a comprehensive overview of how they manifest in a wider and varied urban landscape is lacking. This study estimates the C storage and sequestration potential from GI in Penn State’s University Park campus, using data collected from over 70 studies in similar climatic regions. We classify GI into four different land cover types: turfgrass, including residential lawns and golf courses, urban forests, green stormwater infrastructure, and landscaped cover, including ornamental lawns and urban gardens. Geographic Information Systems (GIS) was used to classify and quantify the land cover areas of the campus. Median values of C storage and fluxes, derived from the studies, were applied to these areas in order to assess the ability of various campus GI to sequester and store C. Covering a total of ~474 ha, GI was estimated to sequester ~900 MT C yr⁻¹. Urban forests had the highest C sequestration potential (~440 MT C yr⁻¹) due to both large land cover and high sequestration rates, followed by institutional turfgrass (~339MT C yr⁻¹). Although covering a large portion of the campus, Penn State’s GI is largely dominated by turfgrass, often accompanied by less sustainable maintenance practices. A review of recommended management strategies, including reduction of maintenance machinery and fertilizer application, strategic species selection, and landscape conversions, is also provided with the goal of maximizing C retention. As an often-unexplored avenue for emissions reduction, this study provides data supporting the C-related benefits of GI implementation across an urban landscape and the potential for GI to participate in emissions reduction strategies. It also provides information that can be used for land management, planning, and design in order to mitigate the impacts of anthropogenic climate change in cities.
Conservation and Hazard Mitigation: Place-Based Narratives as a Strategy for Post-Disaster Land Management

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Keywords: conservation, easement, hazard, mitigation, resiliency

Disasters often result in an increased supply of vacant properties that strain municipal budgets through lost tax revenue and increased maintenance demands, ultimately leading to open space mismanagement. However, legal alignment exists within federal hazard mitigation policy (44 CFR Part 80, 2010) that allows for conserved areas, and the land trusts that manage these lands, to bridge critical post-disaster management and stewardship needs. This presentation addresses the question of how conservation strategies can better support hazard mitigation efforts in low-wealth communities. The authors will share first-hand accounts and lessons learned from multiple action research projects to illustrate methods of engagement, planning and design that effectively integrate conservation strategies with hazard mitigation regulations.

A conservation easement enables a government or non-profit entity the right to restrict the development and use of property for the purpose of accomplishing certain conservation goals in perpetuity (Mann & Roberts, 2018). Since enacted by the U.S. Congress in 1980, conservation easements have become a popular mechanism for protecting lands. The National Conservation Easement Database (2020) estimates that approximately 32.7 million acres are currently held in conservation easements. These conserved lands safeguard vast amounts of ecologically and culturally significant lands that benefit both the environment and public.

U.S. Treasury Regulations (26 CFR 1.170A-14, 1999) require that properties satisfy at least one of the following conservation goals to qualify as a conservation easement: habitat protection, historic preservation, outdoor recreation & education, and/or open space preservation. These serviceable outcomes fail to recognize additional societal gains because the benefits of conservation easements are rarely integrated into the broader needs and challenges of adjacent communities. These environmental factors are most apparent in low-wealth communities who are attempting to rebuild after disasters.

Communities across the U.S. can benefit from using conservation easements to respond to environmental hazards. Environmentally at-risk communities are also often socially and economically vulnerable, thereby limiting their capacity to proactively mitigate known and anticipated threats. Landscape architects are uniquely positioned to respond to these capacity gaps by weaving together place-based narratives informed by geospatial analyses, community identity, and environmental opportunism. Toward these ends, this presentation will: i) describe the criteria required for a property to qualify for a federally recognized conservation easement, ii) illustrate how conservation policies can
work in tandem with hazard mitigation strategies to achieve multiple benefits, iii) share examples of successful landscape architecture applications, and iv) identify emerging research areas.
Conservation and Service in the Agricultural Landscape

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Keywords: Water quality, Conservation Reserve Program, Landscape Design, Nitrogen, Phosphorus, Upper Mississippi River basin

The Conservation Reserve Program (CRP) has been a positive asset to remediation and water quality in the Agrarian environment by providing farmers with incentives and cost share programs. These give farmers the means to implement a number of best management practices, which improve runoff conditions and reduce nutrient pollution in the major waterways of the United States (US). Landscape architects are rarely, if ever, involved as implementers in this program, even though they frequently address water quality issues in urban environments. In this study, we compare the best management practices (BMPs) that landscape architects frequently use to improve water quality in the urban environment with BMPs that are used to improve water quality in rural agricultural environments. In particular, we compare their effectiveness at removing nitrogen and phosphorus. Our results show that the urban stormwater strategies are at least as effective at removing nitrogen and phosphorus as most rural strategies, suggesting that landscape architects would make ideal service providers for the conservation reserve program and that more cross-disciplinary efforts are needed. We explore opportunities for landscape architects to intervene as service providers of the CRP in the state of Illinois, and discuss next steps for research and engagement in agricultural landscapes.
Cultural Ecosystem Service Benefits at the Intersection of Cultural Landscape Heritage Conservation and Land Stewardship

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Keywords: land stewardship, ecosystem services, cultural landscapes, conservation, environmental management

Cultural landscapes are shaped by human-nature interactions, providing nonmaterial benefits to people. As one of four ecosystem service categories identified to support human health and well-being, Cultural Ecosystem Services (CES) benefits include spiritual enrichment, reflection, cognitive development, recreation, and aesthetic experiences (MEA, 2005; TEEB, 2011). CES are situated within a broader context of tangible benefits in provisioning services that deliver human benefits through resources originating in nature—food, water, and fuel—and regulating services delivered through ecosystem processes. These processes, as described by the National Wildlife Federation, moderate natural phenomena such as pollination, water quality, erosion and flood control, and climate regulation. CES realized through cultural landscapes are more difficult to regenerate or replenish in the event of degradation or destruction (extraction, cultural erasure, or gentrification). Protection of these landscapes relies on long-term care through proactive land stewardship that recognizes the cultural dimensions of its overall value. This study examines CES benefits existing at the intersection of cultural landscape heritage and land stewardship to broaden the dimensions of cultural landscape literacy.

To situate cultural landscapes as integral to protective land practices, we establish a typology of land stewardship from a review of literature relevant to cultural landscapes informed by four dimensions—agriculture, environmentally sustainable landscapes, historic resources, and landscape planning, and examine data from The Cultural Landscape Foundation’s (TCLF) Stewardship Stories, consisting of individual interview transcripts (n=62) of people whose “work, passion, or advocacy” had a positive influence on a particular process or project. Through recursive abstraction, patterns are detected using defined terms, corresponding to categories of land stewardship, national categories for cultural resources, and CES components identified. Each participant shares a commitment to a particular initiative, represented in land stewardship through landscape planning, historic sites, and sustainable landscapes. Few represented agricultural landscapes. In terms of national classifications, responses largely correspond to historic resources, threatened designed landscapes, or vernacular landscapes. CES primarily reflect spiritual enrichment, reflection, and aesthetic concerns. Fewer responses included recreation or cognitive development. This synthesis of land stewardship, cultural resources, and CES seeks to broaden the awareness of cultural landscapes and the understanding of this integral relationship. Our research highlights cultural landscapes within a broader context of stewardship and Cultural Ecosystem Services. Further research needs to go beyond conventional descriptions to increase the types of initiatives that are included in the conservation and preservation of cultural landscapes through a perspective of CES for human health and wellness.
Guiding Design for Sea Level Rise and Storm Surge in National Parks: An Example Near the Tidal Basin in Washington, DC

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Keywords: Climate change, sea level rise, storm surge, nature-based design, adaptation, resilience, public lands, national parks

More than a quarter of national park lands fall on ocean coastlines, presenting significant challenges in managing climate change issues of sea level rise and storm surge in national parks. Nature-based design strategies are used to address sea level rise and storm surge in East Potomac Park, an island near the Tidal Basin on the National Mall in Washington, DC, where sea level rise and storm surge in combination could cause serious flooding problems (Caffrey et al., 2018).

Nature-based design incorporates natural features that improve coastal protection (Pontee et al. 2017) and reduce wave height (Narayan et al. 2016). The project proposes that parts of the East Potomac Park be planned as future tidal wetland to provide protective capacity for sea level rise and storm surge, while preserving natural and cultural resources, maintaining place identity, and incorporating climate change education initiatives.

Based on existing literature, the project develops a set of design criteria to guide the implementation of the nature-based design in East Potomac Park. The design criteria address socio-ecological factors of landscape, planning and design for adaptation and resilience, communicating climate change, and design performance evaluation. The goal is to provide an iterative methods framework, composed of the design criteria, for climate change design projects and to connect research with practice by creating a design-science feedback loop.

The proposed design is developed in accordance with the design criteria. The original and proposed landscapes are compared and evaluated against the design criteria, with findings assessing the feasibility and applicability of the methods framework. The results offer a nature-based design solution to projected climate change in East Potomac Park, while providing a methods framework for future design projects focused on nature-based design solutions for climate change.

The National Park Service plays an important role in preserving cultural and natural resources. Estimates suggest that with 1 m of sea level rise over $40 billion of national park assets will be at risk (Peek & Beavers 2015). Moreover, the National Capital Region is estimated to have the highest rate of sea level change in the National Park System by 2100 (Caffrey et al. 2018). By addressing issues of sea level rise and storm surge in national parks in the nation’s capital, the project provides a methods framework for innovative solutions in climate change design, furthers dialogue on the topic, and preserves national park shorelines for present and future generations.
How Effective Are Drainage Systems in Mitigating Flood Losses?

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Keywords: flood insurance; flood recovery; structural flood control; stormwater management; green infrastructure; economic impact

The impacts of flooding can be devastating. Huge financial burdens often follow major storm events to recover from structural damage (Brody et al., 2015; Su, 2016). As a result, flood risk management is pivotal in protecting urban watersheds from such threats and effectively managing natural resources (Brody et al., 2011). Well-designed drainage systems allow for effective discharge of stormwater, reducing property losses and expenditures on recovery. However, a lack of empirical studies on the topic has impeded the determination of which drainage method might be the most effective in preventing or minimizing property losses from flooding. This abstract summarizes particular findings published by the authors in a peer-reviewed journal (Sohn et al., 2020). The major purpose of the study was to statistically assess the economic impacts of three drainage systems − storage-, conveyance-, and infiltration-based facilities − on reducing flood damage recorded from 2009 to 2012 by the Federal Emergency Management Agency in the Buffalo Bayou watershed in Houston, Texas, USA.

Non- and spatially-weighted linear regression models were developed from 1,608 parcels where owners made claims under the National Flood Insurance Program. Flood damage cost was regressed on a group of variables featuring drainage systems, housing structure, geophysical environment, and storm characteristics in the models. The results show that storage-based systems outperform conveyance-based systems. 92% of flood damage cost can be saved by using storage-based facilities, while installing conveyance-based systems on property roads reduces flood damage by 19%. Infiltration-based facilities are found to be less effective in reducing property damage because green spaces disconnected from sewer systems are rapidly inundated after being saturated when excessive overflow is not properly drained. Previous studies have suggested that pervious areas contribute to creating runoff when rainfall exceeds a threshold of 10 to 20 mm (Boyd et al., 1993; Guan et al., 2016; Sillanpää & Koivusalo, 2014). Nevertheless, their role as a major type of drainage system is still of the utmost importance in areas either suffering from frequent storm events or directly affecting downstream flooding (Sohn et al., 2019). This study confirms that a drainage system’s performance varies by facility type and environmental setting. The results encourage the recovery of wetlands and integration of retention/detention basins into community development in flood-prone areas to prevent potential future economic losses. For landscape architecture practice, designers’ and planners’ stewardship for enhancing ecological resilience is crucial to shift the way communities address increasing flood problems.
Investigating the Barriers to Effective Implementation of Phytoremediating Plants in Bioretention Systems.

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Keywords: Phytoremediation; Planting Design; Bioretention; Water quality

The scientific community has found that vegetation in bioretention systems produces measurable water quality and hydrological performance benefits for green stormwater infrastructure but there are few effective resources for designers to implement these technologies effectively. While science is still emerging, there may still be knowledge gaps among scientists, engineers, and horticultural specialists. Stormwater and planting design manuals were reviewed from cities across the nation with rigorous stormwater management programs to see how the most current science is reflected. Experts in the bioretention landscape design field were also interviewed to identify knowledge gaps and barriers for implementing landscape design strategies for pollutant removal. Findings have shown that there is a lack of planting design guidance in current city stormwater management manuals which is slowing down adequate design for maximizing the functionality of plants in bioretention. Manuals for planting guidance were often difficult to locate and information on species recommendations was scattered. Of the manuals surveyed, most provide plant design guidance and focus mainly on attributes such as visibility, erosion control, ecological benefit, and aesthetics. Practitioners and experts expressed a need for more resources and guidance on implementing the latest science on design strategies. Rarely is the idea of using plants as pollutant removal tools suggested as a solution for addressing water quality. Planting design for bioretention systems could achieve multiple functions if advanced literature is integrated into manuals in a logical manner that includes phytoremediating capabilities on plant lists and successful design strategies.
Kairotic Moments in Scenario Planning: Strategic Integration of Landscape-Scale Solutions through Geovisualization

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Communities face numerous challenges to plan for expected or unexpected future change. Researcher-informed scenarios of the future provide local community members and stakeholders with a depiction of current and future issues, trends as possibilities for the future, and a sense of plausible and viable solutions at multiple scales. Scenarios may also offer a timeline as to when solutions might be implemented under certain assumptions. SES (Social-Ecological Systems) scenario-based alternative futures (Hulse, 2004; Hulse, 2008; Steinitz, 2012) can provide community members, planners, and decision-makers with a suite of geovisualizations and solutions at given moments providing multiple exploratory scenario results of these assumptions as specific snapshots of the future. Within this research project, we refer to these critical solution mechanisms on a timeline as ‘kairotic moments.’ The purpose of this research demonstrates a systematic and methodological framework for integrating plausible and viable solutions at integral kairotic moments into the scenario analysis process.

Many frameworks for coupling stakeholder and researcher models for scenarios currently do not generate or evaluate embedded solutions and timesteps to many of the undesirable conditions that surface within these futures and scenarios. They are merely stated and reported. This research proposes a framework to iterate, evaluate, and situate viable solutions into each scenario at key moments along a stakeholder-defined trajectory.

The framework presented within this research utilizes a four-step process to achieve model results: 1) Couple Models: Researcher-based models are iteratively coupled with Stakeholder-driven models of Land use change, 2) Coding and Analysis: Solutions are defined and evaluated for effectiveness, 3) Design and Plan: Solutions are reorganized and demonstrated geospatially and temporally 4) Validate: Results are assessed, validated and verified by stakeholders.

In ‘Coding and Analysis’ of the methodology, we intend to activate stakeholder feedback as input variables combined with researcher-driven scenarios of change (model parameters) and solutions (predictor variables) through a systematic analytical geovisualization method referred to as a space-time cube (Wagner et al., 2019). This methodology utilizes several optimized hotspot analyses (Getis and Ord, 1996; Pelton et al., 2015) at various timesteps over a given geography. The cube outputs (as landscape solutions) can then be evaluated for effectiveness or lack thereof. The generated space-time cube intends to provide a range of viable and, inversely, unlikely spatio-temporal solutions and their effectiveness across a defined SES. This process intends to guide future scenario research projects with a framework for integration of plausible and viable solution sets into landscape-scale scenario modeling.
techniques.

The results aim to guide a strategic plan for landscape-scale solutions used within alternative futures analysis. This project seeks to contribute to the body of knowledge of scenario planning by creating a succinct approach for both embedding solutions into scenario planning and evaluating their effectiveness.
A Landscape Approach to the Conflicts of “Greens”: Planning for Energy and Wetland Land-Use Growth in Southwestern Taiwan’s Coastal Landscape in a Climate-Changed Era

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Keywords: Solar energy, Alternative Future Method, Scenario Planning, Landscape Planning, Taiwan, Black-faced Spoonbill (Platalea minor)

Taiwan’s national plan to expand renewable energy to 20% by 2025 (BoE, 2017) triggered numerous public debate and land-use conflicts since Taiwan’s 2016 presidential election. In particular, the wetlands along the southwest coast have been attracting many solar farms because of their excellent solar radiation potential as former salt pans. However, abundant wetland provides various ecosystem services such as: flood mitigation, local aquaculture, and habitats for many endangered migratory bird species, which has lead to the conflicts of “Greens” (Ko et al., 2011). In particular, although much research reported that wetlands play an important role in flood mitigation especially in coastal landscapes, wetlands in Taiwan show insufficient performance in flood mitigation under current planning (Wang, Kuo, & Shiau, 2013). Furthermore, the proposed renewable energy plan would compromise the integrity of the wetlands in the region (BoE, 2017). Given the growing concerns around sea level rise and increasing floods, wetland preservation is becoming more important for resilient coastal landscapes. Using scenario planning, this project creates alternative futures of the two scenarios (1) the expansion plan that prioritizes solar energy and (2) the adaptation plan that seeks the balance between solar energy and wetland preservation, and further assesses their environmental and land-use performance (Steinitz, 2003; PNW ERC, 2002). This project first investigated local landscape history and land-use patterns to understand the site context and to establish the 2020 land-use condition. By incorporating trends from photovoltaic development policy and flooding projection in the next forty years, as well as inputs from academic and local experts, this project then developed two alternative future scenarios: the expansion plan and the adaptation plan. They project different paths of land use growth strategy in solar zoning overlay and developmental rights (EEA, 2014). The expansion plan gives priority to photovoltaic expansion, which is the current policy. The adaptation plan gives priority to deploying solar energy primarily on already developed lands and saving wetlands for climate adaptation based on experts' input. Future scenarios are evaluated according to its land area and associated performance, including flood mitigation, ecological conservation, energy generation, and land-use efficiency. To better assess the environmental performance for the forty years' timeframe, this study evaluates the land use condition in 2040 and 2060 for each scenario. Findings show that the expansion plan achieves more carbon emission reduction by 2040; however, the adaptation plans are more efficient in land-use, impacting less agricultural land, wetland areas, and flooding capacity than the counterpart in both 2040 and 2060 while reducing compatible carbon emission by 2060. This indicates that adaptation planning brings multiple benefits over photovoltaic expansion planning while equally achieving long-term carbon emission reduction in the southwest coastal Taiwan context. This study demonstrates the promising use of spatial scenario planning to address the increasing "green" conflicts between renewable energy development and other land uses.
Modeling Black Carbon Removal by City Trees: Implications for Urban Forest Planning

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Keywords: urban ecosystem services; urban forestry; urban planning; air pollution; black carbon; land use regression modeling

Urban forests provide multiple ecosystem services, defined as the benefits humans receive from ecosystems [1], including particulate air pollutant interception, air temperature regulation, and stormwater runoff reduction [2,3]. While previous studies have assessed relationships between intraurban air pollutant concentrations and urban land use and land cover variables [e.g. 4], few studies have directly measured air pollution removal by trees in relation to urban form (e.g. topography, land use, land cover, and proximity to emission sources). As black carbon—a byproduct of incomplete agricultural biomass and fossil fuel combustions—is a climate forcing component of fine particulate matter (PM2.5) that has been linked to various cardiovascular, pulmonary, and cardiopulmonary health outcomes [5,6], further understanding the factors that influence its intraurban variability provides an opportunity to mitigate the associated environmental health and climate change impacts through strategic urban forest planning. Building on previous work, we investigated the relationship between urban form and atmospheric black carbon removal by city trees and built spatial models to predict annual and seasonal removal of black carbon to inform urban forest planting and conservation decisions. We coupled an existing dataset containing measured black carbon data from 20 trees (10 live oak, Quercus virginiana, and 10 post oak, Quercus stellata) in Denton, Texas [7] with 228 urban form predictor variables and generated land use regression models [8], using mean seasonal and annual black carbon removal by trees as response variables. Potential models were identified using a best-subsets regression approach, and final models were selected and validated using leave-one-out cross validation. Regression equations were applied at 1m resolution to estimate black carbon removal potential of trees planted across the city. Annual and seasonal models revealed emission source proxies (traffic counts; major road length and right-of-way area within 500m; number of bus stops within 100m; and number of bus stops, four-way stops, and signalized intersections within 500m), terrain exposure towards emission sources, elevation relative to surroundings, and building area within 250m as influential to black carbon removal by trees. Final land use regression maps provide arborists, landscape architects, and urban planners with high-resolution black carbon removal predictions to inform priority locations for urban forest expansion specifically for addressing air pollution.
Offshore Wind and the Green New Deal

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Keywords: green new deal, offshore wind energy, offshore aquaculture, multi-function design, renewable energy

The climate crisis has reached a point of no return, the establishment of a Green New Deal is essential to the survival of our communities (H.R 109, 2019). A plan for a “Blue New Deal” was devised by Elizabeth Warren and Dr. Ayana Elizabeth Johnson to introduce more ocean related solutions to the legislation. The Blue New Deal looks to the ocean for the establishment of offshore wind energy and offshore shellfish aquaculture all while contributing to a healthy ocean ecosystem, a thriving commercial fishing industry, and a local economy boosted by renewable development (Warren, 2019). This project synthesizes research and expert opinions from a range of stakeholders to create a cohesive multi-functional design that addresses the inevitable “Conflict of Greens (Ko et al., 2011)” that arises among ecological, social, and economic factors related to offshore renewable energy development.

The Oregon coast offers some of the most powerful winds in the United States and therefore has the potential to play a major role in securing large scale renewable energy (Data for Progress, 2020). Aquaculture is expanding globally to fill the gap between supply and demand by wild-caught fisheries. As the population grows, a source of affordable seafood is desired (Langdon, 2008). We use the research and design tools of landscape architecture to explore the possibilities of multifunctional design, particularly surrounding the coupling of offshore wind and aquaculture.

In the first phase of the project, we conduct an in-depth literature review of key concepts related to sustainable energy landscapes. These concepts include agroecology, recreation, community disaster resilience, tourism, and environmental restoration. Two case studies were analyzed to identify key multifunctional program elements that merged infrastructure with public space.

In the second phase of the project, we form a regenerative design framework for multifunctional offshore wind energy development based on the research and analysis completed in phase one. This framework informs a set of design typologies that merges the key program elements with the specific infrastructure of offshore wind and aquaculture. We then test this framework and set of typologies by applying it to a site design of Coos Bay, Oregon.

The contribution of this project is to engage with the inevitable conflict engendered by offshore development in order to produce and provide a toolkit for landscape architects and planners on the topic of renewable energy landscape design.
Prioritizing Underserved Communities for Thermal Comfort Street Retrofit in Eugene, OR

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Keywords: Urban Heat island, underserved communities, thermal comfort street

In consideration of climate change and the increasing trend of extreme weather events, communities see urgent needs for climate preparation, especially for vulnerable populations living in underserved communities (EPA, 2016; Cheng, 2019). Reflecting the EPA’s definition of Environmental justice, “the fair treatment and meaningful involvement of all people regardless of race, color, national origin, or income with respect to the development, implementation and enforcement of environmental laws, regulations and policies,” the term “underserved communities” in this study is defined as communities that did not receive fair or adequate allocation of resources for development, implementation, and enforcement of environmental laws, regulations, and policies in comparison to other communities within the city (EPA, 2018). This study identifies underserved communities in relation to urban heat islands (UHI) mitigation and develops a design proposal for thermally comfortable street networks within these communities.

Our study site is Eugene, Oregon, where UHI has become a growing environmental justice concern. A recent thermal mapping conducted by the Sustaining Urban Places Research Lab at Portland State University identified Eugene’s UHI and the result shows that a substantial area of Eugene is within the UHI zone (The Register-Guard, 2017). For example, most of the UHI zones are located in Downtown and West Eugene due to its land use being dominantly industrial and big box retails with impervious surfaces. These areas are also where the vulnerable populations live. Meanwhile, this mid-sized city with an estimated population of 172,622 in 2019 is rapidly growing, especially the senior population (currently about 15% of the population), who are more vulnerable to extreme heat.

This project prioritizes vulnerable communities in Eugene through spatial analysis using American Community Survey (ACS) socio-economic data and the UHI map generated from air temperature measured on a hot day in August 2016. We began our process by conducting expert surveys with 6 selected experts across the environmental-related fields. Using Garrett’s Ranking Technique, we were able to use their responses to calculate and rank 9 different attributes that are used to prioritize underserved communities in this project. With both the expert surveys and Garret’s Ranking Technique, 25 out of 138 block groups were identified and prioritized for thermal comfort street implementation. We then proposed a city-wide thermal comfort street network that incorporated green infrastructure and smart cooling technologies, such as sensor-activated solar fans and mist sprays. To illustrate the implementation of these designs, we developed specific street design recommendations and designs for four selected block groups as prototypes based on their locations, urban form typologies and demographic characteristics. Factors such as primary vulnerable groups, age distribution, proximity to major infrastructure and public transportation of the neighborhood were considered into creating these designs. This proposal could help the City to efficiently allocate its resources for climate change.
adaptation through prioritizing vulnerable communities and implementing effective design interventions.
The Projected Impacts of Smart Decline on Urban Runoff Contamination Levels

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Keywords: Smart decline; urban regeneration; legacy cities; green infrastructure; urban pollution

There has been mounting interest by researchers about how the repurposing of vacant land (VL) through green infrastructure can reduce stormwater runoff and improve runoff quality, especially in legacy cities which are characterized by excessive industrial land uses and VL amounts. As such, legacy cities (already characterized by high VL ratios) experiencing excessive stormwater runoff issues are often at risk from both mixing and transferal of hazardous substances. Smart Decline, an approach to managing VL through planning for less development and the promotion of regreening, has gained traction as a regeneration strategy in legacy cities. This research examines the long-term impacts of smart decline on both stormwater amounts and pollutants loads through the integration of land use prediction models with landscape performance tools. St. Louis, Missouri, USA, as the third largest shrinking city in the United States, has a 2.5% growth rate of vacant housing units and a large number of small and oddly shaped vacant parcels, which makes it a unique study area. Therefore, the City of St. Louis was used as the study area to simulate 2025 land use change using the Conversion of Land Use and its Effects (CLUE-S) and Markov Chain urban land use prediction models and assess these change’s probable impacts on urban contamination levels under different smart decline scenarios using the Long-Term Hydrologic Impact Assessment (L-THIA) performance model. The four different scenarios are: (1) a baseline scenario (based on current patterns of development), (2) a 10% vacant land re-greening (VLRG) scenario, (3) a 20% VLRG scenario, and (4) a 30% VLRG scenario. The CLUE-S model was calibrated using the historical land use of 2000, 2010 and 2015, and a series of demographic, socioeconomic, and proxy variables were used to predict future growth in 2025. Average annual runoff and 14 non-point source (NPS) pollutants, including 12 physical/chemical pollutants and 2 bacterial pollutants were estimated through the L-THIA model for different scenarios. The results of this study illustrate that smart decline strategies can have both direct and indirect impacts on urban stormwater runoff and their inherent contamination levels. Direct impacts on urban contamination include the reduction of NPS pollutants. Among VLRG scenarios, the 30% VLRG scenario has a much better performance on urban runoff and non-point source pollutant reduction than the other scenarios. In the 30% VLRG scenario, the annual runoff volume is decreased by 11% and the total NPS are reduced by 19%, compared to the baseline scenario. Among 14 NPS pollutants, Cadmium, Zinc, and Suspended Solids are the primary pollutants reduced by VLRG. The indirect impacts include reduction of the possibility of illegal dumping on VL through mitigation and prevention of future vacancies. Finally, under the 30% VLRG scenario, the vacancy rate is reduced by 5% compared to the baseline scenario; existing and newly gained VL also dropped by 24.6% and 7.4% respectively, while the VL regeneration rate increased by 31.9%.
Scenario-Based River Morphology Simulation for Ecological Restoration of Yongding River in Beijing

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Keywords: environmental flow; scenario simulation; river morphology; river restoration; ecological responses; habitat suitability; Yongding River

Human activities and modifications such as dams, diversions, and land use changes have fundamentally altered the ecosystem processes in rivers that create and maintain the complex and dynamic environments to which species have been adapted, leading to the profound degradation of large rivers and their floodplains. The Yongding River, commonly known as the mother river of Beijing, had been heavily modified since the 1950s by disturbances including dam construction, stream channelization, gravel mining, agriculture, groundwater depletion, and climatic change. In fact, the lower river became perennially dry since the 1980s. To enhance the lower river’s ecological conditions, flow replenishment started in 2019 to transport water from an upstream reservoir to the lower reaches. To explore the ecological effects of the flow restoration, we conducted a three-step hydrological analysis, hydraulic modeling, and habitat assessment that simulated the landscape evolution of the lower Yongding River and assessed fish habitat suitability under different flow scenarios. First, we characterized the historical flow regime and identified four environmental flow scenarios using the Tennant method and the Indicators of Hydrologic Alteration. The four flow scenarios corresponded to outstanding, excellent, fair, and poor aquatic habitat conditions. Second, CAESAR-Lisflood was chosen to model long-term (10 years) river morphology evolution. Last, the weighed usable areas (WUA) method was used to assess the amount and distribution of suitable fish habitat under different flow scenarios. The results showed minor differences in water surface areas, flow velocity, and water depths among the four flow scenarios. However, the scenario that represented the “outstanding” habitat condition generated the largest suitable habitat for the fish species of Cyprinus carpio and Carassius auratus. The lack of morphological variation may be due to former mining and agricultural practices that created large flat areas within the river channel. Without reshaping the channel itself, flow restoration alone is unlikely to significantly improve the habitat conditions. Future research could incorporate channel design scenarios and explore how the combination of channel reconstruction and flow restoration could reshape the aquatic environment.
The 'Sponge City' Initiative - Opportunities and Challenges to Tackle Sea-Level Rise

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Keywords: Sea-Level Rise, Sponge City, Planning, Opportunities, Challenges

In 2014, China launched the ‘Sponge City’ initiative. It aimed to mitigate urban flood risk with green infrastructure and help urban communities to tackle water scarcity on a city scale. 16 cities were selected as the country’s first pilot Sponge Cities from over 100 bidding cities. Most of the ones selected were inland cities. The sponge strategy requires that 70% of stormwater is retained and reused on site. By 2030, more than 80% of the urban built-up areas in the country shall meet the target requirements (www.gov.cn, 2015).

This study evaluates the "Sponge City" practice and explores the potential to expand the “Sponge City” initiative to tackle the impact of sea-level rise. Shanghai Lingang, China's largest “Sponge City” pilot zone, Guangming New District in Shenzhen, and Sanya Mangrove Park in Sanya City are selected as case studies. Mixed methods research is utilized including literature reviews, interviews and data analysis.

The two ‘Sponge City’ projects in Shanghai and Shenzhen adopted various green infrastructure measures, including rain gardens, constructed wetlands for stormwater storage, permeable pavements, and green roofs, etc. to mitigate urban flooding. However, sea-level rise impact is not targeted. The “Sponge City” practice engages periodic, short-term events in general. New mass constructions are continued to build along vulnerable coastal areas and flood plains. Sanya Mangrove Park restores previously decimated mangroves in a lifeless landfill area and welcomes ocean tides with a natural porous edge condition. The mangrove rehabilitation serves as a case study of strategies to potentially expand the “Sponge City” practice to cope with sea-level rise.

For the ‘Sponge City’ initiative to tackle sea-level rise, a range of issues need to be addressed, including sea-related public health issues, fresh water and soil contamination, long-term green solutions against saltwater inundation, persistent funding sources, and the need for holistic planning interventions. Many ‘Sponge City’ projects are site-specific and the scale is too small. Given the geographic spread of urban coastal regions, additional focus on coastal areas with an interdisciplinary planning approach is needed to adopt.
The Status of Green Roof Research in North America – A Review of Recent History and Future Strategies

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**Keywords:** Research, Living Architecture, Green Roof, Green Infrastructure, UHI, Substrate, Stormwater, Carbon Budgets, Biodiversity, Ecomimicry, Energy Savings, Nature Based Solutions

Over the last 20 years, research has progressed in North America and beyond, developing a vital body of literature that is helping define the global understanding of the emerging field of landscapes on structure, including green roofs, green walls, and related green infrastructure systems. Green roof, green wall, and other living architecture research increasingly requires a highly multidisciplinary approach, including fields such as biology, ecology, engineering, horticulture, climatology, landscape architecture, and architecture.

In an effort to aid North American collaborative efforts, the professional trade organization Green Roofs for Healthy Cities (GRHC) and the Green Infrastructure Foundation (GIF) solicited academic institutions to develop Regional Academic Centers of Excellence (RACE) in Living Architecture. At the 2018 CitiesAlive! Conference in New York, four centers were announced: Colorado Living Architecture (CLA), Greater Ohio Living Architecture Center (GOLA), Southern Illinois University Edwardsville (LARCE), and the Stevens Institute of Technology. Since their initiation, the RACE in Living Architecture academics have joined forces to begin addressing the challenges and gaps that currently exist in living architecture research.

For future growth in the implementation of living architecture, there is still a great need for additional and expanded research on green roofs and as yet undefined innovative green infrastructure. This panel presentation offers an overview of priority topics that have been critical to past success in green roofs, and those that are promising but need future investment, including urban heat island (UHI), energy savings, stormwater (quantity and quality), substrates, carbon budgets, plants, biodiversity, ecomimicry, biodispersal, long-term dynamics, urban food production, synergy with solar panels and financing green solutions. The panel discussion to follow aims to open a dialogue and advance the conversation in search of new alternative/innovative methods and potential new partnerships primed to address current gaps in green roof, green wall, and living architecture research in North America.
Transform a Vehicular Road into a Waterway: Reclaiming a Lost Waterway through Landscape Design

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Keywords: Lost waterway, Landscape Design, Ecology, Dhaka

In the fast-growing cities of developing countries, the preservation of surface water has always been neglected due to pressure from intense urbanization. People from these countries had a connection with water for generations and it was part of their daily life (Sultana & Crow, 2000). Rapid urbanization increases the impervious surface and decreases natural land surface which results in ecological degradation (Xu et.al., 2018). Urbanization and its associated impervious land have altered the topographies and natural processes of our cities to such an extent that it is not easy for the water, soil, vegetation, and heat systems to function naturally (Gajjar, 2017). So, bringing back surface water into the city will improve the ecology of the city, as water has both mitigation and problem-solving power in terms of improving human life. In this case, landscape designers and planners can take a strong step regarding introducing the water surface in city life. There are two ways to work on this issue. One is to introduce new water bodies or waterways or making artificial fountains and another is to reintroduce the lost water bodies or waterway connections to reclaim the lost natural system for that place. This paper will discuss a hypothesis regarding the process of reviving the lost waterway through landscape design.

The study area consists of a lost waterway which is buried under a vehicular road as a box culvert and cannot carry water due to blockage caused for lack of maintenance. This road is one of the important secondary roads for the city. The process will show how reviving this channel through transform the vehicular road into a waterway can bring back nature within the city. To go through the transformation process, the physical survey was conducted, and the road is categorized into several sections based on the activities and appearance at both sides of the road. The surface runoff volume was calculated using the Arch GIS flow accumulation tool and watershed tool to propose the depth of the waterway. The design proposals were suggested according to the categorized road section. An overall design concept is developed, and several functions are proposed here based on site surveys to support the existing transport system. It is an idea-based experimental proposal for the city of Dhaka, Bangladesh. The most positive aspect of this hypothesis is to fulfill the growing demand for water supply for an urban area. This landscape design process can be a prototype for another similar situation also.
In 2017, Georgia began clear-cutting trees on all highway agency property across the state (Hurt, 2018). Far from an isolated case, large-scale tree removal is common along roadsides across the country. Since 2015, for example, public outcry against tree clearing along highways has been documented in parts of California, Connecticut, Florida, Maine, Oregon, Pennsylvania, and South Carolina. These actions are often classified as maintenance projects, which carry no requirements for environmental review or public input, unlike new highway construction that must abide by NEPA regulations. Despite the widespread trend, states like California, Florida, New York, and Washington have strong landscape architecture traditions within their highway agencies, striving to balance beauty, ecology, and traffic safety requirements along roadsides (Harrison, 2014).

All states must incorporate federal roadside design guidelines such as the clear zone, which prohibits trees within a set distance from the road, per a federal formula. While this clear zone requirement is maintained as an absolute rule of road design, its relationship to road safety is still disputed (AASHTO, 2011; Wolf & Bratton, 2006; Marshall, 2018). Along with this engineering tradition, transportation landscape architects must incorporate considerations about storm resiliency, increasing tree mortality due to pests and drought, wildfire risk management, signage visibility, tort liability, and other constraints on roadside trees. Even with these uniform requirements, the visual and environmental outcomes of different roadside vegetation management practices vary widely across the nation.

How do different states develop, interpret, and execute their roadside vegetation management policies? My research compares the decision-making processes within highway agencies regarding roadside vegetation management policy and roadside tree removal, with a focus on the role of landscape architects within highway agency design and maintenance teams. I conducted 28 interviews with landscape architects, maintenance officers, environmental officers, and engineers at state highway agencies, along with staff at state and federal regulatory agencies, environmental advocates, and members of the public, following a snowball method. I analyzed the interview transcriptions to extract themes and document lessons learned, which apply not only to transportation landscape architects, but to any interdisciplinary project team that includes landscape architects, engineers, or environmental professionals.

I will present specific insights for strengthening collaboration and enhancing the environmental outcomes from interdisciplinary teams. Findings include lessons learned about staff structure, communication, staff training, contracting, specifications, legislation, and policy.
Using Green Infrastructure Planning to Increase Coastal Community Resiliency

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Keywords: Green Infrastructure, resiliency, landscape planning

Growth and development of urban environments can lead to degraded ecosystem services, landscape fragmentation, and increased flooding and potential damage. Such flooding is an issue for coastal cities as their coastal location makes them susceptible to natural disasters, such as flooding and hurricanes. Urban areas in coastal communities are implementing “green infrastructure” plans and strategies to increase community resiliency and conserve and protect their natural resources such as greenways, wetlands, and open spaces. This community-based research identified: 1) nine (9) cities that utilized green infrastructure planning in the Mississippi-Alabama coastal region; 2) best practices among those cities; 3) landscape patterns to be protected, and 4) developed a partnership plan to involve governmental leaders as engaged learners. This research used quantitative and qualitative methods to examine green infrastructure planning practices and outcomes in the Mississippi-Alabama coastal region. Faculty and student researchers engaged and assessed the coastal cities in green infrastructure planning strategies using a planning quality scorecard of key indicators, an online survey, interviews and landscape spatial pattern analysis. GIS ArcPro and Fragstats were used to analyze landscape patterns for over 1,000 sub-basins for density and connectivity. A SWAT model was used to calculate each sub-basin's peak annual runoff depth. Preliminary findings show that the average comprehensive plan score was 43.9 out of 60, indicating a high level of quality and green infrastructure engagement, and 22% of municipalities noted local mandates requiring some green infrastructure use or a focus on sustainability. Development was found to have a significant positive association with increased runoff. A regional partnership plan was created to encourage municipalities to engage each other on a local level to transfer their shared knowledge to other coastal communities. In conclusion, green infrastructure planning needs to extend to a regional scale and consider overall landscape interconnection. Green infrastructure planning and practices make a difference in the reduction of runoff.
People–Environment Relationships
Beyond a Feast for the Eyes: Recognizing Everyday Experiences as Cultural Ecosystem Service for Developing Novel Nature-Based Solutions in Cities

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Keywords: Cultural ecosystem services, aesthetics, landscape perception, landscape design, urban ecosystems, sustainability

The purpose of this paper is to call attention to how everyday experiences of urban nature in the immediate landscape surroundings may affect the development of novel nature-based solutions (NbS). NbS are now being explored in many cities to address sustainability challenges under climate change. Specifically, they can integrate rapidly evolving digital technology to more effectively deliver regulating/provisioning ecosystem services (ES). For example, using smart systems to monitor the quantity and quality of storm runoff in real time and remotely control stormwater ponds. It should not be assumed, though, that such novel NbS will automatically provide co-benefits to society, especially when they introduce perceivable change into the commonplace urban landscapes of daily encounters.

In this paper, I conceptualize everyday experiences as cultural ecosystem services (CES) and connect the landscape appearance of novel NbS to the delivery of other broader ES. In everyday situations, desirable experiences of urban nature often connote basic demands such as safety and cultural and social expectations for how a landscape should look. They can also offer important well-being benefits. Further, everyday experience may powerfully motivate people’s behavior and action vis-à-vis landscape change. When novel NbS are proposed for commonplace urban landscapes, people can directly respond to the perceivable landscape characteristics at the human-scale as part of their everyday experiences. But they may not notice or relate to the enhancement of environmental functions. Explicitly framing everyday experiences as CES, therefore, may inform novel NbS that can be supported by people and provide co-benefits.

Drawing on these understandings, I am investigating how people may value the smart stormwater pond landscape in their everyday experiences, and how these experiences may relate to their support for implementing such novel NbS. Our survey data (n = 977) indicated that respondents ranked stormwater regulating functions as much more important than the appearance of the stormwater pond landscape. Yet when smart management systems were adopted, the lower support level was explained by the decreased ratings for everyday experiences (i.e., perceived safety, neatness, attractiveness) rather than enhanced stormwater regulation. These results suggested that CES of everyday experiences cannot be directly inferred from analyzing environmental functions, and they may affect the delivery of broader ES. This paper connects landscape architects to a broader understanding of the landscape experiences elicited by commonplace urban nature in everyday situations, as well as to further opportunities for engaging in developing novel NbS to promote urban resilience.
Blanketing the Alps: Human Response to Melting Glaciers

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Keywords: glacier blankets, geotextiles, climate change adaptation, Alps

For more than a decade now, the Alps have become a stage for glacier preservation efforts. One strategy for the retention of glaciers under a changing climate is to protect this terrain by applying large swaths of insulating geotextiles. These “glacier blankets” represent a Sisyphean effort to mitigate glacial erosion in the Alps, and in so doing highlight the ways in which business owners, designers and engineers respond to the problem of melting glaciers.

The dependent human-environment relationship is well established in the Alps, where tourism serve as a central economic driver and is fueled by human access to mountain landscapes for recreation and leisure. For more than 150 years, the glaciers have served as popular tourist destinations, landscapes that have been cultivated for both sport and an experience of wonder (Hardy, 2020).

In the face of melting glaciers and diminishing snowpack, the application of blankets appear to be a long-shot, desperate effort to shelter vast stretches of ice and snow during the summer months. Geotextiles range in material composition size and durability: white canvas, tarps or fleece are rolled out in the late spring of each year. Surprisingly, the ad hoc application of blankets in early years appeared to work remarkably well; in an early study on the efficacy of these methods, researchers found that melt rates and ablation slowed by roughly 60% (Olefs & Fisher, 2008). Since then, an array of more extensive, technical solutions have been developed and tested.

In the broader context of climate change, however, blanketing efforts may signal the futility of working on adaptation rather than mitigation. Barrier application at the scale of a mountain is characterized by extraordinary cost, difficult terrain and associated access, limitations to large-scale adoption, and various material sustainability challenges. The work of laying geotextiles across mountain landscapes is further hampered by the irregularity of climate change, which may shifts physical landscapes from year to year.

And yet, the adaptation measures employed in the Alps also reveal the deep connections that people have to their mountain landscapes, and the lengths that people will go to in order to sustain endangered experiences. As a variety of design ideas are considered for climate change adaptation and mitigation in mountain landscapes, the application of glacier blankets may have components worth considering anew. This paper shares early fieldwork documenting the glacier blanketing strategies of the Rhône, Pitzal and Andermatt glaciers, including methodology and initial findings.
Community Environments That Promote Older Adults’ Intergenerational and Other Social Interactions

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Keywords: Intergenerational Communities, Intergenerational Interactions, Peer Interactions

Background: Global population aging has brought a significant societal transformation, resulting in many socioeconomic, environmental, and public health challenges (United Nations, n.d.). Literature suggests that intergenerational interactions can help reduce ageism and social isolation as well as promote health and well-being among older adults (Gualano et al., 2018; Zhong, Lee, Foster, & Bian, 2020). Intergenerational communities are important for facilitating intergenerational interactions and supporting healthy aging in place (Generations United, 2016; Lee & Zhong, 2019). This study aims to explore ways to measure the defining characteristics of the intergenerational communities in terms of social environments, physical environments, and neighborhood age composition that are correlated with older adults’ intergenerational interactions in their neighborhood. It examines older adults’ social interactions with four different age groups, to further explore similarities and differences in their correlates.

Methods: We analyzed cross-sectional survey data from 455 community-dwelling older adults, 65 years and over, residing in Austin, Texas. Community environmental factors were captured using Geographic Information System (GIS), based on the neighborhood around each survey respondent’s home (Zhong, Lee, & Lee, 2020). Multivariable binary logistic regressions were performed to investigate correlates of older adults’ social interactions with four other groups (i.e. children, all younger generations, peers, and others of all ages) at least once a week in their neighborhood.

Results: Our study participants had an average age of 73 years, and were approximately 72.1% female and 72.8% non-Hispanic White. Compared to social interactions with children (28.0%, 1+ times/week) and teenagers (21.9%), older adults interacted more with adults (79.2%) and peers (66.9%) in the neighborhood. Multivariable analyses demonstrated that individual characteristics, social environments, physical environments, and neighborhood age composition were all significant predictors of older adults’ intergenerational and/or other social interactions in the neighborhood. Significant social environmental factors included supportive services/programs, social cohesion and trust, digital communications, and resources for social interactions. Physical environmental predictors covered domains of transportation infrastructure, land use, neighborhood development, traffic safety, and neighborhood aesthetics. Our findings further suggested significant differences in correlates of older adults’ intergenerational vs. peer interactions.

Conclusions: This study provides empirical evidence toward developing policy and environmental interventions that can be applied to designing intergenerational communities and retrofitting existing
communities to become more age-friendly. Continued efforts by policymakers, researchers, and practitioners are needed to investigate the full range of environmental facilitators as well as barriers to creating intergenerational communities that can support active and healthy living for all generations.
Design of a Community Energy Park as Solution to Energy Insecurity in the Context of Climate Change

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Keywords: Energy Insecurity, Climate Change, Micro-grid technology, Low-Income Communities, Energy park, Community-Scale Renewable Energy

As climate change continues to influence temperature extremes, the urban poor will be particularly vulnerable to energy insecurity (Jessel et al. 2019; Corburn 2008). Extreme temperatures will increase the amount of energy required to maintain healthy interior temperatures and the urban heat island effect will compound the issue of extreme heat (Berry et al. 2018). The financial impact of increased energy demand threatens to increase the number of people facing energy insecurity. Community-scale renewable energy production has emerged as a likely solution to address both climate change and energy insecurity. However, current energy infrastructure requires extensive modernization to accommodate the intermittent and bi-directional nature of renewable energy production (Denholm et al. 2010). As communities begin to consider the future of their energy systems, landscape architects can position themselves as facilitators to establish a community-driven transition to renewable energy. Current research primarily focuses on technical considerations and does not substantially address the social and spatial aspects of community-scale renewable energy production. This research aims to identify how the design of a community energy park can address the social and spatial considerations of community-scale renewable energy production in an urban area. Residents of nine neighborhoods in Kansas City's Brush Creek Community will be engaged in a community participation survey (n=140) with the goal of understanding their financial stress as it relates to energy costs, their opinions on renewable energy, their awareness of energy infrastructure, and their willingness to participate in a community-scale renewable energy program. The anticipated outcome of this research is to inform the design of a community energy park that (1) decarbonizes, decentralizes, and modernizes the energy grid, (2) anticipates and adapts to future increases in energy demand as a result of climate change, (3) thoughtfully incorporates new energy infrastructure into the Brush Creek Community in a way that increases sense of place and local identity, and (4) benefits low-income residents by addressing energy insecurity, providing educational opportunities, and creating green-collar jobs. This study intends to demonstrate how the design of a community energy park can facilitate the integration of community-scale renewable energy systems into existing neighborhoods. Furthermore, the outcome of this research can be applied to similar communities to establish a modern energy network that addresses climate change and reduces energy insecurity.
The Development and Application of Heat Vulnerability Indices/Models: A Systematic Review

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Keywords: heat vulnerability index, heat vulnerability models

Global warming, urban heat island and intensive heat events are co-occurring, increasing the heat-related risk for populations across the world. The chronic and acute health effects linked with heat exposure cannot be ignored. Heat related illness and mortality especially during heat events are increasing over the years (US EPA). Aggravating the impacts of heat is the social and economic vulnerabilities experienced by certain populations. Identifying the communities and populations that are under high heat vulnerability is important for urban planning and design policy, as well as public health interventions. An increasing number of researchers have been working on collecting multiple heat-related indicators such as regional sociodemographic and environmental factors to create composite indices/models for heat vulnerability assessments and predictions. There is a need of a systematic review to demonstrate the construction, validation and applications of these indices/models such as indicators selection criteria, factor weights, calculation approaches and the models/indices effectiveness. This systematic review using the PRISMA framework included 5 datasets (PubMed, Web of Science, JSTOR, ProQuest, and Scopus) journal articles about heat vulnerability/risk indices/models. Title screening, abstract screening, full-text screening and forward/backward searching are included in the process. Journal articles focusing on heat vulnerability’s geographical distribution at population level, providing estimation or prediction methods or approaches using social-demographic characteristics and physical environment as indicators were included. Studies that are not journal articles, demonstrating the relationship between heat related illness or mortality by regression models without considering physical characteristics, not at population levels, not providing predicting methods/indices, not in English were excluded. 46 studies were included as full-text review. The results reveal the development, validity, and application of heat vulnerability models/indices include: 1) indicators/factors that were utilized in index/model construction 2) weighting schemes 3) models/indices validity and reliability evaluations and 4) models/indices application. We also compare the indices developed in different geographic areas and populations (e.g., high-risk occupational groups versus the general public). Through this study, readers will have a comprehensive understanding of indicators, calculations and applications of the heat vulnerability indices/models. This study will also serve as a compelling reference for researchers developing heat vulnerability models/indices in the future. By synthesizing the findings, we point out the gaps in the current literature, and identify directions for future research regarding model development and application.
Examining the Benefits and Issues of the Living Root Bridges in Meghalaya, India

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Keywords: Living Root Bridges, Khasi, Meghalaya, India, Indigenous, Landscape, Infrastructure

Living root bridges are an indigenous technology the Khasi people of Meghalaya, India have developed to navigate through their steep terrain. By conducting a literature review this study seeks to understand the benefits and conflicts surrounding this indigenous landscape infrastructure. Recent studies have documented the fusing process of the Ficus aerial roots that allows the bridges to grow stronger over time. Living root bridges offer layers of social, ecological, and economic benefits. The process of building a bridge takes roughly 30 years to fully mature, therefore the construction and maintenance can be decided by all stakeholders. The hands-on building process is shared across generations which forms an emotional bond to the bridges. The living root bridges connect the many remote villages that are scattered throughout the steep terrain in the East Khasi Hill landscape. Ficus elastica provides a food source for 1274 bird and mammal species. The terrestrial roots stabilize the steep hillsides to prevent erosion and landslides. Living bridges are used to access markets and farmlands, and recently tourism has offered new income sources in the form of homestays, tour guides, and entry tickets. Developing tourism for the bridges alleviates poverty for the Khasi people, but is also a source of conflict for the environment and community social structures. Interventions for increasing accessibility such as stairs, walls and pathways are constructed from materials that are inappropriate for the region and quickly deteriorate from the heavy rainfall. The weight of these concrete structures and increased foot traffic damages the sensitive ecosystem. Issues regarding ownership of living root bridges express themselves through conflicts at various socio-cultural hierarchies. When a living bridge is maintained by multiple villages, but only one village wants to promote tourism, the villages fight for legal ownership through the court systems, creating a social rift. Within villages, conflicts arise between younger generation and village elders on matters related to replacing living bridges with modern concrete structures, as well as decisions to promote living root bridges for tourism and the environmental degradation that typically follows. The study of the living root bridges demonstrates that while such technologies offer sustainable alternatives to modern construction, their conservation and replication is complicated by socio-cultural complexities. As the Khasi people seek to improve their quality of life, it is important to understand and balance modern interventions with traditional practices to conserve and learn from the cultural heritage that living root bridges represent.
Firesafe: Designing Fire-Resilient Communities in the American West

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Keywords: fireproof, biomimicry, wildfire, fire-adaptation

In recent years, fire seasons in the U.S. have begun burning more acreage and lasting far longer than historically seen. Yet outside of burn bans, suppression by firefighters, and interventions by individual property owners, very little has been done to prevent such conflagrations. The relatively recent surge of human settlement of areas in the American West in landscapes that have evolved with fire has combined with an influx of property owners originating from places foreign to the concept of fire-dependent ecosystems. The rise of wildfire incidence within the US and abroad has resulted in a massive loss of life and the destruction of entire communities, prompting the questions of how landscape architecture might adapt fire vulnerable communities situated within fire-dependent ecosystems. What if communities recognized wildfire as an essential function of the place rather than a liability? Just as plants and animals have evolved to fit into natural cycles of destruction and regrowth, so might humans adapt to these environments. Given the need for new ways to prevent loss of life and property, landscape architects must ask how design thinking might be used to shape the fire-adapted communities of the American West within the context of fire-dependent ecosystems. The perception that wildfires are preventable has caused communities to build in locations that will inevitably experience a fire event, risking human lives and infrastructure. This poster demonstrates five interpretations of biomimicry (fireproofing, burrowing, elevation, submersion, and intervals) for use in the modification of landscapes into fire-adapted communities. Central to this analysis is the idea that sustainable human developments could adopt a form of biomimicry informed by the adaptions of plants and animals that endure and even thrive on regular cycles of fire. Examples of such approaches include the burrowing behavior of animals informing site and form of buildings and their immediate surroundings; plants that store water in their roots and soils to maintain a buffer of moisture to halt ground fires on a site; and the cyclical reduction of fuels on a community scale with the help of grazing animals such as goats and sheep. Based on these methods, design decisions will be customized for the strategic placement of buildings in relation to topography and wind, vegetation planting, fuel loads, fire-retardant building materials, and landform. This poster identifies the broad components of fire risk in the American West, and then uses examples from biology to explore their transference to a design process enabling fire adaptability. This methodology enables components of biomimicry to be reconsidered in the context of fire adaptation. These design ideas and principles can then be applied to a variety of landscapes wherein wildfire is inevitable, thereby exploring how fire-adapted communities may be built to sustain wildfires long-term.
Green Play Infrastructure: [Re]connecting Children with Nature in Underserved Urban Neighborhoods

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Keywords: nature play, GIS, suitability analysis, city

Children are often the most disadvantaged cohort during miserable situations of natural disaster, economic crisis, and environmental degradation (Dewi, 2012). Meanwhile, children’s play is increasingly controlled, costly and standardized with engineered structures and surfaces rather than infused with natural processes and organic materials (Ball et al., 2019). Connecting children with nearby nature has become a movement in education, community development, and health and therapeutic settings (Chawla, 2015). However, access to nature-based playscapes in underserved, lower-income neighborhoods is usually extremely limited, impacted by disparities of race, class, and gender (Koralek, 2005). In these contexts, misused and neglected vacant lots and streets and related interstitial spaces can be (re)claimed and redesigned as playscapes that support active, engaged, meaningful, and socially interactive play. Place-based design and micro-programming can knit these elements and processes together as a play system spatially through a combination of top-down GIS data and bottom-up site analyses. This mixed methods approach can help identify local patterns of insecurity, children’s circulation, and natural resource possibilities within a neighborhood.

Our case study addresses the ample opportunity to re-engage kids and city nature in underserved neighborhoods in Philadelphia, Pennsylvania that are experiencing persistent lot vacancy and degraded urban infrastructure. We used GIS-based suitability analysis, drawing on geo-spatial crime and safety measures with roots in criminology and urban sociology; natural resource assessment with roots in urban ecology; and existing housing occupancy / structural condition and streetscape conditions with roots in urban policy and landscape urbanism. We prepared an aggregated suitability map that evaluated whether linear and nodal neighborhood features were suitable for re-casting within a nature-based playscape network. We then ground-truthed this series of under-appreciated and interstitial spaces, from the stoop-side mini-garden to ruderal plant communities along alleyways to partially buried first-order streams. Finally, we matched these potentialities with playscape categories adapted from the literature to reveal an emergent pattern that we call green play infrastructure.
Landscape Architecture, A Gateway to the Hinterland

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Keywords: human ecology, monumental landscapes, hinterland, colonialism, Manifest Destiny

Some modes of landscape architecture preserve historical values, while others pursue emerging values (1). Some public spaces represent how values change over time, due to the rapid transformation of urban renewal. One such symbolic space is the Gateway Mall in St. Louis—the string of small parks that extends westwardly from The Gateway Arch (2). Solidified in the monument by Eero Saarinen and the park by Dan Kiley, is the celebration of American ‘Manifest Destiny,’ (3) and the role of St. Louis in that colonial project. Therefore, the Gateway National Park (4) and the Gateway Mall are highly charged landscapes. Many designers and planners have formed and reformed these spaces over generations, communicating shifts in people-environmental relationships over the last century (5). At the same time, these symbolic landscapes are open for criticism, of their colonial history (6), and ripe for new landscape architecture to mark emerging relationships. How might future generations reconfigure these symbols?

Building on theories of people-environmental relationships in landscape architecture, this presentation surveys three existing built landscapes and then answers the above question by staging three new design experiments. The primary method is the landscape architecture studio and its exercises, through which students grappled with immense landscape issues in small sites along the Gateway Mall. In order to expand conventional notions of people-environmental relationships in landscape architecture, each student received an industry or infrastructure which ties urban residents to a ‘hinterland’ (7) through the modern development of this city (8). The students investigated their infrastructure at the continental scale and amassed their research in a folded atlas. In the design process three primary strategies emerged—‘data visualization’ (9), ‘the microcosm’ (10), and ‘détournement’ (11)—all meant to publicly communicate how our home city ties us to exploited, degraded environments out of our sight.

The course takes the position that landscape architecture, alone, cannot solve humans’ largest environmental problems. So, students attempt to raise awareness about how urban dwellers are complicit in this process, while we attempt to project more stable human-environment relationships in our city. Given the platform of this monumental site, the implications of these designs are to reshape cultural associations between parks and environmental issues—degradation, species loss, and climate change. The Gateway Mall is now conceived as a stage for advocating and producing the ecological modes we want to cultivate next.

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Keywords: People-environment Interaction, Direct Interaction, Simulated Interaction, Physical Presence, Virtual Presence

Theories such as Attention Restoration Theory (ART) (Kaplan & Kaplan, 1989) and Stress Reduction Theory (SRT) (Ulrich, 1991) suggest that being in nature and/or interacting with nature has a restorative impact on voluntary attention. It has also been demonstrated that improvement in voluntary attention level reduces the chance of mental fatigue and may lead to improved mental health (Keniger, 2013). Some studies have explored this impact with different modes of interaction, including direct interactions, such as physical presence in nature (Berg, 2017) or visual access to natural environments (Tennessee and Cimprich, 1995). Other studies examined modes creating simulated interactions, such as having a photograph of nature (Laumann et al., 2003), or watching video recordings of nature (Pilotti et al., 2014). In the past decade, with the advancement of virtual reality (VR) technology, the study of human-environment interaction and relationships has entered a new era. New and more immersive, and possibly accurate, ways of simulating interactions with nature, and corresponding physical responses, are being developed.

Although previous studies have separately explored the impact of interactions with nature on individuals’ attention and stress level, a comprehensive study that focuses on and discusses all form of interaction’s strengths and weaknesses and elaborates on the advantages and disadvantages of various simulation modes is rare (Fauville, Queiroz, & Bailenson, 2020). This paper is a qualitative literature review that builds on previous research by exploring and comparing a more comprehensive range of options including 2D images, video recordings, 360 images, and immersive 3D virtual environments and presents the advantages and disadvantages of each for studying the impact of interaction with nature on people’s attention restoration or stress reduction. The paper proposes a new theoretical framework that sets the stage for more reliable studies evaluating an environment’s restorative quality utilizing different modes of interaction with nature.
Neighborhood Environment and Physical Activity among Families with Children

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Keywords: Physical Activity, Parents, Children, Family Structure, Neighborhood Environment

Sedentary lifestyle continues to remain a leading public health change in the US. In 2016, only 52% of adults and less than 22% of children/youths met the CDC-recommended levels of moderate-to-vigorous physical activity (MVPA) [1-2]. Childcare responsibility has also been reported to be a major barrier to leisure time physical activity [3-4]. Living in an activity-friendly environment can help both children and adults incorporate more physical activities into their daily routine. This study aims to explore the potentially differential roles of neighborhood environments on physical activity (PA) among adults living in a household with versus without children. This study analyzes the survey data from 2,644 participants (1,425 living with at least one child under 18 and 1,219 living without no children) captured a part of a larger NIH-funded research project called Active El Paso. The study variables were selected based on the social-ecological model to capture intrapersonal, interpersonal, and environmental factors related to PA. Logistic regression models were used to examine how personal and neighborhood environmental factors are associated with the odds of meeting the CDC-recommended 150-minutes of weekly MVPA among adults living with versus without children. Weekly minutes of MVPA were similar between the two groups with 288 and 307 minutes for those living with and without children, respectively. However, walking was significantly lower among those living with children compared to their counterparts, with 89 vs. 104 minutes of transportation walking and 132 vs. 163 minutes for recreational/exercise walking. Contrastingly, adults living with children spent more time in their car (98 vs. 66 minutes per week). Multivariable models suggest that controlling for personal-level covariates, environmental factors including (a) availability of PA facilities, (b) safe street-crossing conditions, and (c) satisfaction with their neighborhoods as a good place to live, contributed to increasing MVPA among those living with children, while availability of restaurants and grocery stores/supermarkets were associated with increased MVPA of those living without children. Social interactions with neighbors and two residential self-selection variables (i.e. consideration of housing affordability and neighborhood safety when choosing the current residence) were significant predictors of MVPA only for those living without children. The results will suggest family structure is a significant yet under-studied factor in environment-PA research. Further analyses will isolate a smaller subset of most significant environmental and interpersonal factors that can be modified through policy and design interventions, as a first step toward developing evidence-based guidelines for child- and family-friendly communities.
Park Characteristics That Affect the Number of Visits before, during, and after the Shelter in Place Order

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Keywords: COVID-19, Park visit, Park characteristics

During the Covid-19 pandemic, the government published the shelter-in-place order for a few months. In concern of social distancing, people have reduced their visit to parks and other public places. It is known that exposure to nature has positive effects on people's physical and mental health, such as encourage physical activities, sustain attention, and reduce stress (Jiang, 2014; Kondo, 2018; Li, 2016). Thus, after the reopening, many people are eager to go out and visit parks again. This offered a great opportunity for researchers to learn about what park characteristics play a better role in terms of reconnecting people with nature. Thus, the research question for this study is: what characteristics of parks affect people's choice of visit? This research chooses Houston as the study site and uses foot-traffic (visitor counts) data of Point-of-Interest (POI) from Safegraph. The data starts from March 2nd, 2020 until May 25th, 2020. Two most important time point in the dataset is March 23, 2020, when the Shelter-in-Place (SIP) order begins and April 3, 2020, when the order ended. The average number of visits for each park before, during, and after the SIP is calculated to examine the changes of visits during the different time span. And then take a deeper look into the relationship between the changes of visits and each park characteristic, such as the size of the park, percentage of green, percentage of tree coverage, the distance between each park and surrounding neighborhoods calculated by Manhattan distance (accessibility) and etc. The analysis adopts descriptive statistics and inferential statistics. The descriptive statistics are used to characterize the park characteristics. The inferential statistics are looking at bivariate relationships between visitor counts and each park characteristic, and further regression analysis using size of the park, percentage of green, percentage of tree coverage, accessibility, and etc. controlling for population density, age, SES of the surrounding neighborhoods within 1-mile buffer zone etc. to predict the number of visits to each park and its variation before, during and after the SIP. In addition, spatial regression is used to analyze the impact of park locations. the results can guide park designs to help people to reconnect with parks and nature, such as implementing larger and greener parks closer to neighborhoods to encourage more visits which will benefit people’s health.
Perceived Site Qualities through the Social Media: A Case Study of Bryant Park, NYC

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Keywords: social media, user experience, social value of landscape architecture

Urban public spaces including parks, greenspaces, and streets can promote physical activities, improve mental health (Hand, et al, 2017), increase social cohesion (Plunz, et al, 2019; Sullivan, Kuo, DePooter. 2004), and bring economic and ecological value to local communities (Crompton, J.L. 2001; Votsis, A. 2017). There is also a general consensus that landscape architecture projects did bring these beneficial effects to the public. However, cities, constrained with limited resources, need to consider the opportunity costs of advocating public space developments that compete with other investments such as energy, roads, education, health care, etc. The question is not about whether the public spaces provide value and welfare but how to maximize these benefits. Therefore, it has been more and more important to measure landscape performances so we could better understand the cost-benefit effect of our landscape interventions. As one of the critical elements of landscape performances, social performance is closely tied to how people interact and experience the built environment, and its assessment usually involves extensive studies of public space users. However, it is challenging to analyze the social performance of landscape architecture on a large scale since on-site observations, surveys, workshops, and interviews pose challenges including a high cost and time commitment, low response rate, outdated information, oversimplification, and consistency issues. By harnessing social media reviews (Tripadvisor.com), this study investigates how users perceive site quality and what kind of site experiences they have as proxies to identify social performances in landscape architecture. Using Bryant Park in New York City as an example, a large dataset including 11,419 Tripadvisor reviews from 10,615 users was collected. Natural language processing and machine learning technique was used to perform semantic analysis which could reveal hidden themes in a large number of texts. The results include five semantic topics and their associated descriptions including Amenities, Holiday Favorite, Summer Hotspot, Place to Relax, and General Experience. A comprehensive overview of the user experiences in Bryant Park were introduced along with their weekly and monthly patterns. The findings provide insights on what were happened in a vibrant urban park from the user’s point of view. Suggestions, future directions and implications were also discussed.
Perceptions of Prescribed Fires in the Mid-Atlantic, USA

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Keywords: Perception, mid-Atlantic, prescribed fire, mismatch

Firescapes of the mid-Atlantic, U.S.A. are understudied relative to other ecosystems in the United States. Yet, they harbor high levels of wildland-urban interface (WUI), have a close intermingling of land ownerships, and reflect substantial regional heterogeneity in burning histories and fire hazards. Moreover, mid-Atlantic fire practitioners increasingly seek guidance for understanding community perceptions of prescribed fire implementation to meet various land management objectives, including hazard reduction, restoration, and biodiversity. Here, we present social perceptions results from an interdisciplinary project that explores the interactions between ecosystems’ need for fire, community perceptions, and management challenges. Using trail-head surveys of forest users and fire manager focus groups, we identified both barriers and opportunities for prescribed fire implementation in the region. Our results highlight critical mismatches between ecosystems, communities, and managers. In particular, ecologically desirable fire frequencies may be longer than agency planning horizons; barriers and opportunities are multi-scalar, often precluding regional-level coordination; perceptions of concerns and benefits differ between fire managers and forest users and within regions; integration of forest user benefits into fire planning may not match optimal timing for ecological objectives. Collectively, these mismatches offer opportunities for better alignment of multi-scalar, multi-objective decision making in the context of landscape-level fire management.
Significant Impacts of Built Environment on Public Housing Residents’ Suicide Rates: A 13-Year Natural Experiment

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Keywords: public housing, built environment, suicide, mental health, natural experiment

Suicide is a global problem. It is known that socioeconomic and demographic factors influence suicide rates, but little is known about the impacts of built environment factors on suicide rates after controlling for self-selection bias. We explored this gap via a natural experiment conducted in 151 rent-only public housing communities in Hong Kong from 2005 to 2017, during which period there were 5,841 suicide deaths in these communities. The regulations of public-housing constituted a natural experiment with minimal self-selection bias. We conducted hierarchical regression analyses and found that built environment factors collectively have a significant association with suicide rates. Three significant environmental factors were identified: distance to the nearest urban center, distance to the nearest Mass Transit Railway station, and gross flat area per person. These findings demonstrate that the built environment plays a significant and independent role in predicting suicide rates. Environmental interventions to prevent suicide is necessary and pressing.
Social Factors and Use of Vernacular Plant-Based Materials to Address Water Issues

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Keywords: sustainable landscape construction materials, Life cycle Assessment, Cradle to cradle, Plant based materials, local materials, India, water infrastructure

Commonly used landscape construction materials negatively impact the environment and human health. The energy, water, and resources put into landscape materials produce emissions, effluents and solid waste which degrade the environment on which people and ecosystems depend. These common materials have a low monetary value which is a misleading indicator of the high energy and environmental costs. Sustainable materials refer to the balance of environmental, economic, and social factors when selecting, producing, implementing, and disposing a material. Presently, sustainable landscape construction materials are quantified through various programs such as the Life Cycle Assessment, the LEED building rating system, and the SITES system. Most life cycle assessments focus on the environmental effects but what these systems lack is a focus on the cultural and socio-economic situations that are local to the resource extraction and use of materials.

Case study reviews on the life stages of materials used globally has shed light on how social factors and communities are impacted by resource use and extraction. The purpose of this research is to propose the use of plant-based materials for landscape construction to address sustainability issues for both environmental, economic, and social issues that arise from using imported and toxic materials. The case study material focus pertains to water conveyance and water collection in India. The case studies in focus include living root bridges in Meghalaya, India; Keni wells in Kerala, India; and Bamboo in Meghalaya, India.

Living root bridges as a material focuses on the structural use of the Ficus elastica plant in India and examines its stability and longevity. The bamboo focus pertains to water conveyance for various water uses, the material is studied for longevity, durability, and efficient growth. The keni wells is a case for tapping into ground water through the Caryota urens palm, the cases are reviewed for palm tree preparation, construction, active filtration, and longevity. Vernacular plant-based materials used on landscapes in India for hundreds of years can inform water infrastructure construction. Additionally, insights into materials and their impacts can better guide one of the most important pillars of sustainability: the social realm.
A Survey of Residents’ Perception of Ecosystem Benefits of Green Stormwater Infrastructure in Chinese Sponge Cities

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Keywords: green stormwater infrastructure, public attitudes, benefit perception

The Sponge City Development (SCD) was launched five years ago to address urban flooding and water quality challenges in China. Green stormwater infrastructure (GSI) of rain gardens, grass filters, etc., have been adopted as important facilities to treat stormwater runoff at the source and provide additional benefits in pilot cities. Current research has focused primarily on the environmental performance of GSI, whereas how the public view the functions and services of GSI has not been fully understood. This study focused on the human dimension of SCD, understanding residents’ flood-related experience, stormwater concern, level of familiarity with GSI, institutional trust, and perceptions of benefits of GSI. This study can contribute to the assessment of the social impact of SCD. It also provided critical information for the design and management of GSI in prioritizing ecosystem benefits, making GSI better serve urban communities socially and environmentally. Intercept surveys were implemented in four sponge cities in southeastern China, and 607 valid responses were collected. In-depth interviews with stakeholders, including local managers, sponge agency officials, design professionals, and researchers, identified the level of public participation and the affecting factors for the benefit provision of sponge projects. Surveys found that the residents were generally supportive of SCD. Although the residents’ familiarity with GSI was not high, they had relatively high trust in sponge institutions. With the high exposure to flooding, the residents were more concerned about the stormwater impact on quality-of-life than that on the water environment. The public perceived good aesthetic and health values from the adoption of GSI, whereas the outcomes of flood mitigation and water quality improvement were not salient. Interview results showed that public participation was inadequate at many levels. Landscape quality, knowledge and engagement, and hydrological performance greatly influenced how people perceive the ecosystem benefits of GSI. To conclude, it was essential to allocate more resources to public education to increase the knowledge of stormwater impact and build stormwater stewardship. Efforts on landscape quality, maintenance, and project assessment should be made to perfect the biophysical efficacy of sponge projects in future development.
The Tool for Observing Play Outdoors (TOPO): Capturing Children’s Play Behaviors in Outdoor and Natural Playscapes

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Keywords: youth, children, play, play type, outdoors, nature, nature play

Research has demonstrated the many benefits children derive from outdoor free play opportunities, particularly those that allow them to engage with and explore nature. ‘Play type’ scales which allow researchers to capture and categorize the different types of play afforded by an environment can increase our understanding of how settings and their features can support diverse and stimulating outdoor play. Most play typologies available to date, however, have been developed for observations of indoor behaviors and do not effectively describe the full and nuanced range of outdoor play activities. This presentation will outline the Tool for Observing Play Outdoors (TOPO), a new scale developed by the authors specifically to capture the unique and diverse behaviors that occur in nature-rich outdoor playspaces. Following an outline of the new typology itself, the utility of the TOPO will be demonstrated through illustrative analyses of children’s outdoor play behaviors in The Backyard’, a nature playspace at the Santa Barbara Natural History Museum. The authors integrated TOPO into a behavior mapping protocol conducted both before and after a renovation of the outdoor play space to study the impacts of the environmental changes on the types of outdoor play in which children engaged. Findings from pre-post renovation analyses will demonstrate how The Backyard environment supports a diverse range of outdoor activities, as well as the value and efficacy of this new outdoor play types scale for illuminating the relationship between outdoor environments and children’s play activities.
Transfer of Vacant Lot Ownership to Residents and Their Improved Level of Condition-Care Predict Crime Reduction

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Keywords: Vacant land; crime; urban greening; resident ownership; cues to care

High levels of land vacancy in U.S. cities have contributed to a wide range of negative outcomes including visual blight, a lost sense of community, and high crime rates in affected residential areas (Sampson & Raudenbush, 2004). Although studies show that vacant lot greening programs reduce crime rates in high-vacancy areas (Branas et al., 2018; Kondo et al., 2016), little is known about the potential impacts of resident-owner-based stewardship initiatives on crime. Using a place-based approach to crime, we evaluated the outcomes of one such initiative, the Chicago Large Lot Program. Specifically, we studied whether the transfer of ownership and subsequent visual improvements in condition and care by local residents would help reduce crimes in residential neighborhoods in the years following implementation. We examined property crimes, gun- and non-gun-related violent crimes, as well as five other types of non-indexed crimes that most frequently occurred within our study areas. Focusing on 2064 residential blocks in two study sites where 234 of the blocks had one or more lots purchased by local residents, we first matched these “treated” blocks with control blocks, in which lots were not purchased, at a 1:3 ratio based on demographic characteristics. We performed difference-in-differences analyses to examine whether blocks with at least one purchased ‘large lot’ showed reductions in various types of crime compared to blocks without large lots for each of four years after program implementation (2015-2018). Using a previously developed condition-care rating scale to assess changes in visual quality of purchased lots over time, we performed a second round of difference-in-differences analyses to examine whether the extent of improvements in condition-care was associated with crime reductions in treated blocks. We found that, starting in the second year of implementation, the program contributed to significant reductions in overall crime density as well as a few types of crime. We also found that higher levels of condition-care in purchased lots was significantly associated with lower crime in the study site that had a higher percentage of purchased lots and a higher mean condition-care rating. This study offers insights into the benefits of resident-owner-based greening initiatives and suggests that policies that support such programs can be a cost-effective catalyst for improving neighborhood safety and quality of life.
The Urban-Rural Battleground: Statewide Socio-Ecological System Drivers of Voting in Pennsylvania

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Keywords: Socio-ecological systems, Political sentiment, Environmental design

Environmental design and planning are becoming increasingly polarized along partisan lines in the United States (Zawadzki 2020, Howe et. al. 2015, Hahnel 2019). Increasingly landscape architects are engaging in systemic large-scale climate change issues, beyond the single client development model, e.g., renewable energy and hazard planning, which cross multiple political divides. Yet, initiatives are slow to materialize because embattled fractures prevent the passage of legislation, such as the Green New Deal, that would realign the country with global efforts to adapt to climate change. Political sentiment typically follows urban-rural spatial patterns (Wallace et. al. 2009, McKee 2008), suggesting that the biophysical environment has an influential role in socio-political values and behavior. Efforts to explain political activity have often relied on estimating individual behaviors from aggregate data, or ecological inference (Amos, McDonald, & Watkins 2017, Hirsch and Nall 2016). Yet, to our knowledge, these efforts have been limited to social variables and have espoused the role of the biophysical environment.

Pennsylvania, a key battleground state in the 2020 Presidential Election, appears to follow these alignments as the traditionally rural counties of Appalachia are generally more conservative despite a higher reliance on natural resource industries (Mainzer, Cole, & Flohr 2019). Our exploratory geospatial analysis of Pennsylvania attempts to describe voting patterns through the ecological inference of biophysical and social factors. We aggregate a representative range of biophysical conditions including; land use, forest quality, farmland quality, conservation lands, the Rural-Urban Continuum Codes index, and traditional demographic characteristics, at the voting precinct level for the entire state (n = 9,275) and explore correlations with the 2018 Midterm Election results across state and local elections. We anticipate our results will describe 1) a persistent conflict in political conservatism and exploitation of natural resources, and 2) a nuanced description of the role-specific socio-ecological systems play in mediating voting behaviors. Landscape architects will need to integrate these findings into novel ways of practice in order to leverage design at the scales necessary to address climate change.
Visualizing People and Behavior in the Past, Present, and Future

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Keywords: People and Behaviors; Visualization; Data gathering ethics; Outdoor environment

The research of methods on observing, documenting, and understanding human perceptions and behavior in the outdoor environment can be traced back to the 1950s. Both the tools and strategies to visualize this information has evolved over the last seven decades. In the 1970s, Sanoff and Coates (1971) observed and studied children’s play and their relationships to residential settings with behavior mapping. They used pens/pencil and predetermined forms to record behaviors while standing on the site. In the 1980s, cognitive maps were used to discover and document spatial injustice and equity issues (see Herman, 1980). Based on years of practice and instruction, Gehl summarized a toolkit that combined counting, observing, mapping, and tracking to study public life in cities internationally (Gehl & Gemzøe, 2004). In the 2010s, geographic information systems (GIS) related software and participatory processes have commonly been integrated into behavior and environment studies (Brown, Strickland-Muro, & Moore, 2017). Today, we are living in an era where researchers are seeking out new ways to find data to understand the new norms of people and places due to pandemic influences. While many data platforms are becoming the new testing grounds and are poised to become a replacement for traditional data gathering and representation techniques, data ethics and privacy invasion are the new challenges for people-behavior research.

This presentation focuses on research that utilizes literature reviews and case studies to demonstrate the methods for identifying, interpreting, and recording individuals’ behaviors and use patterns. We summarize the characteristics of information gathered from different techniques and argue that, no matter which decade, observing and documenting people and their behaviors are crucial to establishing an understanding of the community and specific sites before developing any outdoor environment design recommendations. The presentation will also address the necessity of understanding human behaviors in today's environment where the COVID-19 pandemic and social injustice issues are changing the social patterns and raising questions concerning access, representation, and ownership. These data gathering and visualization methods are an essential complement to typical landscape architectural design processes. The analysis and representation of non-traditional and new uses expands the reliance on two-dimensional site inventory and analysis by capturing the transitional nature of places. By researching visualization techniques and strategies from the past to the present, this paper clarifies the development of future human environmental behavior research and presents arguments for how representation methods should be produced by the community, cater their needs, and empower the participants.
**Why Beige Matters in a Green World**

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**Keywords:** Planting Design, Arid Landscapes, Planting Aesthetics

Water conservation in the designed landscape is compromised in the semi-arid West by the continued and incongruent use of plants from less arid climates, which require additional water. The predominant design aesthetic of trees planted in a lush, green lawn flourishes, seen from the Front Range of Colorado to the grasslands of Texas, and in many urbanized areas across the Central North American Steppe. While an increasing number of design firms, such as Ten Eyck Landscape Architects and Didier Design Studios, create landscapes that appreciate the beauty of drought and accentuate the subtle shades of beige and brown, there remains resistance to the acceptance of alternative planting aesthetics. These challenges are related to underlying values, circumstances, and political economies that support the persistent use of this planting approach (lawns with trees), and that prevent the development and acceptance of alternative aesthetics. Two predominant issues contribute to the challenges of implementing alternative planting options: (1) residents’ loyalty to the pervasive lawn aesthetic of the past, and (2) the designed landscape is “unseen”, overlooked, and undervalued. (Catalano, 2020, p.89).

With an understanding of these challenges to changing the social norm of planting lawns with trees, this investigation proposes an exploration to “see what’s there and what’s possible”. This essay uses drawing and diagramming to further investigate the visual facets and potentials for alternative planting aesthetics that are more congruent with water limitations along Colorado’s Front Range. These drawings are intended as a transitional project proposing speculative intentions and visions intended to provoke designers to consider and invent new and varied responses, not a singular or formulaic response that serves to check off boxes focused on sustainability. This essay and the drawings therein, do so by looking more closely at historic and current landscapes while imagining alternative landscape aesthetics derived from the local cultural and climatic conditions. The drawings include diagrams illustrating the interrelatedness of political policies, land development and the green industry, and collages of past, present and future landscapes that question the emphasis on the color green. The overall collection invites one to see the color, texture, context, and ecological processes of a drought-expressive landscape.
Research & Methods
Research and Methods

Assessing Imageability in Immersive Virtual Environments

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Keywords: Spatial Memory; Urban/Nature Interface; Design in VR; Virtual Reality; Gaming; Landmarks; Wayfinding

Kevin Lynch’s “Image of the City” contextualizes how urban design influences place attachment and significance through the configuration of paths, nodes, districts, edges, and landmarks [1]. This seminal work influenced a generation of speculative urban design and inspired further research in spatial cognition across many disciplines. Our work builds on Lynch and contemporaries by coupling their original sketch mapping and wayfinding exercises with immersive virtual environments. When combined with psychometrics such as those related to scene gist and spatial memory theory, these methods can help make cognitive mapping a more empirically measured process that can directly influence public planning policy [2].

For the past several years, our project team has been developing approaches to measure how well individuals are remembering aspects of urban environments following Lynch’s theories. One of those approaches is to assess how well individuals can recall their navigation through a 3D virtual environment using sketch maps. Navigation and wayfinding are complex processes that combine spatial memory and decision-making amidst a wide range of environmental contexts. Our work to date has demonstrated the role landmarks play in improving navigation of urban spaces and argued that place attachment is associated with how individuals encode spatial memory of the configuration of different elements in an environment [3,4].

We introduce a design process that couples theory-based environmental design with 3D gaming environments. First, we reflect on the theory behind the initial gridded suburban environment in Bruns and Chamberlain (2019). Second, we showcase a new development of a dense urban environment simulating ancient organic settlement patterns like those theorized and analyzed by Lynch and Kostof in their works on urban form [5-6]. Third, we showcase spatial concepts that can be applied to the design of both dense urban and wildland environments. Finally, we discuss how theories of landscape legibility and visual perception in nature can relate to urban contexts [7-9] and more critically examine the “separate from nature” thesis. Our VE-based design process provides an empirically structured approach to test Lynchian imageability concepts. Using quantitative measures such as bidimensional regression, minimum bounding geometry and various shape indices, we assess how quickly and accurately an individual can infer spatial relationships and meaning between elements. The design outcomes
produced by this VE structure will provide an experimental framework for forthcoming psychological studies with the hope that results will provide meaningful empirical commentary on the significance of Lynchian design theory.
Climate Change Mitigation Potential of Green Roofs: Quantifying Urban Heat Island Indicators and a Green Roof’s Capacity to Sequester Carbon in the Flint Hills Ecoregion.

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Keywords: Experimental Green Roof Systems, Climate Change Mitigation, Carbon Sequestration, Building Energy Performance, Soil Biota, Sustainability

Green roofs have evolved as an important part of “sustainable development” initiatives around the world. With increasing global warming many tools are needed, including living roof ecosystems, to reduce urban heat island and climate change impacts. Rooftop green infrastructure can enhance sustainable urban development by reducing atmospheric CO2 due to its ability to reduce the energy consumption of a building (Jaffal et al., 2012, Fioretti et al., 2010) and sequester carbon in plants and substrates (Getter et al., 2009, Whittinghill et al., 2014). Green roof research indicates that temperature regulation atop buildings is quantifiable and demonstrates a crucial role in reducing the energy demand of a building (Sailor, 2008, Sailor et al., 2011). Additional environmental benefits of green roofs include improved air quality by removing pollutants from the air and reducing ambient CO2 concentrations (Li et al., 2010, Getter et al., 2009). Given different climates, plant materials, and construction conditions, regional and place-based research is needed to understand the benefits and limitations of green roofs in specific locations such as the Flint Hills Ecoregion.

The focus of this research is to evaluate the performance of experimental green roof designs related to carbon sequestration and thermal loading, and to make connections to building energy performance. This research seeks to quantify the bulk heat flows through an experimental green roof system using computer simulation software WUFI® Plus (version 3.2.0) and in-situ measurements. Instrumentation to measure soil moisture content, solar radiation, and air, surface and sub-surface temperatures is being used to derive and compare thermal properties that are crucial to understanding heat transfer. Soil and root biomass samples from three green roof plant mixes are being collected from two different substrates of at least two different substrate depths. Regression analysis using statistical computing language R will help researchers better understand how the age of roots, different substrate depths and types, and soil biota (including nematodes) influence carbon sequestration on an experimental green roof implemented in north-central Kansas between July 2017 and June 2018.

This research aims to provide an estimate of urban heat loads and CO2 reductions through observation of surface and sub-surface temperature dynamics, thermal changes, root biomass, and laboratory analysis of soil PLFA, respiration, total carbon and nitrogen, and soil nematode communities. A more
precise understanding of these dynamic processes and systems is essential to improve design, implementation, and management of green roof ecosystems in support of sustainable building design.

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Keywords: Social interaction assessment, Protocol, Social interaction scale, Health benefit, Green Open space, Parks

Parks and urban green spaces offer significant health benefits through physical activity, social interaction, and passive recreation. To better understand these benefits, numerous instruments have been developed to measure the ways people use parks. However, most are designed to measure physical activity while ignoring other significant activities including social interaction. Despite its importance, there is no single protocol developed to objectively assess social interaction in urban parks. To bridge this research gap, we have developed a social interaction scale (SIS) based on the coding scheme of Parten’s (1932) six stages of play. The scale weights social interaction from low to high based on six dimensions including, 1. Solitary, 2. Unoccupied, 3. Onlooker, 4. Parallel, 5. Associative, 6. Cooperative activities. We developed this innovative protocol named Systematically Observing Social Interaction in Parks (SOSIP) to systematically evaluate human interactive social behaviors from both their levels of contact and group size in urban green space. To evaluate the protocol, a t-test statistic and an Intra-class Correlation Coefficient (ICC) analysis were conducted to verify the protocol’s test-retest and inter-rater reliability respectively. Additionally, we applied the SOSIP protocol to a case study to test the parallel form reliability and demonstrate how SOSIP can be applied for exploring the relationships between social interaction and parks. While the Parten’s six stages of play and the SIS establish the validity of SOSIP, both the t-test and ICC indicate good reliability of using SOSIP to assess social interaction. The consistency of results across different versions of social interaction measured by SOSIP demonstrate the parallel form reliability of the protocol. From the case study, we found a significant correlation between social interaction and park quality. This study develops a valid and reliable protocol to objectively assess social interaction by both participants’ number and level for future experimental research. The case study elaborates not only the potential of using SOSIP to study the relationships between health mechanism and the environment, and demonstrates application of the protocol’s reliability for other researchers who strive to make tangible contributions in the realm of social benefits of urban green space.
A Framework for Assessing Antifragility in Urban Systems

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Keywords: Antifragility; Resilience, Urban Systems

N.N. Taleb coined the term "antifragile" to characterize systems that gain or improve after being exposed to disorder and disturbance. His notion was based on an understanding of financial markets, but it has been extended to other domains including computer science and public health. This paper reviews positions on antifragility across disciplines and provides an approach to conceptualize and computationally test dense urban areas as potential antifragile systems. The work is motivated by the increasing size and density of contemporary cities and by the expanding role of large cities in national and international security, economic, and environmental matters.

Antifragility is predicated on an assumption of ontological uncertainty and, as argued in this paper, expands planning and design considerations of uncertainty beyond sustainability (normative uncertainty) and resilience (epistemological uncertainty). With regard to landscape planning and landscape architecture, it builds upon premises of urban metabolism, which considers urban areas as coupled biophysical-social systems, to consider and track adaptive uses of resources to address novel challenges. A central question is how cumulative quantitative change in performance capacity results in qualitative change in system behavior and possibly change in system state. With regard to security studies, the framework provides an approach to qualify the effects of internal dynamics of cities that exist on the edge of failure. Applied through a computational model, the framework allows for comparative studies of urban system forms and functions, including the identification of critical tipping points.

The framework assumes that capabilities which enable societies to meet needs and manage disturbances—perturbations in functionality—come about by orderings of city systems. It is posited that orders emerge through configurations of political-security-infrastructure sub-systems and/or through social-economic-information sub-systems. It is also offered that with advancing and intensifying use of the Internet of Things (IoT), order might come by way of algorithms that combine political-information-infrastructure sub-systems. Disturbances are graded by intensity and extent of their effects. Exposure to increasing or new types of disturbance prompts responses with different effects. Marginal gains in capacity to manage disruption (becoming more antifragile) or losses (becoming more fragile) emerge through re-allocation or re-distribution of resources. Transformative improvement or deterioration may come though fundamental re-ordering of systems. Issues for experimental validation will be presented.

This work received funding from a US Defense Advanced Research Projects Agency (DARPA) Small Business Technology Transfer (STTR) research contract. This program stimulates collaboration between entrepreneurs and research universities to address emerging challenges.
Landscape Architecture Faculty Performance Evaluation Using Citation Analysis

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Keywords: citation analysis, bibliometrics, landscape architecture scholarship, research performance

1) PURPOSE: This article provides a citation analysis for faculty from the Council of Educators in Landscape Architecture (CELA) member schools.

2) BACKGROUND: The academic field of landscape architecture has taken a recent interest in scholarly productivity and impacts of faculty researchers. Quantitative measures of academic output and reputation have been used to assess performance, especially for academic promotion and tenure. For university faculty and administrators, the question is often about how to evaluate the significance or impact of scholarly output. Albeit its limitations, citation analysis is an effective way to assess scholarly activity, being used in related fields such as urban planning and tourism.

3) METHODS: This analysis uses Google Scholar data because its coverage extends beyond traditional peer-reviewed publications and includes “gray literature” such as project reports, dissertations and theses, conference proceedings, and white papers and briefs, which might also have a significant impact in landscape architecture and related fields. We collect the citation data from Google Scholar Citation Profiles (if a faculty member has it) and Harzing’s Publish or Perish program (otherwise). Citation data for tenure-track faculty are analyzed by program and university, as well as by rank, years of service, and other professional characteristics.

4) FINDINGS: The results show citation patterns for landscape architecture faculty including 1) citations per faculty for landscape architecture programs, 2) citations per years of service, 3) citations based on school where the degree was obtained, 4) citations and years since the degree was obtained, and 5) citations by academic rank. We also discuss the distribution of citation activity across the discipline.

5) IMPORTANCE: We believe that the information presented in this paper can be used to assess the level of scholarly faculty contributions both at the individual level and the program level. We encourage landscape architecture scholars and administrators to undertake more analysis of scholarship to understand academic performance and impact.
Landscape Armatures for Climate Change Mitigation: Identifying Conditions and Potentials of Marginal Agricultural Productivity within the Erie Canal Heritage Corridor, New York.

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Keywords: Climate change, research by design, fallow, hybrid programs, landscape armatures

How can landscape architecture design research contribute to a higher performance of secondary forests and non-productive farmland for carbon sequestration, while at the same time activating economic territories and improving their landscape qualities? Conventional agricultural practices conflict with the increasingly urgent need to mitigate climate change. Landscape-based, or natural climate solutions, such as agro-forestry practices may provide effective CO2 mitigation (Griscom, et al, 2017) via changes in land use and management. Adaptive mitigation includes practices that lower global CO2 levels while producing regional benefits like heat stress management, flood management, and enhanced agricultural resilience (Stone, 2012). Adaptation to climate change in NYS will involve a significant amount of land cover change, and will require changing crops and innovating farming modes. The need to navigate a diverse and often conflicting set of land uses and values makes landscape-based climate mitigation a design issue. Can design for adaptive mitigation expand food resiliency along with water quality, habitat conservation, recreation, tourism, etc. while optimizing the sequestration of carbon?

This ongoing research showcases the first results of a combined set of methods that aim to identify the causes, spatial implications, and developed materialities of the abandonment of agriculture along the Erie Canal heritage corridor in NYS. We explore the potential for climate mitigation on three different sites: the Montezuma Wildlife Refuge and surrounds, focusing on landscapes along the historic Erie canal [1825-1840] that inadvertently drained adjacent wetlands; the Baldwinsville area agroforest mosaic, with flooding issues and advancing residential development; and a site along the Mohawk River between the towns of Rome and Utica, to include landscapes of timber harvest. For the first time in the area, comparative cartographies are developed to assess secondary forest and ‘non-productive’ land in time, including past and future projections. Fallow lands are catalogued and examined through mapping at various scales, field work, and interviews with farmers and experts. Testing these lands with hybridizing programs and design strategies reveals their potential to become a landscape armature that combines conditions for increased carbon sequestration, habitat, connectivity, and enriched landscape identity. This last step informs the final research product, contributing a projective component to the analytical work. The paper provides a critical overview of advanced carbon sequestration modes through natural climate methods internationally, as well as on relevant cartographic or typological studies on fallow land. Finally, it distills the methodological challenges in regard to scale and parametric modelling of the hybrid approach.
The Landscape of American Urban Stormwater Pollution

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Keywords: stormwater, watershed management, landscape planning, machine learning, data science, python

The urban landscape—composed of buildings, roads, lawns, parks, etc.—discharges a variety of contaminants known to severely degrade water bodies. In fact, according to the EPA, urban stormwater impairs 49,000 miles of rivers and streams, 759,000 acres of lakes and reservoirs, and 17,000 square miles of bays and estuaries in the United States.

In this research, we investigated the relationship between a watershed’s landscape characteristics and the stormwater pollution it produces. We analyzed pollutant data from stormwater samples taken in 1,172 storm events across 26 American cities from 1992 to 2003, a subset of the National Stormwater Quality Database (NSQD). We utilized machine learning techniques due to their superior capacity to detect subtle signals compared to classical statistics and because their application to urban stormwater remains sparse.

First, we used a machine learning ensemble approach to identify 5 stormwater "signatures"—distinct combinations of 9 common contaminants spanning organics, sediment, and heavy metals. Specifically, we ensembled three clustering algorithms—hierarchical, k-means, and k-medoids—to obtain more statistically-robust signatures. The signatures show that stormwater can be categorized as very dirty, moderately dirty with particulates, moderately clean with high organic waste, moderately clean with medium organic waste, and moderately clean. These signatures allowed us to compare stormwater from across storm events and watersheds.

Next, we combined the NSQD data with additional data detailing the landscape characteristics of the watershed that produced each stormwater sample, including land cover, land use, urbanization intensity, climate and weather. We applied multinomial logistic regression to this newly combined data to explore associations between the 5 identified stormwater signatures and landscape characteristics. For example, the very dirty signature was associated with warmer days and higher imperviousness. We found that watersheds often produce more than one signature, and their most frequent signature was related to their urbanization intensity and land use. Overall, our research exposes high-level national trends linking landscape and stormwater pollution in the United States that can inform watershed management and low-impact development guidelines. Our results can be used to give a broad assessment of the stormwater pollution likely produced by un-monitored urban watersheds, and predict stormwater pollution from un-built urban development.
The Map Maker and the Milieu: Art as Example in the Cognitive Process

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Keywords: Mapping; Art; Cognition; Site Analysis; Landscape Architecture; Urban Design

This paper explores the role of maps and the process of map-making, especially pertaining to how cognition of site is developed in landscape architectural projects through what has often been called “site analysis,” or “community engagement.” More specifically, art and historical art practices are regarded as models for new modes of mapping in the design disciplines. This approach is predicated upon Arthur Robinson and Barbara Petchenik’s book The Nature of Maps, which focuses on the cognitive process in cartography, both for the map maker and the map reader. A primary issue called into question is the bias of the one who maps, called “the mapper.” The mapper attempts to “increase their spatial knowledge of the milieu,” the milieu being “one’s surroundings or environment in addition to its meaning of place.” However, it has become apparent, and has been discussed by many authors, that this often takes a narrow perspective and relies on dominant themes.

Artistic practice, however, has been proven to expand cognitive awareness, and therefore provides a useful model for alternative approaches toward conceptualizing the milieu. Art practice is open and exploratory, and through the creation of work, organizes the world, offers perception and secures meaning.

To explore artistic methodologies, case studies are shown that emulate historical art projects through cognitive mapping processes, but for the use of landscape and urban design. Examples are used to translate Andy Warhol’s Screen Tests (1964-1966); Richard Long’s A Line Made By Walking (1967); Robert Rauschenburg’s collages, Robert Smithson’s Spiral Jetty (1970) and Joseph Beuys 7000 Oaks (1982). As a cumulative body of work, projects reveal unique and valuable cognitive insights as to the nature and relationships embedded within a place. Not only is the (landscape) architect able to achieve project goals as directed by the client, they are able to expand design concepts in relationship to the ‘milieu’, and represent non-dominant or possibly subjugated aspects of a place within their work.

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Keywords: Renewable energy; post-occupancy evaluation; criteria tree; urban integration

Among the various types of renewable energy, solar photovoltaic arrays have seen tremendous growth in implementation and continues to have great promise as a leading renewable energy. Yet valuable landscapes and ecosystems are threatened by the sprawling infrastructure needed to harness the sun (Marcheggiani et al. 2013; Moore-O’Leary 2017). As the world strives to offset the carbon emissions associated with conventional energy, physical, biological and societal impacts from land use change emerges as an unintended consequence due to renewable energy’s low-density power conversion (van Zalk and Behrens 2018).

Photovoltaics, however, have advantages in the inherent ability for modular distribution near sources of use without the health and safety risks found in conventional energy sources. More than other renewable energies, photovoltaics could conceivably shift more from centralized utility-scale distribution to decentralized commercial-scale systems within the already-developed footprint of the urban boundary to avoid environmental impact.

To some extent, photovoltaic systems are already being implemented within the complex urban environment at residential and commercial scales to reduce dependence on conventional energy sources and reduce energy expenses. While a majority of systems are placed on building roofs, more and more are being constructed in the landscape on ground mounted structures. With continued growth anticipated, attention to the integration of this new infrastructure is imperative to preserve and enhance the quality of place and to maximize the benefit beyond the singular use of energy production. Therefore, this study seeks to determine what criteria and indicators are necessary to measure the level of integration of photovoltaics in the urban environment.

A preliminary survey for evaluating urban integration of photovoltaics is proposed based on the review of established design theory and solar PV literature. Drawing from Reyes Nieto et al. (2017), del Carmen Torres-Sibille et al. (2008) and Collier et al. (2013) the process involves, 1) review of design and PV research, 2) the establishment of a criteria tree based on spatial and functional indicators, and 3) the development of a qualitative field survey to evaluate urban photovoltaic systems.

The criteria tree and field survey illustrate the many considerations for urban integration of photovoltaics both on and adjacent to the project site, including tradeoffs in system function, aesthetics, synergistic opportunities and environmental vulnerabilities. The criteria tree is proposed as a tool for landscape architects to improve the planning and design of future urban photovoltaic systems, and the survey for post-occupancy evaluation.
Methods for Examining Plant Growth, Substrate Moisture Content, and Other Variables on an Experimental Green Roof in the Great Plains, USA

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This presentation highlights the purposes and methods associated with a recently published paper in Science of the Total Environment (Liu et al, 2019) and how first-year baseline monitoring activities relate to ongoing studies focused on experimental green roof by our interdisciplinary research team. Between 2018 and 2020 university faculty and students from landscape architecture, plant pathology, agronomy, and bio-agricultural engineering have explored the performance of planted sedums and native plants in three vegetative species mixes, planted side-by-side in two unique green roof substrates, repeated four times in randomized blocks at three different depths. The research team's initial international publication (Liu et al, 2019) focused on part of the monitoring data collected on the experimental green roof. A synopsis of the paper follows: To explore multi-species green roof ecosystems, this research assessed the first-year growth (June to October 2018) on an experimental green roof in the Flint Hills Ecoregion. A mixture of plants (four native prairie grasses and two sedums) was evaluated for two substrates—a commercial substrate (rooflite® extensive 800) and a regionally-mixed substrate (Kansas BuildEx)—placed at two depths: 6.0-13.0 cm and 16.5-25.5 cm. Supplemental irrigation was provided equally to each experimental plot. Plant height, coverage, survival, visual appearance, leaf stomatal resistance, and volumetric substrate water content were measured. It was shown that the regionally-mixed substrate had greater effect on plant height at the shallow depth and on coverage at the deep depth. However, volumetric water content was usually higher in the commercial substrate. Substrate type did not affect visual appearance and leaf stomatal resistance. All prairie species survived, while Sedum reflexum had poor survival and coverage. Bouteloua curtipendula, Bouteloua gracilis, Schizachyrium scoparium, and Sedum rupestre performed well. Bouteloua dactyloides grew very well (Liu et al, 2019).

This presentation discusses ways to collect data on a green roof when we are interested in pinpointing resilient plant species, measuring vegetative coverage, assessing thermal benefits and carbon sequestration, and better understanding the implications of specific green roof management practices. This research helps designers better understand the changes and dynamics of selected plant mixes and their abiotic environment over several years. Via interdisciplinary conversations our team of 10 different disciplines seeks to improve green roof design, installation, and management—and the quality and range of ecosystem services. We summarize the intentions and methods of undergraduate, MLA, PhD,
and faculty studies, and show the importance of different disciplinary perspectives in green roof research.
Research by Design & Implementation
Breaking Down Socioeconomic Barriers for Persons with Disabilities

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Keywords: Socioeconomic, Disability, Commerce, Accessibility

Worldwide, about 1 billion people have a disability, and this number is expected to double in the next three decades (WHO, 2011). Due to social stigma, lack of accessible transportation, workplace accommodations, educational services, or other infrastructure, finding a job and living independently becomes even more challenging (Kuper, et al., 2018; WHO). Without economic independence, the cycle of poverty and social isolation can lead to a poor quality of life (WHO). Sustainable development goal eight under the Human Development Index, or “decent work for all”, encourages human dignity and equality (Kuper, et al.; WHO). What if the design of the built environment transformed the socioeconomic status of the differently abled? Focusing our research on Raipur, a city in Chhattisgarh, India, we aimed to understand how disability is viewed culturally and what Indians with disabilities need most from the built environment. In Chhattisgarh, there are 400,000 people with sight, mobility, or hearing-related disabilities (Chhattisgarh Disability Census, 2011). Cultural stigma of those with disabilities presents a challenge. Many cultures believe disability is a punishment for wrongdoings in a past life. A term to describe this, “divinely-abled,” only worsens that stigma. Our project’s vision is to create an area of commerce for people of all abilities, including visible and accessible economic, living, social, and cultural spaces. Using research by design, we examined programming and corresponding spatial solutions specific to the cultural and social context of India. Research included literature review and case studies that determined approach and program in the design. The synergistic programs are centered around designing for access, reduction of social stigma, encouraging accessible transit, and proper economic conditions. Key design elements proposed include housing, play spaces, public arts, hospitality and food packaging industries, rickshaw stations, and universal way-finding features. By designing for people of all abilities in the public realm, the expected outcome is the reduction of social stigma, while simultaneously providing gainful employment for persons with disabilities. The project can ultimately serve as a paradigm for countries such as India to strive towards so that all can live a high-quality life with dignity and independence.
Design as Research: Cultural Landscape Icons and Embodied Interaction

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Keywords: Tourist Photographs, Landscape Icons, Cultural Landscapes

This study employs a research agenda developed through traditional research methods and publishing avenues and tests these ideas and concepts using ‘research by design’—through design thinking in a graduate level studio.

The purpose was to use research in cultural landscape icons, tourist photographs, embodied interaction, and tourist behavior to explore a response to cultural landscape icons using site analysis and design solutions as a method of understanding place. Studio participants focused on cultural landscape icons of a major city. Each student assessed how others see their icon through the lens of social media (Instagram), then challenged typical ways of seeing the icon through mixed media re/presentation, and delved into a visual historical narrative of the place. They collected a library of textures, colors, and forms that typify each icon, and lastly, studied and considered how people move around the icon and/or use the space that the icon occupies. For the final assignment the students proposed a design installation that embraced their collected ephemera of the icon and served to change how others see, use, and experience the icons chosen at the beginning of the semester. Methods included observation, drawing, mixed media representation, reading, and design.

The design studies pushed the boundaries of how and why certain landscape elements are perceived as iconic, and how the fabric of a city might be changed, improved, or clarified through a better understanding of the elements that make a place unique. The findings are twofold. First, the students curated critical thinking skills about the public realm and reconsidered celebrated public landscapes through their own installations and design interruptions. Second, this research shifted how we recognized that cultural landscape icons formed an integral part of student interpretation of the city.

Although traditional research suggests tourist experience of place (including photography) is habitual, mediocre, and part of a cultural practice that lacks individuality, findings from the studio suggest an alternative. These icons hold value for the students in this studio and tourists who seek them out for documentation and self-promotional purposes. In addition these icons, and tourist behavior that seeks them out, might be worth studying for what they add to the understanding of the cultural landscape rather than only for what they take away.
Let's Build a Landscape: Collaboration and Reuse

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Keywords: gamelike systems, material recycling, simulation

St. Louis has a vibrant history of creatively reusing building material to make community space, resulting in visionary projects like the late sculptor Bob Cassilly's City Museum. This is made possible by what is usually seen as a negative: the city's declining population has left an oversupply of buildings and infrastructure. While community regreening and pro bono professional design work has achieved successes in managing vacant lands and reusing building material, these efforts tend to be time-intensive, unevenly distributed, and often fleeting in impact. The city has traditionally managed its portfolio of vacant land by clearing built parcels to make lawns, squandering the material resources on site. Recently, however, it has experimented with methods of building deconstruction, attempting to capture quality materials from unliveable structures.

Where widespread vacancy taxes the capabilities of conventional models of civic planning, professional design services, or volunteerism, a path of compromise may be possible. Through a design studio, the author and a group of graduate students tested the agency of landscape design in addressing the situation. Can the deconstruction process directly benefit surrounding landscapes of vacancy? Can uncontaminated material be reused in the landscape without extensive training? Can top-down management plausibly meet community regreening efforts halfway? Can nonconventional frameworks for design and building expedite and regularize a time-consuming process?

Accordingly, the studio explored the potential of two methods to empower labor forces to remake vacant landscapes. First, we tested the use of flexible, game-based guidelines to make planting and hardscape design choices. Such systems, used as a collaboration framework between community groups and city work crews, could be responsibly and extensively reiterated over large tracts of land. Students collectively simulated the results of gamelike design systems to test how well they facilitated collaboration and generated high-quality site design choices. Second, students identified local sources of building materials that could be quickly and safely reused in the landscape. Given form through gamelike processes, such materials can create stormwater controls and visible cues to care in otherwise vacant and undermaintained lands. The studio group tested our initial methods through creating and evaluating hypothetical interventions matching vacant sites in St. Louis with close-by building material. Students demonstrated the ability to use iterated gamelike rules to generate effective and varied site features including circulation and stormwater management. Acknowledging the significant constraint of being tested remotely in simulated conditions, this process demonstrates promise in conceiving and managing community regreening efforts.
Making a Space for Landscape Architecture in Rural India

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Keywords: Rural India, Public Space, Community Participation, Architecture

India is predominantly rural. About 70% of its population, 833 million lives in villages, a landscape which is untouched by the gaze of landscape architecture. In such a context, this paper documents the design and delivery of over 50 Holkar Community Halls in rural India and how this was used to propose outdoor public spaces for the community. The author led the design team that was awarded the project. Through a critical reflection on the design and implementation of this project, the article argues that outdoor gathering spaces in such contexts are more flexible and inclusive public spaces that can be achieved by leveraging community participation and using architectural design to support outdoor spaces.

The Holkar Community Halls project seeks to create public halls on 57 rural sites dispersed across Maharashtra state, which when completed will serve over 200,000 villagers. The design team involved over 6,000 villagers in the project’s development through public presentations, design discussions, collective site visits, and workshops. Funds were carved from the architectural budget for basic landscape improvements because while the building would be closed at night or at other times, the outdoor public space could be the true amenity for all times. The perimeter of the building was designed to feature a covered plinth which provided an outdoor seating area and framed the public spaces on either side of the building. Play equipment, sports court and ample seating through an expanded plinth, planter and seat-walls are key elements. Durability, ease of construction and low maintenance were the guiding factors in choosing materials. The planting for the project began with the design team’s public participation visits which also included plans to create community murals on the exterior walls of the building. While the building was modified only slightly for each site because of the cost involved, different site and landscape plans could be developed for each of the 57 sites. These have spaces designed to provide activities of interest for different age groups, genders, and recreation types.

While architectural details like plinths for seating fall in the hard scope of contracts, participatory interventions that can further craft outdoor space can fall in the soft scope of a project. Both come with their advantages and disadvantages. For example, in the first completed project site, the raised plinth, being a part of the contractor’s scope was constructed and formed a good edge for the public space but the participatory workshop had to be cancelled due to Covid19. Projects like the Holkar Community Hall provide many lessons on aspects that work and also plans that fail.
A Preadaptation Garden

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Keywords: preadaptation, garden, social & environmental justice, equity, disinvestment, experimental methods, visualization, subjectivity

Proponents of ecological restoration struggle to adapt their methods for cities. Some ecological thinkers claim that restoration practices are not fit for urban spaces (1). Degraded conditions—compounded by social, political, and economic challenges—make it impossible to recreate ecosystems as they previously functioned. Still, landscape architecture can adjust ecological frameworks and test the limits of adaptation (2). Private investment for publicly disinvested urban spaces has been slow, yielding social and environmental inequity. Social engagement strategies and economical applications are necessary to work in disinvested spaces. “A Preadaptation Garden” is a design experiment for reinvesting and reassembling environmental and social value in a disinvested vacant lot in St. Louis, through grassroots landscape architecture methods. Designers have speculated on vacant urban land and the potentials for increased environmental and social value, while also calling for more experimentation (3, 4). Sites of resilience- and adaptation-themed work are often adjacent to populations vulnerable to climate change and other public health crises. Resilience and adaptation are powerful words, rooted in evidence, but these ideas are also misused as they become ubiquitous (5). What does adaptation require? In order to engage these sites and serve a marginalized neighborhood, social value must be at the center, neighbor engagement a key strategy. This presentation outlines one design experiment, wherein the top priority was to tether social values to environmental values at each phase—design implementation, and maintenance. The design process began by locating untapped values already in this neighborhood and in this bioregion. My team and I selected native plants that might be preadapted for urbanized, degraded conditions (6). We surveyed neighbors to better understand what was desired and what was meant by the discussed ideas for the vacant lot garden. The transition between design and implementation went on full display, when the neighbors and I stationed and sketched the design onto the site at 1:1 scale. Instead of a sign stating the obvious signifiers about place and typology, the garden sign marks the relationships made here—among the demolished house (the brick), the neighbors (the hand), and the desires for the garden (the wildflower and the butterfly). Finally, the neighbors will each receive a deck of cards for identifying the plants by seed, seedling, or bloom. In this design experiment, I found that the perceptual ecology (7), the self-reflexivity in the project process, strengthened the clarity of this adaptive project and promoted more varied ecological values.
Service Learning &
Community Engagement
Connecting Youth and Seniors: Towards a Multigenerational Community in Rupert, West Virginia

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Keywords: Multigenerational Community, participatory design, community interaction point

Creating a livable community environment for the aging population is a serious issue in West Virginia. Most adult senior citizens in the United States prefer to age in place (Binette & Vasold, 2018), but a considerable number of them eventually move into senior living facilities. These facilities are often isolated from the community and all the interactions are only limited among the senior members. This limited amount of social interaction and lack of social connections could create a sense of loneliness (Weeks, 1994) and affect the physical and mental state of older adult’s health (Blazer, 2003). Although West Virginia has a long tradition of multigenerational caregiving due to unique cultural factors (Phillips & Eitzman, 2016), formal facilities that provide multigenerational communal support are rare. Facing increased demand for senior living facilities, the Rupert town in Greenbrier County of West Virginia initiated a project to remodel a school campus to accommodate affordable housing and a medical clinic that targets the senior population in local communities. The proposal also integrates The Meadow River Valley Early Childhood Learning Center (MARVEL), a school that provides learning opportunities to infants and children up to 12 years of age. The redesigned outdoor spaces of the school campus will be shared between the two groups of users. This creates a unique opportunity to create a shared landscape where the senior-most member of the community can interact with the junior-most members. This research study focuses on exploring the opportunities of utilizing the unoccupied school campus to create a community space where occupants of the senior living facilities and young students of the early development center can interact. The study will be conducted in three phases. First, an initial survey followed by focus group interviews will be conducted with different user groups in the pre-design stage to identify the crucial interaction opportunities. In the second phase, the community will be involved in the design process through participatory design exercises and design workshops. Finally, the design proposals will be shared with the community for a post-design evaluation. Because of the health concerns related to the COVID-19 pandemic, the study will be limited to online techniques including surveys (Dillman et al., 2014) using Qualtrics, focus group interviews (Stancanelli, 2010), and community meetings to gather initial data and design evaluations. The study will play a crucial role to identify the challenges and provide a framework to set up multigenerational facilities in rural West Virginia.
Evaluating Community Engagement Mechanisms for Green Stormwater Infrastructure Development

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Keywords: green stormwater infrastructure, community engagement, engagement mechanism, engagement evaluation and assessment

Despite their known environmental and social benefits, green stormwater infrastructure (GSI) projects face various implementation barriers. One particular barrier is low community acceptance due to reasons including the lack of understanding of GSI benefits, different aesthetic expectations, and disregard for GSI maintenance. Community engagement plays an essential role in addressing this challenge; however, a comprehensive and meaningful community engagement mechanism remains missing from the literature, one that best fits the contextual background of the community, well-suits the nature of the issue, educates the community on the matter of concern, and builds capacity for long-term collaboration. In particular, a few studies have documented how communities are engaged in GSI projects and if the engagement mechanisms produced the intended outcomes and impacts. Thus, we are left wondering if the chosen mechanisms were successful or not or if other approaches should have been pursued.

To close the gaps, this study employs a web survey methodology to document the predominant ways communities are engaged in GSI projects and evaluate the degree to which various participation mechanisms impacted achieving the projects’ stated goals. We utilize the stratified and snowball sampling methods to recruit both public and private sector planning and design professionals once involved in GSI projects across the U.S. The survey was launched on Qualtrics in June 2020 and will remain open until December 2020. So far, we have contacted 270 people and received 90 responses.

Our preliminary data analysis indicates that the primary goals of current community engagement projects are capacity building, community buy-in, input collection, and education on the topic. Traditional engagement mechanisms such as public hearing, information sessions, design workshops, charrettes, and surveys are the most common engagement mechanisms for GSI development. Technology-facilitated engagement mechanisms such as online mapping had only been utilized in a few cases, due to the lack of familiarity and access to the tools that support such mechanisms. Because the engagement processes have rarely been evaluated by project partners or other parties, it remains unclear if the engagement goals were met. Once the full survey responses are received, we will report additional results on the evaluation of each engagement mechanism on their strengths, weaknesses, and enhancement potentials.

Ultimately, we expect to demonstrate the significance of applying multiple engagement mechanisms to
meet the intended goals. Additionally, assessing the applied mechanism throughout the process is also essential to ensure the mechanisms are flexible, accessible, and equitable.
Landscape Architecture Extension as a Hub: A Model for Community Engagement and Service Learning

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Keywords: extension, land grant, service-learning, charrette, community engagement

Applied learning through community engagement projects continues to be a pedagogical component of many undergraduate and graduate landscape architecture programs. Studio projects that expose design students to real-world challenges are highlighted by students as both memorable and impactful. Students who engage in service learning projects also gain skills they identify as important to their education and eventual careers (O. Sleipness, Powell, J., Anderson, D., Evans, D. McCann, R., Chen, S., 2019). Effective models for engaging design students in service learning projects abound and the comparative advantages and drawbacks have been well documented. (Bose, 2014). These service-learning efforts often require independent administrative structures with associated financial and operational expenses. Providing design students with service-learning opportunities often requires coordination and resources in addition to those found in a typical classroom setting (Eyler, 1999).

Landscape architecture programs often struggle to efficiently solicit projects, match projects with appropriate studios, manage each project, and coordinate the successful completion of these projects? This presentation details how one land grant university’s department of landscape architecture utilizes its land grant mission and Extension services as a “hub” for coordinating and funding service learning and community engagement projects for nearly three decades. Of the 97 accredited graduate and undergraduate landscape architecture programs in the United States, 47 programs are located within land grant universities (ASLA, 2020). The mission of land grant universities is to address local needs with research-based education and outreach activities (O. Sleipness, Ryan, K., Krikac R, Gomez, S., 2016). This land grant mission and the Extension system contain an existing administrative infrastructure, connections, and resources that can provide an efficient means of connecting pressing design and planning challenges in local communities to landscape architecture students and programs. However, diversifying traditional Extension programs to include design and planning efforts requires strategic administrative bridge building and departmental support. This presentation will provide other universities an opportunity to compare this service-learning model to their own. Additionally, other land grant universities can gain insight into the details of how the administrative structure, financial management, project coordination and staffing of this Extension “hub” turns community needs into meaningful service-learning opportunities.
A Process of Understanding Place: A Service-Learning Design Project to Find and Enhance a Sense of Place for Historic Communities

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Keywords: Service Learning, Placemaking, Cultural Urban Landscape

Small, historic cities and towns serve as hubs for people living, working, and recreating throughout Washington’s Okanogan County. Downtowns and the street networks remain neglected and in disrepair, and many settings lack a sense of identity and character that honors the rich history and diverse cultures of region. However, there are certain values and amenities in which local communities feel affinity. The enrichment of community character through design requires a process to understand place.

In a Landscape Architecture studio, students explored opportunities to enhance and create vibrant downtowns for a set of communities in Okanogan County, Washington. Proposals included a research-based inquiry considering the ‘cultural urban landscape,’ streetscape improvements for main streets, and the design of downtown public spaces such as: town squares, pedestrian promenades, plazas, parklets and pocket parks, public art spaces, and other types of enhancements. Students developed a process and designs which utilized local feedback to evoke a ‘sense of place’ through landscape architecture proposals.

In this paper, we examine the following research question: “How can students competently design for a ‘sense of place’ within a service-learning project?” The methods utilized a survey instrument to evaluate student learning with spatially-explicit metrics. Iterations of student designs were incrementally evaluated with student-driven studio-specific design metrics. The evaluation results were coupled with community-based feedback to evaluate effectiveness in design strategies. Results of these evaluations intend to answer the research question concerning design for a sense of place. The results can potentially provide revisions of studio course layout, assignments, and transferable guidance for similar service-learning studios in Landscape Architecture. The results also aim to generate a set of outputs for communities in Okanogan County, Washington with design guidance to support and bolster community appeal and stewardship through creation and understanding of a ‘sense of place.’
Research on Community Engagement Model of the Urban Co-Construction Garden in Shenzhen

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Keywords: community engagement, co-design, community garden, Shenzhen

Many cities are experiencing rapid urbanization in the context of booming population. Urban regeneration within built-up areas is therefore becoming an important way for urban development. Shenzhen, as a metropolitan city with over 13 million people, has undergone a rapid of green spaces. The shift of urban regeneration towards refined governance is followed to make the green space perceptible to residents. Community gardens are of value to provide a space for residents to negotiate, self-govern, and share, in order to improve the community environment and to facilitate gardening activities. 120 urban co-construction gardens will be implemented by the end of 2020. This research takes the urban co-construction gardens in Shenzhen as an example. Policies, design, and construction, feedback, and maintenance, tools, and process have been explored for the urban co-construction garden. This research found that pre and post Surveys, volunteer training, and workshops can provide platforms for different target participators to receive environmental knowledge and express their thoughts. This empirical research also found challenges and opportunities that inter-sectoral and inter-organizational collaboration brought to urban regeneration. Community groups as the key stakeholder, its engagement extends the content of urban planning and design. Community garden as the urban public space, links governments, community groups, built environment professionals, and researchers together. The initiative of community engagement was largely driven by the conflicts of demand and expectations between different stakeholders. The barrier of professional knowledge is detected as an important obstacle during the process. Community engagement models have been formulated, stakeholders and their contributions have been mapped. Considering the background of the “garden city construction” in China, this research provided inspirations and experiences for policy formulation, and practical implementation, etc.
Students Design to Transform a Vacant Lot into Archway Park in Baltimore

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**Keywords:** Vacant lots, Service learning, Design implementation, Community managed green space, Stormwater

The purpose of this presentation is to share students’ design and research process of transforming a vacant lot into a community managed open space. Vacant lots negatively affect the health and safety of residents. They often become sites for illegal dumping and are filled with trash, broken glass and remains of criminal activities. The increase of vacant property was associated with an increased risk of violent assaults (Branas, Rubin, & Guo, 2013). Overgrown vegetation also attracts illegal activities and unwelcome pests. However, with proper design and care, vacant lots can be assets for community residents as public green spaces. Previous research found that in-view proximity to a greened vacant lot decreases heart rate, compared with in-view proximity to a non-greened vacant lot will result in an increased heart rate to the observer (South, Kondo, Cheney, & Branas, 2015). Other study found that green vacant lots resulted in a reduction in feeling worthless or depressed (South, Hohl, Kondo, Macdonald, & Branas, 2018). Greening vacant increased residents’ perception of safety (Garvin, Cannuscio, Barnas, 2013).

In Druid Heights, Baltimore, over 40 percent of properties are either vacant buildings (18.4%) or vacant lots (23.2%). There is an urgent need to revitalize the Druid Heights neighborhood through the development of vacant lots into sustainable and functional green spaces for the community. The University of Maryland Landscape Architecture students worked with Druid Heights’ residents and the Druid Heights Community Development Cooperation to transform a vacant lot into the community’s Archway Park. They worked with community residents, leaders and stakeholders to shape design ideas. After hosting a community meeting, the community members voted on two design concepts as possible park solutions for their Archway Park. The winning designs envisioned a dynamic community space to accommodate the present and future needs of the Druid Heights community. They provided gathering spaces, as well as performance and relaxation areas for the residents. They also integrated water quality improvements by capturing stormwater runoff and treating the pollutant load. The student designs promoted the use of native plants and increased tree canopy cover to support urban wildlife habitat.

The winning designs were further developed into construction documents for bidding and implementation. With the help of Maryland Department of Natural Resources and Maryland Department of Housing and Community Development, the new Archway Park has been constructed in the spring of 2019. The collaboration among community residents, a community organization, state agencies, a local university and private professionals have contributed to the transformation of a vacant lot into an urban green space.
Urban Design
Urban Design

Assessing Human Perception of Floodable Urban Design for Sea Level Rise Adaptation

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This study examines how floodability influences approach and avoidance behaviors towards areas with different water levels and flood frequencies in Venice. Floodability is an emerging concept for addressing flood resilience as a paradigm shift from a resistance paradigm of “design against nature” towards a resilience paradigm of “design with nature” (La Loggia, Puleo, and Freni, 2020; Pasi, 2016). Adaptive water urbanism has mainly been discussed as localized adaptive management of floodwater through urban design features that are safe-to-fail, such as water plazas and floodable parks (Palazzo, 2019). Floodable development has become an increasing popular adaptive response to large-scale flooding for developers and municipalities seeking to balance economic development and flood adaptation despite the public health consequences of increased exposure to mold and cross-contamination of flood water by sewer and toxic wastes (Rising, 2017). However, little research has been conducted to understand the market viability for such amphibious real estate strategies and the impact of floodable development on people’s willingness to conduct normal activities during a flood event as business usual. A survey with semi-structured questions was conducted with 300 participants conveniently sampled from residents and tourists in Venice. Mediation analysis indicates that the average water level experienced is significantly correlated with the anticipated flood water level that will make participants avoid tourist and/or business activities. The frequency at which participants experienced flooding without damage in the past is a partial mediator that significantly reduces the anticipated water level that triggers participants’ avoidance of normal activities in flooded areas. The findings suggest floodable developments may not be a viable market strategy in areas with more intense and recurrent flooding due to a rising sea level similar to Venice because the tolerable flood water level for conducting daily activities will continue to drop as the city floods more frequently. Floodable developments are likely to be abandoned in the long run as businesses and tourism cannot sustain themselves without people willing to adapt to flooding with the attitude of business as usual. Rather than encouraging floodable developments in flood-prone areas for short-term flood adaptation, municipalities faced with rising tides should consider proactive relocation as a more sustainable sea level rise adaptation approach by supporting the creation of relocation destinations on safer higher ground further inland. This study is the first that has investigated human perception of floodable developments to help inform sustainable adaptation strategies for sea level rise (Molinaroli, Guerzoni, & Suman, 2019).
Developing a Revitalization Planning and Design Guideline for Enhancing Land Use Performance of a Shrinking City

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**Keywords:** landscape performance, urban design, urban regeneration, vacant land, community participation

Land vacancy is a persistent issue in most urban areas in the United States, yet few case studies have examined how vacant lots are used and the functions they serve in local communities. It is often the result of deindustrialization, workforce relocation, and suburban expansion. The over-expansion of cities is likely to cause the most decline in urban cores.

The goal of this study was to propose a comprehensive master plan for optimizing revitalization of the target area, providing different development scenarios with a design guideline and quantitatively measuring the expected benefits via landscape performance metrics. The project site was the Durant-Tuuri-Mott (DTM) target area in the shrinking city of Flint, MI, USA where presents severe issues related to neighborhood vacancy with over 30% vacant lots.

For developing a revitalization planning and design guideline, this study developed several design modules with three main design themes. Then, landscape performance of the final design proposals was analyzed by three development scenarios, based on implementation level: 100%, 75%, and 50% of development. To generate a comprehensive development plan by optimizing design module allocation in the study area, this research employed a system-oriented approach, analyzing the existing cultural, natural, and built environments. A community participant process was adopted to collect stakeholders’ opinions on future development.

To quantify the benefits of the proposed design, landscape performance research was conducted focusing on three primary dimensions: environmental, social, and economic benefits. Through newly proposed greenspaces and diverse design modules, the proposed design will contribute to enhancing environmental quality by reducing stormwater runoff, improving CO2 sequestration, and removing pollution. To enhance the sense of community, the design proposal offers several social benefits by providing more gathering space and community gardens, which offer residents increased opportunities to interact with their fellow community members. To address safety concerns, proposed traffic-calming devices, new or enhanced sidewalks, and well-maintained infrastructure will encourage people to engage in outdoor activities both safely and comfortably. In terms of economic benefits, increases in rental income and tax revenue and reductions in maintenance costs will significantly improve economic revenue.
This research offers a flexible design method for balancing objectives in vacant land redevelopment that can be applied in other shrinking cities.
Do Small Green Spaces Cool Down Urban Air Temperature More than Building-Shaded Spaces in Summer?

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Keywords: Built environments, Solar radiation analysis, Urban design, Urban green space, Urban heat islands

Urban heat mitigation has been considered to enhance urban resiliency to climate change. As urban cooling factors, greenspaces and shaded areas by buildings (BSs) have been reported repeatedly how well they mitigate urban heat. Moreover, small greenspaces (SGs), such as street trees and small parks, reduce air temperature influencing their cooling to surrounded areas. However, existing studies have not investigated SGs’ and BSs’ cooling effects to find an optimal cooling design. Also, previous studies have conducted mainly simulation models without field survey data. The purposes of the study were 1) to investigate SGs’ and BSs’ cooling effects by green spaces’ fraction at the block level and 2) to find whether SGs’ cooling effects were larger than those of BSs by block size. Six urban blocks located in Seoul, South Korea were selected as study sites. Based on the size of each block, they were divided into three pairs in which one had larger green spaces than the other. Air temperature measurement was conducted every minute during the daytime by walking across each block and repeated for six clean and hot summer days. The air temperature data was recorded at a height of 1.5m from the ground using loggers. Through field survey, measured data points were specified into three land covers SGs, BSs, and paved spaces exposed to solar radiation. To analyze the cooling degrees of land covers, a series of T-test and ANOVA were performed. As our major findings, SGs’ cooling degrees were significantly positive in reducing the urban air temperature surpassing those of BSs. Our results also presented that SGs’ mean cooling degree was 0.5 °C greater than those of BSs in the blocks with more amount of green spaces. Besides, SGs’ contribution to reducing air temperature continued in the blocks having less amount of green spaces and a large amount of building-shaded area. In larger urban block groups, SGs’ and BSs’ cooling effects became larger significantly. Our findings will contribute to optimal cooling designs using SGs and BSs when community resiliency programs search for hotspots to cool down to maximum effect. The findings can illustrate where SGs should be included to facilitate cost-effective cooling designs expecting limited budgets.
Parisian Uses of the New Parks in Paris Contrast to Typical American Uses

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Keywords: Direct Observation, William H. Whyte, Mitterand, Art

A decade after Francois Mitterand began the Grand Projects, including I.M. Pei’s Pyramid at the Louvre, and Tschumi’s Parc La Villette, new major parks were begun, Parc De Bercy, Le Jardin Atlantique, and Parc Andre Citroen. Promenade Plantee and Viaduc des Arts. Like the Parks built by Adolph Alphand during the major reshaping of Paris, they are the centers of new neighborhoods. All occupy formerly industrial sites in strategic areas.

In 1997 a Grant from the French Government enabled me to visit the new Parks. The visits were brief, but I observed that the uses of the parks were not typical of what one expects in the U.S.

In 2005 I had the opportunity to return to Paris for 3 ½ Months during which time I used direct observation of all the parks to determine how the Parisians used them. I was inspired by those techniques used by William H. Whyte in his studies of use and non-use of New York City plazas. Likewise I sought empirical evidence not relying on other’s research which also reflected Lewis Mumford’s method, “personal experience and observation . . . unreplaceable by books”, The City In History.

During the 3 ½ months from September to December, I made multiple visits to all the parks every week. The climate changed from late summer to early winter and weather changes and the times of day visited provided a comprehensive view of the parks in use. Observations were recorded during each visit to learn if uses changed or remained the same.

For comparisons of the old and new, the much loved historic Luxembourg Gardens was included in the observations. It is still by far the most heavily used of the Paris parks.

I have returned and visited the parks several times over the past 15 years. Other than their physical deterioration, the way the people use the parks has not changed. The Parisians continue to use the parks in the same way. They are appreciated as works of art and recreational activities common to U.S. Parks are not typical. Perhaps Olmsted, from his conferences with Adolph Alphand, during the design and construction of Central Park, influenced its attributes of artful scenery rather than programmed recreational activities.

This paper will summarize all the observed uses, which from an American viewpoint, are quite simple.
Street Tree Density and Distribution in Five Capital Cities

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Keywords: street trees, urban greening, landscape legacies

Street trees are now ubiquitous in cities, but this has not always been the case. Indeed, trees did not become commonplace elements of the urban public realm until the 19th century, when street trees and public parks in North America and Western Europe established what has been described as “a model for the world.” Yet, anecdotal observation combined with scholarship on the legacy effects of urban forests suggests that street tree density and distribution may vary depending on historical, cultural, and geographic context. To the best of our knowledge, international comparative analysis of these factors is lacking in scientific literature. This gap is noteworthy because urban greening—a social practice of organized or semi-organized efforts to introduce, conserve, or maintain outdoor vegetation in urban areas—has become a common aspiration of cities worldwide, and tree planting figures prominently in these efforts. Thus, norms guiding such activity would benefit from international comparative analysis. To address these matters, we analyzed street tree density and distribution in five capital cities: Buenos Aires, Paris, Washington, D.C.; and Ottawa and Stockholm. The first triad and the latter pair are, respectively, located in the same climate zones, allowing us to control for climatological factors and draw out cultural distinctions. The analysis draws upon up-to-date datasets from local authorities and includes geospatial analysis of street trees across hierarchical street classes within the central zones of each city. The results show clear differences in street tree density in cities within and between climate zones as well as differences in street tree distribution in cities within the same climate zone. Substantial differences within climate zones further suggests that cultural factors—including but not limited to urban form, aesthetic norms, and governance regimes—may play a pivotal role in the distribution and density of street trees. This illustrates the importance of place-specific cultural and environmental legacies as determinants of street tree density and distribution, and it supports further comparative research on the topic.
Trees in Urban Design: A Recombinant Urbanism

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Keywords: trees, urbanism, sylvan city, design

This paper aims at providing a historical understanding of the roles different tree planting types can serve in urban design and landscape architecture. The research is based on a range of formal approaches in the evolution of tree planting in landscape architecture and urban design, 1) vernacular versus designed woodlands and forest; 2) the popularization of the street tree and the development of a new framework for urban design; 3) the urban wilderness; and 4) the grove. Through an analysis of design and discourses of leading landscape architects/urban planners such as Andre Le Notre, Aldo Van Eyck, Gilles Clément, and Michel Desvigne, the paper demonstrates how the spaces created by the judicious planting and management of urban trees can create new social, ecological and spatial frameworks. The paper demonstrates how an historical awareness of traditions of tree planting and new design practices can help to set out strategic goals for the design and management of the contemporary urban forest as a place of both production and consumption, and as expressive of local identities and culture.

The paper elaborates a design method that conceives of the forest as the super-structure of the city; as instrumental and enduring as built form. Tree-based urban design is the composition and conservation of an arboreal interplay of routes, rooms, fields, boundaries and transitions into which buildings and built infrastructure are woven. Such an approach allows for a responsive, recombinant urbanism, one that is infinitely varied; adaptable to ecological and social imperatives. While much emphasis has been on the need to reach a particular canopy cover percentage or increase numbers of trees in cities, this paper offers an experiential and formal dimension to how and where trees are planted in cities and how they are managed.

The paper examines designing with and adapting sylvan archetypes based on the experience and functions of tree places– drawn from traditional and contemporary forms of tree cultivation in woodland, forestry, agriculture and horticulture. It aims to elaborate the intricate spatial poetics of trees through their distinctive configurations in urban contexts over time from the large scale tree territory of the city to the delicate shaded texture of small places; from a wider forest to the lone tree.
Urban Agrivoltaics: Typological Explorations within the Urban Realm

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Keywords: Agrivoltaic, productive landscapes, typological design, urban agriculture, renewable energy, responsive systems, research by design, energy democracy, urban agrivoltaic design

The purpose of this study is to explore how the implementation of Agrivoltaics (Agriculture + Photovoltaics), or APVs, may be woven into the urban environment. As we see increased demands for renewable energy, land-use efficiency, and city-wide food security in our urban environments, landscape designers and planners are challenged with understanding how we may provide more reliable, localised sources of energy. APVs can be an impactful piece of infrastructure throughout cities by integrating responsive solar tracking technology in conjunction with efficient vertical farming practices. All together, APVs provide essential resources for communities, and this study will question how this kind of infrastructure may benefit marginalized communities and fit the theme of energy democracy.

Recently, Agrivoltaic systems have received ample attention through the energy and agricultural fields; however, APVs have only been discussed in relation to commercial-scale farmlands in rural areas. Although typical Agrivoltaic systems remain to be considered efficient in terms of land-use, they typically require much more land than modern cities have to offer. As a result, this study will include the design of smaller-scale APVs that consider affordability, modularity, and flexibility. In doing this, we must consider how the APVs may be transformative and responsive to changing urban life-styles and future pressures brought on by climate change. The main goal of this project will include a design process exploring the various ways in which Agrivoltaic typologies may be integrated into the urban fabric.

The primary methodology of this study will utilize design operations such as descriptive case studies exploring urban photovoltaic examples and urban agricultural examples as well as a typological design process merging the cases above as a form of interpretive design. One major question of this study involves where and how APVs fit into existing built urban infrastructures. The design process will involve developing a method for appropriately analyzing and simulating environmental factors, such as solar angles, radiation, climate, and physiography upon a site in Portland, Oregon. Through this process, we may better understand the relationship between both aesthetic form and functional viability as it overlaps environmental factors. Ideally, this process will examine how to integrate such a system into a site within an urban environment; perhaps illuminating new insights and correlations amongst environmental data and social needs.

Ultimately, by investigating various urban-scale Agrivoltaic typologies, this study will provide designers a new way of imagining affordable, renewable energy systems in urban places. This pursuit may lead to a more resilient-based energy and food security infrastructure that provides for communities long-term.
Urban Design Framework for Sustainable Energy Landscapes: The Case of Portland, Oregon

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Keywords: solar, photovoltaics, hyperfunctional landscapes, renewable, energy, equity, urban design

Between 60% and 80% of global energy is consumed in urban areas, and this will increase with urbanization and population growth [1]. We must meet this new demand sustainably. By 2050, the Green New Deal (HR-109) calls for global net-zero emissions [2], and by 2040, Oregon will require fifty percent of its energy use to be fueled by renewable energy sources [3]. Scientists at The Nature Conservancy have noted that the US contains enough developed land to retrofit to meet our renewable energy goals without using greenfields [4]. In addition, scholars have proposed siting new energy infrastructure within the built environment of cities, thereby preserving habitat, reducing energy sprawl, and reducing transmission losses [5,6]. What design interventions can we employ to ensure that renewable energy becomes widespread, developed land becomes hyperfunctional, and that ecological health remains intact in the urban built environment? In this study, we define hyperfunctional landscapes as multifunctional, synergistic spaces that produce more than the sum of their parts.

This study uses Portland as a case study to demonstrate how a city can integrate decentralized energy resources into its energy system, reducing reliance on a single, centralized grid. By situating energy with people, we investigate how decentralized energy systems, especially micro solar and wind can be beautifully woven into the social urban fabric of Portland, Oregon. Focusing on Portland’s underserved outer-east neighborhood of Lents, this intervention seeks to increase energy resilience and equity on a neighborhood-scale, recognizing that environmental and social justice are deeply intertwined [2].

The study reviews literature on sustainable energy landscapes, decentralized energy systems, multifunctionality, environmental justice, and climate literacy. Following the literature review, descriptive research was conducted through analysis of existing sources, primary observations from site visits, and interviews with community organizations. An inventory process was used to analyze the hyperfunctionality of winning submissions to Land Art Generator, an annual design competition with the motto “Renewable Energy Can Be Beautiful” [7]. This inventory was used to inform a projective design.

Projective design involved the development of hyperfunctional typologies followed by an application of these typologies to the site in Lents. These typologies exhibit innovative ways of synergizing energy infrastructures with social space, sustainable transportation, and urban ecology. The main findings of the study include the development of unique typologies for urban solar projects and solutions for integrating these typologies into Portland’s urban fabric.
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