ECOTONAL OFFICE

a shift in workplace well-being

ABSTRACT

The Ecotonal Office challenges the conventions of approaches to the design of wellness environments in modern commercial offices by inverting the integration of biophilic design.

While exposure to natural elements have proven psychological and physiological benefits, design and client sensibilities approach the blending of nature into the built environment as a suggested, optional harm reduction practice, rather than an essential part of commercial office design. Catalyzed by combining newly perfected, affordable technologies, we are enabled to reconsider where and how we work.

METHODS

Field research was conducted in four ecoregions, which were selected to represent the diversity of climates in the state of Washington from August–October 2023. At each site, a mock office was erected to gather data on productivity, comfort, and wellness outcomes. Analog and digital activities were conducted to be representative of individual and collaborative tasks typical to a North American office worker within a modern commercial office (MCO) setting and to record the experience of working in the outdoors.

RESULTS

A conceptual design of a fully technologically leveraged, human-centric, wellness prioritized remote workspace was created in response to field and literary research. It aims to unlock the potential of workplace wellness effects work within Ecotonal Office site typologies.

CONCLUSION

Work from home culture has driven society to the cusp of a workplace revolution. With recent advancements in technology, the ability to work productively in the outdoors is within our grasp. The Ecotonal Office creates the setting in which productivity and comfort challenges can be overcome.

ecotone (n.)

a region of transition between two biological communities

Merriam-Webster

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LAND ACKNOWLEDGMENT

We acknowledge that this research takes place on the traditional land of the first people of the state of Washington, specifically the associated tribes of Mount Rainier, the Olympic Peninsula, the Coast Salish, Confederated Tribes of the Colville, Wanapum, Yakama, Cayuse, Umatilla, and Walla Walla peoples. We express our deepest respect for and gratitude towards the land and these caretakers of the region.

Sources
National Park Service: Mount Rainier National Park, 2023
National Park Service: Olympic National Park, 2023
Native Land Digital, 2023

THE ECOTONAL SHIFT

The Ecotonal Office will be a technologically leveraged productivity space that is completely open to the elements. It will be an advanced and open-air workspace that challenges traditional urban work settings, often stifled by sterility, control and "harm reduction" thinking. By merging inside with outside,

THE ECOTONAL OFFICE HARMONIZES NATURE, DIGITAL CAPABILITIES, AND ARCHITECTURAL DESIGN. THIS BLEND USHERS IN A TRANQUIL, REJUVENATING, AND BALANCED ATMOSPHERE, ENHANCING WELL-BEING DURING THE WORKDAY.

We have the opportunity to create an environment that nurtures and empowers us to reach new heights of wellness, productivity, creativity, and fulfillment. **It's time to reshape our perception of the boundaries of the office and imagine the possibilities.**

THE CONVENTIONAL APPROACH TO BIOPHILIC WORKPLACE DESIGN IS FUNDAMENTALLY FLAWED.

The design industry treats biophilic design, the practice of incorporating natural or nature-inspired elements into the built environment, as a harm reduction strategy to make occupants feel marginally better inside the status quo these spaces. It is often an optional feature—something to be added to spaces that are already up to code, weatherproof, and hermetically sealed.

HARM REDUCTION

The Modern Commercial Office (MCO)'s negative impact on mental health has been acknowledged by the American Psychological Association, most recently in their 2022 Work and Well-being Survey. Additionally, studies show that the MCO has a long history of being detrimental to our physical wellness when indoor environment qualities are low (Hedge, 1984; Burge, 2004; Paevere, 2008; Nielsen & Knardahl, 2020).

To combat these adverse effects, it is common of design practitioners to integrate wellness moments within the built environment for the purpose of curating spaces that provide escapism from the rest of the building. Good indoor environmental qualities have several benefits, including reduction in illness, improved productivity, and increased worker retention (Paevere, 2008), however, like many other harm reduction approaches, these optional design features offer only momentary relief if not integrated effectively through the entirety of a building. They treat the symptoms but not the cause.

As soon as an individual returns to their primary workspace, they are immediately confronted by the sterile glare of computer screens, the monotonous drone of HVAC systems, and a sea of generic, repetitive work settings. Designed to limit company liabilities for people and technology and to maximize branding- and culture-focused messages, these conditions are hardly designed to sustain the full-spectrum of basic human needs, let alone the 40+ hours a week that we spend in them.

"...like many other harm reduction approaches, these optional design features offer only momentary relief if not integrated effectively through the entirety of a building. They treat the symptoms but not the cause."

CAUGHT OFF GUARD

Looking back, it is almost amusing how unprepared we were for the remote-work revolution. Humans are naturally drawn to spaces that offer a sense of refuge—environments where they feel safe and comfortable. It is no wonder that workers—particularly in America and Europe—found their workplaces so repellent upon being called to return to the office (Dua, Ellingrud, et al., 2022). Even while the risk of COVID-19's immediate threat has receded, the unhealthy exposure to aspects of the MCO has persisted.

THE ECOTONAL SHIFT

Advances in both digital productivity tools and outdoor equipment technology have reached a point where it is now possible and also economically feasible to work collaboratively outside of the MCO. These technologies, initially designed for varied demographics (including, but not limited to, mountain climbers at base camps, Red Cross volunteers at disaster sites, soldiers in the field, etc.) provide everything needed for a modern, fully technologically leveraged outdoor workspace; Comfort, dryness, relaxation, productivity, electricity and connectivity.

Our challenge now is to seamlessly integrate these technologies into the outdoor environment in a transient, unobtrusive way that is respectful of the ecosystem. Achieving this balance of nature and technology to support human wellness and commercial productivity could revolutionize how the design industry approaches workplace design.

MODERN COMMERCIAL OFFICE (MCO)

An office built or renovated within the last 10 years designed for a workforce of a privileged class of knowledge worker (from a global perspective) Most spaces are fully technologically leveraged. The space meet the needs of a medium to large size company by IRS standards (50–250+). It features fully functional Urban Infrastructure access including transportation options, HVAC, Telecom, plumbing, electrical, and acoustical functionalities. It emphasizes code compliance, limited liability and productivity. *(Excludes financial considerations.)*

ECOTONAL OPPORTUNITY

By understanding the conditions, pros, and cons of workplace site types, opportunities can be identified for improving the experience of working in outdoor spaces.

FIG. 1
Workplace Site Typologies

MORE INFRASTRUCTURE ← → LESS INFRASTRUCTURE

TRADITIONAL OFFICE

OFFICE
MCO

IBC Code, OSHA, ADA, compliant architectural space, ideal for technological performance and limited liability.

Control of Space
None

WiFi & Power
Consistent reliability

Restroom & Amenities
Shared private

Specialty Clothing
Traditional office attire

REMOTE OFFICE

HOME
HOME OFFICE

A dedicated area in the home, configured for regular knowledge work. May consist of a room, a workspace, or multiple rooms.

Control of Space
Maximal

WiFi & Power
Reliable

Restroom & Amenities
Private

Specialty Clothing
Casual attire

DROP-IN
CO-WORKING SPACE

Office or desk spaces available for short-term rental cater to individuals or small teams, offering shared amenities with renters.

Control of Space
None

WiFi & Power
Consistent reliability

Restroom & Amenities
Shared private

Specialty Clothing
Casual attire

HOSPITALITY
HOTEL, AIRPORT, CAFÉ

Semi-public area accessible through short-term social agreement, typically via other paid services like food or accommodations.

Control of Space
None

WiFi & Power
Variable reliability

Restroom & Amenities
Public

Specialty Clothing
Traditional or casual office attire

TRANSPORT
AIRPLANE, VAN LIFE

Private or semi-private vessels designed for transport with confined spaces pose obstacles to both comfort and productivity.

Control of Space
None

WiFi & Power
Unreliable

Restroom & Amenities
Variable access

Specialty Clothing
Traditional or casual office attire

ECOTONAL OFFICE

URBAN GREEN SPACE
PLAZA, PARK, TERRACE

Public outdoor spaces offer minimal indoor conveniences, are open to the elements, and may require supporting equipment.

Control of Space
Limited

WiFi & Power
Variable access

Restroom & Amenities
Variable access

Specialty Clothing
As required for safety and comfort

SEMI-RUGGED
YARD, PARK, RETREAT

Outdoor spaces that are semi-private or public with minimal infrastructure. Require enhancement with supporting equipment.

Control of Space
Limited

WiFi & Power
Variable access

Restroom & Amenities
Variable access

Specialty Clothing
As required for safety and comfort

REMOTE GREEN SPACE
RURAL, RANCH LAND

Semi-private or public spaces located on the outskirts of infrastructure. Require equipment for comfort and productivity.

Control of Space
Limited

WiFi & Power
Limited access

Restroom & Amenities
Provided by employee

Specialty Clothing
As required for safety and comfort

FULLY RUGGED
STATE, NAT'L PARKS

Public park areas, fully exposed to the weather and devoid of built-in infrastructure. Require equipment for comfort and productivity.

Control of Space
Limited

WiFi & Power
Scarce access

Restroom & Amenities
Provided by employee

Specialty Clothing
Outdoors or survivalist attire per climate

OUT OF OFFICE

OPEN SKY
LIMINAL GREEN SPACE

The wilderness offers no infrastructure. Comfort and productivity reserved for the advanced, prepared, and well-equipped.

Control of Space
None

WiFi & Power
Provided by employee

Restroom & Amenities
Provided by employee

Specialty Clothing
Survivalist attire per climate

TYPICAL WORK SITES

BUSINESS TRAVEL WORK SITES

FIELD RESEARCH FOR THIS STUDY

HIGH RISK WORK ENVIRONMENTS

ECOTONAL SHIFT OPPORTUNITY ZONE

MCO DESIGN PRACTICES HAVE CREATED MANY TIGHTLY CONTROLLED, ONE-SIZE FITS ALL SPACES THAT OVERLOOK NEGATIVE WELLNESS EFFECTS.

The legacy of such industry-wide practices have manifested in the isolation of people from the natural world and the rise of such adverse effects as Sick Building Syndrome (SBS) and Building-related Illnesses (BRI) (Environmental Protection Agency, 1991). These ailments, which include symptoms ranging from fatigue to dry skin to nausea, have been reported and recognized for decades (Burge, 2004; Crawford & Bolas, 1996; Finnegan, Pickering & Burge, 1984). Environmental factors that cause SBS include, but are not limited to, indoor air quality, temperature, and humidity (Burge, 2004).

WELL STANDARDS

Today, Americans spend an average of 90% of their time indoors (Environmental Protection Agency, 2023) when studies have shown that spending at least 2 hours a week in nature is associated with good health and well-being (White, et al., 2019). To resolve this discrepancy, the WELL Building Standards were created as a performance-based system that can measure the impact of design, engineering, and construction decisions on human health (International WELL Building Institute, 2020).

When WELL Building Standards are not able to be applied to the entirety of an MCO, the greatest amount of effort to infuse elements of WELL often occur in specialty rooms or amenity spaces. These designated areas function as retreat spaces, where one can escape from a characteristically unwell environment.

Amazon is an example of a corporation that has experimented with workplace wellness spaces, offering valuable insights into the success of their implementation within a single organization. A notable example is the Spheres at the Seattle HQ, which was opened in 2018. The Spheres is a stand-alone new build that immerses employees in a hybrid office-greenhouse environment, providing access to natural light, fresh air, a café with food and drink, and varied settings to meet diverse productivity needs. Conversely, in 2021, Amazon unveiled the "AmaZen," a relocatable booth with a fan for air flow and monitor that guides individuals through mindfulness exercises (Massie, 2021). Massie writes that it is an attempt to introduce a wellness environment into architecture that has traditionally been rather hostile to its employees: the distribution center. While intended to be a retreat, the design solution has been criticized as a "cry closet" and "dystopian" band-aid that ignores the larger problems of the work environment and its culture.

What these examples and similar case studies show is that the current approach to wellness as a non-compulsory requirement supports the continued construction of spaces that make people physically and mentally unwell.

THE ECOTONAL SHIFT

Despite the best efforts of the workplace design industry, wellness design requires rethinking. Better furniture, décor and geometry cannot deliver a natural environment experience. **The momentum of the commercial ecosystem surrounding MCO design has reached diminishing returns.**

FIG. 2
Seven Concepts of Wellness
Modified from the WELL Building Standards, 2020

"I FELT LIKE A HUMAN VERSION OF THE SOLAR GENERATOR. TASKS ONLY BRIEFLY DRAINED MY ENERGY. THE ENVIRONMENT WAS CONSISTENTLY INVIGORATING." — CHARLES FADEM, 2023

	CURRENT DRIVING FACTORS	NEGATIVE WELLNESS EFFECTS
TECHNOLOGY OPTIMIZATION	Optimal air conditioning, lighting, electricity and connectivity options for technology leveraging and support.	Cooler than normal room temperatures with no variance during time of day, a significant delta from comfortable interior temperatures which vary by age, gender and physical needs. Lack of variable breezes typical of the outdoors.
SAFE & EQUITABLE WORKPLACES	IBC Code, OSHA, ADA, Internal Corporate Standards, compliant architectural space, ideal for legal compliance and serving the average of all regardless of individual need.	Visibly odd clearances, corner guards, conspicuous railings destroy any residential feel, or natural stimuli and remind people of the strangeness of their surroundings by constantly reminding them of the very accidents they are attempting to prevent.
CULTURAL FACTORS	Each workplace has its own culture in terms of the appropriateness of its spaces from large scale considerations (such as meeting room sizes and kitchen capabilities) and small scale (such as colors and light) or lack thereof.	"Culture" is a vague and often moving target that prioritizes the comfort of a vocal and often powerful group within a company, and rarely those whom might experience the most negative effects.
BRAND NARRATIVES	The brand or individual stakeholder of a commercial client oftentimes determines which colors, finishes, signage and graphics are utilized, or avoided.	The brand of a company is meant to be client facing, and operate as a branch of marketing a product or service. This narrative rarely incorporates prioritizing worker wellness or simulating natural surroundings or elements.
LIMITED LIABILITY	Any departure from the priorities above can present legal challenges ranging from HR issues to technological failures, both of which can have significant impact to company performance.	Natural comforts such as varying light levels, varying, personally controlled temperature levels, access to flowing water, wind, create bland, lifeless environments with reduced comfort or visual interest.

FIG. 3
MCO Driving Factors & Negative Wellness Effects
excluding financial considerations

The implication is not that the current driving factors are unimportant in the design of MCO's. Functionality, safety and equanimity are, of course, paramount considerations.

What is implied is that the efficiency by which we achieve these basic driving factors has overshadowed the need to address the mental and physical health crisis of the American workforce.

THE ECOTONAL SHIFT

Typical MCO design achieves success by minimizing access to the natural environment, focusing on maximizing productivity, limiting liability, and accommodating technology. Conversely, an alternative approach would involve maximizing access to the natural environment. This would serve to enhance mental and physical health, reduce negative psychological effects, and necessitate the selection of technology that can flourish in an **environment where humans naturally thrive.**

"If we are to consider whom architecture should serve and re-establish the relationship between architecture and humanity, then we must consider the essence of human nature and grasp how human beings came to create particular kinds of structures. We must account for the neurological processes that operate as our interface with the physical worlds, and ask ***why, if these processes are intrinsically human, were we ever able to stray so far away from this human dimension."***

SALINGAROS & MASDEN, 2006

BIOPHILIC DESIGN IS A DESIGN PRACTICE INTENDED TO RESTORE & RECONNECT PEOPLE TO THE NATURAL WORLD.

Biophilic design is the design industry's response to decades of corporate design wherein controlled conditions were implemented for work productivity to be optimized. Proponents of biophilic design argue "the assumption that human progress and civilization is measured by our separation from if not the transcendence of nature is an erroneous and dangerous illusion" due to the inherent benefits of contact with the natural environment and humanity's evolutionary predispositions (Kellert, Heerwagen, & Mador, 2013).

DESIGN APPROACHES

Biophilic design approaches are utilized by all disciplines that engage in the creation of the built environment, namely architecture, experiential design, and interior design. According to Kellert, Heerwagen, & Mador (2013, p. 5), design solutions that embody biophilic principles manifest in three distinct ways:

- **Direct integration** of the existing natural environment
- **Indirect integration** of natural elements via artificial, human-curated means
- **Symbolic representations** of the natural world

Due to the conditions of the MCO, which more than often inhabits buildings in urban and suburban settings, the vast majority of implemented biophilic design solutions range on the spectrum between indirect and symbolic solutions. Biophilia thus becomes a thematic narrative, a framed view, or added to the office in strategic locations. The resulting built environments nevertheless continue to separate the interior productivity spaces from direct engagement with the elements of the natural world via walls and glass.

VISTAS

Additionally, it is widely acknowledged that people have a predisposition to the preference of savanna-like spaces due to our evolutionary history in these environments (Appleton, 1990). In 1975, Appleton proposed a "habitat theory" which he defined as "prospect-refuge," wherein he argued that because these environments supported our survival as a species, we continue to feel psychologically safe when exposed to their patterns. These patterns may be symbolic, such as a cozy interior room with a curated view of the Puget Sound, or direct, like the awe-inspiring view of Mount Rainier from the nearby highland forests.

THE ECOTONAL SHIFT

This research effort challenges the idea that the MCO needs to exist in traditional indoor settings, where relationships with the natural world are symbolic or indirect. **Instead, the Ecotonal Office would allow workers to have a direct relationship with the awe inspiring vistas and the qualities of the natural world that provide wellness benefits.**

PROSPECT (n.)
An unimpeded view over a distance, for surveillance and planning.

REFUGE (n.)
A place for withdrawal from environmental conditions or the main flow of activity, in which the individual is protected from behind and overhead.

Browning, Clancy, & Ryan, 2014

FIG. 4
Relationship to Nature via Biophilic Design Solutions

Our draw towards the natural world is derived from its psychological and physiological benefits. Time spent in natural spaces can improve health, cognitive function, and combat the negative effects of nature deficit disorder. The combination of health benefits, coupled with cultural value systems and the quantifiable economic costs of work-related health issues, has not only revealed the importance of biophilia in our work environments, but has been proven to provide benefits in fields like policy-making, urban planning, medicine, education, and therapy.

POLITICS & URBAN PLANNING

In the political sphere, integration of nature within the urban environment is approached as an equity and public health issue that affects overall well-being physically and mentally. Data shows that in urban areas with more greenspace have improved quality of life (Brown & Grant, 2005; Maller, et al., 2009; Nagamatsu, et al., 2013; Cox, et al., 2017; Yang, et al., 2021). The construction of parks, greenways, and the expansion of urban tree canopies are all means by which policy-makers attempt to combat the negative effects of urbanization and loss of our wild areas.

THERAPEUTIC HORTICULTURE

At a smaller scale, the garden is also acknowledged to have healing benefits. Taylor (2016) writes of wild places as therapeutic. They provide psychological benefits like social connectedness, improved mood, and reduced cognitive fatigue.

Helphand (2019) also discusses the curative character of the outdoors thorugh the implementation of therapeutic gardens in the Pacific Northwest, where patients, visitors, and healthcare workers can find respite from stress and improve their well-being. He cites studies wherein hospital gardens are prescribed to improve recovery of patients and those which "not only validated anecdotal evidence that breaks taken in the garden provided a reduction in burn-out but also that they were more effective than breaks taken indoors, even though they were typically shorter" (Helphand, 2019).

OUTDOOR EDUCATION

The Danish tradition of forest schools are ubiquitous across the world due their known benefits in childhood development and education (Dean, 2019). Forest schools allow students to have a direct relationship with nature by hosting education outdoors through experiential learning. Studies of forest schools and various outdoor education environments show benefits that range from greater social competence and self confidence to improved focus and creativity (Schäffer & Kistemann, 2012; Gill, 2014).

FOREST BATHING

The Japanese practice of *shinrin-yoku*, translated to forest bathing, is a sensory immersion nature. Originating in the 1980s, it was a cultural reaction to technology burnout and a means to improve the society's relationship with its natural wonders (Fitzgerald, 2019). Since its emergence, studies have shown forest bathing's ability to improve cardiovascular health, reduce cortisol levels, and improve task performance (Phillips, 2011).

It has become indisputable across industries ranging from urban planning to education that maintaining our personal health equates with maintaining a healthy relationship with the natural world.

NATURE DEFICIT DISORDER (n.)

A term coined to describe the negative implications, health and otherwise, of a lack of exposure to the natural world.

Louv, 2008

THE ECOTONAL SHIFT

The Ecotonal Office disrupts the barrier of the workday, which currently requires us to be indoors. **By designing work settings that enable direct contact with the natural world, psychological and physiological health benefits become integrated into the work day and combat the negative effects of nature deficit disorder.**

CARDIOVASCULAR HEALTH
Opportunities for physical activity and reduction in stress

CREATIVITY
Need for adaptiveness, problem-solving, and exposure to awe of natural beauty

SLEEP QUALITY
Exposure to natural light and diurnal rhythms

STRESS LEVELS
Reduction in stimuli, including but not limited to sound

MOOD
Exposure to sunlight increases levels of seratonin

SOCIAL CONNECTEDNESS
A sense of belonging within a team or society through shared experience

FOCUS & ATTENTIVENESS
Opportunities to concentrate with less distraction

FIG. 5
Psychological and Physiological Benefits of Nature

INDIVIDUAL COMFORT DEPENDS ON AGE, GENDER, BODY TYPE, AND PROFESSIONAL ATTIRE, AS WELL AS CLIMATE AND GEOGRAPHIC LOCATION. THERE ARE, HOWEVER, UNIVERSAL COMFORT DESIRES THAT ALL WORKERS SHARE.

These universal desires are dictated by weather and our relationship to the sun. They include access to natural light, variable temperature, and shelter from wind and rain.

As diurnal beings, our natural rhythms have evolved to be directly tied to the sun's variations in intensity, hue, and even radiation level. Exposure to natural daylight has many benefits to our health, including but not limited to the generation of vitamin D and improvement our sleep quality through managing melatonin production (Mead, 2008).

LIGHT COLOR SPECTRUM & DYNAMIC SUNLIGHT

In an MCO, exposure to blue light is prevalent at a consistent rate throughout the day due to controlled overhead lighting and exposure to LED screens for work and collaboration. Exposure to this hue of light can affect our bodies' natural production of hormones and cause disorientation an inability to gauge the duration of time. This phenomenon is known as temporal distortion, and is commonly used in the design of digital platforms, casinos, and retail spaces to encourage people to stay in a physical or digital location longer than intended.

Similarly, variations in lighting are neutralized within the office environment in favor of glare free, diffused light. The character of the light is low contrast and consistent (Baker, 2006). While the sun may cause some discomfort by causing us to perspire and require some protection from its UV light, natural light, with its effortless complexities, supports our natural rhythms and is healthier for our well-being.

COMMERCIAL OFFICE TEMPERATURES

To maintain the comfort and safety of people, OSHA, the Occupational Safety and Health Administration, "recommends temperature control in the range of 68-76°F and humidity control in the range of 20%-60%" for indoor work environments" (n.d. & 2003).

"...people are more accepting of fluctuations in their experiences when they are empowered to modify their relationship with the variable stressors."

For outdoor work environments, OSHA has requirements in place to prevent occupational heat exposure and related illnesses (n.d), which are also augmented by protections at the state level. In the state of Washington, where the Ecotonal Office field work is set, the Washington State Department of Labor & Industries outlines specific policies in their updated Outdoor Heat Exposure (2023) rules for access to shade, water, acclimatization, procedures for high heat when the temperature exceeds 90°F, and protocol for proper responses to heat-related illnesses, such as but not limited to dehydration and heat exhaustion.

LOSS OF AGENCY

Temperature is typically preset throughout the day by building management, withholding control from the individual office worker to personalize the settings and negating any natural fluctuations. While the intent of this is to maintain the functionality of equipment, control cost, reduce environmental impact, and create an equitable experience for all building inhabitants, this action introduces a gender bias in office design that originates from the male-dominated work forces of the 1960s (Kingma & van Marken Lichtenbelt, 2015; Parkinson, et al., 2021) and takes autonomy away from the individual to participate in adaptive behavior.

When individuals are given the opportunity to adapt their behavior to their environment, they report higher rates of satisfaction, or overall well-being. In the case of temperature, "it was found that people sitting outdoors [...] had greatly increased tolerance of non-neutral conditions, compared to what we would expect for indoor comfort" (Baker, 2006).

In MCO design, diurnal systems disruptions, like the neutrality and stasis of lighting and temperature, are heralded as the means to achieving comfort. (Baker, 2006). However, people are more accepting of fluctuations in their experiences when they are empowered to modify their relationship with the variable stressors. Control over comfort-related factors on an individual level is a universal driver.

THE ECOTONAL SHIFT

The Ecotonal Office focuses on ample exposure to variable sunlight and air, and relies on individuals' use of equipment and attire to manage their personal level of comfort. **It improves well-being by combining adaptive behavior with integrated technology to glean the benefits provided by the natural world.**

OSHA STANDARDS
INDOOR OFFICE COMFORT (n.d.)

Temperature	68–76° F
Humidity	20%–60%

THE FUN SCALE

Originally a climbing term coined by Dr. Rainier Newberry, the Fun Scale has morphed into a common term used to define the level of suffering an individual is willing to endure to participate in an activity.

The Fun Scale is a spectrum that is divided into three categories: *Type I, Type II,* and *Type III*. While all are considered to be "fun" by certain individuals, the levels of discomfort one is willing to tolerate to experience fun ranges from person to person.

Type I is absent of suffering, and can be understood as the simplicity of being entertained or experiencing enjoyment in the moment. According to Matt Samet, who published the Fun Scale in his book "The Climbing Dictionary: Mountaineering Slang, Terms, Neologisms & Lingo," a Type I experience can be used to describe a range of activities from good food to good sex (2011).

Type II involves a fair amount of suffering, and is perceived as fun only after the individual recalls the experience in retrospect. Type II is generally the term used by outdoor enthusiasts to describe their enjoyment of ultramarathons, mountaineering, and a host of other outdoor activities (Cordes & Crampton, 2021).

Type III, simply put, is the definition of suffering. This category may seem enjoyable in the anticipation of the experience, but proves not to be during nor after the moment. Type III can involves situations with the potential to be fatal (Strout, 2022).

As an addition to Dr. Newberry's scale of fun, which focuses on outdoor activities, this research project introduces the concept of **Type 0**. The Type 0 category defines experiences wherein there is a complete absence of suffering, risk, and effort.

In interviews with professionals who currently work in the field, the experience of working outdoors was described to have some element of discomfort included. Their work trends between Type I and Type II. In these circumstances, safety is paramount, so there are occasions where comfort may be sacrificed in order to ensure safety.

"if you're making the person safe, you're probably making them more comfortable, and in return for comfort, you're going to get better quality work produced"

Professionals explained that they bring only necessary equipment to spend as little time as possible in the field to complete necessary tasks and to be conscious of the cost. They then return to an indoor environment to complete productivity tasks, like processing information or communication. Amelia Bower, researcher at National Oceanic and Atmospheric Administration (NOAA) Fisheries, adds, "if you're making the person safe, you're probably making them more comfortable, and in return for comfort, you're going to get better quality work produced."

THE ECOTONAL SHIFT

This research intends to enhance the outdoor work experient for individuals who are willing to participate in Type I Fun. **These individuals are willing to engage in a minimal amount of exertion and discomfort in order to gain a greater wellness impact from their workday.** They may already be conducting field work and would like to improve their experience or be a traditional office worker, new to working in the outdoors.

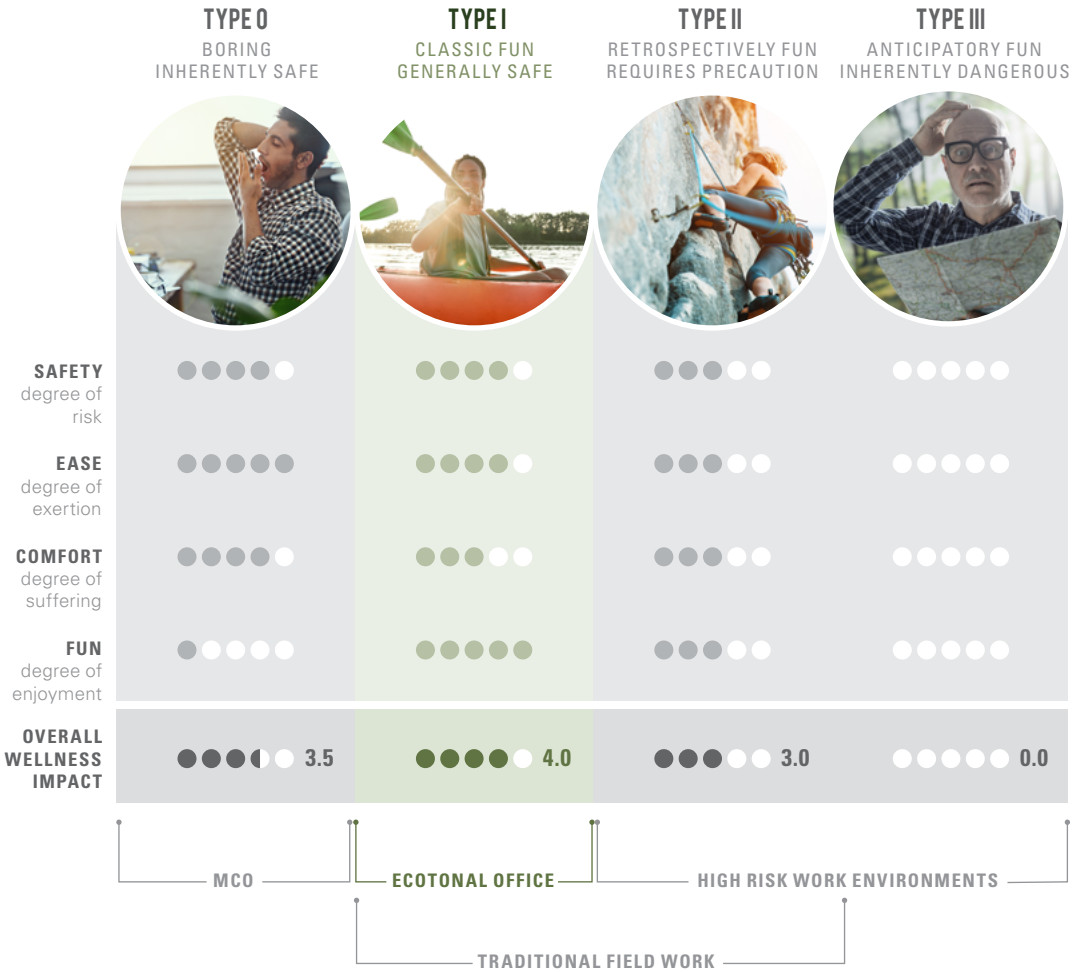
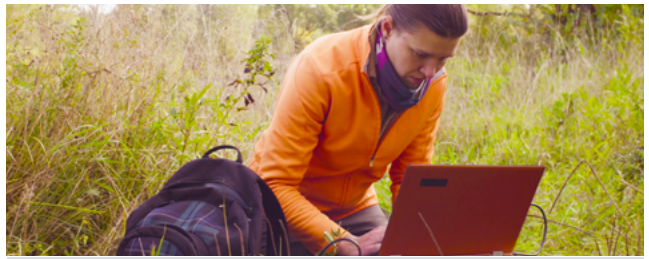


FIG. 6
Level of Discomfort Relative to Overall Wellness Impact

FIELD WORK IS RARELY REQUIRED OF OFFICE WORKERS. SUBSEQUENTLY, THE TOOLS AVAILABLE AND DESIGNED FOR THE MCO FARE FAR WORSE IN ENVIRONMENTS WHERE PEOPLE FARE FAR BETTER. HOWEVER, THE TECHNOLOGICAL TIDE IS TURNING.

Unless an individual's role pertains to a specific outdoor site, as is common in professions like architecture, field work and the equipment associated with it has been reserved for military mobilization, emergency and disaster relief workers, and scientific fields wherein datasets are collected through observation. This niche work-style has given way to the market of *fully-rugged technology*. This category of technology is touted for its ability to withstand huge swings in temperature, humidity, weather, and even a rougher level of physical handling required in outdoor environments (Grevstad, 2023).

Laptops designed for the MCO, on the other hand, are recommended cannot handle being in sunlight or weather without losing performance capabilities. Apple, for instance, recommends that its laptops are utilized within well ventilated spaces where the ambient temperature of the room is between 50°F–90°F and humidity is between 0%–90% (Apple, 2023). Equipment accessible to office workers is designed for the comfort of their neutralized built environments.



FIELDWORK (n.)

a temporary fortification thrown up by an army in the field; work done in the field (as by students) to gain practical experience and knowledge through firsthand observation; the gathering of anthropological or sociological data through the interviewing and observation of subjects in the field

Merriam-Webster

Leveraging the wrong gear in the outdoors can also be a disaster from personal and productivity perspectives. This applies across the spectrum from the type of clothing a person wears to the means by which they gain shelter from the elements. Poor performing gear can transform a wellness environment to one of distraction, stress, and even one of physical and psychological harm. This can not only lead to damaged equipment and impair productivity, but have lasting harmful effects on an individual.

Technology is always evolving and changing, and today's fully-rugged technology may be tomorrow's standard. Price and availability are constantly improving, and every year, new products hit the market. These innovations make the need to conceptualize the MCO as a "human-centric box for computers" so much less relevant.

As technology becomes smaller and lighter, it will also be integrated almost invisibly into workplaces, furniture and accessories. As technology becomes more invisible every day, the outside world will come that much more into focus.

THE ECOTONAL SHIFT

In recent years, there have been significant technological advancements in product design that make the Ecotonal Office effort possible. **While the intent of this research is not to compare and contrast brands and their products on the market, the travel research revealed the necessity of specific equipment interventions.** By reviewing what functioned and what did not, the study sets a benchmark for the pain points the Ecotonal Office needs to address in its design.

COMPUTING

Panasonic studies the needs of the digital field worker someone whose profession requires them to leverage digital technology outside the typical electronic and architectural infrastructure of the urban environment (Panasonic Corporation of North America, 2023). Their *Toughbook* line of computers can be often seen in the hands of EMS workers, firefighters, soldiers, and many government workers who need **a reliable device that is water, impact, and dirt resistant.**

POWER

Jackery and other manufacturers have created **solar powered generators that are light weight and take minutes to set and pack up** (Jackery, 2023).

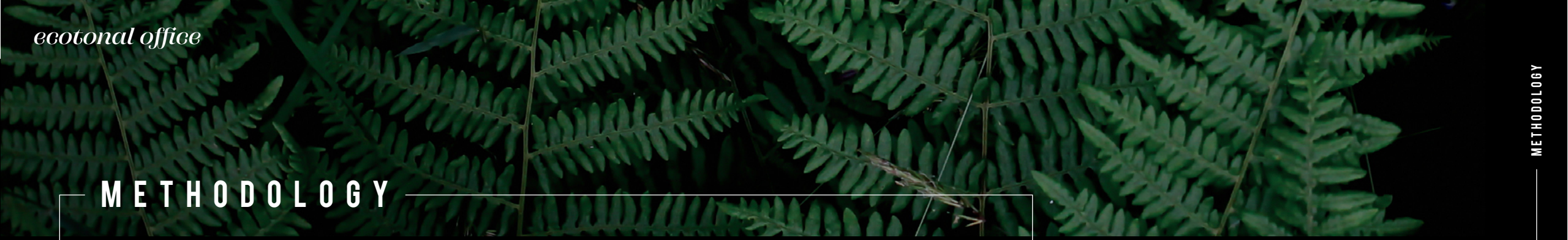
Wireless charging pads have been commercially available in all shapes and sizes for years, in addition to weather and waterproof outdoor extension cords and power strips.

CONNECTIVITY

Companies like *SpaceX* are pioneering remote **satellite Internet access** with equipment that can be set up in remote locations or installed on vehicles (Starlink, 2023).

Additionally, small, light, mobile wifi routers, like *Solis*, are available that can hop from **5G network** to network (Solis Wifi, 2023). These devices constantly hunt for the best signal without users losing connection.

FIG. 7
Available Outdoor Office Technology
2023



METHODOLOGY

"Designing with nature begins with an intimate understanding of place. [...] Understanding place helps determine design practices such as solar orientation of a building on a site, designing with existing topography pattern and finally the preservation of the natural environment, whether the design site is a building in the inner city or in a more natural setting, connecting with nature brings the designed environment back to life. ***Effective design helps inform us of our place within nature."***

A.J. ANSELM, 2006

WASHINGTON PROVIDED THE OPTIMAL SETTING FOR STUDY DUE TO THE DIVERSITY OF ECOREGIONS IN THE STATE.

Washington State is home to 56 distinct ecoregions, ranging from coastal rainforest in the west to dry, arid deserts in the east. For the purposes of field research, four ecoregions were selected to be representative of the state as a whole.

TEMPERATE NORTH CASCADES NATIONAL PARK

The North Cascades Lowland Forests (77a) ecoregion is composed of low mountains, broad glaciated valleys, and glacial-fed rivers that receive, on average, 60 to 90 inches of precipitation per year.

ALPINE MOUNT RAINIER NATIONAL PARK

The Cascades Sub-alpine/Alpine (4d) ecoregion is an area of high, glaciated, volcanic peaks that rise above sub-alpine meadows. Active glaciation occurs on the highest volcanoes and decreases from north to south.

DESERT HANFORD REACH NATIONAL MONUMENT

Today, Pleistocene Lake Basins (10e) is the lowest and driest area on the Columbia Plateau (10) and receives an annual average precipitation of only 6 to 12 inches.

RAINFOREST OLYMPIC NATIONAL PARK

The Low Olympics (1c) ecoregion contains foothills and mountains and rises to an elevation of approximately 4000 feet. Copious precipitation (up to 200 inches/year) supports a lush, epiphyte-rich rainforest.

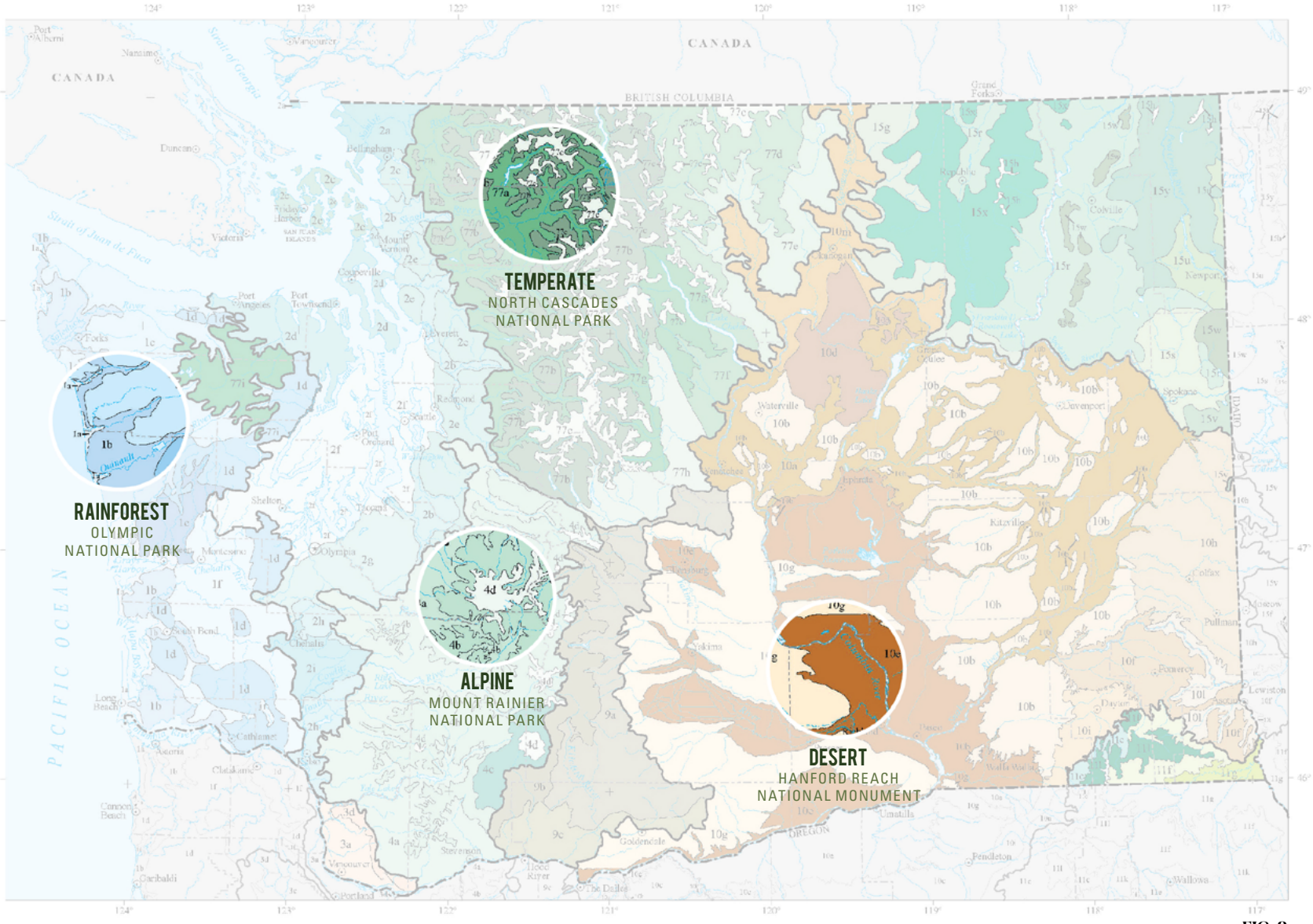


FIG. 8
Initial Project Site Selections
August 2023

Sources
Bryce & Woods, 2000
Environmental Protection Agency, 2010

"WASHINGTON STATE STANDS ON THE ANCESTRAL HOMELANDS AND TERRITORIES OF NATIVE PEOPLES WHO HAVE BEEN HERE SINCE TIME IMMEMORIAL." — UNIVERSITY OF WASHINGTON, 2023

site selection

Environmental factors can be unpredictable, no matter the time of year. When preparing for any outdoor excursion, one is at the whim of the elements.

Due to the Sourdough Fire within North Cascades National Park and the presence of smoke throughout the region, the Temperate project site was relocated further south to Cle Elum Lake.

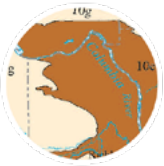
Additionally, due to concerns about accessibility of suitable sites with cellular service and radiation exposure at Hanford Reach National Monument, the Desert project site was relocated north to Wanapum State Park.

TEMPERATE CLE ELUM LAKE

The Chiwaukum Hills and Lowlands are composed of feldspar-rich sandstone. Its low mountains, hills, and cuestas can be highly erodible and unstable.

ALPINE MOUNT RAINIER NATIONAL PARK

The Cascades Sub-alpine/Alpine (4d) ecoregion is an area of high, glaciated, volcanic peaks that rise above sub-alpine meadows. Active glaciation occurs on the highest volcanoes and decreases from north to south.



DESERT WANAPUM STATE PARK

The Yakima Fold belt is a series of unforested anticlinal ridges and synclinal valleys covering the western Columbia Plateau. Located in the rain shadow of the Cascade Range, it receives little precipitation.

RAINFOREST OLYMPIC NATIONAL PARK

The Low Olympics (1c) ecoregion contains foothills and mountains and rises to an elevation of approximately 4000 feet. Copious precipitation (up to 200 inches/year) supports a lush, epiphyte-rich rainforest.

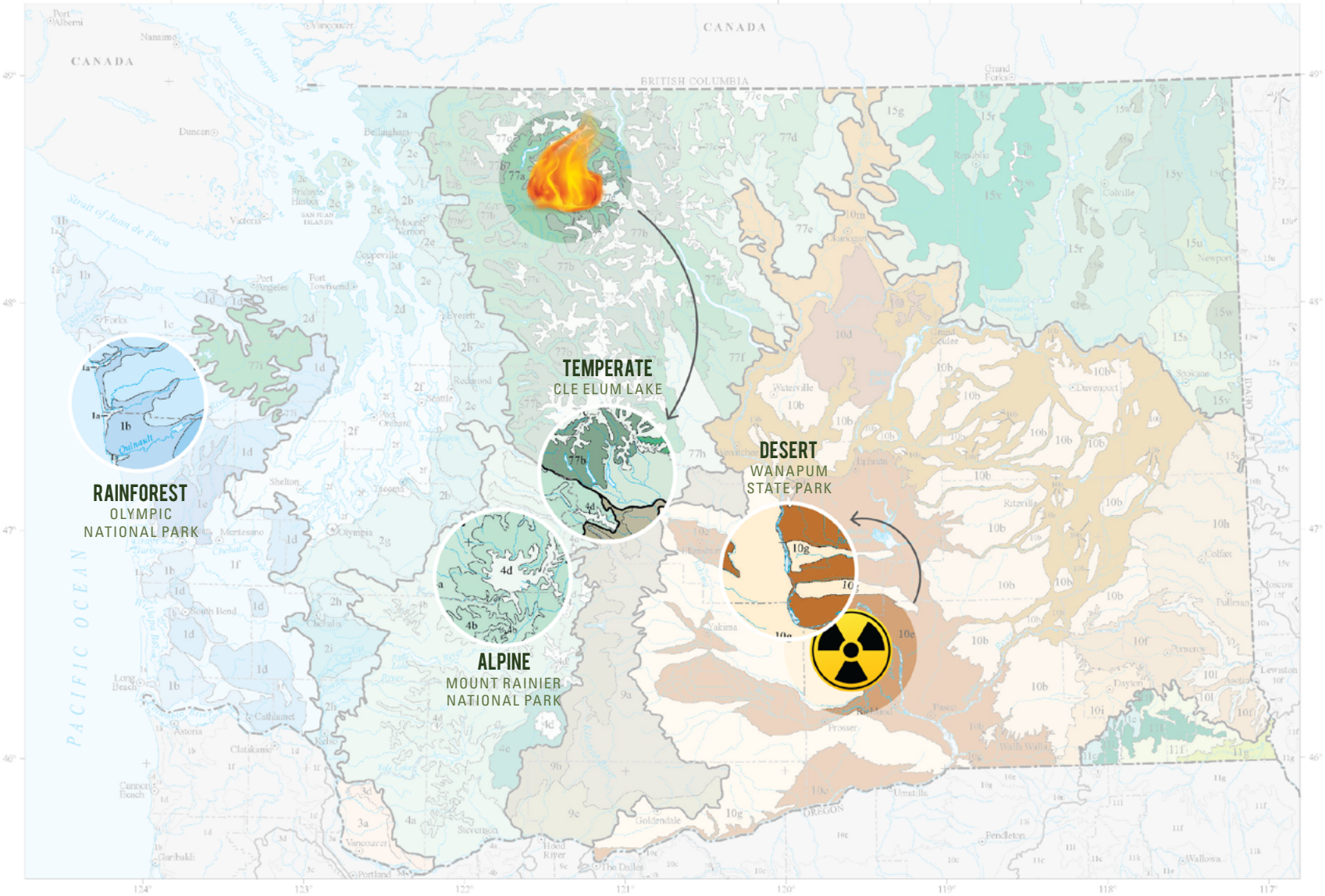


FIG. 9
Final Project Site Selections
November 2023

Sources
Bryce & Woods, 2000
Environmental Protection Agency, 2010

EACH SITE VISIT WAS DESIGNED TO CREATE THE MOST MINIMAL AMOUNT OF ARCHITECTURAL OR TECHNOLOGICAL INTERACTION WITH THE NATURAL WORLD, WHILE MAINTAINING A HUMANE, COMFORTABLE, AND FUNCTIONAL WORK EXPERIENCE THAT IS INDEPENDENT OF EXISTING PUBLIC PARK INFRASTRUCTURE.

This objective guided site selection within each park and the procurement of the necessary equipment required to simulate a workplace environment in the outdoors. *The following factors dictated the purchase of equipment for field research to address productivity and comfort needs:*

- **Size** when packed and set up
- **Sturdiness**, perceived
- **Ease of assembly**, perceived
- **Affordability**, for field research and audience
- **Weight,** manageable for transport
- **Weather** forecast
- **Impact** to ecosystem

PRODUCTIVITY

	PRODUCT UTILIZED
COMPUTING	
Laptop	*Panasonic Toughbook 33*
Cell Phone	*iPhone & Android*
POWER	
Pre-Charged Generator	*Jackery Solar Generator 500*
Solar Panel	*Jackery Solar Panel*
Extension Cord	*Clear Power Heavy Duty 50'*
Outlet Tree	*CRST Heavy Duty Power Strip*
CONNECTIVITY	
5G Router	*Solis Router*
LIGHTING	
Telescoping Lights	*FLI-Pro 8' Telescoping Light*
COLLABORATION	
Projector	*Anker NEBULA Capsule*
Projection Surface	*Vispro Dry Erase Board*
Whiteboard	*Vispro Dry Erase Board*
FURNITURE	
Work Surface	*Mountain Summit Gear Folding Table*
Storage Table	*Mountain Summit Roll Top Kitchen*
Storage Table	*REI Co-Op Camp Roll Table*

COMFORT

	PRODUCT UTILIZED
SHELTER	
Rainfly	*ENO ProFly XL Hammock Rain Tarp*
Adjustable Umbrella	*Versa Brella*
Landscaping Tarp	*Tespher 7ft x 7ft Waterproof Tarp*
Sunshade Canopy	*Neso Tents Grande Beach Tent*
HEATING & COOLING	
Heater	*Mr. Heater Little Buddy Heater*
Fan	*GeekAire Portable Fan*
FOOD & BEVERAGE	
Cooler Backpack	*REI Co-op Cool Trail Pack Cooler*
Water Jug	*Dometic GO Hydration Water Jug*
RESTROOM	
Privacy Shelter	*Caddis Rapid Privacy Shelter*
Portable Toilet	*Dometic SaniPottie 966*
LOUNGE SEATING	
Chairs	*Ozark Trail Folding Camp Chair*

While the intent of this research is not to compare and contrast brands and their products on the market, the goal of travel research was to reveal the necessity of specific equipment interventions to inform the final design constraints of the Ecotonal Office.

A QUALITATIVE RESEARCH PROCEDURE WAS IMPLEMENTED IN EACH ECOREGION TO SIMULATE THE COMFORT AND PRODUCTIVITY NEEDS OF A TYPICAL WORKDAY.

By repeating the same process with the same equipment at each site, the research team sought to discover how environmental conditions in each ecoregion impacted individual comfort, productivity, and wellness. These factors included, but were not limited to, sunlight, wind, temperature, and presence of natural sheltering.

SEASON

Field research was completed in the autumn between the months of *September–October 2023*. By traveling during this transitional season, the research team was able to experience a range of weather conditions and variations in sunlight as the days grew shorter.

WORKDAY

Each ecoregion was visited for a period of *4–8 hours* extending from morning to afternoon during the course of a single day. The quantity of time spent at each site was determined by the ease of set-up and the ability to maintain comfort and productivity to complete.

ACTIVITIES

Analog and digital activities were representative of typical individual and collaborative tasks conducted in an MCO to illustrate proof of concept.

PREPARATION

Goldilocks Zone
- Determine optimal sites for potential office set-up

Assumptions
- Document biases

WORKDAY

am

Site Selection
- Visit pre-identified sites and determine the best fit for field research

Conditions Report
- Record *coordinates, site conditions,* and *weather data*

Set-Up: Humane
- Use equipment to provide *shelter, power, food, drink,* and *restroom*

Set-Up: Comfortable
- Use equipment to provide *temperature control, seating,* and *sunlight management*

Set-Up: Productive
- Use equipment to enable *internet connection, lighting, analog* and *digital tasks*

pm

Lunch

Analog Tasks
- Document in situ wellness experience
- Measure floor plan and record adjacencies

Digital Tasks
- Utilize web-based collaboration tool
- Conduct a video conference call
- Project presentation

Happy Hour

Break Down
- Final photographic documentation
- Leave no trace

REFLECTION

Wellness Report
- Document retrospective wellness experience

FIG. 10
Qualitative Research Procedure

Leave No Trace (2023) principles were followed to avoid harming fragile ecosystems

A series of documents for each ecoregion were created for data collection

Lisa reviews Go Pro framing for time-lapse video at Lake Cle Elum

Charles tests the digital individual and collaborative equipment

"I FELT LIKE A HUMAN VERSION OF THE SOLAR GENERATOR. TASKS ONLY BRIEFLY DRAINED MY ENERGY. THE ENVIRONMENT WAS CONSISTENTLY INVIGORATING." — CHARLES FADEM, 2023

FIELD RESEARCH

*"I felt my lungs inflate with the onrush of scenery—air, mountains, trees, people. I thought, "**This is what it is to be happy.**"*

SYLVIA PLATH, 2005

Cle Elum Lake

TEMPERATE

DATE
08.26.2023

TIME
09:04am – 16:10pm PDT

LOCATION
Speelyi Beach

TEMPERATURE
83°F / 28.33°C

ELEVATION
2227.42 FT

AQI
58 Moderate

WEATHER
Direct sun, moderate wind, dry, occasional clouds in afternoon, light sun shower

SOUND ●●●○○
Dirt bikes, power boats, helicopter in distance. No ambient traffic noises (planes or highway), occasional sound of birds and wind in trees.

PEOPLE
Outdoor activities at lakefront

*In the summer months, Speelyi Beach is a dry portion of the **exposed lake bed with small shrubs, smoothed rocks, driftwood, and an uneven, sandy surface.** It was near a forested tree line with a view of the lake and mountains in the distance.*

47° 15' 18.23" N 120° 58' 43.98" W

1 ASSUMPTIONS

Prior to arriving at the site, the research team documented assumptions about the site and its conditions in order to identify biases.

HOW *WILL* THE WEATHER AFFECT MY EXPERIENCE?

C – The sun will be hot and require lots of sunscreen. Tech will need to be protected from overheating. Air quality may be poor and lead to headaches.

L – It will depend on if the site we select is in direct sunlight or dappled with shade. The region is experiencing a heat wave.

HOW *WILL* THE EXPERIENCE MAKE ME FEEL EMOTIONALLY?

C – I will be excited and eager—happy to be outside, enjoying nature.

L – I enjoy the outdoors, so will be happy to be outside. I anticipate that the temperate climate will be the most comfortable, so I do not expect to become too irritable due to environmental conditions.

WHAT TASKS *WILL* BE A CHALLENGE?

C – Digital tasks requiring Internet may be slow, projection during the daytime could be challenging.

L – Projecting and video calls will be the most challenging. The projection will be affected by controlling the amount of daylight, and the video call will require a reliable Internet connection.

ON A SCALE OF 1–5, HOW DIFFICULT DO YOU THINK THIS ECOREGION *WILL* BE TO WORK IN?

C – *easy* ● **2** ○ ○ ○ *difficult*

L – *easy* ● **2** ○ ○ ○ *difficult*

HAVE YOU PREVIOUSLY TRAVELED TO THIS SITE BEFORE?

C – Yes. During the winter.

L – No

2 FIELD EXPERIENCE

After setting up the site, the research team completed a seated individual task to record their personal experiences of utilizing the prototype of the Ecotonal Office.

WHAT DO I OBSERVE AROUND ME?

C – Sandy beaches, faraway lake shore, tree line in the distance, a few bushes in the distance, far away cars and beach-goers, sky, clouds, insects, Lisa B, equipment, my car.

L – Forested tree line, the grit of sand on every surface, heat from the sun, wind on my face, relatively quiet environment. There are people here, but everyone is keeping to themselves and motor noises are occasional.

WHAT WAS WORTH REMEMBERING?

C – Wellness is relative, connection with nature comes at a cost of some creature comforts and distractions. My environment is completely my responsibility.

L – Laughing about the ridiculous challenges of the set-up, quick reactions to the wind whisking our gear away, and jokes about flying away. This place is beautiful!

HOW AM I FEELING AND WHY?

C – I am excited and am having fun, but my eyes are burning from the smoke and I have a distracting headache. I am a little achy and tired, but am loving every minute of being here.

L – I felt productive during our set up and was thankful we prepared ahead of time with equipment. Everything was charged for set up. Overall, the process has not felt like work. We are exploring, on an adventure, and are having fun trying to figure things out.

WHAT PAIN POINTS DID YOU ENCOUNTER?

C – The light levels were a major obstacle to projection, the wind knocking down our shelter was distracting, the equipment had to be kept cool. Setting everything up, fighting the sun and the wind was exhausting.

WHAT POSITIVE EXPERIENCES AM I HAVING?

C – Working with and hanging out with Lisa B. Enjoying the sun and snacks. Observing nature in motion.

L – Charles was able to solve an equipment issue relatively quickly by driving to a nearby town. I am enjoying the beautiful weather. It is hot but there is a cool breeze, and it's refreshing to be in the outdoors after being in air conditioning all week. The view of the lake is gorgeous.

WHAT NEGATIVE EXPERIENCES AM I HAVING?

C – The wind is annoying, everything keeps falling over, and it's hard to keep up with it all. The Go Pro keeps overheating.

L – I'm pretty sure I'm getting sunburned. I am definitely dehydrated and am thankful we packed extra water. The water was heavy to carry, some of the equipment was cumbersome to bring to site.

IS THIS EXPERIENCE SUPPORTING MY WELL-BEING?

C – Yes. Being immersed in nature is simultaneously relaxing and exciting. The mountains and the lake are beautiful. To me, this outweighs the drawbacks.

L – Yes. Now that the site is set up, I feel like I can relax and take in the day. We had a nice lunch with a view of the mountains, and I am feeling energized. The experience of working in the Ecotonal Office has been enjoyable and put me in a positive mood.

L – Wind knocked items over and damaged equipment. High temperatures and direct sunlight affected individual comfort. Equipment was cumbersome to carry from the car to the site. Seating, technology, and food/water needed to be moved often into the shade. Soft, uneven surface made it difficult to walk and secure equipment.

3 REFLECTION

Five days after the site visit, the research team reflected to record their memory of working in the Ecotonal Office.

HOW *DID* THE WEATHER AFFECT MY EXPERIENCE?

C – The sun was dehydrating and tiring, the smoke in the air gave me a headache and burned my eyes, the wind knocked down our shelter, the sun overheated the Go Pro and warped our furniture.

L – The weather was generally pleasant, but long exposure to the sun resulted in dehydration, exhaustion, and sunburn. One had to be conscious of drinking enough water and staying in the shade.

HOW *DID* THE EXPERIENCE MAKE ME FEEL EMOTIONALLY?

C – Engaged, challenged, invigorated, alive, connected to the natural world, connected with my work partner, happy to be outside.

L – I was excited to be in a location which I had never visited before. The quiet, serene landscape made me feel relaxed. I often paused to admire and take pictures of the changing light on the landscape.

WHAT TASKS *WERE* A CHALLENGE?

C – Wifi signal was weak and we could not access the server, or even basic web pages. Presentation digitally was not possible.

L – The Internet connection made digital tasks impossible to complete. The daylight conditions made projecting impossible. Analog tasks were able to be completed, but were disrupted by the wind.

ON A SCALE OF 1–5, HOW DIFFICULT *WAS* THIS ECOREGION TO WORK IN?

C – *easy* ● ● ● **4** ○ *difficult*

L – *easy* ● ● ● **4** ○ *difficult*

CLE ELUM LAKE

PRODUCTIVITY CHALLENGES

- Carrying gear through sand to get to site securing gear into sand
- Wind toppling gear over and blowing light weight objects away, like paper and trash
- Maintaining a level work surface due to soft, uneven surface
- Technology overheating

COMFORT CHALLENGES

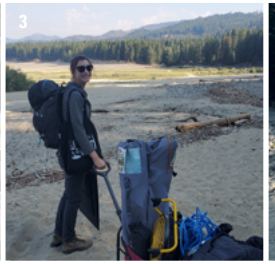
- Dehydration
- Exposure to direct sunlight and wind
- Inhalation of smoke
- Preventing heat exhaustion

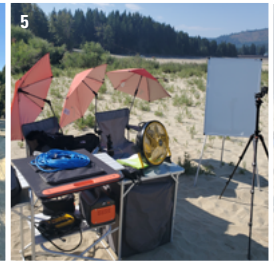
WELLNESS EXPERIENCE

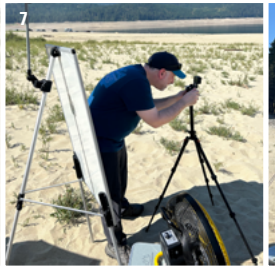
- Physical stress and discomfort throughout due to weather and smoke
- Psychologically positive and negative experience due to new challenges at beginning. Had to maintain positivity. Once site was set up, an overall positive experience.

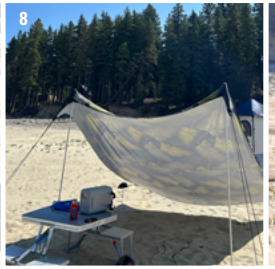
"The grit of the sandy beach is on every surface. I take shelter from the heat of the sun, and am thankful for the breeze and the increasingly cloudy skies."

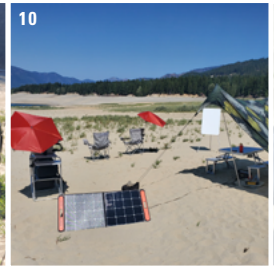
LISA K. BAMBACH

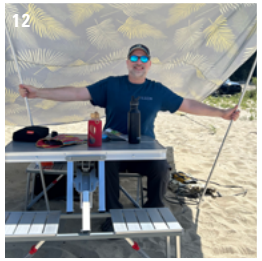












1 – Selected site
2 – Packed vehicle
3 – Schlepping equipment
4 – Distance from vehicle
5 – Staged equipment
6 – Staged equipment
7 – Video framing
8 – Initial set-up
9 – Vehicle
10 – Full site AM
11 – Overheated camera
12 – Windy conditions
13 – Portable restroom
14 – Equipment on ground
15 – Relocated table
16 – Digital task
17 – No internet
18 – Projection capabilities
19 – Happy hour
20 – Vista from workstation
21 – Team selfie
22 – Site post-research

EQUIPMENT

Throughout the day, the utilization of equipment was recorded. Equipment may change from site to site due to damage or malfunctioning in the field.

PRODUCTIVITY

COMPUTING	SET UP	REPOSITIONED	UTILIZED	DAMAGED	MALFUNCTIONED	NOTES
Laptop	●		●			
Cell Phone	●		●			*Texting only*

POWER	SET UP	REPOSITIONED	UTILIZED	DAMAGED	MALFUNCTIONED	NOTES
Pre-Charged Generator	●	●	●			*Access to direct sunlight meant that charge of generator never fell below 94% charge even while laptop, two cell phones, and fan were plugged in at the same time.*
Solar Panel	●	●	●			
Extension Cord	●	●	●			
Outlet Tree	●	●	●			

CONNECTIVITY	SET UP	REPOSITIONED	UTILIZED	DAMAGED	MALFUNCTIONED	NOTES
5G Router	●	●	◐			*Service not strong enough to use.*

LIGHTING	SET UP	REPOSITIONED	UTILIZED	DAMAGED	MALFUNCTIONED	NOTES
Telescoping Light #1						
Telescoping Light #2						

COLLABORATION	SET UP	REPOSITIONED	UTILIZED	DAMAGED	MALFUNCTIONED	NOTES
Projector	●		◐			*Projection worked but was not visible due to daylight conditions.*
Projection Surface	●	●	●			
Whiteboard	●	●	●		●	*Did not stay upright due to wind.*

FURNITURE	SET UP	REPOSITIONED	UTILIZED	DAMAGED	MALFUNCTIONED	NOTES
Work Surface	●	●	●	●		*Aluminum bent when whiteboard fell onto table due to wind. Metal buckled when folded during pack out process.*
Storage Table #1	●	●	●	●		
Storage Table #2						

COMFORT

SHELTER	SET UP	REPOSITIONED	UTILIZED	DAMAGED	MALFUNCTIONED	NOTES
Rainfly						
Adjustable Umbrella #1	●	●	●	●	●	*Umbrellas did not stay upright due to wind and toppled other equipment. One broke when wind knocked it over.*
Adjustable Umbrella #2	●	●	●		●	
Adjustable Umbrella #3	●	●	●		●	*Canopy toppled over due to wind and had to be re-secured or held by a person several times.*
Landscaping Tarp						
Sunshade Canopy	●	●	●		●	

HEATING & COOLING	SET UP	REPOSITIONED	UTILIZED	DAMAGED	MALFUNCTIONED	NOTES
Heater						*Fan was critical for cooling people and technology equipment in heat.*
Fan	●	●	●			

FOOD & BEVERAGE	SET UP	REPOSITIONED	UTILIZED	DAMAGED	MALFUNCTIONED	NOTES
Cooler Backpack	●	●	●			*Cooler and water jug both were repositioned multiple times to be in the shade.*
Water Jug	●	●	●			

RESTROOM	SET UP	REPOSITIONED	UTILIZED	DAMAGED	MALFUNCTIONED	NOTES
Privacy Shelter	●		●			*Privacy shelter was used as a place to reapply sunscreen in addition to restroom use.*
Portable Toilet	●		●			

LOUNGE SEATING	SET UP	REPOSITIONED	UTILIZED	DAMAGED	MALFUNCTIONED	NOTES
Chair #1	●		●			*Privacy shelter was used as a place to reapply sunscreen in addition to restroom use.*
Chair #2	●		●			

ADDITIONAL NOTES

- MicroSD card was damaged in its packaging and this was realized on site. Charles went to a nearby town to purchase a new one.
- GoPro overheated in direct sunlight, frequently shutting itself off, so a
- Umbrellas had to be utilized to protect the documentation equipment.
- Utility cart was utilized to help carry the equipment to site.
- Lounge seating addition introduces comfort where productivity table is not ergonomic.

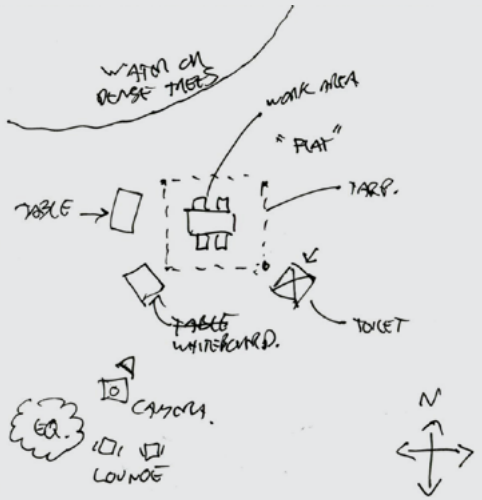
1 ASSUMPTIONS

Prior to arriving at the site, the research team documented assumptions about the site layout in order to identify biases.

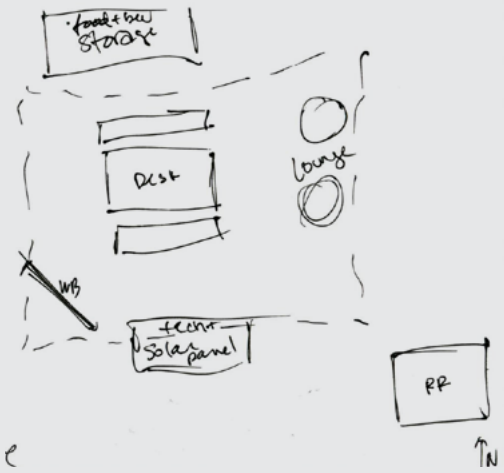
2 FIELD EXPERIENCE

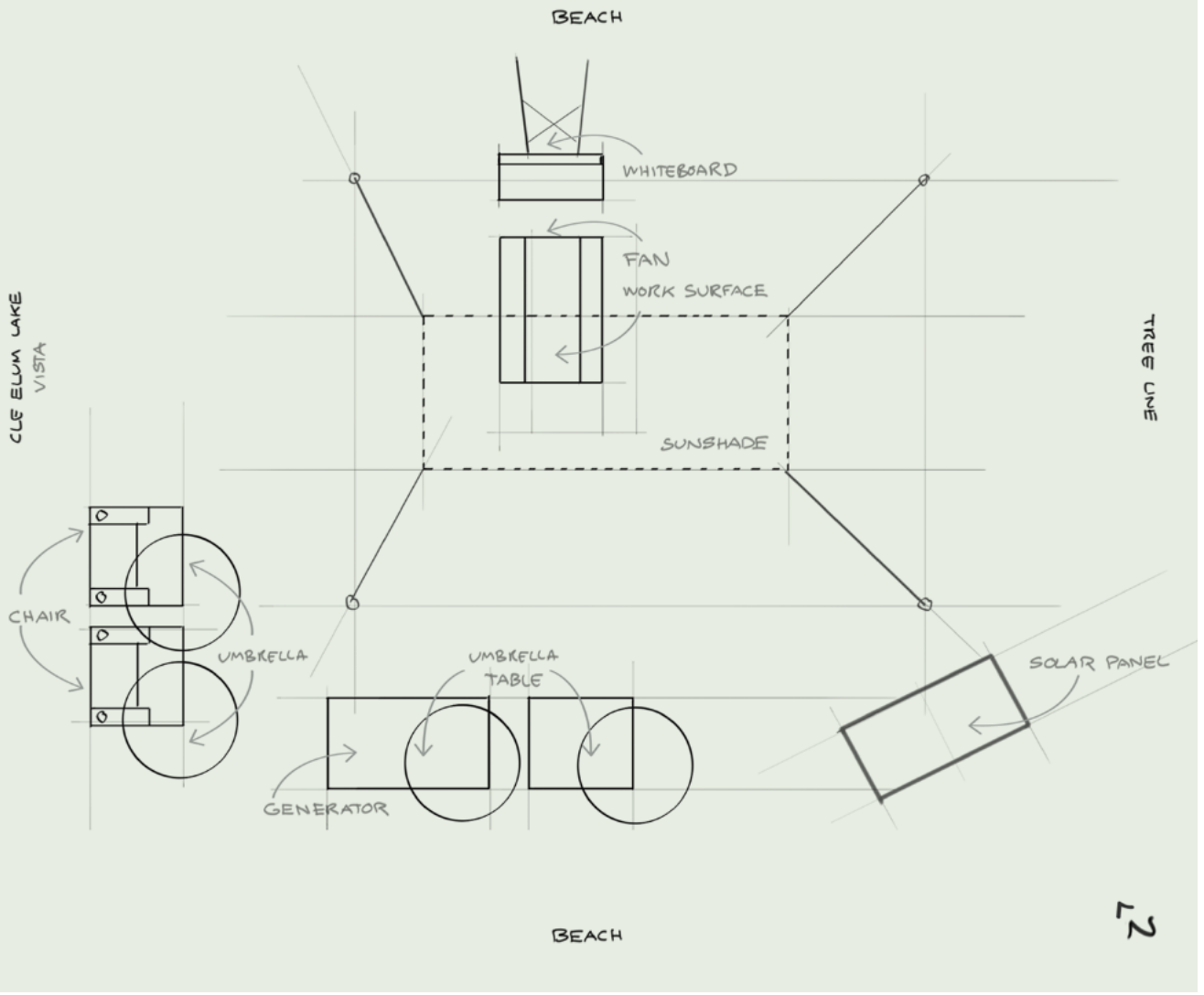
After setting up the site, the research team completed a standing collaborative task to document the actual layout of the Ecotonal Office.

C



L





WHAT COULD IMPROVE YOUR EXPERIENCE?

C – Better Seating, more stakes to secure shelter from wind, more umbrellas, no smoke, cooler weather for equipment and comfort.

L – Ability to stake items securely. Ability for shelter to be easily adapted to create shade versus moving all of the equipment it sheltered. Firm surface for site selection.

C: Charles Fadem *L: Lisa K. Bambach*

Mount Rainier

ALPINE

DATE
09.09.2023

TIME
10:21am – 15:50pm PDT

LOCATION
Paradise Picnic Area

TEMPERATURE
67°F / 19.44°C

ELEVATION
5254.54 FT

AQI
18 Excellent

WEATHER
Sunny, clear, light breeze with clouds at the top of the mountain

SOUND ●●●●●
Buzzing of bees, birds chirping, grasshoppers, the soft hum of fans in equipment. Overall, nearly complete quiet.

PEOPLE
None

The area surrounding the Paradise Picnic Area is a sub-apline meadowland. The selected site was a ***flat clearing in a meadow with an even surface and direct view of Mount Rainier.*** *Evergreen trees were scattered nearby through the meadow, creating a variety of layers and textures.*

46° 46' 38.23" N 121° 44' 10.27" W

1 ASSUMPTIONS

Prior to arriving at the site, the research team documented assumptions about the site and its conditions in order to identify biases.

HOW *WILL* THE WEATHER AFFECT MY EXPERIENCE?

C – Great forecast today, so I think that the mild sun and cool breeze will have me feeling relaxed, comfortable, and easy-going. Sun could make projection difficult.

L – The forecast this weekend is sunny and mild, so I expect the weather to be beautiful! The only thing I am concerned about is the mountain making its own weather, so I packed extra layers and rain gear.

HOW *WILL* THE EXPERIENCE MAKE ME FEEL EMOTIONALLY?

C – With the mountain so close, I imagine feeling in awe and connected to nature. I imagine feeling rested and peaceful.

L – I think there will be a feeling of serenity. The location is isolated and the landscape promises to be varied and dramatic. I think I will feel a oneness with the majesty of nature.

WHAT TASKS *WILL* BE A CHALLENGE?

C – Digital projection may be an issue, but otherwise I don't imagine it will be and trouble.

L – I think projection will prove difficult due to sunlight. I am hopeful our digital tasks will be made accessible due to the strategic site selection in a 5G capable area.

ON A SCALE OF 1–5, HOW DIFFICULT DO YOU THINK THIS ECOREGION *WILL* BE TO WORK IN?

C – *easy* ● ● **2** ○ ○ ○ *difficult*

L – *easy* ● ● **3** ○ ○ *difficult*

HAVE YOU PREVIOUSLY TRAVELED TO THIS SITE BEFORE?

C – No

L – Yes. On a cloudy, rainy summer day.

2 FIELD EXPERIENCE

After setting up the site, the research team completed a seated individual task to record their personal experiences of utilizing the prototype of the Ecotonal Office.

WHAT DO I OBSERVE AROUND ME?

C – The mountain, evergreen trees, tall grasses and weeds, blue sky, a few tiny puffs of clouds, Lisa B, our equipment, the sun shade.

L – A cloud is slowly growing at the summit of Mt. Rainier. The sounds of insects are buzzing around my ears. The vista is a rolling meadow interspersed with young evergreen trees. There is a soft, cool breeze. The generator is humming quietly. The hushed sounds of the environment make me feel like I should whisper.

WHAT WAS WORTH REMEMBERING?

C – The majesty of the mountain. We are in the "Goldilocks Zone" where we are far enough from roads and the trailhead for visual and auditory privacy, but close enough for strong wifi and easy transportation of equipment.

L – The shadows on the mountain and the glaciers shifting as the sun moves. The set up at this site was stress-free. We were prepared and more efficient.

HOW AM I FEELING AND WHY?

C – Relaxed and engaged. In awe of the mountain, refreshed by the cool, clean, oxygen rich air. Just ate lunch, and am full of energy.

L – I feel rested and ready for the day. I am focused, relaxed and calm. I think all of the follies of our first outing prepared me better for this excursion, so I arrived feeling less anxious. The weather is also comfortable today.

WHAT PAIN POINTS DID YOU ENCOUNTER?

C – Light wind knocked over the camera once. Bees took a liking to our food.

WHAT POSITIVE EXPERIENCES AM I HAVING?

C – Energized! The sun and mild weather has me feeling like the solar panel — constantly replacing energy spent. Set up was fast and easy. More mental space for observation and insight.

L – When Charles went for a walk, I sat alone for a while taking in the view of the mountain. We had a pleasant lunch together, set up was easy, and our equipment felt more manageable and familiar. I also knew this site, so felt more confident upon arrival.

WHAT NEGATIVE EXPERIENCES AM I HAVING?

C – The bees are slightly anxiety inducing. The equipment must be monitored for heat and functionality.

L – We had to walk a bit of a distance to find the right location where we would be far enough from people but close enough to the car so that it wasn't cumbersome. The multitude of insects was an issue until we used bug spray.

IS THIS EXPERIENCE SUPPORTING MY WELL-BEING?

C – Yes. I feel constantly relaxed and engaged. I am ready for challenges and work, yet present and aware of the beauty surrounding us at all times. And Lisa B is great company and a great partner.

L – Yes. The weather and the views make me feel at peace. Being in nature with others to share the experience makes me feel closer to my colleague as an individual.

L – Projection failed in daylight setting. Insects were bothersome.

3 REFLECTION

Five days after the site visit, the research team reflected to record their memory of working in the Ecotonal Office.

HOW *DID* THE WEATHER AFFECT MY EXPERIENCE?

C – It was energizing! The sun was warm and the air was cool. I was always comfortable. The wind was mild and only affected our shelter configuration briefly.

L – The weather was stunning. Even though we were in direct sunlight, we were able to maintain a comfortable temperature and enjoy a cool breeze. The clear skies make the color of the landscape vivid, and the view of the mountain was awe inspiring.

HOW *DID* THE EXPERIENCE MAKE ME FEEL EMOTIONALLY?

C – Constantly engaged and re-energized. I felt like a human version of the solar generator, tasks only briefly drained my energy. The environment was consistently invigorating.

L – I felt calm and centered. I was able to focus, complete tasks effectively, and at the same time maintain a relaxed and clear state of mind. I noticed that the quiet nature of the soundscape impacted me strongly. I tend to get distracted and stressed by people talking, causing me to wear headphones when I am in an office. I did not have the urge to play music or noise canceling headphones because I was amidst natural sounds.

WHAT TASKS *WERE* A CHALLENGE?

C – Eating lunch only because some of the busy bees. Otherwise tasks were all a breeze.

L – The projection was the only task that failed.

ON A SCALE OF 1–5, HOW DIFFICULT *WAS* THIS ECOREGION TO WORK IN?

C – *easy* ● **2** ○ ○ ○ *difficult*

L – *easy* ● **2** ○ ○ ○ *difficult*

alpine

MOUNT RAINIER

PRODUCTIVITY CHALLENGES

- Wind picked up in the afternoon, so equipment needed further securing
- Insects were distracting while trying to complete work, especially when snacks were eating at the productivity work table

COMFORT CHALLENGES

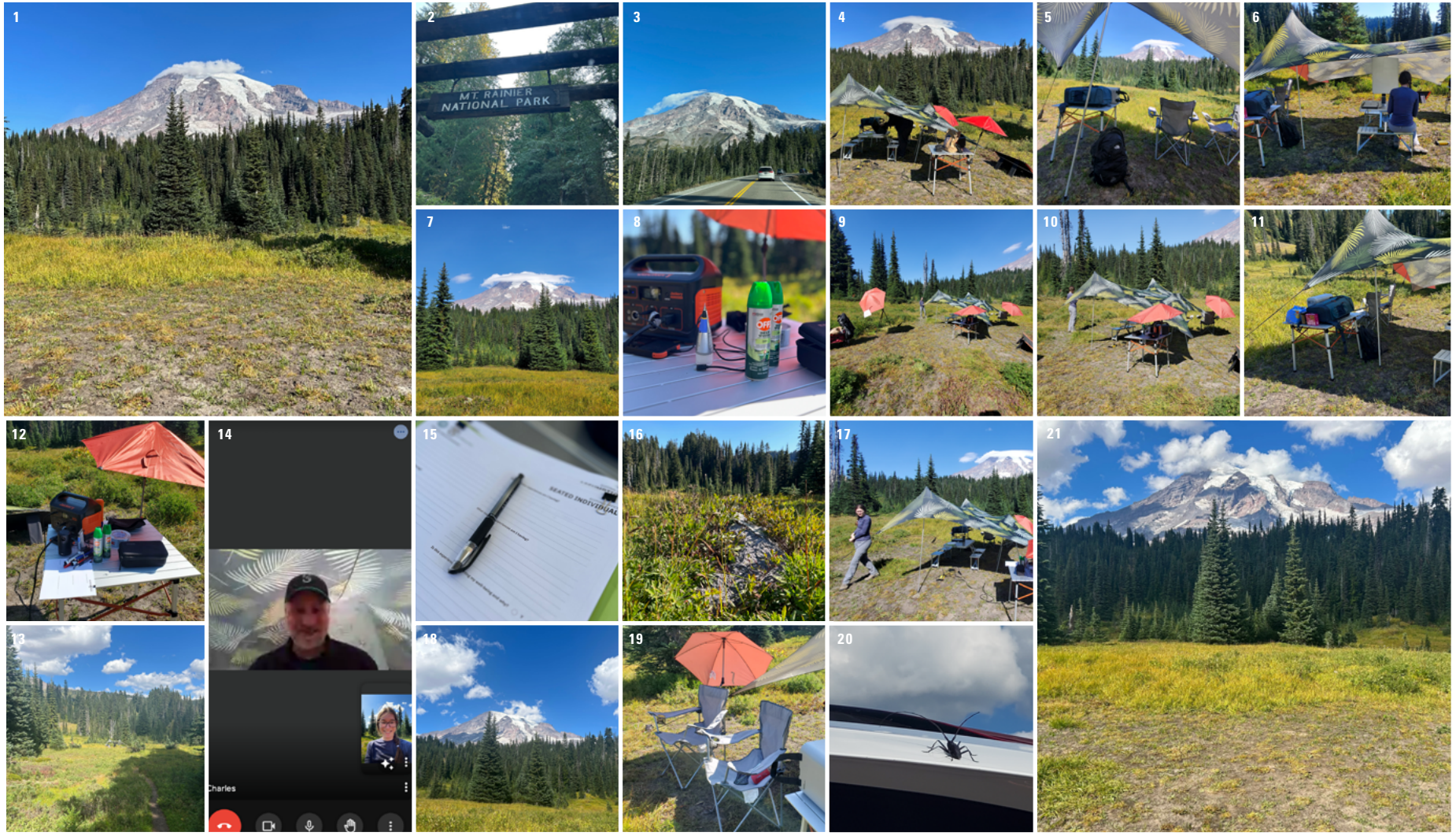
- Insects

WELLNESS EXPERIENCE

- Minimal physical stress
- Psychologically positive experience

"A cloud is slowly growing at the summit of Mt. Rainier. The sounds of insects are buzzing around my ears. There is a soft, cool breeze. The hushed sounds of the environment make me feel like I should whisper."

LISA K. BAMBACH



1 – Selected site
2 – Park entrance
3 – Commute to site
4 – Initial set-up
5 – Vista from workstation
6 – Seated analog task
7 – Increasingly cloudy
8 – Bug spray was required
9 – Overall site set-up
10 – Overall site set-up
11 – Food station
12 – Productivity station
13 – Site from afar
14 – Video conferencing
15 – Analog task
16 – Fragile ecosystem
17 – Moving shade
18 – Increasingly cloudy
19 – Lounge station
20 – Large insect
21 – Site post-research

EQUIPMENT

Throughout the day, the utilization of equipment was recorded. Equipment may change from site to site due to damage or malfunctioning in the field.

PRODUCTIVITY

COMPUTING	SET UP	REPOSITIONED	UTILIZED	DAMAGED	MALFUNCTIONED	NOTES
Laptop	●	○	●	○	○	*SSO for company online software and digital whiteboard via browser.*
Cell Phone	●	○	●	○	○	

POWER	SET UP	REPOSITIONED	UTILIZED	DAMAGED	MALFUNCTIONED	NOTES
Pre-Charged Generator	●	○	●	○	○	
Solar Panel	●	●	●	○	○	
Extension Cord	○	○	○	○	○	
Outlet Tree	●	●	●	○	○	

CONNECTIVITY	SET UP	REPOSITIONED	UTILIZED	DAMAGED	MALFUNCTIONED	NOTES
5G Router	●	●	●	○	○	*Great service—video calls enabled.*

LIGHTING	SET UP	REPOSITIONED	UTILIZED	DAMAGED	MALFUNCTIONED	NOTES
Telescoping Light #1	○	○	○	○	○	
Telescoping Light #2	○	○	○	○	○	

COLLABORATION	SET UP	REPOSITIONED	UTILIZED	DAMAGED	MALFUNCTIONED	NOTES
Projector	●	○	◐	○	○	*Projection worked but was not visible due to daylight conditions.*
Projection Surface	●	○	●	○	○	
Whiteboard	●	○	●	○	○	

FURNITURE	SET UP	REPOSITIONED	UTILIZED	DAMAGED	MALFUNCTIONED	NOTES
Work Surface	●	○	●	○	○	*Gear was divided on two camp roll tables. One was used for productivity tools and the other served as a comfort item station.*
Storage Table #1	●	○	●	○	○	
Storage Table #2	●	○	●	○	○	

COMFORT

SHELTER	SET UP	REPOSITIONED	UTILIZED	DAMAGED	MALFUNCTIONED	NOTES
Rainfly	○	○	○	○	○	
Adjustable Umbrella #1	●	●	●	○	●	*Umbrellas did not stay upright due to wind and toppled other equipment.*
Adjustable Umbrella #2	●	●	●	○	●	
Adjustable Umbrella #3	●	●	●	○	●	
Landscaping Tarp	●	○	●	○	○	
Sunshade Canopy	●	○	●	○	○	

HEATING & COOLING	SET UP	REPOSITIONED	UTILIZED	DAMAGED	MALFUNCTIONED	NOTES
Heater	○	○	○	○	○	
Fan	○	○	○	○	○	

FOOD & BEVERAGE	SET UP	REPOSITIONED	UTILIZED	DAMAGED	MALFUNCTIONED	NOTES
Cooler Backpack	●	○	●	○	○	*Stayed at station away from electrical equipment and in shade.*
Water Jug	●	○	●	○	○	

RESTROOM	SET UP	REPOSITIONED	UTILIZED	DAMAGED	MALFUNCTIONED	NOTES
Privacy Shelter	●	○	●	○	○	*Placed a further distance away from the site due to discretion and mitigation of odor.*
Portable Toilet	●	○	●	○	○	

LOUNGE SEATING	SET UP	REPOSITIONED	UTILIZED	DAMAGED	MALFUNCTIONED	NOTES
Chair #1	●	○	●	○	○	*Lounge seating set up to face view, adjacent to table for food.*
Chair #2	●	○	●	○	○	

ADDITIONAL NOTES

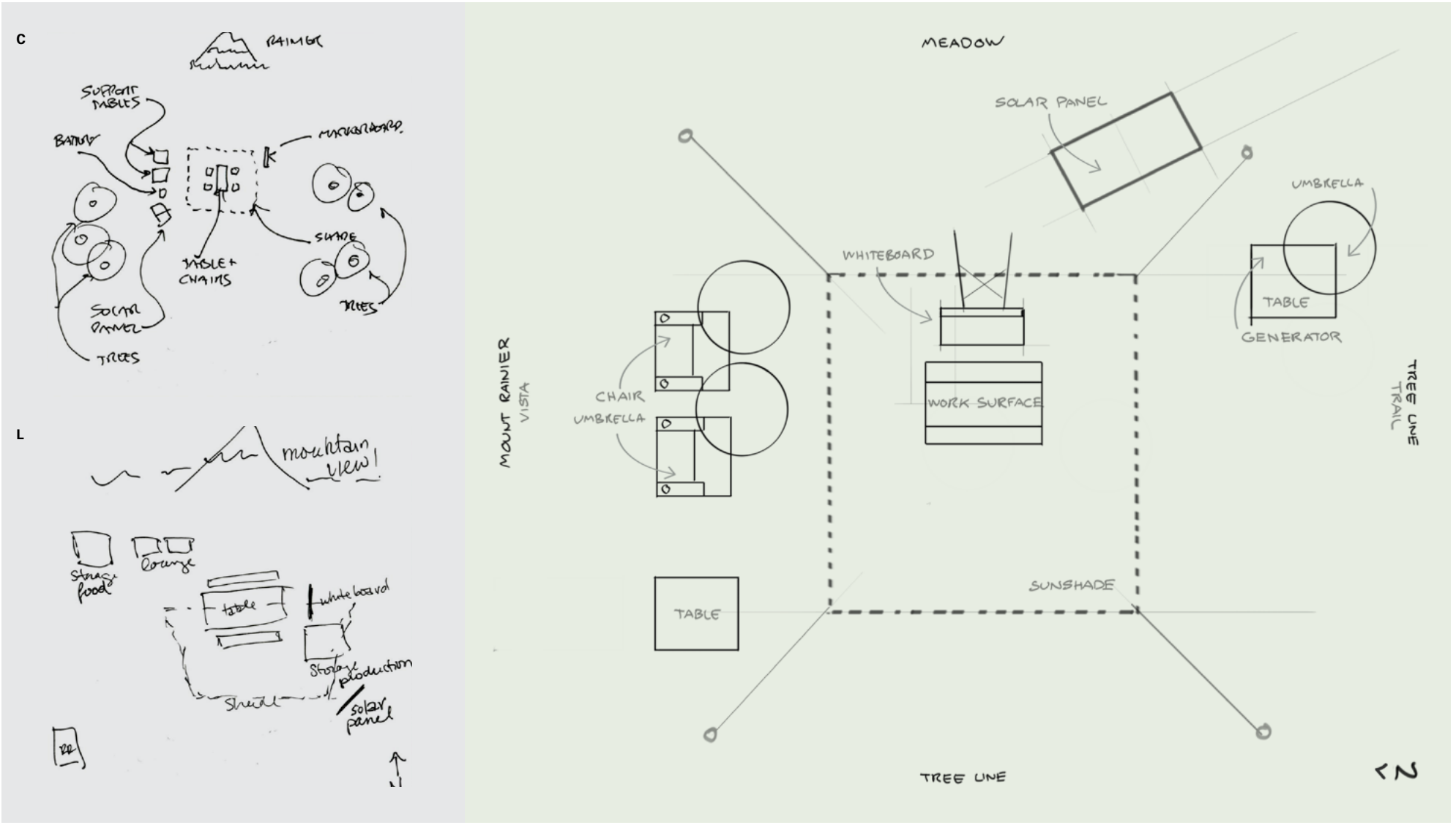
- Stakes were purchased to secure the sunshade in lieu of not having rocks or sand to weigh the corners down.
- Bug spray was required due to flying insects.
- Landscaping tarp was used to keep power cables out of the dirt.

1 ASSUMPTIONS

Prior to arriving at the site, the research team documented assumptions about the site layout in order to identify biases.

2 FIELD EXPERIENCE

After setting up the site, the research team completed a standing collaborative task to document the actual layout of the Ecotonal Office.



WHAT COULD IMPROVE YOUR EXPERIENCE?

C – Almost nothing besides more thorough control of bugs and insects. This day was an absolute joy.

L – Set-up was a breeze, but getting items to the site is still a pain point. I would like our final solution to be easier to transport. The act of working in the outdoors was comfortable and productive.

C: Charles Fadem *L: Lisa K. Bambach*

Wanapum State Park

DESERT

DATE
10.07.2023

TIME
9:36am – 13:06pm PDT

LOCATION
Wanapum Rec. Area

TEMPERATURE
67°F / 19.44°C

ELEVATION
623 FT

AQI
19 Excellent

WEATHER
Sunny with light breeze, cloudless skies, dry, low humidity

SOUND ●●○○○
Insects and birds give light chatter, some faint traffic noise and boats in the distance

PEOPLE
Indirect activity at nearby campsite

The Wanapum Recreation Area is an overlook adjacent to the Columbia River in eastern Washington. The selected site was a ***semi-level clearing amongst the dried grasses and shrubs of the desert environment. The soil was composed of the eroded remnants of an ancient basalt lava flow.*** *The only trees were intentionally planted by the park service to provide shade and wind breaks around the nearby parking lot and camp sites.*

46° 58' 52.92" N 119° 29' 12.84" W

1 ASSUMPTIONS

Prior to arriving at the site, the research team documented assumptions about the site and its conditions in order to identify biases.

HOW *WILL* THE WEATHER AFFECT MY EXPERIENCE?

C – I'm betting the wind will make maintenance of the office tricky, the heat will be mean, and extra hydration will be required. Sunscreen reapplication will be vital.

L – I expect to be in direct sunlight all day. Shade will be critical. I also think wind may be an issue due to the open landscape.

HOW *WILL* THE EXPERIENCE MAKE ME FEEL EMOTIONALLY?

C – Today may be tricky. I am tired this morning. I am hoping that the sense of accomplishment and beautiful surroundings make me feel relaxed and fulfilled.

L – I expect to feel a bit stressed due to the heat and exposure to sunlight. However, I hope that the time spent working will be relaxing due to the remote nature of the setting.

WHAT TASKS *WILL* BE A CHALLENGE?

C – Electrical equipment may get hot, otherwise tasks should be easy.

L – Projection will be an issue, however, all other tasks should be manageable as long as we have an internet connection.

ON A SCALE OF 1–5, HOW DIFFICULT DO YOU THINK THIS ECOREGION *WILL* BE TO WORK IN?

C – *easy* ● ● 3 ○ ○ *difficult*

L – *easy* ● ● 3 ○ ○ *difficult*

HAVE YOU PREVIOUSLY TRAVELED TO THIS SITE BEFORE?

C – No

L – No

2 FIELD EXPERIENCE

After setting up the site, the research team completed a seated individual task to record their personal experiences of utilizing the prototype of the Ecotonal Office.

WHAT DO I OBSERVE AROUND ME?

C – The river, the sky, bluffs, dry brush, sandy dry hills, our equipment, Lisa B.

L – The glistening waters of the Columbia River, a flock of birds swimming in a cove, a crow cawing, the soft breeze on my face, golden hillsides, trees and lush plant life near the water turning into their autumn colors and highlighting the landscape with reds and yellows. Charles, very focused.

WHAT POSITIVE EXPERIENCES AM I HAVING?

C – A sense of accomplishment in getting everything set up. Starting to settle and relax since the wind is no longer knocking everything over. I feel connected to the earth and the sky and to Lisa.

L – I am more comfortable that I expected to be. The sun is not terribly intense and the breeze is frequent but soft. I had fun looking for a site with Charles– usually this is a point of stress for me. It felt more like an adventure this time, now that I have an understanding of what to seek.

WHAT WAS WORTH REMEMBERING?

C – The astonishing stillness of the world, how the river seems to shiver as the only thing that moves. Desert spiders and beetles seem friendly.

L – The vastness of the landscape, making me feel small. The wide expanse of the river. Meeting an individual who was interested in our research and engaged in positive conversation.

WHAT NEGATIVE EXPERIENCES AM I HAVING?

C – Cranky! I was hoping the desert would be cool and comfortable by now. The table has sunken into the soft ground, and posture is hard to maintain. I am slightly dehydrated.

L – It was difficult to set up the sunshade. The ground is made of soft, volcanic soil. When we applied tension to the shade to raise it, a stake pulled from the ground and almost hit me in the face!

HOW AM I FEELING AND WHY?

C – Tired, a little cranky. The crooked ground makes it hard to relax, and I am worried about breaking equipment.

L – I am feeling relaxed. I feel like Charles and I have gotten the hang of setting up equipment and are better able to focus on the work at hand. It is still cumbersome, especially transport, but no longer such a burden. I am enjoying the scenery. It's incredibly peaceful and I am grateful to be discovering a new place.

IS THIS EXPERIENCE SUPPORTING MY WELL-BEING?

C – Yes, and no. The stress of maintaining the work environment can be difficult at times, especially if you are not feeling 100% at the get go. However, it feels awesome to be outside with a friend.

L – Yes. The golden textures of the hillsides and the shadows cast on the bluff are beautiful. Although we are near people, it generally has a quiet serenity. Being near a body of water is calming, and visually creates a dynamic contrast against the warm hillsides.

WHAT PAIN POINTS DID YOU ENCOUNTER?

C – A little dehydration, a little difficulty setting up the sunshade. But the work itself was easy.

L – I was surprisingly comfortable in the climate and weather conditions as long as I maintained engagement with the shade we erected. Charles did have to remind me to drink water, so I would not become dehydrated.

3 REFLECTION

Five days after the site visit, the research team reflected to record their memory of working in the Ecotonal Office.

HOW *DID* THE WEATHER AFFECT MY EXPERIENCE?

C – Not as much as I expected— The air was not hot, the sun was manageable, and the wind was light.

L – The weather was mild. I was surprised at how comfortable the desert environment was able to be. A sunshade was critical to create this positive experience.

HOW *DID* THE EXPERIENCE MAKE ME FEEL EMOTIONALLY?

C – It was invigorating and rejuvenating. I started the day a bit grumpy and ended the day excited.

L – Although I started the day fairly tired, I was able to feel reinvigorated by the environment. The dramatic landscape felt ancient and otherworldly. The bluffs in the distance felt so near, but I could see for miles.

WHAT TASKS *WERE* A CHALLENGE?

C – The work tasks themselves were simple (besides projection). It was set up that was a little more challenging than usual.

L – The projection was the only task that truly failed. I believe that digital collaborative tasks will have to be redesigned for the outdoors. The sunshade was difficult to secure to the ground.

ON A SCALE OF 1–5, HOW DIFFICULT *WAS* THIS ECOREGION TO WORK IN?

C – *easy* ● 2 ○ ○ ○ *difficult*

L – *easy* ● 2 ○ ○ ○ *difficult*

desert

WANAPUM STATE PARK

PRODUCTIVITY CHALLENGES

- Soil was too soft to securely anchor equipment
- Frequency of wind required that trash and other light materials be secured to avoid littering

COMFORT CHALLENGES

- Uneven surfaces
- Heat and direct sunlight, vista and sun in same place
- No protection from wind
- Insects

WELLNESS EXPERIENCE

- Minimal physical stress
- Psychologically positive experience

"The waters of the Columbia River glisten, a flock of birds swim in a cove, a crow caws, the soft breeze touches my face. There are golden hillsides, trees, and lush plant life near the water, turning into their autumn colors."

LISA K. BAMBACH

1 – Selected site
2 – Commute to site
3 – Trail adjacent to site
4 – Initial set-up
5 – Sun location
6 – Overall site set-up
7 – Unpacking equipment
8 – Solar generator
9 – Workstation
10 – Productivity station
11 – Lunch break
12 – Collaborative analog
13 – Internet connectivity
14 – Video conferencing
15 – Digital individual task
16 – Team selfie
17 – Laptop in shade
18 – Insect
19 – Site from afar
20 – Lounge station
21 – Site post-research

EQUIPMENT

Throughout the day, the utilization of equipment was recorded. Equipment may change from site to site due to damage or malfunctioning in the field.

PRODUCTIVITY

COMPUTING	SET UP	REPOSITIONED	UTILIZED	DAMAGED	MALFUNCTIONED	NOTES
Laptop	●		●			*SSO for company online software and digital whiteboard via browser.*
Cell Phone	●		●			

POWER	SET UP	REPOSITIONED	UTILIZED	DAMAGED	MALFUNCTIONED	NOTES
Pre-Charged Generator	●	●	●			*Repositioned to protect from overheating in direct sunlight.*
Solar Panel	●		●			
Extension Cord	●		●			
Outlet Tree	●		●			

CONNECTIVITY	SET UP	REPOSITIONED	UTILIZED	DAMAGED	MALFUNCTIONED	NOTES
5G Router	●		●			*Great service—video calls enabled.*

LIGHTING	SET UP	REPOSITIONED	UTILIZED	DAMAGED	MALFUNCTIONED	NOTES
Telescoping Light #1						
Telescoping Light #2						

COLLABORATION	SET UP	REPOSITIONED	UTILIZED	DAMAGED	MALFUNCTIONED	NOTES
Projector	●		●			*Projection worked but was not visible due to daylight conditions.*
Projection Surface	●		●			
Whiteboard	●		●			

FURNITURE	SET UP	REPOSITIONED	UTILIZED	DAMAGED	MALFUNCTIONED	NOTES
Work Surface	●		●			*Gear was divided on two camp roll tables. One was used for productivity tools and the other served as a comfort item station. Repositioned due to sun.*
Storage Table #1	●		●			
Storage Table #2	●	●	●			

COMFORT

SHELTER	SET UP	REPOSITIONED	UTILIZED	DAMAGED	MALFUNCTIONED	NOTES
Rainfly						*Umbrellas were closed when not in use to deter toppling in the wind. The view and the sun were both southward, so the sunshade required positioning that allowed for a view while working but still protected from the sun. The sunshade was difficult to secure to the loose soil and did not stay secure once tension was added.*
Adjustable Umbrella #1	●	●	●			
Adjustable Umbrella #2	●	●	●			
Adjustable Umbrella #3	●	●	●			
Landscaping Tarp	●		●			
Sunshade Canopy	●		●			

HEATING & COOLING	SET UP	REPOSITIONED	UTILIZED	DAMAGED	MALFUNCTIONED	NOTES
Heater						*Breeze and shade were sufficient for cooling during the high heat of the day.*
Fan	●					

FOOD & BEVERAGE	SET UP	REPOSITIONED	UTILIZED	DAMAGED	MALFUNCTIONED	NOTES
Cooler Backpack	●	●	●			*Cooler was relocated by lounge seating during lunch.*
Water Jug	●		●			

RESTROOM	SET UP	REPOSITIONED	UTILIZED	DAMAGED	MALFUNCTIONED	NOTES
Privacy Shelter	●		●			*Placed a further distance away from the site due to discretion and mitigation of odor.*
Portable Toilet	●		●			

LOUNGE SEATING	SET UP	REPOSITIONED	UTILIZED	DAMAGED	MALFUNCTIONED	NOTES
Chair #1	●		●			*Lounge seating set up to face view, but was away from comfort station.*
Chair #2	●		●			

ADDITIONAL NOTES

- Landscaping tarp was used to keep power cables out of the dirt.

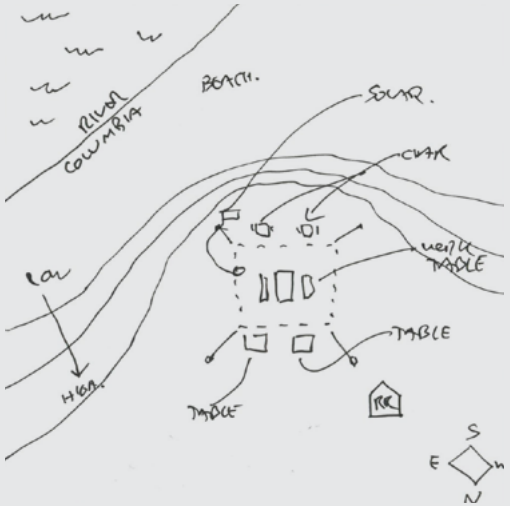
1 ASSUMPTIONS

Prior to arriving at the site, the research team documented assumptions about the site layout in order to identify biases.

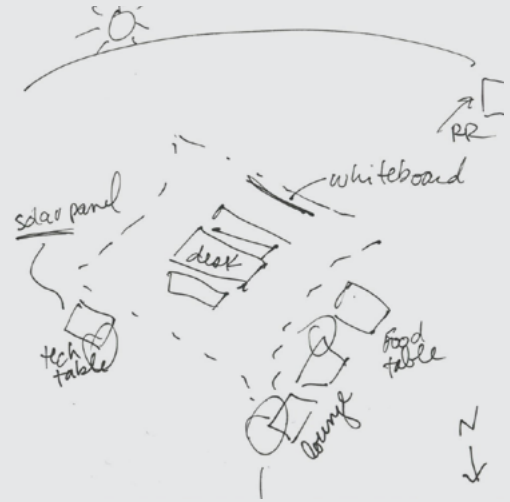
2 FIELD EXPERIENCE

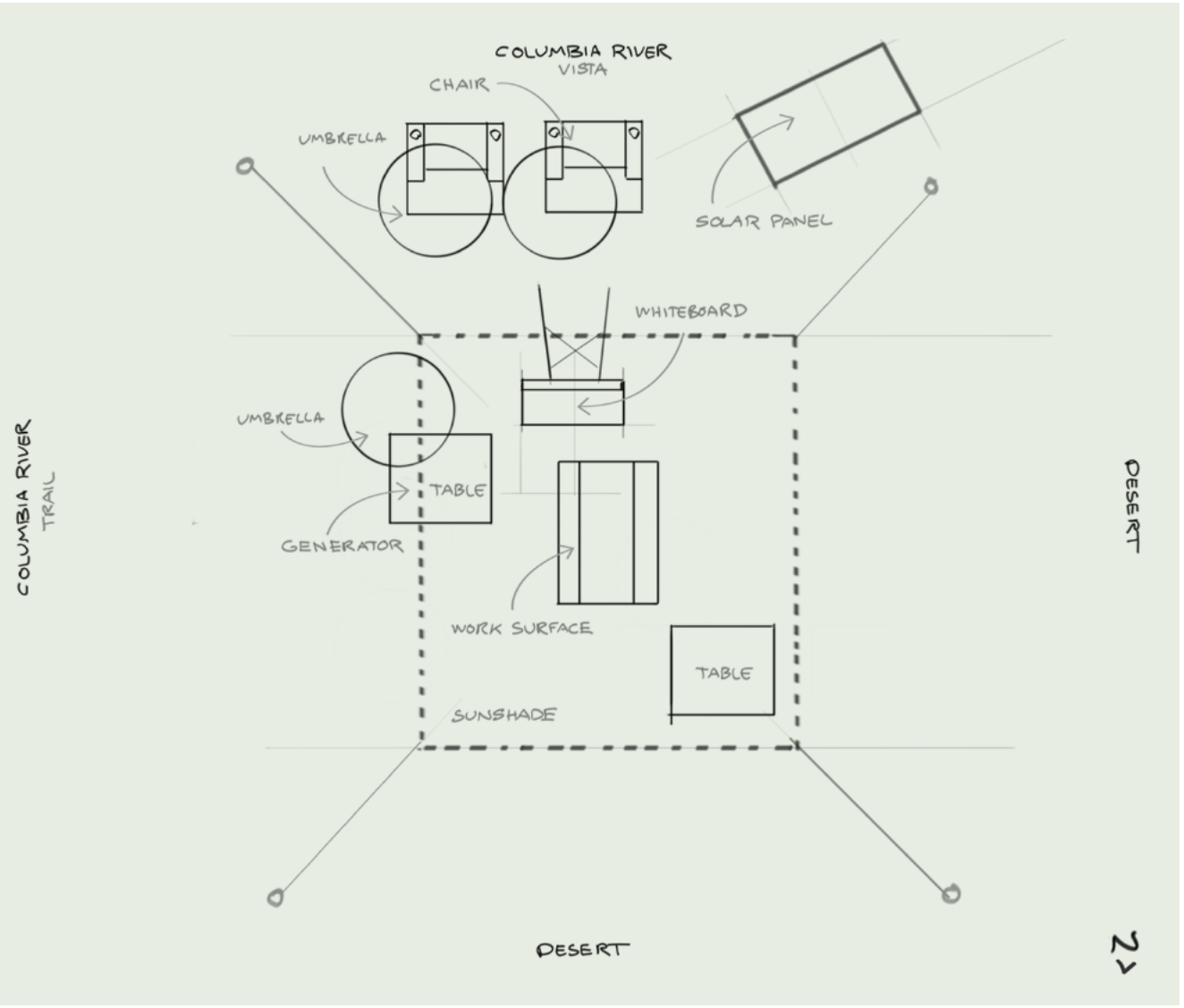
After setting up the site, the research team completed a standing collaborative task to document the actual layout of the Ecotonal Office.

C



L





WHAT COULD IMPROVE YOUR EXPERIENCE?

C – Better hydration, more preparation in terms of weights to anchor equipment in the soft ground.

L – If the shade providing systems were secured to the furniture in a seamless way, concerns about them blowing over would be alleviated. Ability to adjust the shade providing systems to the sun versus relocating the furniture to exist within the shade will be critical.

C: *Charles Fadem* ***L:*** *Lisa K. Bambach*

Olympic Forest

RAINFOREST

DATE
10.28.2023

TIME
11:21am – 15:50pm PDT

LOCATION
South Fork Hoh

TEMPERATURE
40°F / 4.44°C

ELEVATION
560 FT

AQI
28 Fair

WEATHER
Sunny with light breeze, cloudless skies, dry, low humidity

SOUND ●○○○○
Rushing river, birds chirping.

PEOPLE
A single neighboring campsite.

The South Fork Hoh Campground is a semi-primitive campsite along the Hoh River in Olympic National Park. The selected site was a ***compacted clearing surrounded by pine trees, ferns, and a bed of moss.*** *The tree canopy was dense with rays of sunshine cutting through, creating distinct columns of light.*

47°58'18.9"N 123°59'39.3"W

1 ASSUMPTIONS

Prior to arriving at the site, the research team documented assumptions about the site and its conditions in order to identify biases.

HOW *WILL* THE WEATHER AFFECT MY EXPERIENCE?

C – The cold will make my hands a little numb, keeping warm will be a challenge. My face might feel a little numb.

L – We are going to the rainforest during a time of year where it is typically cold and rainy. I expect to be uncomfortable, and I plan to bring extra layers in case my clothes get wet.

HOW *WILL* THE EXPERIENCE MAKE ME FEEL EMOTIONALLY?

C – Energized being so close to nature, the beauty and peace of it. I will possibly less agreeable in the cold. Excited.

L – I find the temperate rainforest in Washington to be quite magical. It is an otherworldly place. I expect to be in awe of the dappled light peeking through the tree canopy.

WHAT TASKS *WILL* BE A CHALLENGE?

C – Projection, possibly wifi tasks like video chat and digital online tasks.

L – I am concerned about power generation due to access to sunlight amongst the dense trees. I think that projection may fair a bit better in the conditions due to the thick coverage of the trees.

ON A SCALE OF 1–5, HOW DIFFICULT DO YOU THINK THIS ECOREGION *WILL* BE TO WORK IN?

C – *easy* ● ● ● 4 ○ *difficult*

L – *easy* ● ● ● 4 ○ *difficult*

HAVE YOU PREVIOUSLY TRAVELED TO THIS SITE BEFORE?

C – No

L – No

2 FIELD EXPERIENCE

After setting up the site, the research team completed a seated individual task to record their personal experiences of utilizing the prototype of the Ecotonal Office.

WHAT DO I OBSERVE AROUND ME?

C – Dense trees, streaks of sunlight, trees are covered with dense moss. Autumn foliage falling from birch trees. Red, green, and yellow leaves. Patches of blue sky peering through.

L – I can see every shade of green. The sun casts strong beams of light between the trees, reflecting on the floor of ferns. The world is high contrast. The ground is soft under my feet from the layers of pine needles. I can see my breath.

WHAT WAS WORTH REMEMBERING?

C – The coziness of the denser set up. The fresh, delicious air rich with oxygen and pine. The rushing river and the silence. This is the most peaceful site yet.

L – The rainforest is stunning. I am in awe of the environment. We have seen wildlife: deer and many kinds of birds.

HOW AM I FEELING AND WHY?

C – Cozy and relaxed. While set up took some new tinkering and presented new challenges, now that we are working, I am relaxed and invigorated. I want to stay here all day.

L – The site feels a bit cramped. The equipment is cluttered because we had to condense it in case of rain.

WHAT PAIN POINTS DID YOU ENCOUNTER?

C – The tight quarters were hard to manage at first and the cold could be distracting, but the heater was a godsend.

WHAT POSITIVE EXPERIENCES AM I HAVING?

C – So many! Cozy and happy. The heater means we can be outside together on a cool, crisp day. Comfortable and excited. It has really cut the chill. I am relaxed by the sounds of the forest and the birds activity.

L – I am feeling productive. Our set up was more efficient and easier even though we were solving a new problem. We were confident in our site selection, choosing a location that did not damage the ecosystem. I find the temperate rainforest extremely soothing and engaging. We were lucky to get a sunny day, so the lighting is especially beautiful.

WHAT NEGATIVE EXPERIENCES AM I HAVING?

C – I was cold, but not anymore. I am otherwise happy and productive.

L – Cold! My toes are frozen, and I am glad I brought extra socks with me.

IS THIS EXPERIENCE SUPPORTING MY WELL-BEING?

C – Yes. The rainforest is magic! It is a special place—a full-sensory experience that makes you feel more alive head to toe.

L – Yes. I am relaxed and enjoying the time I am spending outside. There is some physical discomfort, but it is minimal and manageable with clothing and adjustments enabled by our equipment.

L – The site set-up needed some improvisation due to the location of trees and limited access to sunlight.

3 REFLECTION

Five days after the site visit, the research team reflected to record their memory of working in the Ecotonal Office.

HOW *DID* THE WEATHER AFFECT MY EXPERIENCE?

C – It was cold but enjoyable, especially once the heater was up and running. There was plenty of sunlight and shade, cool crisp air had me feeling alert.

L – The prospect of rain caused us to condense our site, which became crowded. It did not rain that day, however, so we were able to set up a lounge space in a spot of sun without an extra rain fly. The air was humid and cold, so I spent the day seeking warmth, but was comfortable when I did so.

HOW *DID* THE EXPERIENCE MAKE ME FEEL EMOTIONALLY?

C – Invigorated, if not dependent on the right clothes, and the right technology. I was grateful that we left this for last, and felt satisfaction that we met the challenges of the site. I was connected to nature in an intimate and profound way, all day.

L – I was relaxed and centered. The quiet was serene and almost palpable. I felt rejuvenated after the day.

WHAT TASKS *WERE* A CHALLENGE?

C – Slow internet, but otherwise able to complete tasks safely and dry.

L – The internet connection was spotty, so we were unable to complete digital tasks that required a connection.

ON A SCALE OF 1–5, HOW DIFFICULT *WAS* THIS ECOREGION TO WORK IN?

C – *easy* ● 2 ○ ○ ○ *difficult*

L – *easy* ● 2 ○ ○ ○ *difficult*

OLYMPIC FOREST

PRODUCTIVITY CHALLENGES

- Indirect, dappled sunlight made it difficult to generate energy
- Uneven ground
- Minimal access to 5G internet service

COMFORT CHALLENGES

- Low temperature
- Humidity, moisture in air

WELLNESS EXPERIENCE

- Minimal physical stress
- Psychologically positive experience

"I can see every shade of green. The sun casts strong beams of light between the trees, reflecting on the floor of ferns. The world is high contrast. The ground is soft under my feet from the layers of pine needles. I can see my breath."

LISA K. BAMBACH

1 – Selected site
2 – Forest setting
3 – Fragile ecosystem
4 – Initial set-up
5 – Seated analog task
6 – Solar generator
7 – Site from afar
8 – Heater
9 – Cables
10 – Productivity station
11 – Tree canopy
12 – Team selfie
13 – Projection capabilities
14 – Projection capabilities
15 – Heater placement
16 – Solar generator
17 – Team selfie
18 – Shadow puppets
19 – Forest setting
20 – Analog individual task
21 –Site from afar
22 – Site post-research

EQUIPMENT

Throughout the day, the utilization of equipment was recorded. Equipment may change from site to site due to damage or malfunctioning in the field.

PRODUCTIVITY

COMPUTING	SET UP	REPOSITIONED	UTILIZED	DAMAGED	MALFUNCTIONED	NOTES
Laptop	●	○	●	○	○	*Online tasks were not able to be completed due to service, but all equipment was operable.*
Cell Phone	●	○	●	○	○	

POWER	SET UP	REPOSITIONED	UTILIZED	DAMAGED	MALFUNCTIONED	NOTES
Pre-Charged Generator	●	●	●	○	○	*This was our most condensed site to keep everything under the rain fly, so an extension cord was not needed. Solar panel repositioned due to lack of sunlight.*
Solar Panel	●	●	●	○	○	
Extension Cord	○	○	○	○	○	
Outlet Tree	●	○	●	○	○	

CONNECTIVITY	SET UP	REPOSITIONED	UTILIZED	DAMAGED	MALFUNCTIONED	NOTES
5G Router	●	○	●	○	○	*Service not strong enough to use.*

LIGHTING	SET UP	REPOSITIONED	UTILIZED	DAMAGED	MALFUNCTIONED	NOTES
Telescoping Light #1	○	○	○	○	○	*The built in light on the pre-charged generator was utilized to illuminate whiteboard.*
Telescoping Light #2	○	○	○	○	○	

COLLABORATION	SET UP	REPOSITIONED	UTILIZED	DAMAGED	MALFUNCTIONED	NOTES
Projector	●	●	●	○	○	*Projection was able to be conducted in the shade of the tree canopy. It worked in indirect sunlight.*
Projection Surface	●	○	●	○	○	
Whiteboard	●	○	●	○	○	

FURNITURE	SET UP	REPOSITIONED	UTILIZED	DAMAGED	MALFUNCTIONED	NOTES
Work Surface	●	○	●	○	○	*Gear was divided on two camp roll tables. One was used for productivity tools and the other served as a comfort item station. Relocated in case of rain.*
Storage Table #1	●	○	●	○	○	
Storage Table #2	●	●	●	○	○	

COMFORT

SHELTER	SET UP	REPOSITIONED	UTILIZED	DAMAGED	MALFUNCTIONED	NOTES
Rainfly	●	○	●	○	○	*Rainfly utilized as sunshade. It did not rain.*
Adjustable Umbrella #1	○	○	○	○	○	
Adjustable Umbrella #2	○	○	○	○	○	*Landscaping tarp was used to keep power cables out of the dirt.*
Adjustable Umbrella #3	○	○	○	○	○	
Landscaping Tarp	●	○	●	○	○	
Sunshade Canopy	○	○	○	○	○	

HEATING & COOLING	SET UP	REPOSITIONED	UTILIZED	DAMAGED	MALFUNCTIONED	NOTES
Heater	●	●	●	○	○	*Critical for cold weather, but need to seek a safer solution than propane due to open flame.*
Fan	○	○	○	○	○	

FOOD & BEVERAGE	SET UP	REPOSITIONED	UTILIZED	DAMAGED	MALFUNCTIONED	NOTES
Cooler Backpack	●	●	●	○	○	*Trail pack cooler needs a bear-safe alternative product. Pre-filled water jug is most cumbersome.*
Water Jug	●	●	●	○	○	

RESTROOM	SET UP	REPOSITIONED	UTILIZED	DAMAGED	MALFUNCTIONED	NOTES
Privacy Shelter	●	○	●	○	○	*Placed a further distance away from the site due to discretion and mitigation of odor.*
Portable Toilet	●	○	●	○	○	

LOUNGE SEATING	SET UP	REPOSITIONED	UTILIZED	DAMAGED	MALFUNCTIONED	NOTES
Chair #1	●	○	●	○	○	*Lounge seating set up to face trees where sun was most visible through the canopy.*
Chair #2	●	○	●	○	○	

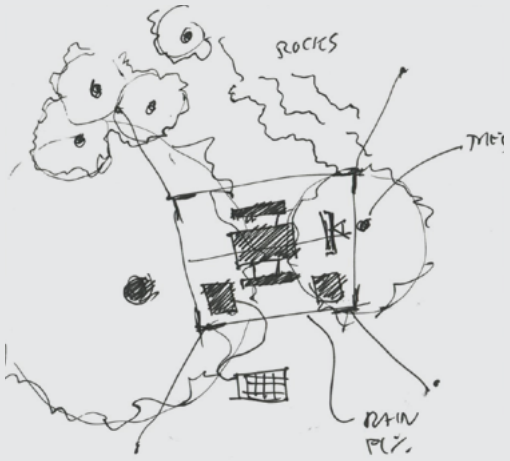
ADDITIONAL NOTES

- Mallet, stakes, and poles are critical to improvising in accordance with the environment. Tree spacing is not guaranteed to work and straps can harm the health of trees.
- Light meter would have been an ideal additional piece of equipment to judge conditions in which projections are capable of being seen.

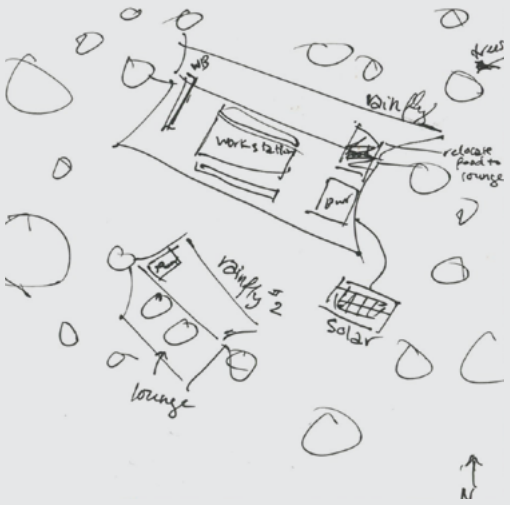
1 ASSUMPTIONS

Prior to arriving at the site, the research team documented assumptions about the site layout in order to identify biases.

C

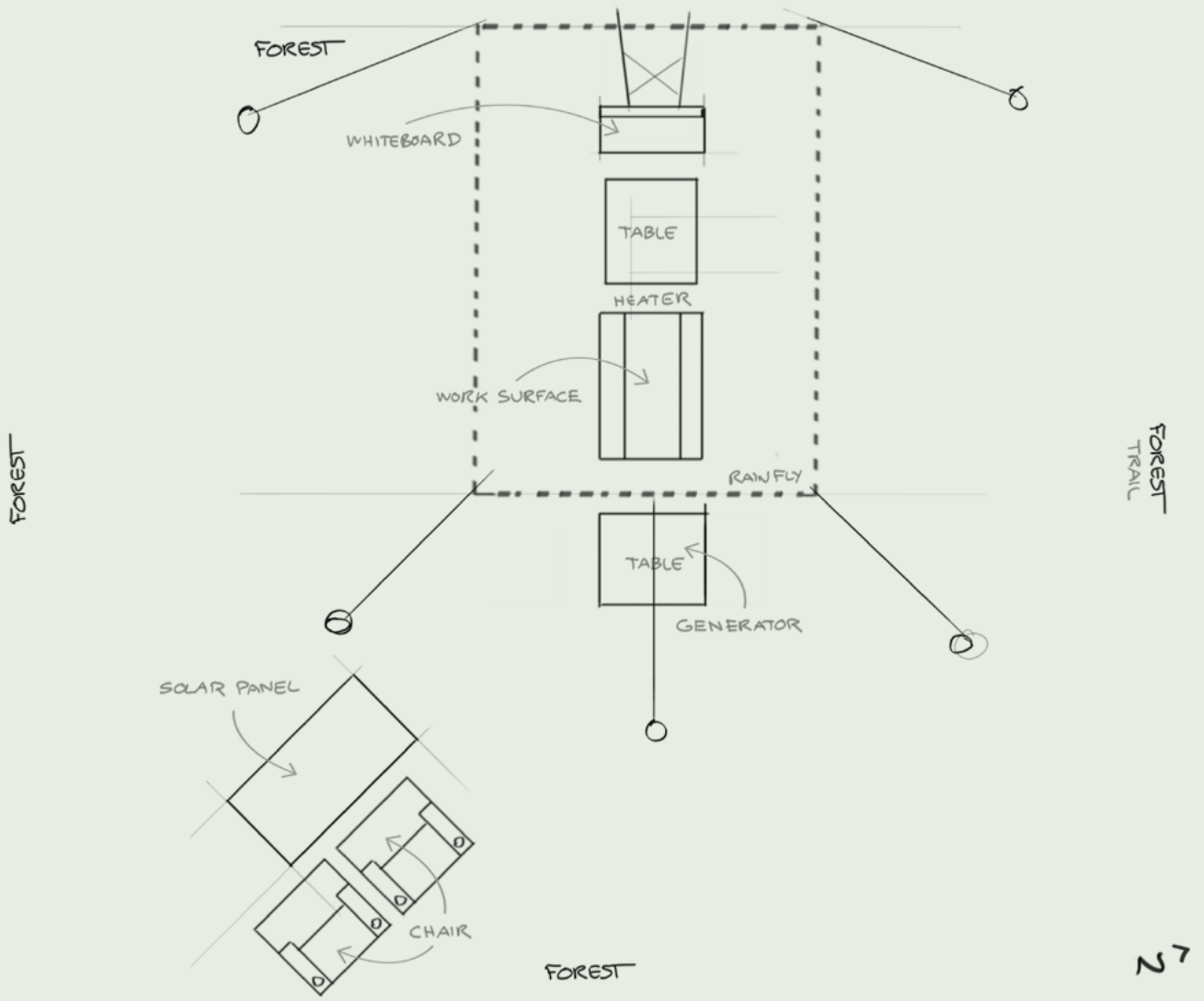


L



2 FIELD EXPERIENCE

After setting up the site, the research team completed a standing collaborative task to document the actual layout of the Ecotonal Office.



WHAT COULD IMPROVE YOUR EXPERIENCE?

C – More heaters, and optionality—the rain, or the potential of rain causes a closing off of options in terms of seating and siting.

L – Due to the condensed arrangement, I felt uncomfortable due to clutter and would like to find a way to simplify the equipment to make it feel more spacious and connected with the environment around me. This site had the most "architectural intervention" feeling to be because it was much more enclosed, and I did not have a clear view out to the environment.

C: Charles Fadem *L: Lisa K. Bambach*

Field Research

SUMMARY

LOCATIONS
4 sites

NATIONAL PARKS
2 parks

MILES OF DRIVING
1,042 miles

FLAT TIRES
2 tires

HEAT STROKES
1 gopro on ice

HITCHHIKERS
1 horn rimmed beetle

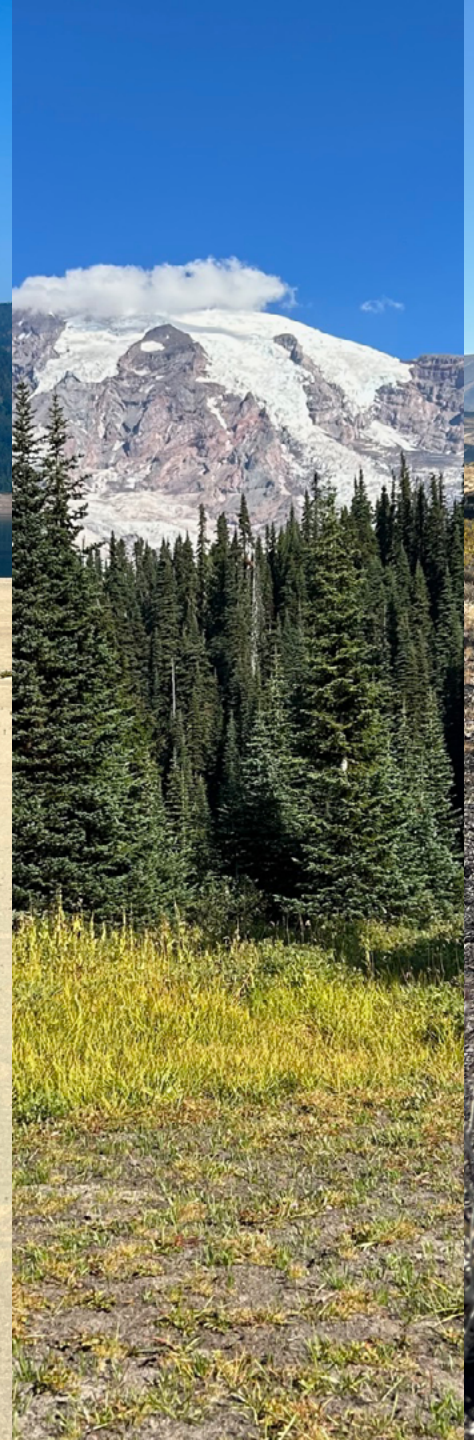
MARINERS HATS
3 hats

BROKEN EQUIPMENT
2 tables, 1 sunshade

ENCOUNTERS
1 nosey neighbor
2 park rangers

WIND DISRUPTIONS
7 video recordings

WASHINGTON, UNITED STATES



PREPARATION AND SITE SELECTION WERE THE MOST CRITICAL COMPONENTS OF A PRODUCTIVE, COMFORTABLE & SAFE ECOTONAL WORKDAY.

The Ecotonal Goldilocks Zone is the location where a technologically leveraged work environment can exist to support work output and wellness. A successful site selection ensures that the environment is respected, employees are safe, productivity is maintained, and comfort is achieved. Field research revealed several factors to consider when determining if a site location fits the Goldilocks Zone criteria:

- **Environment:** efficiency and physical safety
- **Inclusivity:** accessibility and psychological safety
- **Access:** proximity to resources and infrastructure, private or public ownership of land

ENVIRONMENT

The Ecotonal Office must consider strategies for site selection from the traditions of architecture, backcountry camping, and safety practices for outdoor work environments due to its integral relationship with the natural world. In combination, considering these traditions in site selection ensure comfort, efficiency, and safety.

Architectural practices vary throughout the world and are rooted in heritage. Author Michael Pollan, for instance, describes using approaches that range from the philosophies of 1st century BC architect Vitruvius, the traditional Chinese practices of fêng-shui and the modern theories of human habitation of Appleton and E.O. Wilson when he make considerations for the construction of his writing retreat (2008). What is common amongst all of these cultural traditions, however, is the structure's relationship to the natural world and rhythms.

No matter where on our planet a place is designated for human inhabitence, it is recommended that the structure's orientation to the sun and integration with climatic conditions must be considered. These factors have a significant impact on thermal comfort, wind management, and energy efficiencies. For example, Anselm (2006) explains that in a survey "buildings with an elongated east-west orientation, built virtually anywhere in the United states, will experience a 10% reduction in energy consumption compared to a square building, and a 20% energy reduction compared to a north-south building." In a setting like the Ecotonal Office, where exposure to fluxuating conditions is expected and resources are limited, simply considering orientation to cardinal directions can have a significant impact on comfort and productivity.

Backcountry camping practices intend to minimize risk to people and their impact on natural as they recreationally engage with the natural world. The Washington Trails Association (n.d.) and REI (n.d.) make the following recommendations for site selection:

- Review land management guidelines to ensure if permit or reservation is required and where campsites are prohibited
- Choose a flat, durable, compact surface away from fragile habitats—ecosystems may take years to recover
- Maintain a 200' distance from water sources, restrooms, and food storage
- Do not cut vegetation or damage the ecosystem to enhance the amount of space available, create windbreaks, or any other purpose

GOLDILOCKS ZONE (n.)
A habitable zone; a term traditionally used by astronomers to describe the habitable zone in which it is possible for life to exist, but in the context of the Ecotonal Office is the location where a technologically leveraged work environment can function in the outdoors
NASA, n.d.

- Strategically consider the wind to avoid bugs or position yourself alongside natural wind breaks
- Avoid low spots where stormy weather may cause flooding
- Strategically use the sun for warmth during the cooler parts of the day
- Follow the seven Leave No Trace principles to protect the natural environment and share its wonders with future visitors (2023)

Outdoor work hazard awareness keeps indivuduals who work in wild environments safe. In addition to Outdoor Heat Exposure Regulations (OSHA, 2023), the US Department of Labor (n.d.) notes several hazards to be aware of when working in the presence of trees. These types of hazards, which include but are not limited to lodged trees, widowmakers, and snags, are familiar to the logging industry, but apply to any work environment in which unmaintained trees are present.

LEAVE NO TRACE

7 PRINCIPLES

- PLAN AHEAD & PREPARE
- TRAVEL & SET UP ON DURABLE SURFACES
- DISPOSE OF WASTE PROPERLY
- LEAVE WHAT YOU FIND
- MINIMIZE CAMPFIRE IMPACTS
- RESPECT WILDLIFE
- BE CONSIDERATE OF OTHERS

FIG. 11
Leave No Trace
September 2023

"OF COURSE THERE IS MORE TO CHOOSING A SITE THAN ORIENTATION TO THE SUN [...] WHAT EXACTLY WAS MY PLACE IN THIS PARTICULAR LANDSCAPE?" — MICHAEL POLLAN, 2008

summary: site selection

INCLUSIVITY

The Goldilocks Zone is not only restricted by the technological bounds of service networks, but will vary from person to person based on the availability of accessible infrastructure and psychological safety.

Environments managed by the public sector, like the National Park Service, have policies in place to make their "facilities, programs, services, and employment accessible for visitors and employees with disabilities," including a strategic plan to improve access to facilities and our nation's stories across the country (2023). These policies include providing ADA compliant areas as well as spaces that aspire to maintain inclusivity for the entire public, like gender agnostic restrooms.

One's socio-cultural relationship with the outdoors can also vary greatly, impacting the sense of safety. Psychological safety is greatly impacted by place identity (Manzo, 2005), meaning that safety has just as much to do with social-cultural implications of being in outdoor environments as it does with ones' relationship to risk in those environments.

While the Ecotonal Office aspires to immerse people in the natural world to provide a wellness outcome, a positive experience cannot be universally guaranteed, even on public land which is ideologically intended to be universally accessible. A successful outcome is determined by the individuals who are utilizing the Ecotonal Office. Because personal needs and required accomodations vary dramatically, it is therefore the responsibility of the employer and employees to prepare accordingly, utilizing resources like national and state park websites to aid in site selection (National Park Service, 2023; Washington State Parks, 2023).

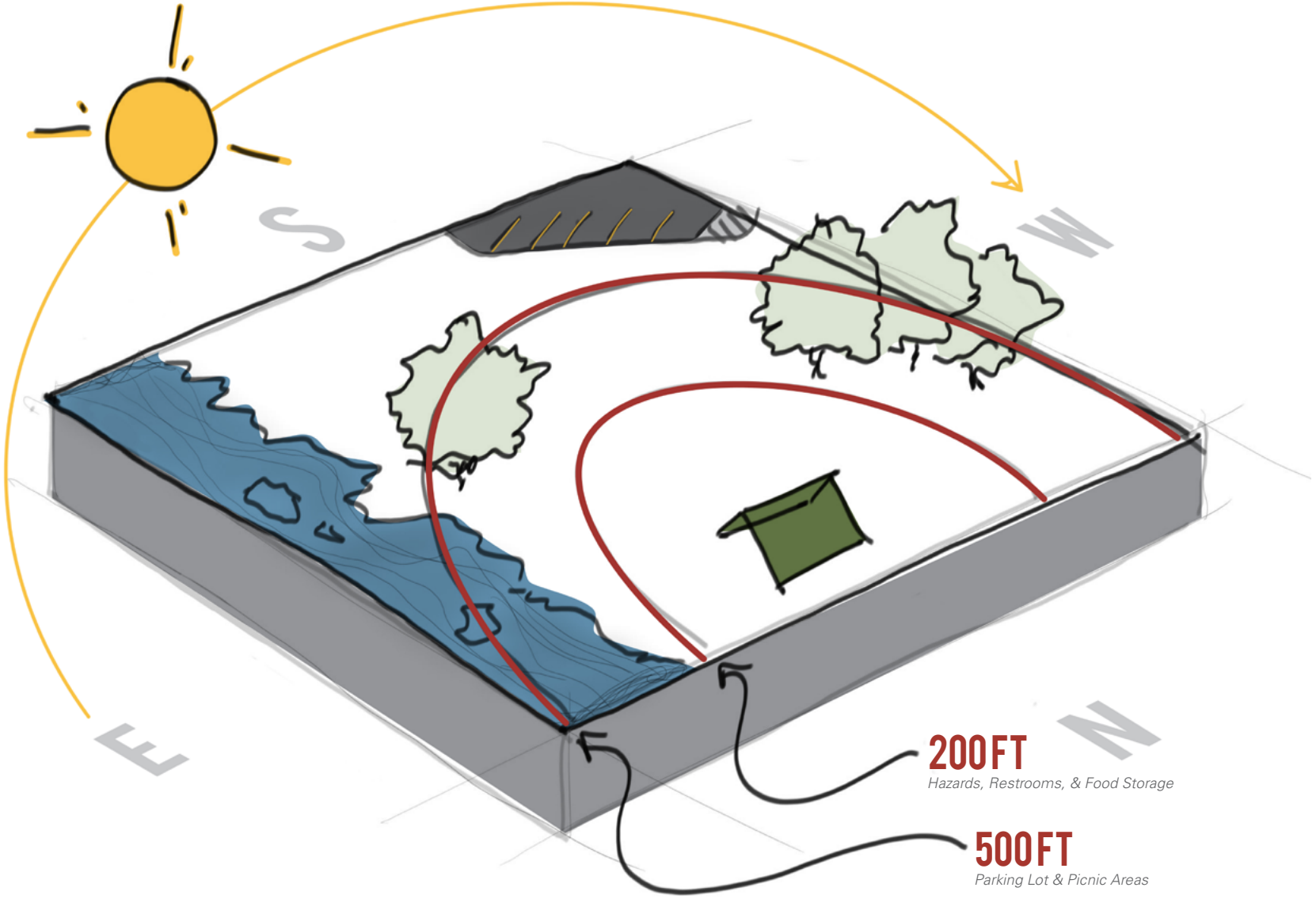


FIG. 12
Site Selection Recommendations

"ANY EXPLORATION OF PLACE AS A PHENOMENON OF DIRECT EXPERIENCE...MUST BE CONCERNED WITH THE ENTIRE RANGE OF EXPERIENCES THROUGH WHICH WE ALL KNOW AND MAKE PLACES." — RELPH, 1976 FROM MANZO, 2005

summary: site selection

ACCESS

The sites selected for field research tested the boundaries of connectivity and infrastructure, and revealed the importance of proximity and access. Conditions allowed the research team to identify pain points and make recommendations for an optimized site.

Although no emergencies occured during field research, it was acknowledged that proximity to communities with health care and supplies would be essential should a team member befall injury or illness. It is the responsibility of the employer to determine how much risk they are willing to assume by defining the distance from emergency centers which their employees are required to be.

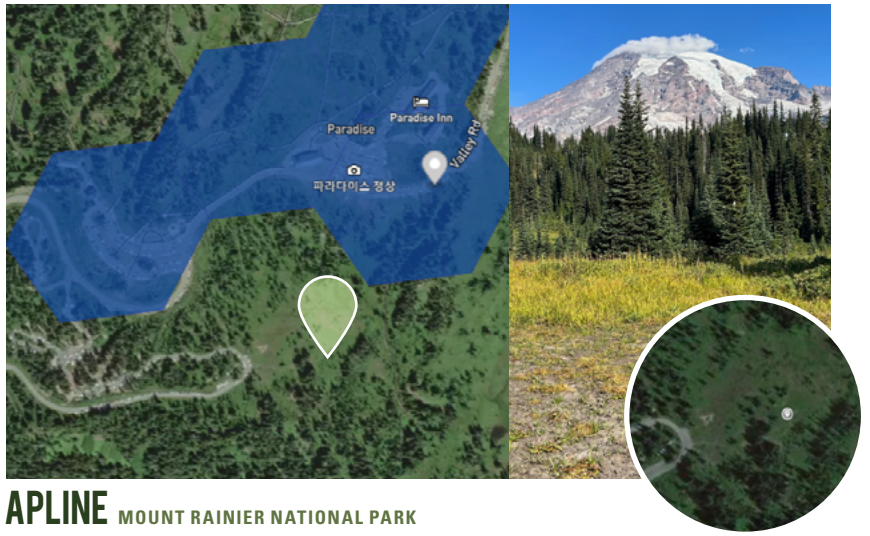
Goldilocks Zone sites are also recommended to have existing restrooms and potable water to ensure that basic human needs are met. While it is possible for individuals to engage in wilderness activities without these resources, the nature of the Ecotonal Office as a work site requires that these infrastructure elements are available to employees during their workday.

Access to infrastrucutre is also critical for basic workday productivity. When relying on 5G internet access, it is recommended that potential site locations are identified using the Federal Communications Commission (FCC) website (2023) to ensure connectivity. If connectivity is not available, it is recommended that the workday is structured around in person collaboration and offline applications are used while working and synced upon returning to an internet connection to avoid loss of data. Satellite internet access is also an option when working in remote areas.

TEMPERATE CLE ELUM LAKE

Distance from Vehicle ~700ft

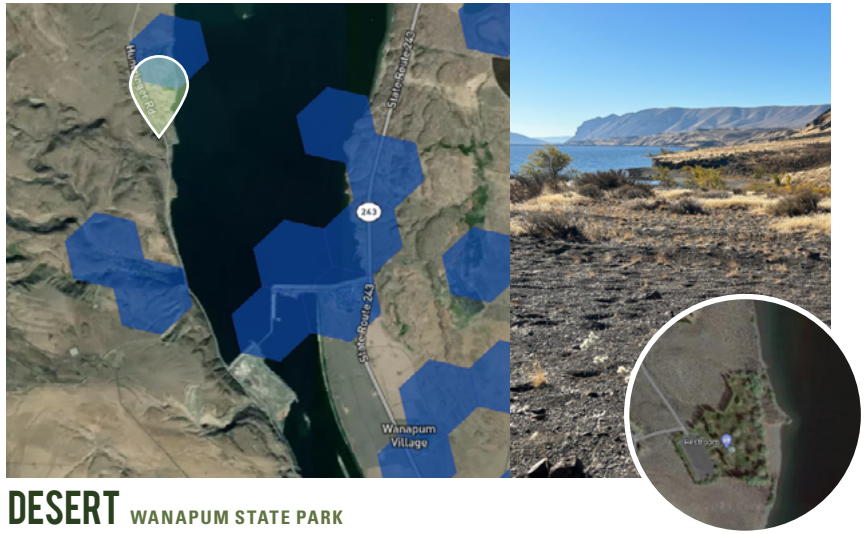
5G Service No



APLINE MOUNT RAINIER NATIONAL PARK

Distance from Vehicle ~670ft

5G Service Yes



DESERT WANAPUM STATE PARK

Distance from Vehicle ~300ft

5G Service Yes

RAINFOREST OLYMPIC NATIONAL PARK

Distance from Vehicle ~20ft

5G Service No

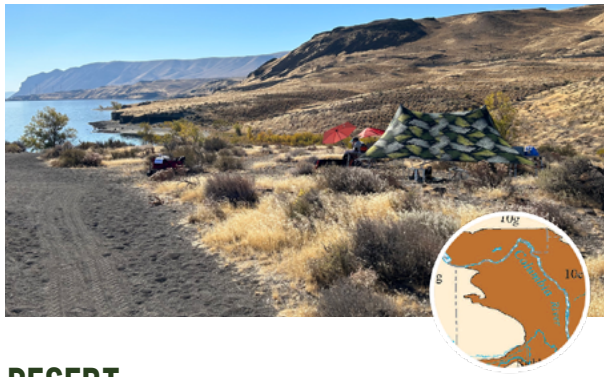
FIG. 13
Final Project Site Selections
Maps from the FCC, 2023

TEMPERATE CLE ELUM LAKE

Flexibility was crucial due to the heat and constantly changing shade patterns caused by the sun's movement. This necessitated **frequent repositioning** of our work surface. We had to regularly reapply sunscreen and **strategically organize our supplies** in the shade, which affected the placement of our equipment. This site presented the largest learning curve, extreme environmental stressors, and was the least productive.

APLINE MOUNT RAINIER NATIONAL PARK

With a better understanding of the sun's movement, we **improved the arrangement** of our site. We also purchased new camping tables, which faired better on **uneven terrain**. Our foresight in **anticipating wind conditions** resulted in more effective anchoring methods. By addressing the equipment and environmental challenges encountered at the first site, we were able to significantly **boost our productivity**.

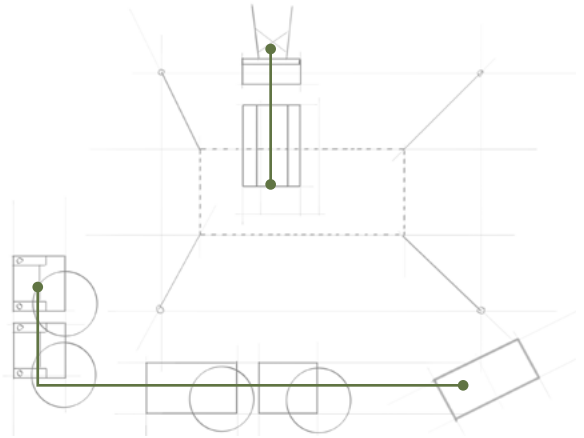


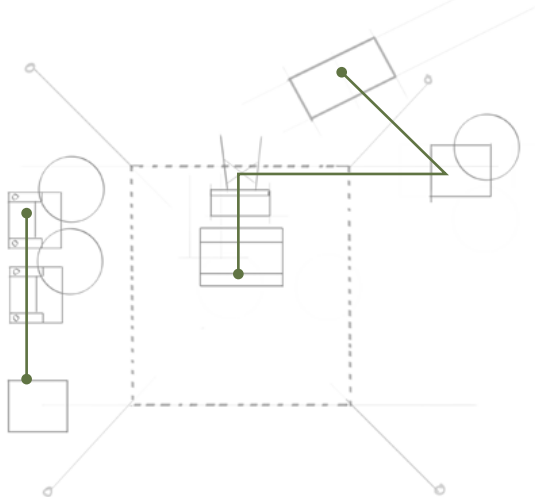
DESERT WANAPUM STATE PARK

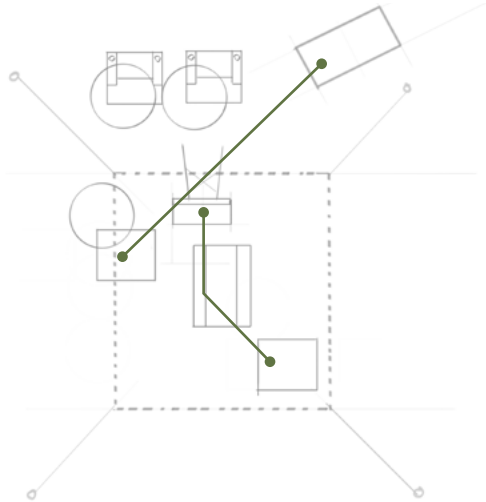
We anticipated challenges like intense heat and dryness, but we encountered the unforeseen issue of soft ground. This combination of conditions made the relocation of equipment a delicate process, and resulted in **a compact arrangement that reduced the need for adjustments.** By avoiding dehydration, exhaustion, and the need to re-anchor the sunshade, we learned that **wellness is closely linked to the simplicity and efficiency of the office** layout.

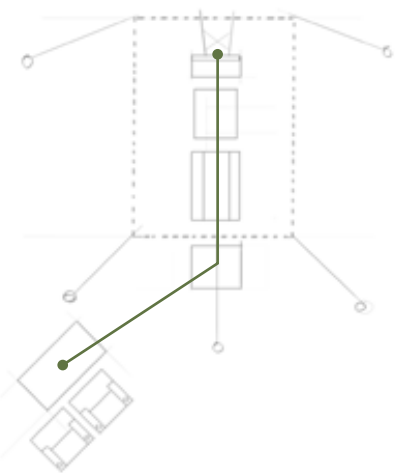
RAINFOREST OLYMPIC NATIONAL PARK

Maintaining **warmth and dryness for both people and equipment** is crucial for comfort and productivity. This necessity lead to a **highly compact arrangement** of equipment along a central axis under the rain tarp, creating a "spine" of productivity. This streamlined layout addressed immediate environmental challenges and offered additional insights regarding **equipment and technology integration** due to their proximity.





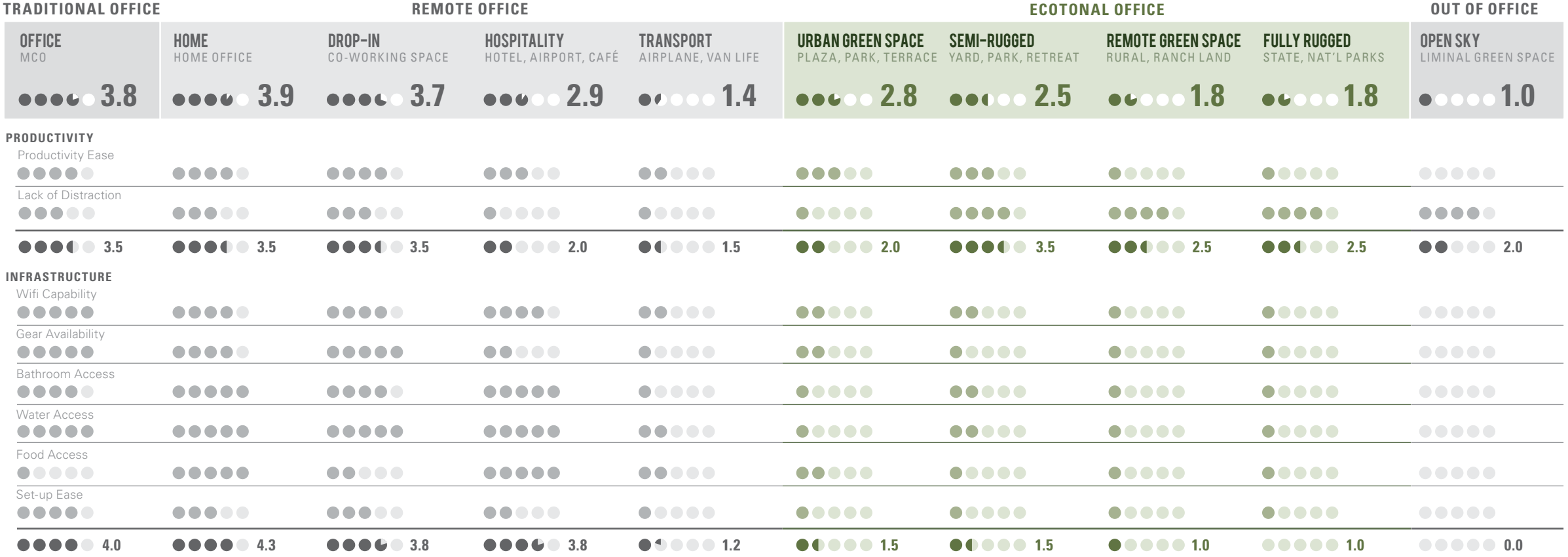




WORK OUTPUT SCORE - +

Work output scores reflect the amount of effort required to achieve productivity and comfort to complete work-related tasks.

FIG. 14
Work Output Scores for Each Site Typology



summary: site typologies

WELLNESS SCORE - +

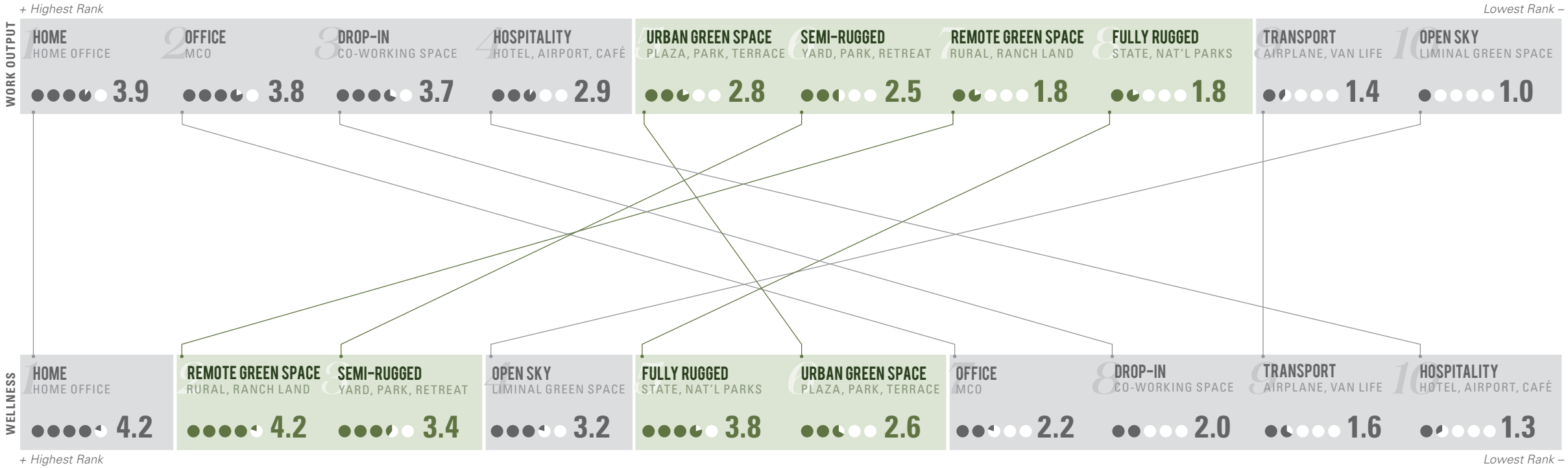
Wellness scores reflect access to the benefits provided by a direct relationship to the natural world.

FIG. 15
Wellness Scores for Each Site Typology

RANKED WORK OUTPUT & WELLNESS SCORES

By organizing each site typology into a ranked diagram for work output and wellness, opportunities for design interventions can be identified to improve the overall experience.

FIG. 16
Ranked Work Output & Wellness Scores



The **Home Office** is already providing the best work output and wellness environments, consistently ranked with the highest scores in both categories.

While optimized for work output, the **MCO** scores the fourth lowest of the wellness environments.

THE ECOTONAL SHIFT

Site typology rankings reveal that the Ecotonal Office environments are already providing high wellness experiences through their inherent exposure to the natural world and can be most improved through productivity interventions. This would make outdoor work environments competitive with home offices and other indoor environments that are favored by the business community due to their high work outputs.

TOTAL WORK OUTPUT & WELLNESS SCORES

By organizing each site typogoly into a ranked diagram, the sites that are most advantageous for both work output and wellness are revealed.

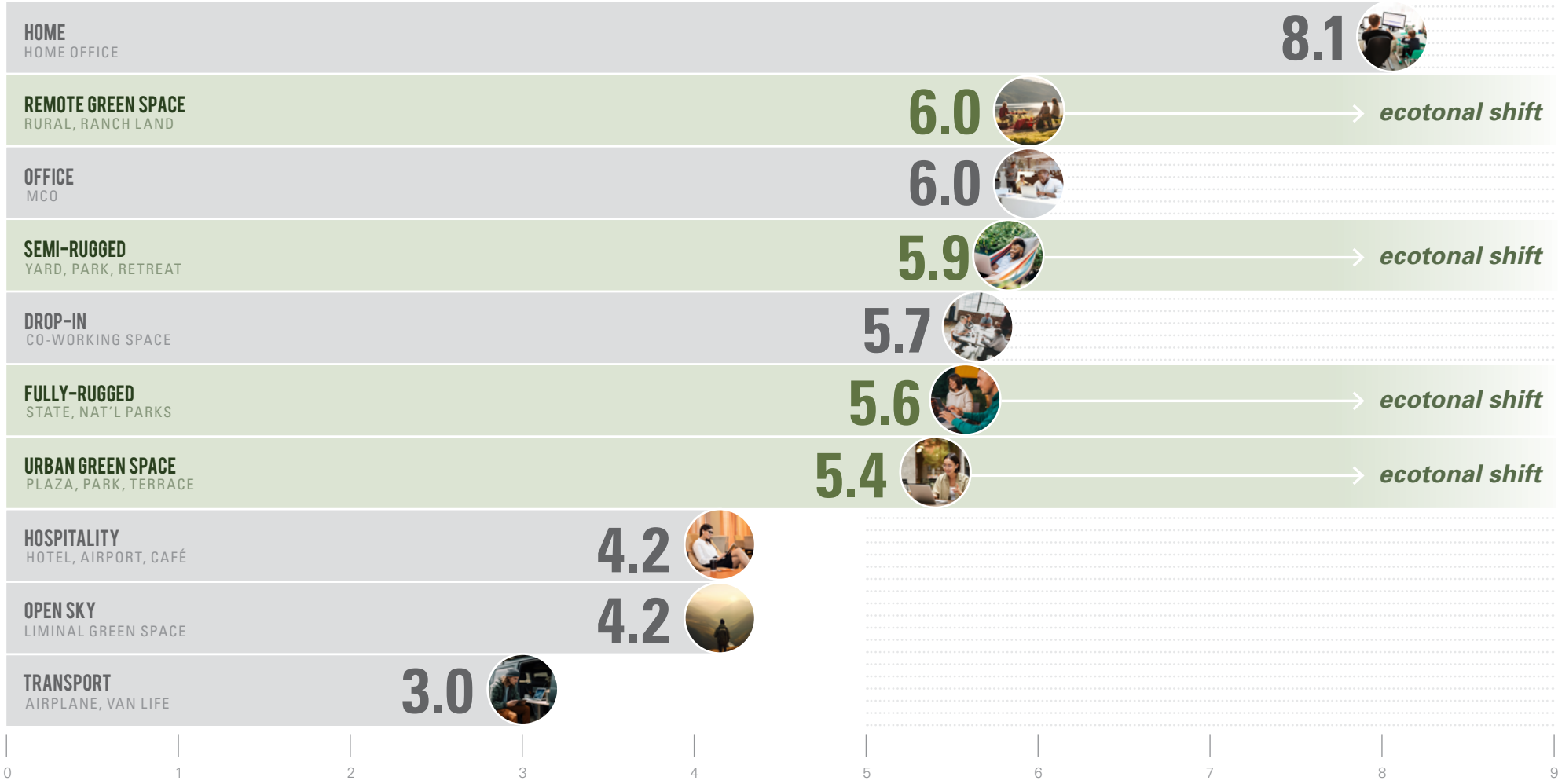


FIG. 17
Ranked Work Output & Wellness Scores

THE ECOTONAL SHIFT

When work output and wellness scores are totaled for each work environment, all Ecotonal Office sites remain competitive with traditional indoor office environments. Already ranked with high wellness scores, these outdoor sites offer the most opportunity for improving work output through the design of a productivity structure—**the Ecotonal Office.**

MCO and **Drop-In** sites also have the opportunity to be more competitive with the **Home Office** via the prioritization of wellness design throughout the entirety of the built environment. These spaces rank low due to the consideration of wellness as a harm reduction strategy rather than integral to the indoor office environment experience.

CONCEPTUALIZATION

"Work should invigorate us, not drain us. The same goes for our designed environment. The natural world is an endless source of recharging, I hope we can help people plug back in."

CHARLES FADEM, 2023

A STRUCTURE THAT ENHANCES COMFORT AND PRODUCTIVITY FOR BOTH PEOPLE AND OFFICE TECHNOLOGY TO PROVIDE AN OPTIMAL WELLNESS EXPERIENCE .

By enhancing productivity and comfort, the Ecotonal Office makes outdoor work environments viable for everyday office work. Literary and travel research defined the following constraints for designing the Ecotonal Office:

4 PERSON TEAM

Collaborative experience that can be shared with others to build team comaraderie and **practical** for carrying equipment to site.

TYPE I FUN

Individuals who are willing to **engage in a minimal amount of exertion and discomfort** in order to gain a greater wellness impact.

WASHINGTON STATE

Informed by ecoregions within the state of Washington with opportunity to test in additional climate zones beyond the state.

DIRECT INTEGRATION

Direct relationship with biophilia and the vistas that **inspire awe and provide wellness benefits.**

PRODUCTIVITY

COMPUTING	INTEGRAL	SEPARATE	NOTES
Laptop	○	●	*Provided by employer*
Cell Phone	○	●	*Recommend fully-rugged laptop and/or protected in case*

POWER	INTEGRAL	SEPARATE	NOTES
Pre-Charged Generator	●	○	*Recommend pre-charging generator before going to site*
Solar Panel	●	○	*Cable management system required within structure to keep equipment out of dirt*
Extension Cord	●	○	*Solar panel built into structure*
Outlet Tree	●	○	

CONNECTIVITY	INTEGRAL	SEPARATE	NOTES
5G Router	●	○	*Must be in Goldilocks Zone*

LIGHTING	INTEGRAL	SEPARATE	NOTES
Telescoping Lights	●	○	*For work surface and whiteboard*

COLLABORATION	INTEGRAL	SEPARATE	NOTES
Projector	●	○	*Combine projection surface and whiteboard to minimize equipment needs and weight*
Projection Surface	●	○	*Provide black out element in shelter to improve visibility of projection*
Whiteboard	●	○	

FURNITURE	INTEGRAL	SEPARATE	NOTES
Work Surface	●	○	*Use work surface to manage cables and provide structural support*
Storage Table	○	●	*Storage table for food and additional office equipment provided by end user as needed*
Storage Table	○	●	

COMFORT

SHELTER	INTEGRAL	SEPARATE	NOTES
Rainfly	●	○	*Combine all overhead shelters into single element, including a black out material for projections*
Adjustable Umbrella	●	○	*Shelters pivot to adjust to sun and wind*
Landscaping Tarp	○	○	*Tarp for ground not required due to cable management within furniture*
Sunshade Canopy	●	○	

HEATING & COOLING	INTEGRAL	SEPARATE	NOTES
Heater	○	●	*Provided by end user as needed for ecoregion conditions*
Fan	○	●	*Electric compatible with generator*

FOOD & BEVERAGE	INTEGRAL	SEPARATE	NOTES
Cooler Backpack	○	●	*Food provided by end user as needed*
Water Jug	○	●	*Recommend to choose site with potable water*

RESTROOM	INTEGRAL	SEPARATE	NOTES
Privacy Shelter	○	●	*Recommend to choose site with infrastructure, such as outhouse*
Portable Toilet	○	●	

LOUNGE SEATING	INTEGRAL	SEPARATE	NOTES
Chairs	○	●	*Provided by end user as needed*
			Recommend chairs with shelter

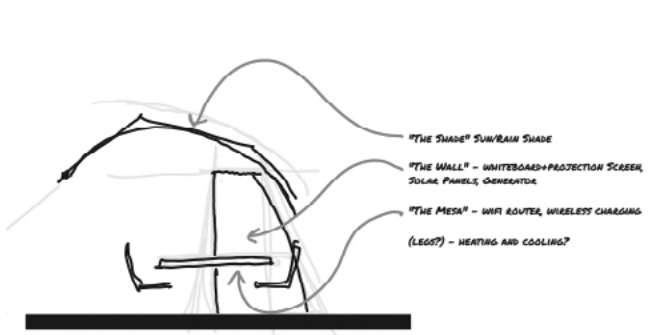
STRUCTURAL NOTES

- Not enclosed to maintain vista and direct engagement with natural environment
- Installed on a natural surface that is level and compacted
- Does not have a solid floor to prevent damage to ecosystem
- Flexible to adapt to site and sun conditions, but stable and secure to manage wind
- Fold to be carried on back or slung over shoulder from vehicle at ~500ft distance or less

ADDITIONAL CONSIDERATIONS

- Affordability
- Ease of setup to minimize learning curve
- Physical safety
- Aesthetics and tactility
- Rugged capabilities

"ONE OF THE GREATEST OUTCOMES OF THIS RESEARCH PROJECT WAS THE SHARED EXPERIENCE. THE ECOTONAL OFFICE NEEDS TO BE MADE FOR THE CONNECTION TO NATURE AND OUR TEAMS." — LISA K. BAMBACH, 2023



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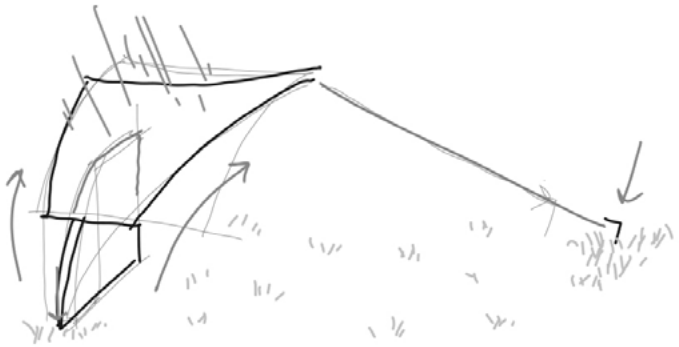

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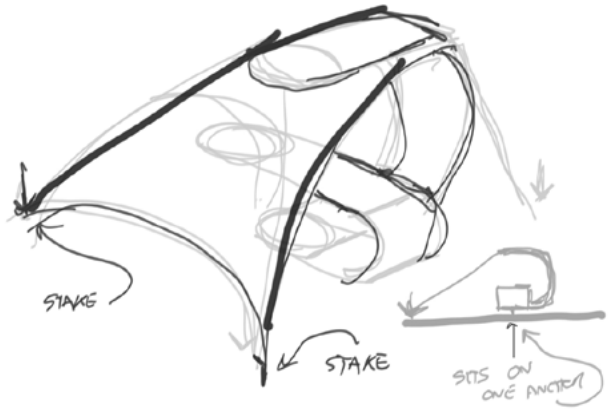

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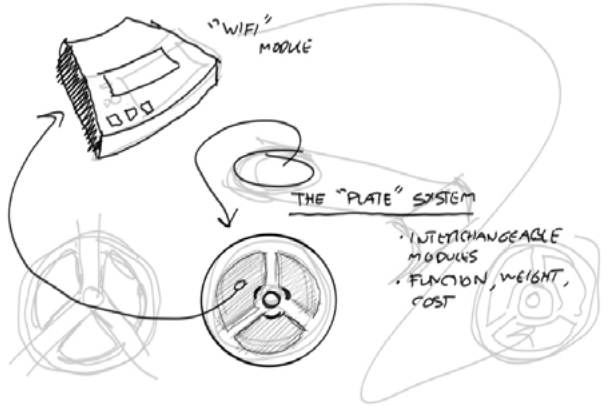

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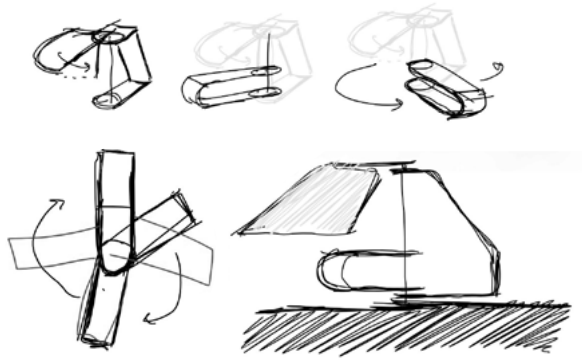

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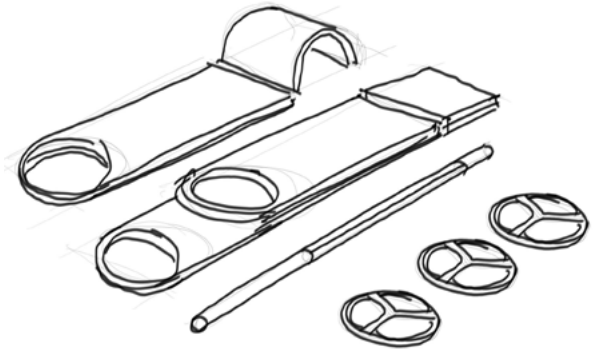

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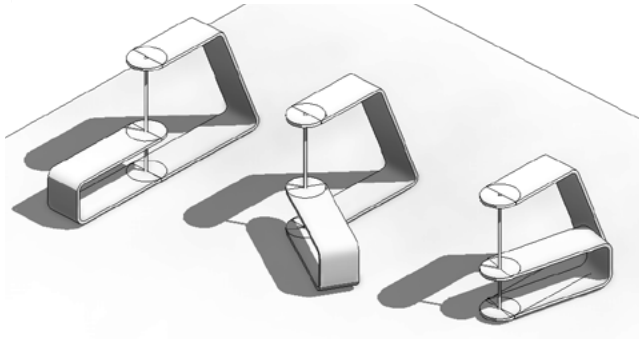

8

1 – Starting with a sectional extrusion, we slowly developed an armature that looked like the sail of a ship. This led to a study of anchoring methods for sails.

2 – The "sail" idea reached diminishing returns. The tri-anchor approach could not sufficiently protect the horizontal work surface below while maintaining a comfortable clearance height. The raising and dousing of the sail would conflict with the vertical structure.

3 – The breakthrough: an inexpensive USB charger had a single-pivot structure, which provided a cover for the stick and swung 360°. This type of movement and pivot enabled a desk or tarp to adjust to the movement of the sun.

4 – Two interlocking "C" shaped elements evolved into a structure and work surface. The shelter could pull down from above, but presented some early feasibility problems. We focused on what was working in the sketch for development.

5 – The circles at the center of the pivot evolved into a "plate" system. Technology modules could connect to power and swap out to support worker preferences. Heavier structural plates separate from the overall structure could provide steadiness, balance.

6 – The final hand-rendered sketches studied motion. The pivoting element and overall form began to evolve into something more simple and elegant.

7 – The design was simplified to 3 "plates," a "pivot" pole, a desk, and a vertical "ironing board." The density could be consolidated in the plates, and the body could be made out of durable, rugged, lightweight recyclable plastic

8 – The 3D model proved the concept. The desk rotated under a shade and, if sited properly, would rotate throughout the day to avoid the sun's path, making productivity and comfort possible.

ECOSTATION 1.0

SHELTER
Retractable and adjustable combination sunshade + raintarp

FURNITURE
360° rotating 4-person desk

Fully-rugged polypropylene body made from 100% recycled material

Built-in wireless charging for entirely of work surface

Stabilization via adjustable rugged legs at corners for non-level surfaces

STORAGE
Dry storage area

SHELTER & LIGHTING
Central pivot pole with ground anchoring system and integrated 360° LED lighting element

STORAGE
Fold-out supply shelf

SHELTER
Adjustable tension joints

POWER
Adjustable, lightweight, pop-out solar cell panel

COLLABORATION
Combination whiteboard + projection surface *or* fully-rugged touchscreen display

FOOD & BEVERAGE
Combination food storage + worktable

POWER & CONNECTIVITY
Technology plate system with interchangeable modules to adapt to team comfort and productivity needs and remote work duration:

- 5G or satellite wifi
- Heating & Cooling
- Rechargeable batteries
- USB & Power outlets
- Weight for wind stability

APPENDIX

*"Nature is **the most information-rich and intellectually stimulating** environment that people ever encounter."*

KELLERT, HEERWAGEN, & MADOR, 2013

LISA K. BAMBACH

SENIOR EXPERIENTIAL DESIGNER
MASTER OF DESIGN CANDIDATE, UW

Lisa K. Bambach *(BS Graphic Design, University of Cincinnati)* is a designer and educator from Cincinnati, Ohio. As an experiential graphic designer who specializes in workplace and urban design, Lisa enhances interaction with physical spaces by integrating narratives and navigation cues into the environment. Whether working within the private or public sector, she aspires to build collaborative environments that promote discourse and build relationships.

CHARLES FADEM

SENIOR DESIGNER

Charles Fadem *(B. Arch, Cornell University)* is an architectural designer with a focus on lifestyle and commercial interior design. With over 20 years of experience, Charles has developed a unique ability to create narrative driven design, creating spaces that tell a compelling story. His work is characterized by a meticulous attention to detail and a deep understanding of the latest trends in design and sustainability. Beyond his professional pursuits, Charles is an avid comic book restoration enthusiast, a baseball aficionado, and enjoys meditative practices that contribute to his holistic approach to both life and work.

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The ONEder Grant Program by One Workplace supports new or evolving research into how design influences the human experience. By empowering architects and designers to explore the impact of design on environments that shape us, we help to uncover new perspectives on engagement, technology, design, wellness, network science and ESG applied to the workplace.

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The use of artificial intelligence large language models for this project was restricted to grammatical editing recommendations and was not utilized to generate new concepts, research, nor citations.

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