Unearthing the Palouse Topography:
Reconciliations of constructed flatness and natural slope

Introduction by Paul Hirzel
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The provocation for this study by 8 Washington State University graduate architecture students, is the accelerating degradation of an extraordinary contoured landscape called the Palouse through building construction. Located in southeastern Washington State this remarkable topography has been a draw to artists, photographers, (see Figure 2) tourists, and geologists for many decades, and considered by many as one of the most beautiful landscapes in the world – featured in *The Most Beautiful Places in the World* by Jay Maisel. Covering a land area of approximately 4000 square miles (the size of Connecticut) this mountain girdled prairie resembles an ocean of rolling hills, "a rough sea at the height of storm" notes Alexander McGregor in the book *Palouse Country* (see Figure 1). This unique topography is the result of a traumatic geological history beginning 12 million years ago – first, massive lava flows inundated all but the highest peaks (Kamiak and Steptoe Buttes) resulting in the thickest basalt layers in the world. Then southwesterly winds carried rich silt from the Pasco basin to form top soil dunes resembling waves of up to 200 feet thick. These spectacular geological events produced topography that David Alt, in his book *Northwest Exposures*, calls one of the "strangest of western landscapes." The Palouse embodies a landform type where, he continues "the logical continuity of an erosional landscape is missing. Hills do not continue into ridges, and the valleys do not connect into an integrated network of streams".

The Palouse landscape is a sprawling plain of "gigantic earthen dunes connected by twisting benches, amphitheaters, and saddles" notes another Palouse author Richard Scheurman in his book *Palouse Country*: *A Land and Its People*. Inspired by this remarkable landscape and distressed by it continuing destruction, the students were first presented with the task of analyzing the current conditions. Using the community of Pullman at the local scale and Whitman County at the regional scale for case studies, the students first inventoried examples of recent building construction which (to varying degrees) overwhelmed the native slopes of the Palouse by flattening - cutting, filling, and retaining (see Figure 3). They discovered that early building construction in the Palouse was far more sympathetic and respectful of the existing topography (perhaps because of limited excavation options. Towns were located in the flats near rivers and streams and farms were located in the valley folds for protection from the winds. This produced a more congenial relationship between the human need for flatness and protection and the preservation of the natural slopes of the Palouse. Unfortunately, as new excavation equipment and advancements in explosives made earth moving more economical, combined with population increases, both housing and commerce spread onto the adjacent hills – flattening the contours for parking lots, big box stores, an housing developments (see Figures 3 and 4). The availability of low cost air conditioning, insulation improvements, and high performance siding and roofing made it more feasible to locate your house anywhere – people felt sheltered by the house structure itself and no longer used the topography as a means of protection. Houses started to be located on ridgelines to enjoy the view (see Figure 5). Driving through the Palouse, one can see the contrast between the early farmsteads, carefully hidden in the protective folds (see Figure 6), and the new housing, precariously perched on ridgetops and windward faces.

Figure 1

The Palouse country today. Photo courtesy of The Palouse Country: A Land and it's People, by Richard Scheurman

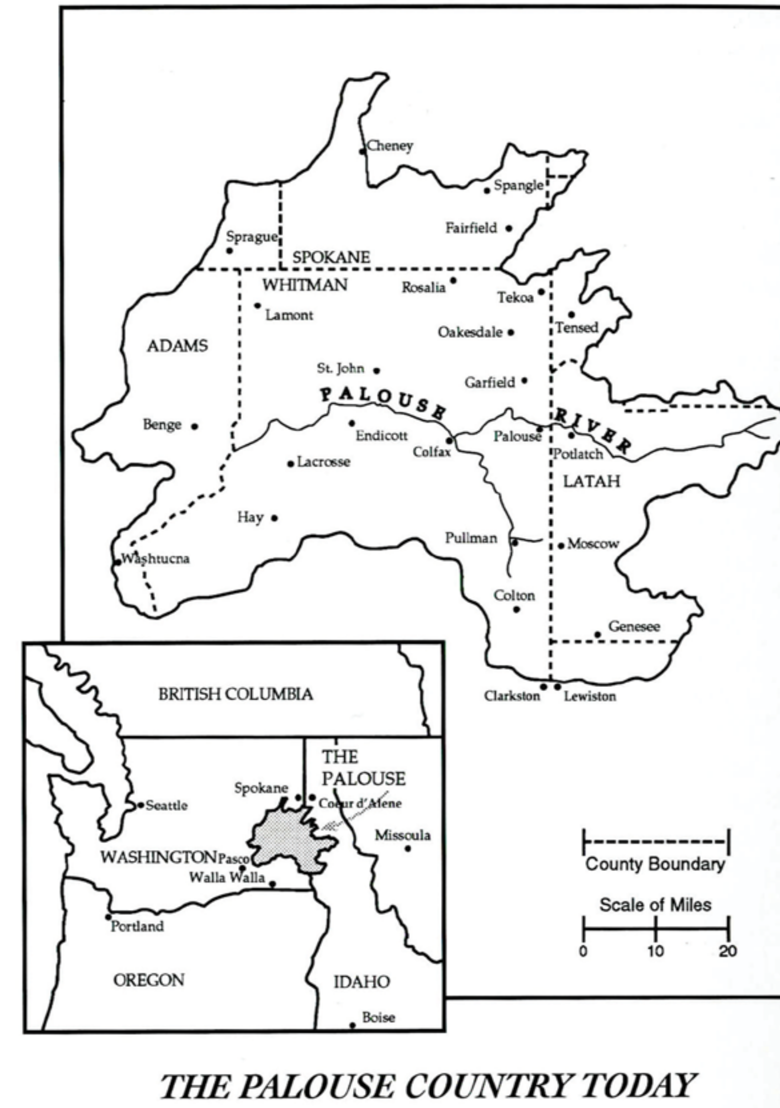

Figure 2

Photographing the Palouse, Photo by Scott Stulberg

Following their inventory analysis, students developed proposals to reconcile this difficult conflict - our desire to make the world flat in a landscape of rolling hills “at the height of storm.” They “unearthed” ways to both preserve this iconic heritage of topography and respond to life in a world of shopping carts, wheel chairs, and cars. Matt Bardon looks at bringing miniature examples (inspired by Japanese gardens) of the Palouse topography to the university campus to create an enticing topographic pathway to connect downtown Pullman with the summit of campus. Lauren Cherry looks at how a big box store might be redesigned from one level to two– reducing land area requirements for parking and commercial space by half to save money and preserve farmland. Plus it provides the added benefit of improved cardiovascular health from stair climbing – getting your work out shopping, versus using the Stairmaster at the gym. Samantha Stanfield challenged the idea that we love flatness. She argues that we secretly love slope, referencing fashion examples such as high heel shoes - which allows one to carry slope with you. Her invention was a topographic flooring system that can transform your banal flat floor into sensuous hills and valleys. Josh Neumann reveals natural flatness in the Palouse with a series of interventions that use light, plastic tubes, chairs, tie down straps and anchors, and imagination to create secret flat places to wander in the Palouse countryside.

Figure 3

Demolition of the contour. Photo courtesy of Google Earth

Figure 4

The scars left behind by big box stores. Photo by Lauren Cherry

Figure 5

Building on the ridgelines. Photo by Jose Hurtado

Figure 6

Building in the folds

Kevin Jones uses the potential energy of slope and rainwater to design housing that uses rain to power micro turbines. Multiplied - a sloping housing subdivision creates community by sharing power. Xixi He brings an international perspective to the problem by using the ancient traditions of Feng Shui to reconcile slope and construction. She considers the continuity and disruption of the dragon veins of Qi, to envision a Pullman that maximizes “harmony with nature”. Finally, Jose Hurtado and Ashley Swanson, taking a more pragmatic view, researched slope preservation strategies from other regions in the United States. From regulations to prevent sky lining (building on ridgelines) to limits of building footprint size and contour modifications, they make a series of recommendations as to how Pullman and Whitman County governments might encourage future protection of our iconic natural slopes. In closing, it is our hope that these essays will provoke dialogue about how we might better protect the beauty of the Palouse topography and, at the same time, recognize our desire for flatness – we are always searching for “the path of least resistance”. This effort is not a “either/or” but a “both/and” proposition. If these imaginative and heartfelt perspectives add to this discussion, this effort will be considered a success.

Miniaturizing the Landscape by Matthew Bardon

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This study focuses on the iconic landscape of the Palouse, and how specific architectural elements can respond. Understanding how the Palouse turned into the iconic topography that it is today leads us into a geologic study of the Region. The windswept formations are explained in order to grasp the geometric arrangement. This leads into a digital analysis of the Palouse and it's contours. Isolating certain recurring topographical features, we can further our understanding of the dynamic nature of this landscape. These typologies were then documented and analyzed in 3D. The importance of flatness in the human condition means grading is investigated in order to provide one way in which architecture can interact within topography. With this investigation, a new way of incorporating topography into design is explored: miniaturization. In an effort to build a relationship between the iconic landscape of the Palouse, and Washington State University, the design proposal will create a series of urban interventions set around campus that reference the topographic typologies of the Palouse. In the end, we will reflect on the architectural potential of miniatures.

Figure 1 (next page)

These landscapes have all been formed with the same loess soil as the Palouse. This Loess soil is a result of glacial silt that was blown onto the landscape and settles. The wind continues to erode the glacial silt creating rolling hills as we observe in these areas of the world. Photos: Google Earth Database

Figure 2

The majestic rolling hills of the Palouse inspired a study into the causes and the effects that this iconic landscape can have within design. Photo by Author

The Palouse is a diverse mosaic of topographic conditions formed by some of the most catastrophic geologic events on record. Lava flows, volcanic eruptions, glacial floods, and wind swept loess dust have created the dynamic topography that is the Palouse.[1] This Loess soil is responsible for the formation of similar hills in other parts of the world as seen in Figure 1. The Palouse is defined as the area to the east of the Columbia Plateau that sits on an ancient basalt that rises into the foothills of the Rockies. The most iconic feature of the Palouse are the majestic rolling hills. These hills are comprised of a fine grain silt, or loess, that sits on top of the basalt bedrock. The hills form a wind-based pattern when observed as a system. The windward side to the south of the hills gently slope, while the leeward side to the north is considerably steeper.[2] The Palouse is a complex network of sloping features acting as a system. The hills of the Palouse are dune-like, but a network of crests emerges to connect them. These crests can be spotted from photographs of the Palouse, as seen in Figure 2. Using 3D mapping I have identified ten different topographic conditions on the Palouse to be used as a portfolio of recurring typologies within the Palouse. These areas within the landscape will provide the samples necessary for a digital analysis. This exploration led into a documentation of how slope begins to inform architecture, and how these topographic features have been conditioned for human habitation. This attitude towards the contour changes the landscape for human development. Relating architecture to topography is something that we continue to struggle with, and this analysis provides other ways for architecture to relate to the iconic landscape of the Palouse.

The Palouse is one of many Loess formations around the world that exhibits rolling hills. Loess is windblown silt made up of clay, sand, and cemented by calcium carbonate. It is a siltlike substance that can be found all over the world, as seen in the photos in Figure 1. Loess, the word itself, comes from the German word Löß which translates to loose, describing soil conditions in the fertile Rhine Valley.[3] The dune-like formations of the Palouse can be attributed to this silt that is constantly eroding at the mercy of the wind. These samples display a pattern of erosion present within the Palouse topography, as a result of wind and water erosion. There are ten digital samples of the landscape that have been compiled to display the complexity of the Palouse landscape (see Figure 4).

Figure 3

10 samples were taken from Google Earth, and by using 3D modeling programs converted into 3D topographic regions

Figure 4

1. The Snake River exhibits the typology of the gully, which drain water down into the river. 2. Kamiak Butte exhibits the Butte typology, and possesses a discernible leeward and windward side like the rolling hills 3. This flood plain south of Colfax displays both the valley typology as well as the rolling hills surrounding it. 4. This area above the Snake river represents the typology of the gully. 5. This area of the Palouse displays both the rolling hills as well as the connected crests. 6. This sample at the base of Moscow mountain represents the crest. 7. This area near Palouse represents the typology of the valley, hill, and crest 8. Pullman sits within a the typology of the Valley among three hills. 9. This area near Uniontown represents the Butte typology. 10. This area on the way to Wawawai landing displays the valley typology.

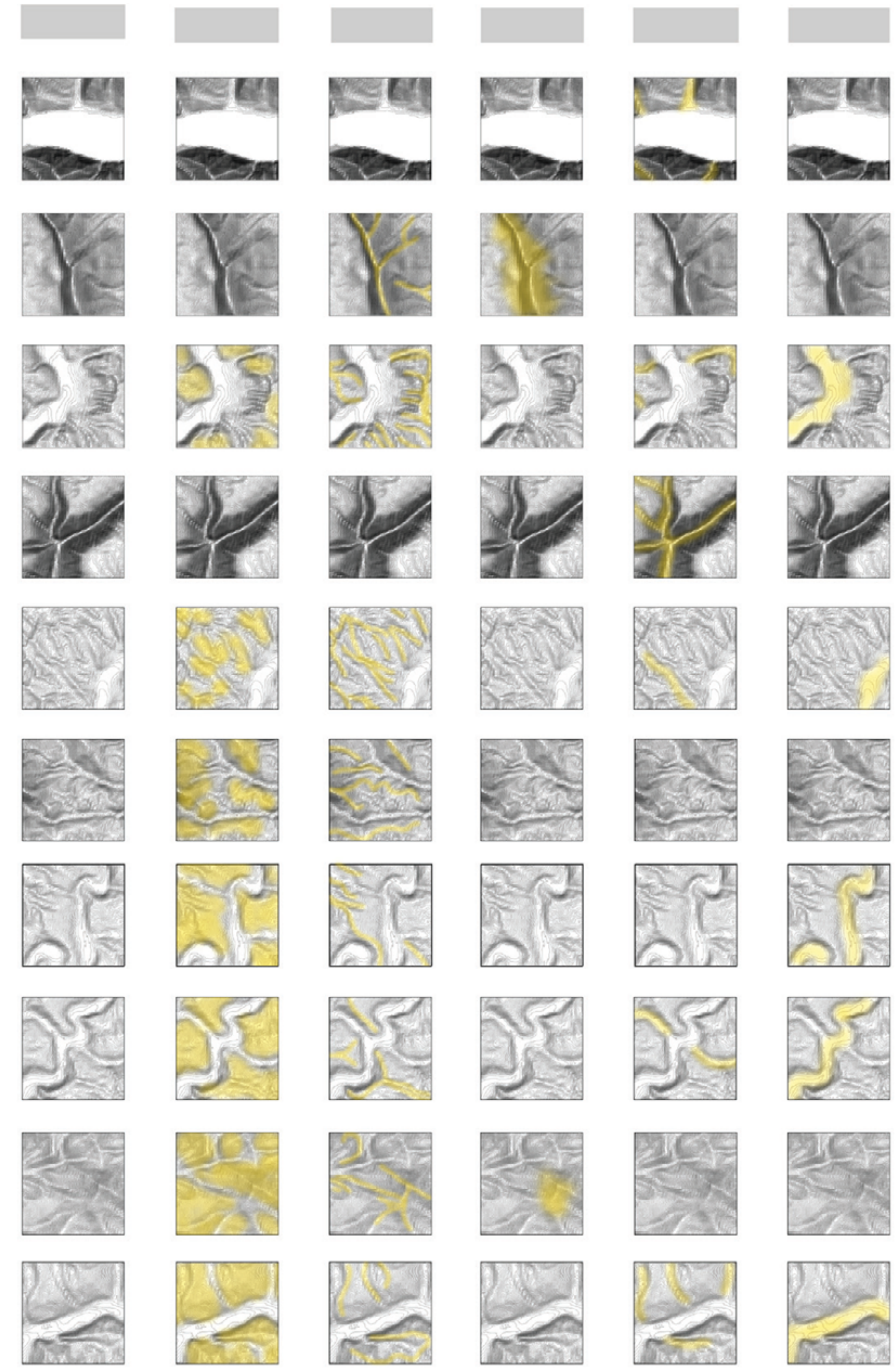

Figure 5

The ten samples inform the five typologies by using color mapping of the slope conditions in order to pinpoint the topographic typologies. The yellow areas show how these typologies can sometimes overlap.

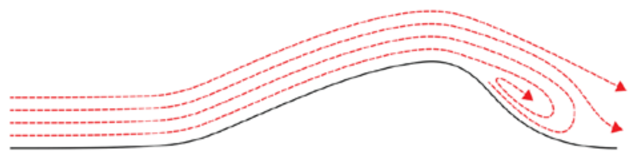

Figure 6

The windward and leeward side of hills are one of the five major typologies. They form as a result of the wind. This diagram exhibits the windward side on the left, and the leeward side on the right.

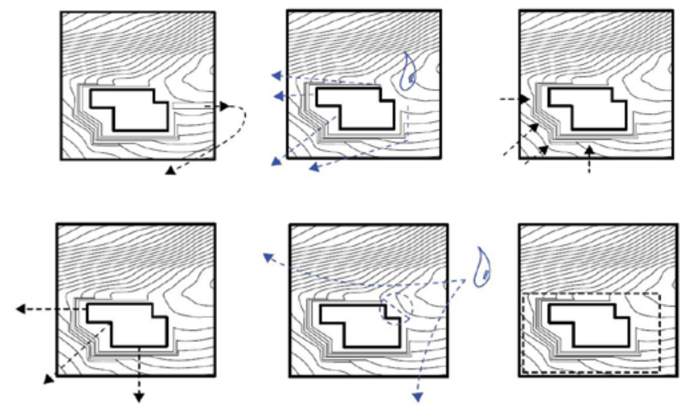

Figure 7

The following diagrams outline the strategies used in grading to control water flow and accessibility. Grading is seen here as a strategy at odds with topography. This technique is the basis for most architecture within the Palouse. The black arrows identify soil erosion, while the blue arrows highlight water movement across the site.

Through analyzing the Palouse as well as these regions I have discerned that there are five major topographical features that form a pattern within the landscape (see Figure 5). The first major topographic typology is the dune-like fine grained **HILL**, with a steep slope on the leeward side and a gentle-sloping windward side as seen in Figure 6. These small hills create the visual presence in the landscape. From satellite imagery, we can also see that these hills tend to be connected with an undulating linear crest. These fine-grained folds separating the leeward and the windward side of hills are the crests of the Palouse, and these **CRESTS** represent the second major typology. The third major typology within the Palouse is the **BUTTE**, large pieces of rock where Loess has accumulated, such as Kamiak and Steptoe butte. These features emerge from the landscape often inviting dense tree cover on the leeward side. The fourth major typology is the **GULLY**, a small creek of water that cuts through the Loess creating a natural drainage system. These gullies slowly erode the basalt bedrock, where they form the fifth topographic typology, the **VALLEY**, where many of the roads as well as cities are built. These areas are relatively flat and often follow common drainage routes from the networks of hills. These topographic conditions can be observed within the Palouse in a myriad of different areas as seen in Figure 5. It is these five typologies that dominate the morphology of the Palouse.

Within the morphology of the Palouse there are seldom areas untouched by humans, but these loosely scattered areas tend to be the most dramatic topographically. Common areas of human habitation tend to be the valleys, where our species gains access to water, as well as larger plots of flat land. These surfaces are where the Loess silt has settled as a result of runoff from the hills. Yet the cities easily out grew these valleys and grading is a common practice. Plots of land have been cut out of hills leaving scars. Despite our power to analyze and understand the landscape, construction often employs grading to reduce cost. Grading can have one of three attitudes: a cut, a fill, or as a combination of cut and fill. There are several criteria to consider before developing a grading scheme.

The following criteria, listed in *Grading for Architects and Landscape Architects*, highlights some important considerations before grading that are outlined diagrammatically in Figure 7:

1. The grading around buildings should always be oriented to fall away from the building.

2. Level areas with puddling water should never be allowed to occur.

3. Site grading extends only to the site boundaries.

4. The grading concept always starts with elevations of existing building, roads, and paths.

5. An initial grading concept on sketch paper with contour lines should be further developed in parallel with the overall design and drainage concept. The end result should be a grading and layout plan with existing and proposed contour lines, spot elevations, gradient indications, grade parting (crown) lines, and layout of all important construction elements.

6. The maximum and minimum gradient of various surfaces must be observed. Gradients of 4% and above are visible to the naked eye![4]

Figure 8

The Denver Airport by Curtis Fentress uses the landscape to inspire an iconic building that is set on a relatively flat site. It mimics the undulating peaks that surround the city to create an iconic building that relates to the context through miniaturization. Photo by Denver Post

Considerations for grading can be applied to the Palouse, but this outlines a formal grading strategy based on a cause and effect relationship with a predetermined building. The idea that we should design based on the flatness requirements of a particular building is one way to approach the problem, but we should consider the topographic conditions before and after we design. If we consider flatness as a requirement for building we may use the topography to our benefit instead of viewing it as the problem. It is important for the purposes of creating flatness to see the ways in which flatness can be created despite drastic changes in elevation. The Washington State University campus represents an entire area that has been planned with very little acknowledgment towards the changes in elevation. The attitude on campus has been one of creating buildings that cut into the topography, and connecting these buildings with the landscape. This cut and fill strategy is based within the grading criteria listed in Figure 7. Is there another way that we can connect to topography that rises above the dialogue between the topography directly around a building?

Seeking a strategy for both referencing and reconciling the conflicts between grading and natural slope, representation and miniaturization were researched. Can we create architecture that is born out of a quest to experience features of the landscape at a more accessible scale? Japanese rock gardens, and the Denver airport, inspired by the rocky mountains, as seen in Figure 8 and 9 Inspired by these ideas by miniaturization, five architectural interventions are proposed for the Washington State University campus. The concept of miniaturizing topography into architectural elements that we can experience in our daily life fulfills a psychological need for people to associate physical objects with memories. The landscape and topographic features of the Palouse form an indelible mark on the psyche of those who visit the area surrounding Pullman. Miniaturizing the Palouse can create delicate hardscape and softscape designs.

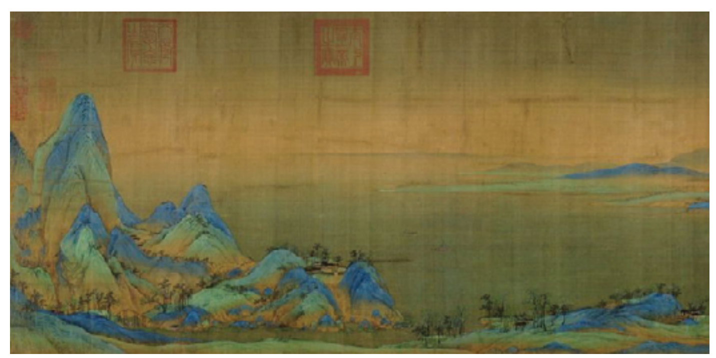

Figure 9

The dry-landscape Gardens of Japan reference landscape paintings of the Song dynasty, creating landscape elements that hint towards the topography at a smaller scale. These beautiful works of art inspire what relationship architecture could have to the landscape.5 Photos from top to bottom: Summer Mountains, Northern Song dynasty (960–1127), 11th century, Met Museum; Best Home Design, Japanese Rock Gardens; Thousand Miles, Wang ximeng, Northern Song Dynasty (1096 - 1119); Ryoan-ji Dry Landscape Garden, Nathan Bauman Photography.

Figure 10

This a site plan of the Washington State University Campus, Stadium way and Reaney Park are highlighted in red, with the pathway going through campus. Photo courtesy of Google Earth

Washington State University is situated on one of four hills within the city of Pullman. The main axis of the Campus cuts through college hill, from the bottom of Reaney Park over to Stadium way labeled in red in Figure 10. The picture above represents this axial progression through the campus where there is opportunity for architectural interventions. Mixing the concept of the five typologies within the Palouse landscape as well as the concept of miniatures, the design essentially illustrates the Palouse. As you are walking across campus these follies recall the landscape around them. These miniatures are shown by location on the path in Figure 11.

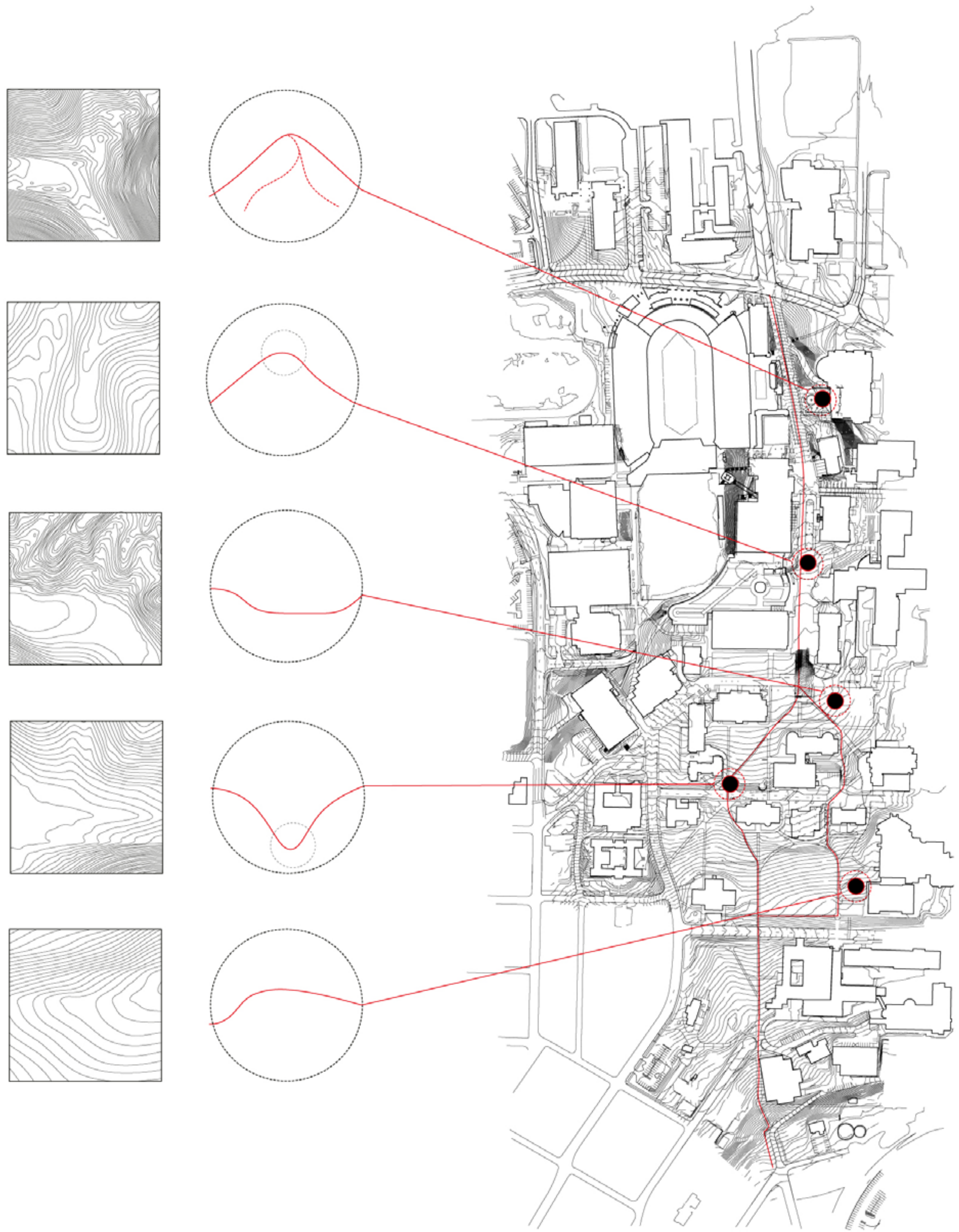

Figure 11

Typological miniatures top to bottom on the pathway through campus: 1. Butte 2. Crest 3. Valley 4. Gully 5. Rolling Hills

Figure 12

The colors of the Palouse are used in the designs to create another level of association within the landscape.

While the design is not meant to mimic nature, it uses nature as inspiration. By exploring the processes of the landscape, we can create colorful architectural abstractions that are based on the dynamic landscape of the Palouse (see Figures 13-15). The softscape miniatures relate to the Palouse directly in Figures 16 and 17. Design can look at nature through many lenses, and miniaturization is just one. These designs create abstractions that display of the wider context of the Palouse in an accessible way.

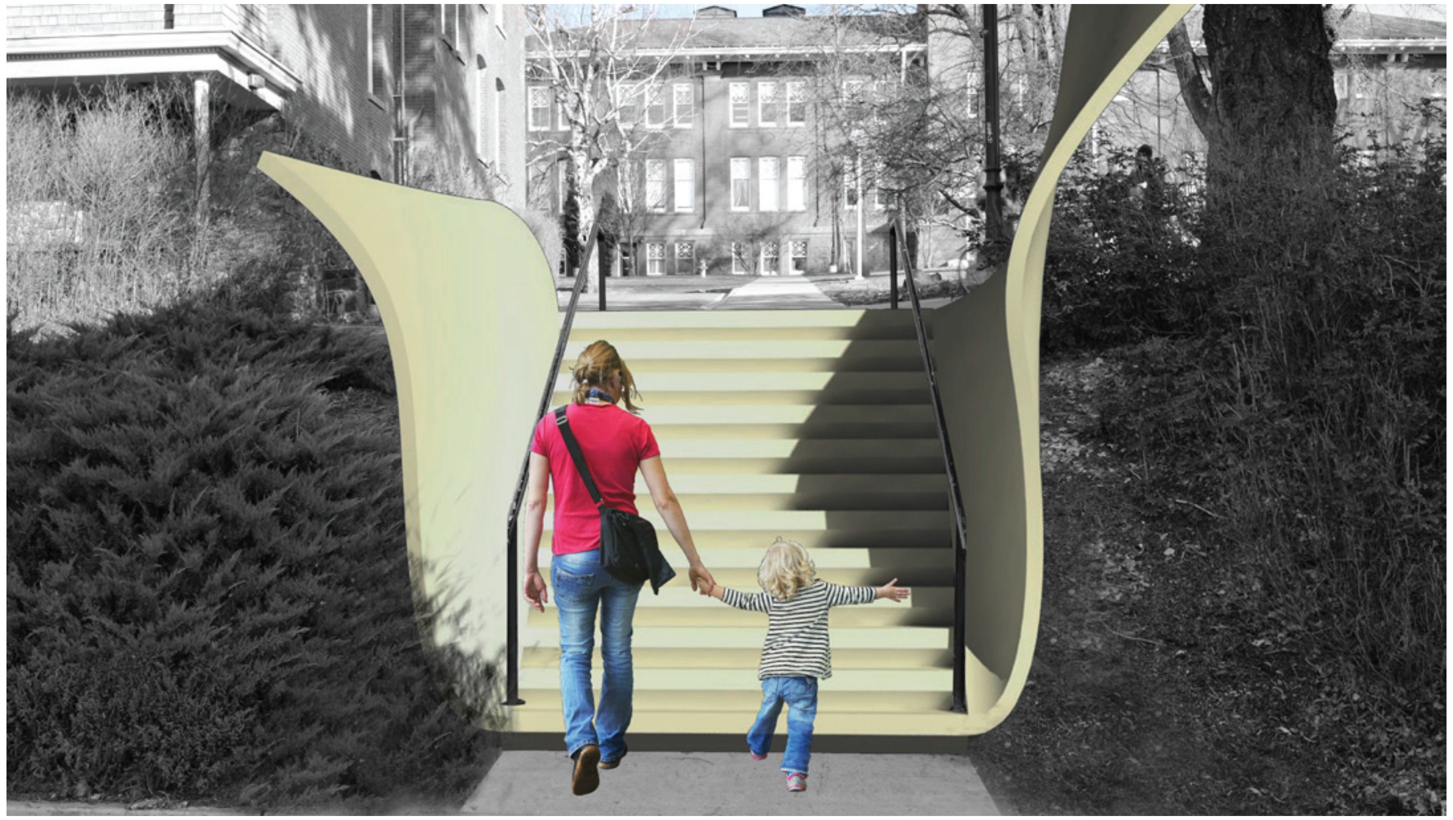

Figure 13

The light brown coloration represents the native grasses that tend to occupy the gullies in the Palouse. Photo by Author

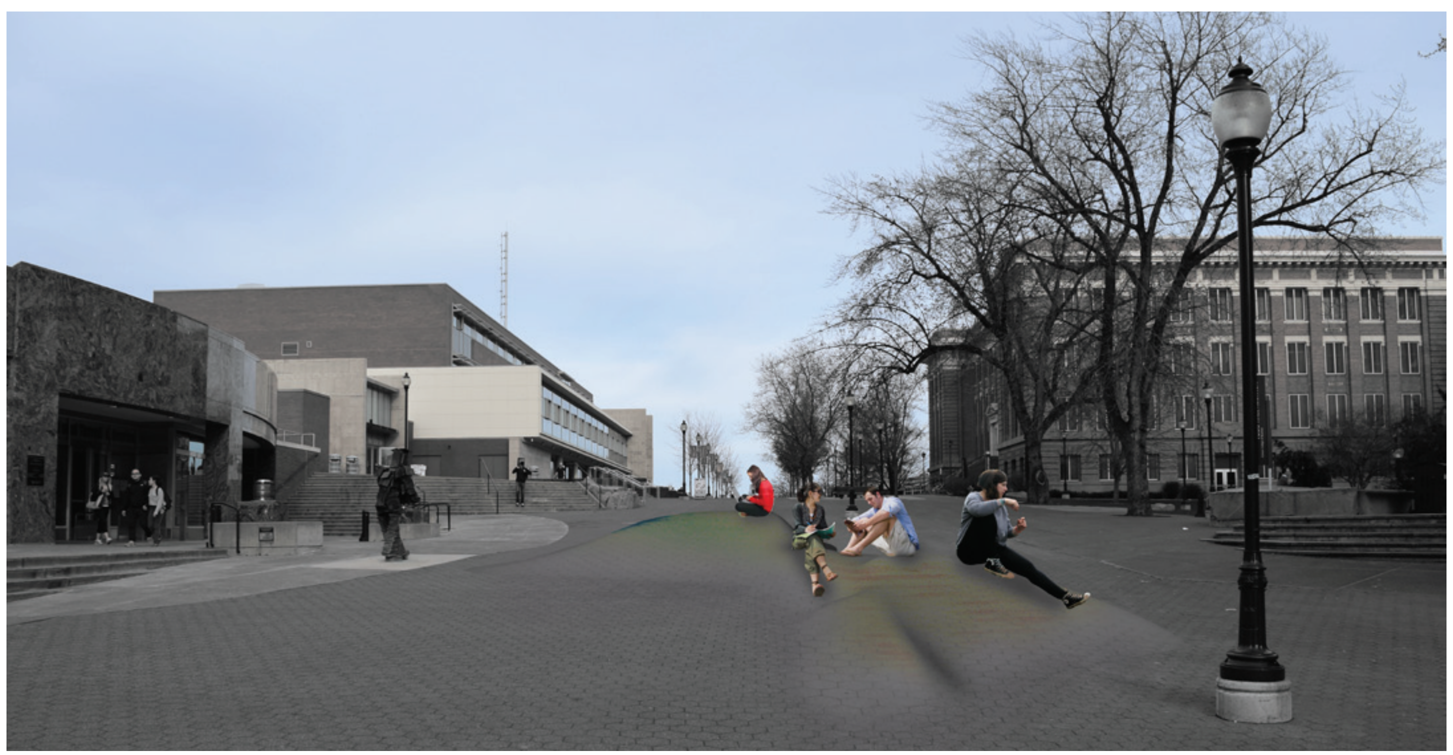

Figure 14

The coloration within the concrete comes from the contrast of color within the hills of the Palouse. Photo by Author

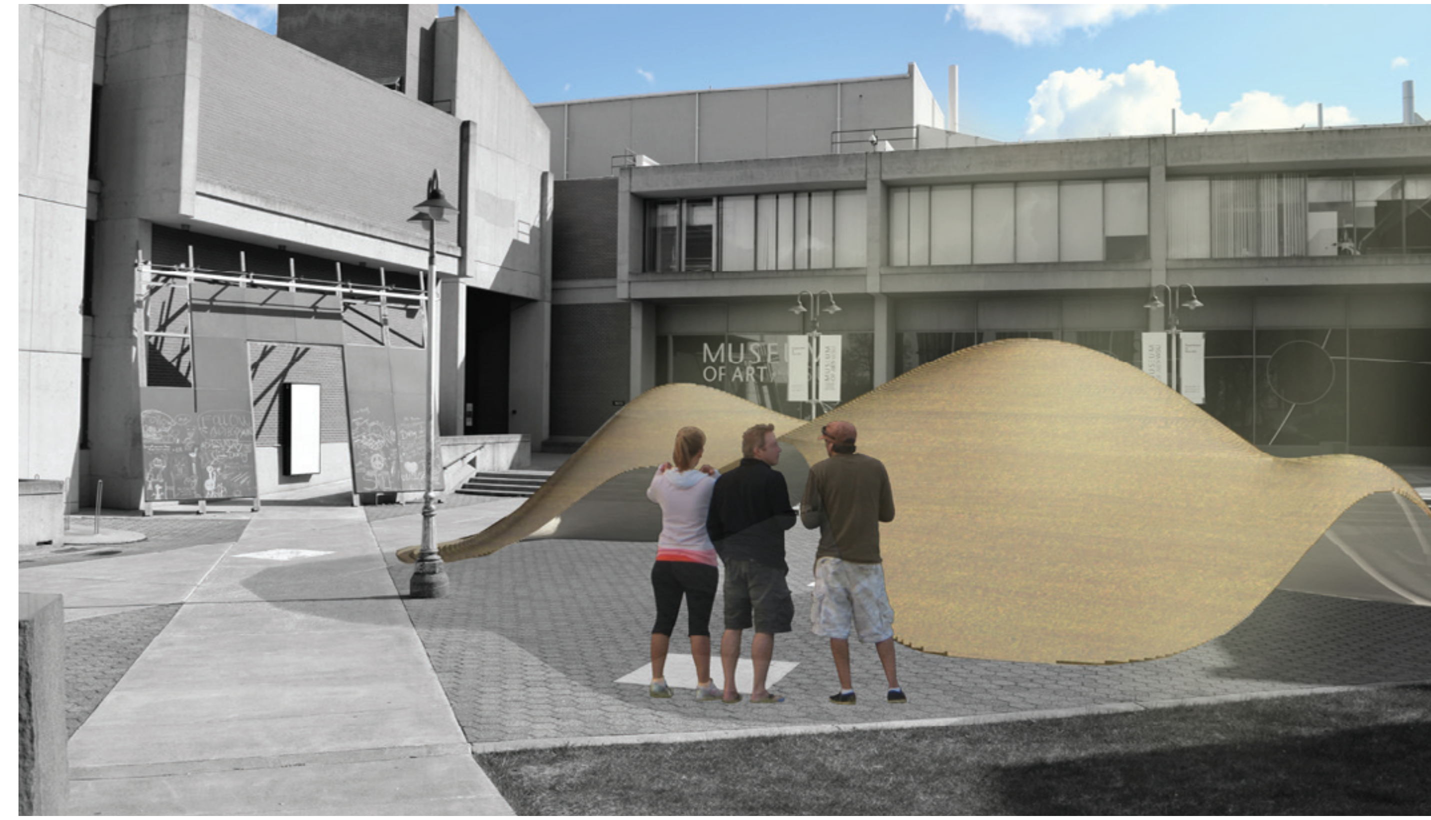

Figure 15

The brown and green is inspired by the butte's coloration. Photo by Author

Figure 16

The valley provides a place to relax and enjoy flatness, night or day. Photo by Author

Figure 17

A subtle miniaturization of this Palouse landscape. Photo by Author

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