

Minecraft as a Tool for Investing Adolescents in Climate Adaptation: A Case Study in Westport Washington

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Abstract

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Adolescents are often neglected or excluded from conversations about community environmental hazard adaptation in part because few community adaptation outreach strategies cater to their demographic. In the last decade, researchers and planners have identified the sandbox game Minecraft as an effective tool for gathering feedback from children and adolescents on community planning decisions and approaches. Minecraft has also been used by teachers across academic disciplines to engage students in immersive learning. This research included the design and implementation of a climate adaptation curriculum for Westport, Washington, a peninsula on the Pacific Ocean subject to multiple environmental hazards including sea level rise. Minecraft was used to quickly recruit and engage middle school students in adaptation conversations through a local park planning exercise. Students proposed park designs within a series of sea level rise scenarios and developed an understanding of their communities environmental precarity and possible design solutions. The pedagogy utilizes an iterative approach between design professionals and students to home in on planning solutions that respond to adolescent desires for their community in light of environmental hazard realities.



Acknowledgements

This work has a lot to do with the critical importance of belonging and embeddedness in a particular landscape, in this case, the Chehalis River Estuary. I was lucky to spend winter of 2022 on the unceded lands of the Chehalis people. The land of shifting sands is an extraordinary place perched on the edge of the sea, at the edge of the continent, facing the great Cascadia Subduction Zone. Like many edges it is a place that is constantly in flux and constantly evolving.

One of the biggest wins of this thesis process is that I gained many new personal and professional role models. First, much gratitude to Kevin Goodrich at the City of Westport whose unwavering commitment to the safety and resilience of his community is palpable and moving. Next, a thank you to John Shaw at the South Beach Historical Society for providing so much context on historic Westport and its place within Grays Harbor more broadly.

Next, a thank you to my advisor Dan Abramson who has cultivated relationships and social networks in South Beach and beyond to help facilitate resource exchange between the University of Washington and coastal communities like Westport. I am lucky to have participated in a small part of this grander vision that is coming to fruition through his sustained and tireless effort.

Thank you to my advisor Ken Yocom who offered thoughtful guidance and feedback with a dose of pragmatism that neither Dan nor I could often muster. It is chiefly because of this that I am graduating on time.

I am grateful to the Ocosta School community for welcoming me in, and particularly for Andrea Mirante, Coordinator of the After School Program, who facilitated every step of this process including helping to recruit students, coordinating transportation and connecting me with people in the school community who could provide the technical support this program needed. I am also grateful to the students of the after school program who participated in this project. Seventh grade is challenging, and I am grateful for their forbearance, humor and genuine engagement.

I was able to carry out this work in tandem with a number of on-going projects by the University of Washington that helped defray some of my travel expenses and supported the participation of students and staff through the Ocosta After School Program. The UW's "Community-embedded Drone Program for Improving Traffic Safety of Rural, Isolated, Tribal, and Indigenous (RITI) Communities in Washington State" formed a drone club for Ocosta Junior High School students, with support from the Center for Safety Equity in Transportation (CSET #2102). Drone Club students formed the pool of talent to use Minecraft for my project. An NSF Coastlines and Peoples Early Action Grant for Exploratory Research grant (CoPe EAGER #1940024) also supported aspects of this thesis through the Coastal Hazard Planning in Time project.

Jetsam at Bottle Beach// Photo by author



Search and Rescue drone demo during Drone Club at Ocosta High School // Photo by author

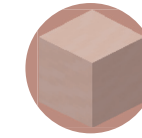
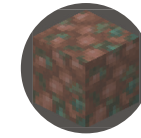
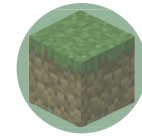


Table of Contents

1. Introduction	9
2. Grounding: a brief history of Westport's development	11
3. Community organizing for resilience planning: Westport framework	29
4. Pedagogical Approach	35
5. Minecraft Resilience Planning Methods	42
6. Recommendations based on student input for Westport park planning	51
7. Reflections and Takeaways, and where to next	63
8. Conclusion	67
9. Appendix A: Lesson Plans	74
10. Appendix B: Community assets activity	86



Entrance to future park site at Pacific Street // Photo by author

CHAPTER 1: Introduction

This thesis designs and implements a part of a climate and environmental hazard adaptation curriculum in an environmentally precarious community on the Washington Coast. As sea level rise worsens with climate change, communities across the globe must either adapt or retreat from waters edge. However, many of these existential conversations fail to involve young people whose futures hang precariously in the balance. This thesis is a small part of a much broader effort in the Westport community to engage students and citizens more generally in conversations around coastal hazard adaptation. For a bit over a decade, the University of Washington College of Built Environments has worked in concert with several other universities, NGOs, state agencies and local governments to support adaptation planning in South Beach (See Figure 15) ((Abramson et al.; *Cascadia Coastlines and Peoples Hazards Research Hub*; Hutchison and Abramson; Pacific County Emergency Management; Stanton; “Washington Coastal Resilience Project”; Washington Sea Grant and Washington State Department of Ecology; University of Washington Built Environments Studio; *Willapa Erosion Control Alliance Now (WECAN)*).

I started working at the Ocosta school in Spring 2021 as part of a drone program sponsored by the Center for Safety Equity in Transportation based in the Civil Engineering department at University of Washington. This ongoing after school program takes students out into their community to fly drones for different hazard mitigation applications.

Early in summer 2021, I started to identify a thesis subject with Westport’s Public Works Director, Kevin Goodrich. He suggested that I submit designs for two prospective park acquisitions along the Grays Harbor edge of the Westport Peninsula to help the city apply for grant funding. At that point, the work from the CSET Drone project was already underway and demonstrating the promise of drone based curriculum to quickly recruit students and help them understand the existing environmental conditions of their community. This suggested another question - what other technologies could be used to both quickly recruit and deepen student engagement in adaptation conversations? Based on previous research and curricular applications, the sandbox game Minecraft seemed like a promising tool; it had the potential to create an accessible model environment to engage students in designing parks for the city while simultaneously teaching them about the environmental precarity of their community - effectively killing two birds with one stone.

This thesis provides a short process for engaging adolescents in adaptation conversations using Minecraft. For the process, I created a topographically accurate model of Westport in Minecraft including the two park properties where the students were asked to intercede. During winter 2022 thirteen students worked together within the model space to suggest different park programs and design interventions responsive to a range of sea level rise scenarios. I further refined these suggestions in Minecraft and then gave the model back to the students for a final response. Together we clarified adolescent public space priorities and gaps in park programming and imagined how the community might respond to rising sea levels.

This thesis includes the following: first a brief description of Westport’s environmental history and development, followed by a summary of previous research that uses Minecraft for similar planning applications, a delineation of the pedagogical approach, methods for world building using digital elevation models in Minecraft, student public park recommendations for Westport and finally reflections and takeaways from this particular applied curriculum approach.



CHAPTER 2: Grounding: a brief history of Westport's development

In January 2022, I found a sublet in Westport, Washington on one of the low ridges that run north to south forming the peninsula's only high points outside the tsunami inundation zone, as modeled for the "worst considered" case of a strong Cascadia Subduction Zone megaquake for purposes of evacuation planning - the kind of earthquake that recurs on average only once every 2,500 years. I packed up my grandma's car with all the requisites: rain jacket, rain boots, rain pants and my old pair of clogs, which because of their height, transcend the puddles. The blue house on the hill looks out on Grays harbor as it laps at the long and low foot of the peninsula.

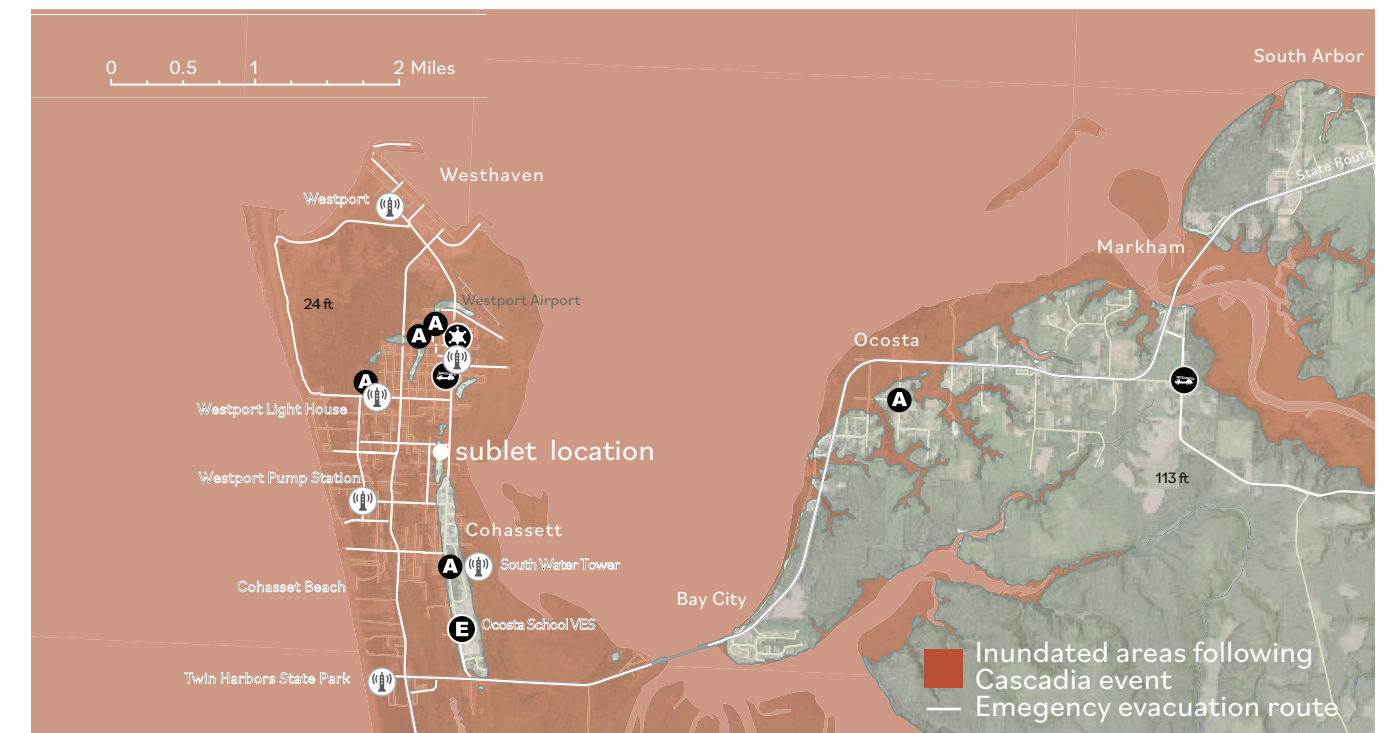


FIGURE 1. My home in winter 2022 indicated on tsunami inundation modeling map. Gray areas are ridges above the level of anticipated flooding (Eungard et al, 2018). Although my house was ostensibly at a high enough elevation, the vast majority of the peninsula is severely at risk.

As in most small communities, it became immediately apparent where the community's centers of gravity exist. These hubs include the Ocosta School, the marina (the city's main commercial hub), and the Shop n' Kart and library, all of which spur off of the main drag, Montesano street. These are places that are key to the cohesion of the community and represent places of social resilience. Unfortunately, and

not surprisingly some of them are exceptionally vulnerable to environmental hazards.

Two main themes drive Westport's development over time: ecotourism and the maritime industry. In both cases, human engineering and development pressures have quite literally impacted the contours of the peninsula making many of the city's key institutions more vulnerable to environmental hazard. This is a lesson for future land use planning on the peninsula looking into a future where sea level rise will increasingly threaten the well being of this precipitously placed community.

This chapter is written as a walking tour around the outer edge of the upper peninsula. I have chosen this mode for a couple of reasons, primarily to highlight how fluid this outer edge is - I encourage you to take this walk (it's very pleasant), and to reflect on the aerial photos as you proceed - they show a small city emerging more or less from a glorified sandbar. I focus on development interventions at the margins of Westport - many of the community anchors that have led to changes in the shoreline over time. These anchors are set up sequentially by location, not by date of intervention, so certain themes will come to the fore at different junctures.

Walking is a particularly relevant method for this paper which focuses on environmental hazard and development, because in the event of a tsunami, evacuation will occur on foot. As you walk, keep track of your proximity to high places on the peninsula. These are the places where Westport's citizens can expect a modicum of protection in the event of a tsunami. Any planning and development decisions the community makes, need to be made through this lens. Looking back is also instructive because when Westport was established, development was limited by slower modes of transportation than cars, and entry points were constrained largely by viable boat landing locations (see Figure 6). Understanding the historic fulcrums of the community can be instructive in considering where density should happen as Westport moves into an uncertain future.

Additionally, on foot you can start to see the fine grain differentiation of land use, and the accumulation of decision making that creates a community. John Shaw, the president of the local historical society describes Westport's development as "organic". Westport is an example of a community that has come together in a fairly ad hoc fashion - historically, roads were built independently to reach housing and then slowly added into the municipal road network (if they were added at all). In speaking with John, there is this sense of continual expanding and contracting, or if you will, ebbing with the tide. The peninsula has gone through many booms and busts - expansions and contractions that have shifted the points of gravity and the literal shoreline.

Before we begin our walk, I would like to zoom out a bit to discuss the historic evolution of Westport's shoreline at a more macro level: below is a map that shows Westport's historic shoreline developed by Kaminski et al. Evident are changes in accretion patterns over time contingent not only on the quantity of Columbia River depositional material migrating up the Coast and out of the Chehalis River, but on various human interventions which will be discussed in greater depth below. This includes the construction of the south jetty which extends from the western edge of Point Chehalis into the Pacific Ocean. As the figure shows, between 1860 and 1909, a significant amount of land accumulation occurred south of the Jetty. However, since 1909, that accumulation has reversed. The other side of the Peninsula, although not as dramatically altered, also shows significant fluctuations over time (Kaminsky et al. 114).

Westport is part of the Columbia River littoral cell which extends from Tillamook Head just south of Minecraft as a Tool for Investing Adolescents in Climate Adaptation

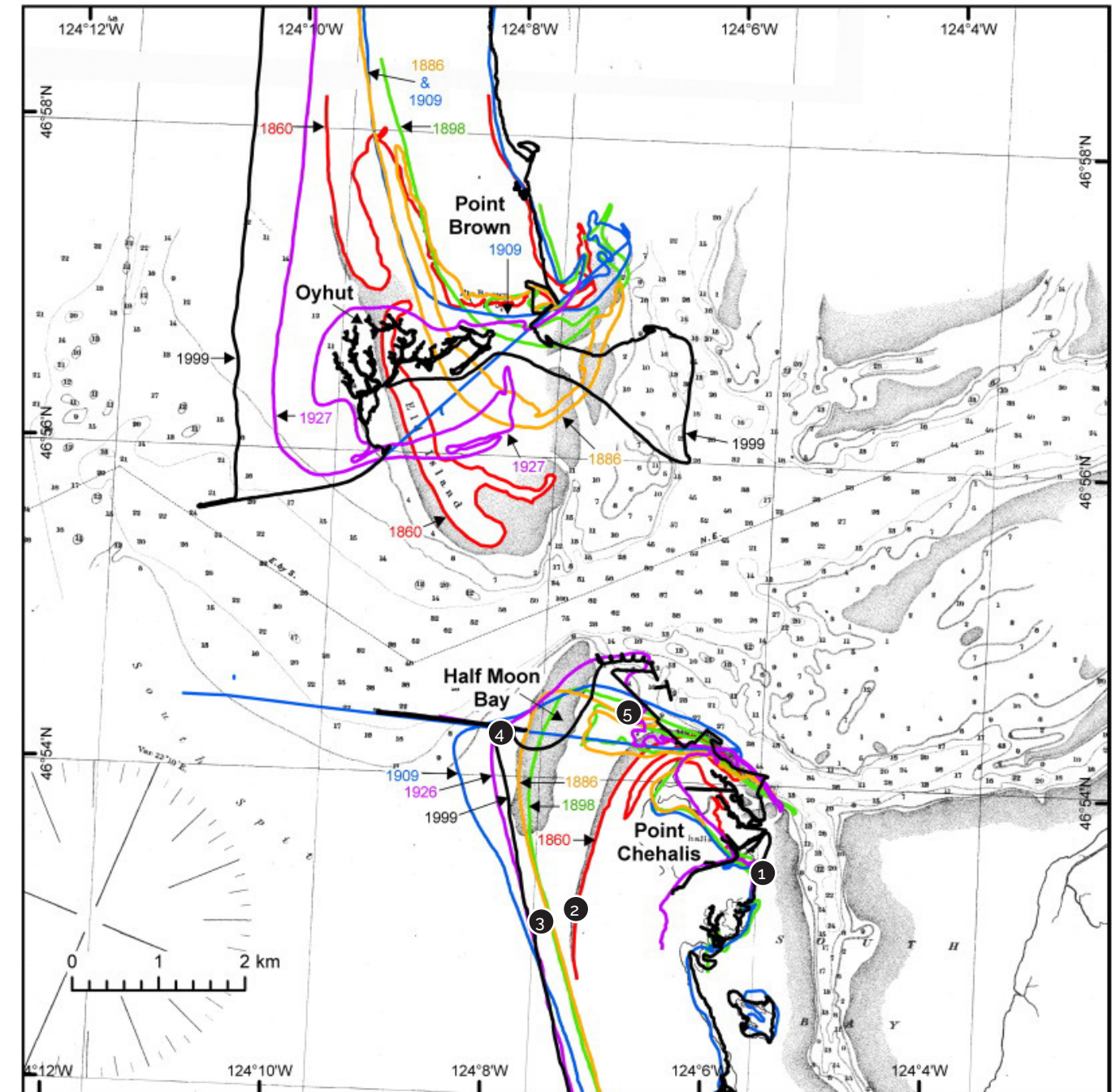


FIGURE 2. Diagram from Kaminski (2010) showing Westport's fluctuating shoreline from 1860 to present. Westport to the South shows relatively little change along its eastern side, but a huge amount of variation on the Pacific (western) edge. Rough location of walking path spots are indicated showing how tenuous their location is relative to the 1860 shoreline.

the mouth of the Columbia River to Point Grenville a little over 100 miles to the north. The littoral cell consists of a series of estuaries including Grays Harbor and Willapa Bay. As such, Westport's edge is

strongly influenced by what is happening “upstream” in the Columbia River depositional system. In their 1999 paper, Guy Gelfenbaum and his co authors analyze how different factors both human and natural influence depositional budgeting in the Littoral Cell. This analysis anticipates how changes in the system can result in different accumulation patterns over time. One of the major influencing factors that has likely contributed to Westport’s decades-long erosion is the construction of dams along the Columbia River during the mid 1900s which trap sediments that normally would have traveled into the Pacific and migrated up the coast (Gelfenbaum et al. 6–7). Because of this, Westport as a landform relies heavily on policy and land use decisions and environmental interventions made elsewhere and far beyond the control of locals.

Let’s begin our walk:

Pacific Street

We will start our walk at the very end of Pacific Street where the line of the road continues on into a line of piers, now just creosoted logs standing in a long but well regimented line. On a low tide you can walk out almost to their very end - far into the harbor - where the sternwheeler could pick up and drop off passengers without running aground. This is one of Westport’s original points of entry, and an influential location in determining early development. In Figure 4 we can see the route that travelers might take from the harbor side out to the ocean on foot or by carriage. Areas of development are densest along that trajectory - along Pacific, down Montesano and out on Ocean Ave. We will follow this trajectory on foot out to the Westport Lighthouse. Pacific street is the site of one of the future park proposals highlighted in this thesis.

Westport Lighthouse

As indicated above, the fluctuation of Westport’s shoreline is a negotiation between different economic and development interests over time both beyond the community (as illustrated above) and within. In the case of the Westport by the Sea Condos, referenced below, tourism is the key force leading to encroachment on the ocean and subsequent efforts to defend that encroachment by armoring the shoreline. In the past, the negotiation has had more to do with the maritime industry than with real estate development. The Westport Lighthouse (2) stands on the outside edge of the peninsula’s western coastal dune, which roughly follows the tree line in historic aerial in Figure 4. On foot we can see and feel the drop off as Ocean Ave slopes toward the shore. When it was constructed 1897, the lighthouse stood at the edge of the peninsula, and its lights could be seen 23 miles out at sea, helping vessels to avoid the sand bar and to find their way into the safety of Grays Harbor. The lighthouse and the South Jetty were constructed in the same period (construction of the South Jetty began in 1898). Subsequently, the shoreline accreted significantly so that the lighthouse no longer hugs the shore, but rather stands in the midst of a newly formed forest composed primarily of invasive pines planted in the 1970s (Mattheis and Hutchison).

Westport by the Sea

Unlike the edge of the Peninsula, properties are of course fixed, and property owners must contend with a receding shoreline that impacts property value and access. This is perhaps a manageable risk



FIGURE 3. Walking path circumnavigates the top of the Peninsula (about 7 miles) but does not touch the early claimed land along present day Highway 105. Key anchors that have influenced the Peninsula’s edge and settlement patterns are indicated along that path.

when people are living lightly on the land, as they once did, but becomes more vexing when density is proposed at water’s edge. In my conversation with John, he mentioned that early on, many of the beach front cabins on the Peninsula were amalgams of driftwood and other found materials. This low investment approach is an interesting precedent for current development, but not the prevailing paradigm

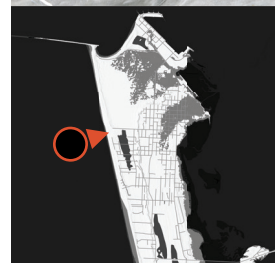
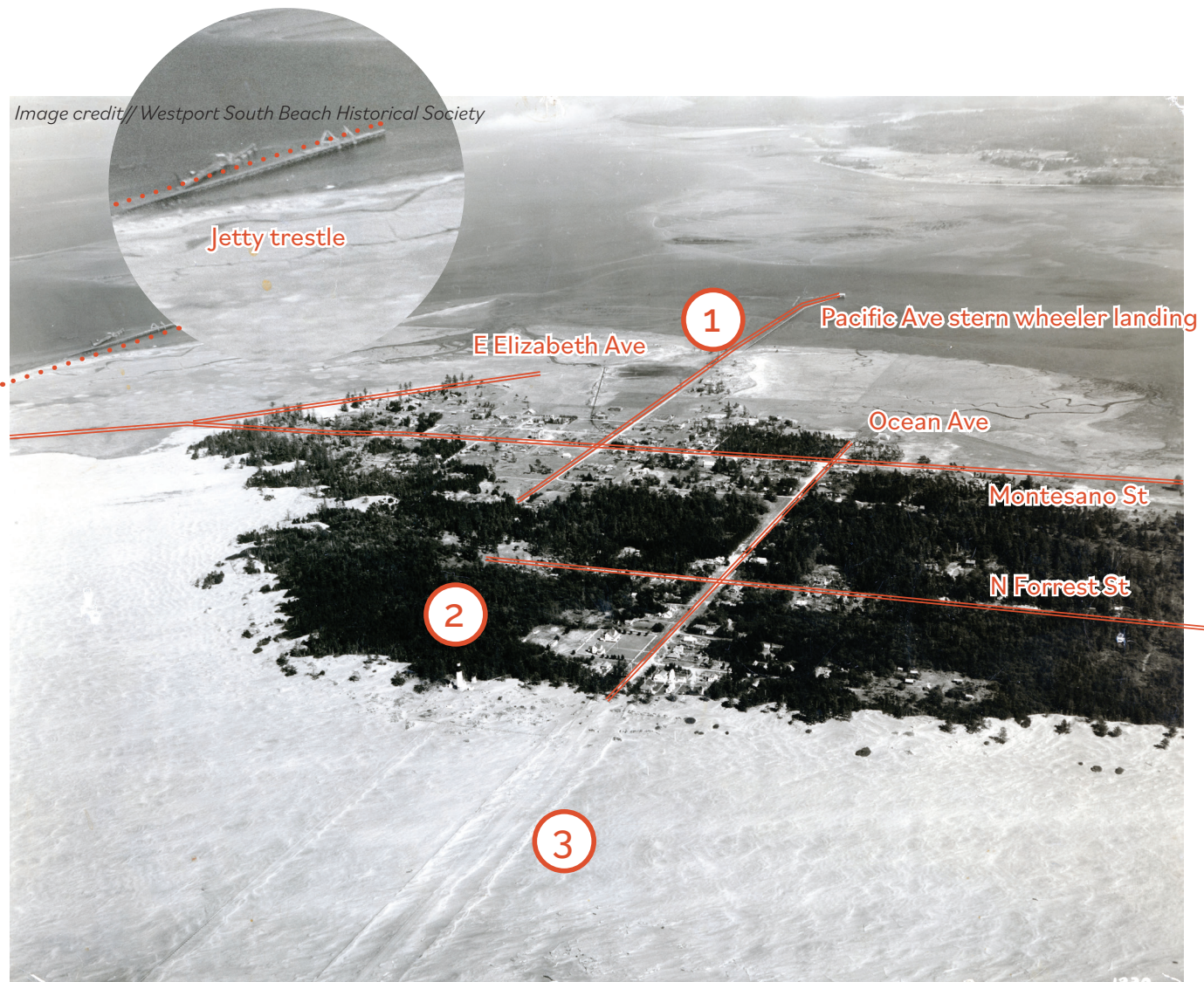


FIGURE 4. 1937 Aerial looking East from above the Pacific. Approximate location of the current Westport by the Sea Condominiums (3) is indicated. Westport's Lighthouse (2) stands just west of the western dune (ridge) that runs parallel to the shore and then curves toward Gray's harbor roughly following the tree line. Since this photo was taken, vegetation has established almost to the high water mark. To the East, Pacific Ave extends into Grays harbor where the stern wheeler delivered passengers to Westport from Montesano and Aberdeen.

on the Pacific edge. Walking west toward the ocean from the lighthouse we reach the edge of Ocean Ave and to our left stands Westport's only large condo development. Window sills host a regatta of toy sailboats and other nautical paraphernalia, but few people are home.

Unlike the above more fluid development approach, Westport by the Sea, as the name suggests, is a condo development at the very end of Ocean Avenue that practically dips its toe into the Pacific. The condos are built on land that was submerged prior to the development of the South Jetty (see Figure 4 for approximate location). They are evidence of a different development paradigm than the one that guides the peninsula at large. Whereas most of Westport's density hugs Montesano and Forrest Ave (including a large number of RV parks and motels), Westport by the Sea throws caution to the winds and parks itself on the peninsula's receding western edge. Given that the shoreline was already receding

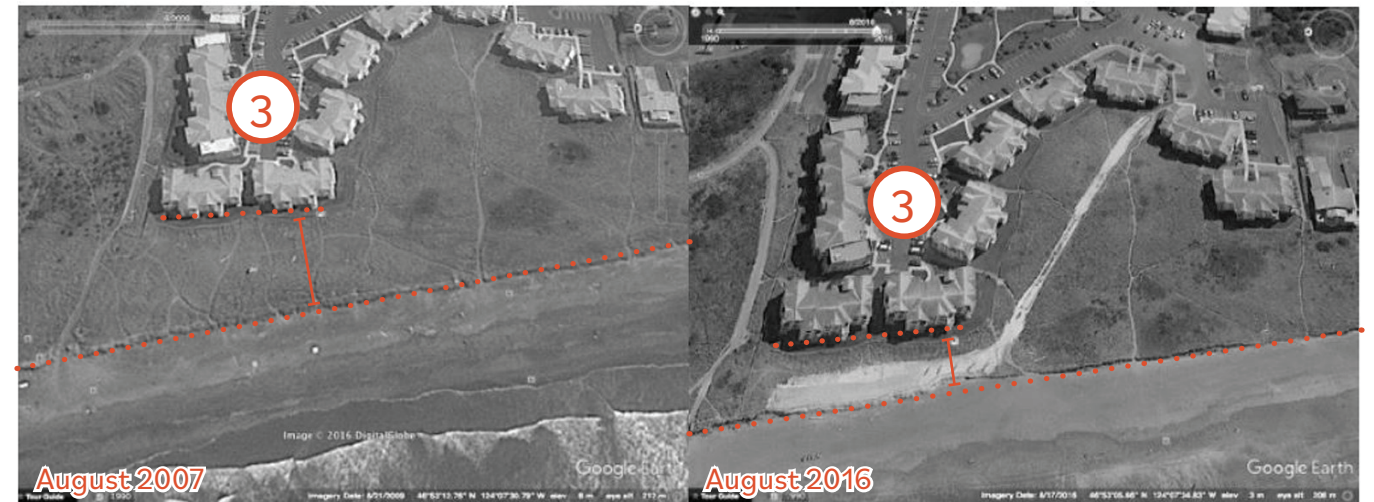


FIGURE 5. Erosion at the Westport by the Sea Condos between 2007 and 2016.

Image credit// Westport by the Sea Dune Committee's 2017 Report, Google Earth

for several decades prior to development, building in this location seems like tempting fate. The image below shows the swiftly eroding shoreline between 2009 and 2016. In that period, significant efforts were made to fortify and stabilize the shoreline using erosion control blankets, anchoring large woody debris and filling. In 2015 the situation was so dire that the condo association asked for a suspension of the Shoreline Master Plan to pursue emergency actions that would usually need to go through a lengthy permitting process (Aue, "Westport by the Sea Condos Erosion — the Fix Is in — Again"). Subsequent efforts included the construction of an artificial dune. Not surprisingly, organizing the homeowner's association to pursue any sort of armoring activity was challenging, and the cost for members of the association was significant. The artificial dune alone cost \$215,000 over the course of three years (*Case Study: Protective Dune Westport by the Sea Condominiums, Westport, Washington*). Efforts to build a more permanent solution run up against the Shoreline Master Plan, with homeowners arguing that they are losing property because of upstream effects and as such they should be allowed to defend their property (Conversation with condo owner, January 2022).

It is difficult to know if those who bought into the project were aware of the potential environmental hazards. The condos were designed to cater to temporary residents - both second home owners and vacationers looking for short term rentals. Very few people use the condos as primary residences. After construction in the early 2000s - a three phase process - most of the condos were purchased by people from King County rather than locals or people from Grays Harbor more broadly (Quigg). This is a meaningful dynamic in Westport that has a historical precedent too. In my conversation with John, he spoke about the many people who have temporarily inhabited the peninsula over time including a long tradition of what could be deemed ecotourists - initially pursuing duck hunting and later sport fishing and surfing. A large number of temporary residents might lead to an underappreciation of or disregard for environmental hazards, hazards that more permanent denizens of Westport are unlikely to forget. In this vein, I joked once to a friend that Westport is the plaque capital of Washington. Hardly a public asset exists that doesn't have an oval bronze plaque. Significantly, many of these plaques are dedicated to mariners lost at sea, in particular the Fisherman's Memorial in the center of the roundabout at the end of Neddie Rose Drive (the road on the artificial peninsula that protects the mouth of Westport's marina).

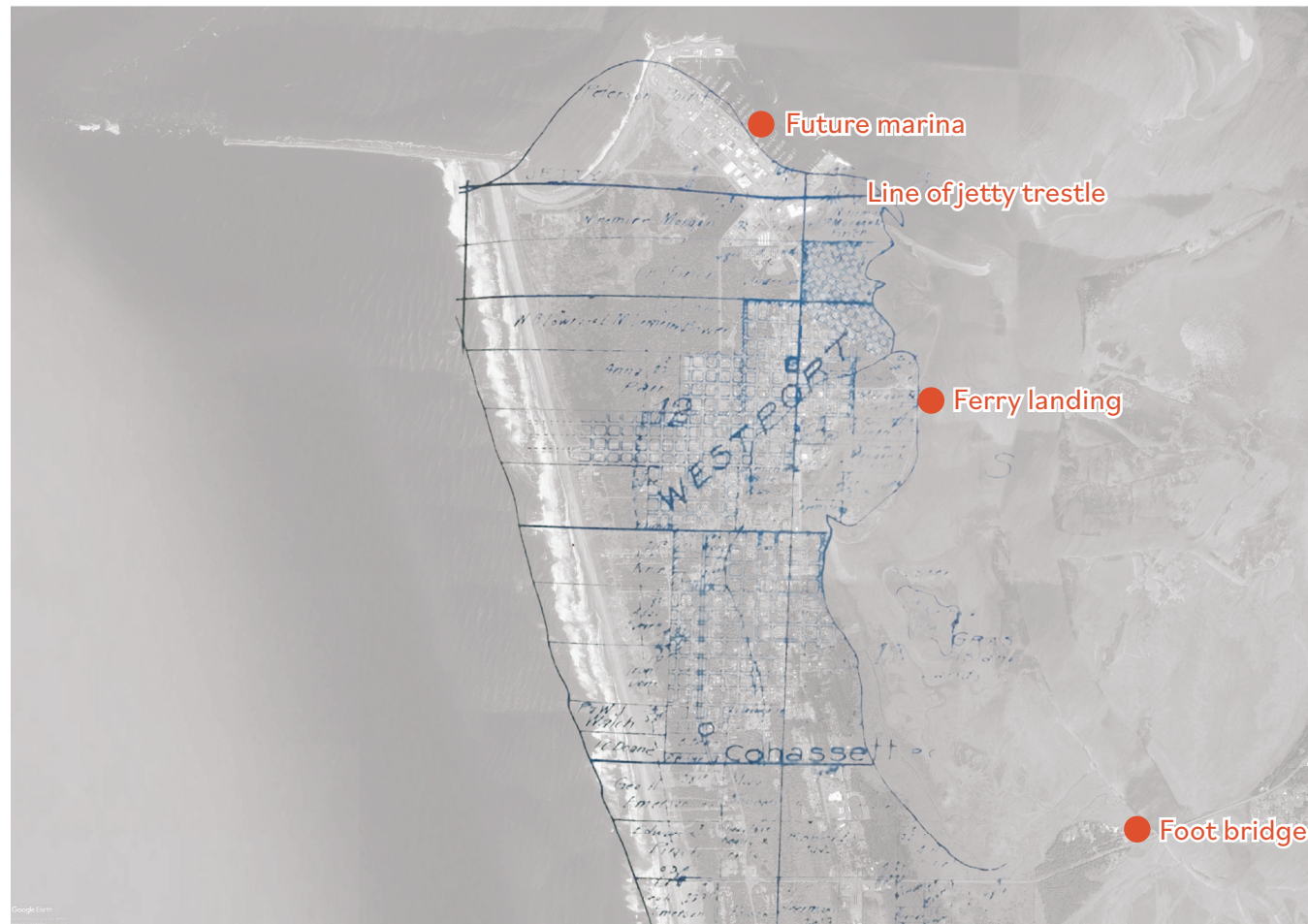


FIGURE 6. Kroll map of Westport (1909) overlaid over current satellite image. The map shows the early 20th century with land ownership indicated on large parcels. Platting along the inside of the Peninsula roughly follows the north south Montesano Street. Existing ownership hugs Pacific Ave - the location of the ferry landing (est. 1859) and below Cohassett. See Figure 14 for photo of bridge to Southern portion of the Peninsula. Peterson Point (Point Chehalis) to the north is named after the first white settlers to live on the Peninsula.

There are many reminders in the community of the perils of living so close to the Pacific. In the winter, the marina district is subject to periodic floods usually occurring when storm surges correspond with the king tide. Municipally available sand bags and water chutes built into the road are just some of the interventions that allow local business owners to weather these events. It is not difficult to sense the dissonance between those who work on and near the water and Westport's visitors and the developers that seek to accommodate them.

In fact, the Westport by the Sea condos are more reminiscent of the development paradigm that shaped Ocean Shores - the mirroring peninsula on the northern edge of Grays Harbor. Ocean Shores development took off in the 1960s as a master planned community surrounding a golf course with a system of artificial canals. Early on, Ocean Shores identified itself as an entertainment capital and haven for retirees and second home owners. The development billed itself as the "Venice of the West". Other monikers for Ocean Shores included the "Palm Springs of the Northwest". This boosterism could be seen as



FIGURE 7. 1942 Aerial looking South West towards the Pacific ocean. The Westport Maritime Museum (US Coast Guard) at far left within original sea wall (still extant). 2nd Sea wall and filling evident on Westhaven Drive. The area along the Pacific Coast now includes significant vegetation.

detrimental - neither Palm Springs nor Venice share similar environmental hazards to Ocean Shores, which like Westport, is vulnerable to tsunamis and subsidence from a cascadia subduction zone event in addition to chronically shifting sands (Hughes and Beckwith 143-48). Kaminski's diagram (2010) highlights the marked changes in Ocean Shores' Pacific edge. Unlike Westport, Ocean Shores has invested very little in tsunami preparedness despite having even less high ground (Eungard et al.).

Similar to Ocean Shores, the Westport by the Sea condos were only one small part of a larger proposal. Fortunately or unfortunately that proposal was deadended by the 2008 financial crisis. That initial proposal included a golf course, club house, convention center and hotel all abutting the Pacific (Aue, "State Parks Buys Links Golf Course Property in Westport Marina District"). The only remnants of that plan are the condos and two retention ponds behind the parking lot at Westhaven State Park that were meant to hold golf course runoff. Unlike in Ocean Shores, which was developed prior to the implemen-



FIGURE 8. 1993 South Jetty breach.

tation of the Shoreline Management Act, efforts to develop the golf course were held up in court by environmental advocacy organizations like the Washington Environmental Council and the Friends of Grays Harbor, an organization that coalesced around opposition to this coastal development (“Links Golf Course Beginning to Take Shape at Westport”). FOGHs membership is a consortium of smaller organizations that range from surfers to birders to members of the aquaculture business community. All are invested in supporting a resilient and healthy shoreline ecology probably at odds with this larger development scheme. Conversely, the would be developer, Chuck Maples, is a local who holds interest in a number of different golf courses and luxury condos across Grays Harbor. At stake are conflicting visions of how Westport should develop and who its recreation should cater to. Maple’s investments have helped to increase the local tax base and to bring tourist dollars into the community. However Maple’s vision for Westport, like Ocean Shores’ earlier development, recreates a version of the coastal get-away that is ultimately at odds with the environmental realities of the community. A question facing Westport is how to develop a resilient tourism economy that supports local ecologies and that doesn’t negatively impact the community’s disaster preparedness.

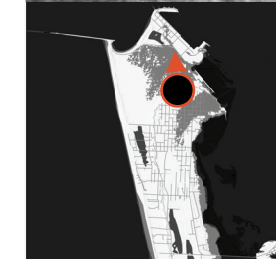
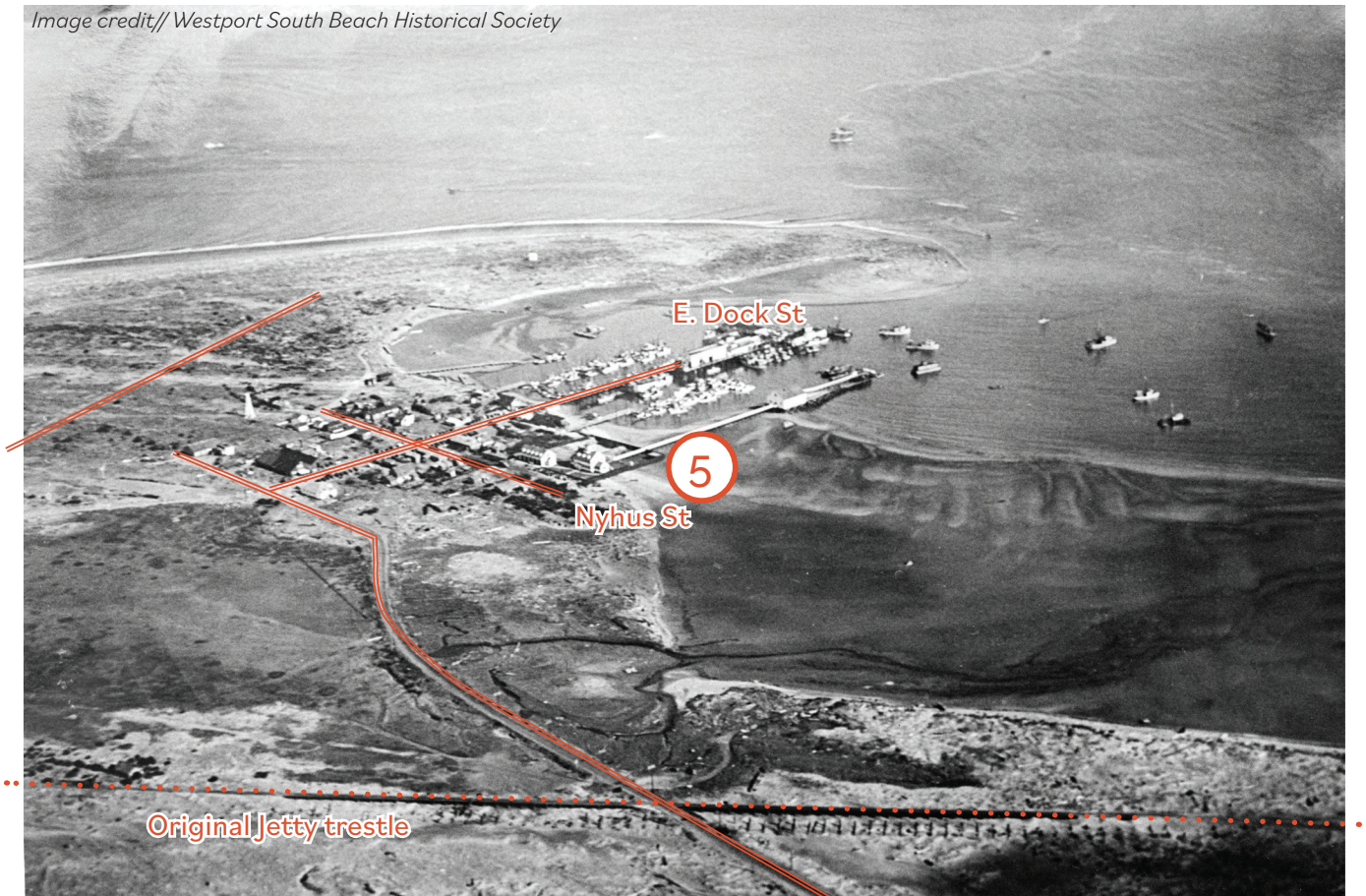


FIGURE 9. 1940 Aerial looking North West towards future Neddie Rose Drive. The Westport Maritime Museum (US Coast Guard Station) sits within the original sea wall (still extant). 2nd Sea wall and filling evident for West Haven Drive incomplete. The edge of the marina is still fairly soft and docks extend far into the water to reach greater depths in this shallow depositional inlet. Buildings extend over the water on piers.

From Westport by the Sea take a right and walk along the shoreline towards the South Jetty skirting the low bluff that indicates the high water mark and the current state of coastal erosion.

South Jetty

The South Jetty is probably the single most influential human intervention shaping Westport as a landform. As you walk along the shoreline towards the jetty, surfers bob in the artificial cove created by its long arm reaching out into the Pacific. The South Jetty is of critical importance to the viability of Grays Harbor as a navigable harbor because it lessens sand migration into the shipping channel at the harbor’s mouth which in turn minimizes the need for dredging (the outgoing tide now scours the shipping channel). Consequently, it opposes substantial forces from the ocean and as such requires periodic and expensive bulwarking efforts. In 1993 a large winter storm breached the South Jetty where it meets Half Moon Bay. The cost for filling was around \$1.3 million (Hammock; Friends of Grays Harbor). As indicated above, the Army Corps of Engineers originally constructed the Jetty in 1898 on Point Chehalis. Figure

Image credit// Westport South Beach Historical Society

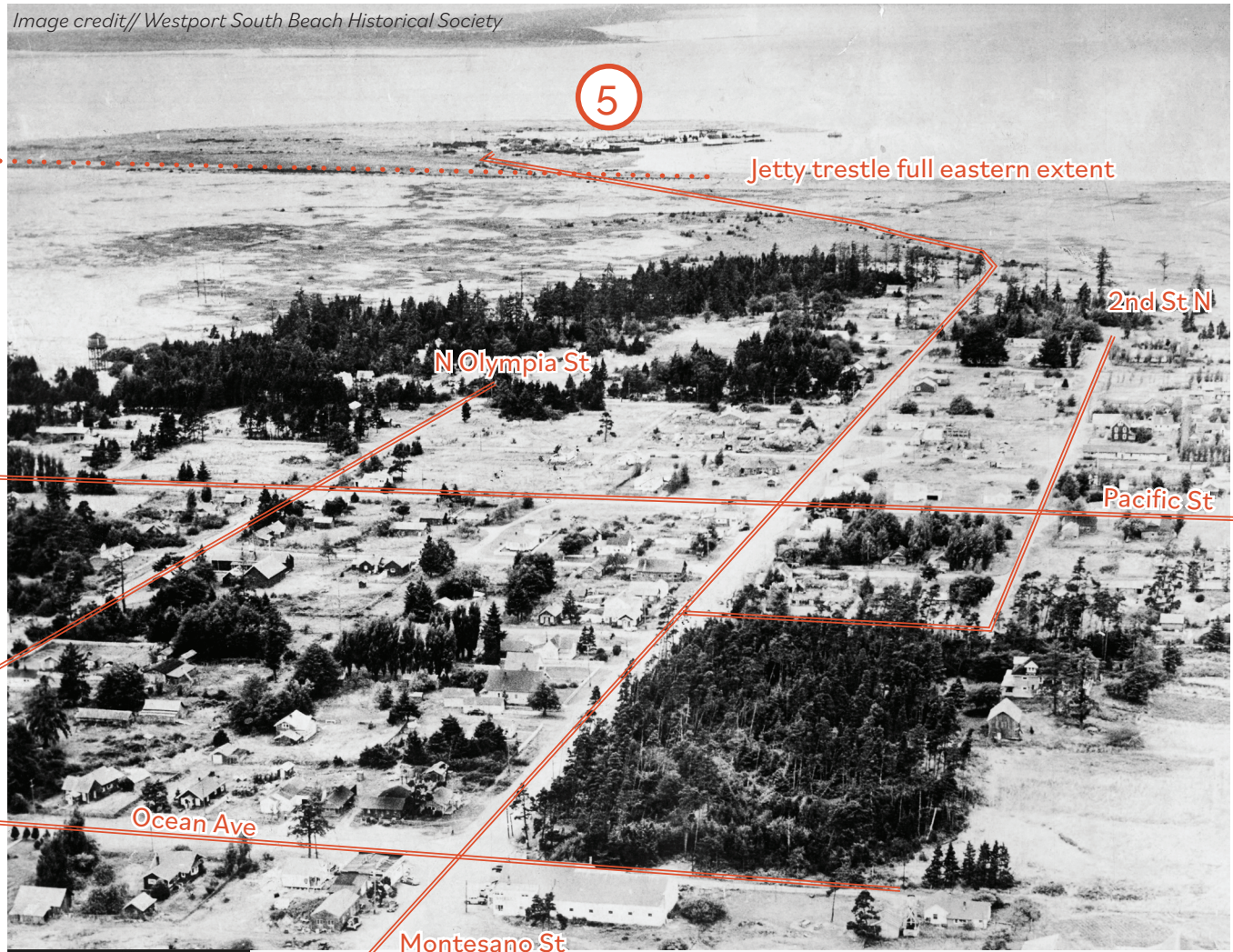


FIGURE 10. **1940** Aerial looking North West up Montesano St towards Ocean Shores from roughly above modern day Harms Field. Glen Acres Inn is in the foreground. Jetty development is started in the background and road connection between the marina with anchoring US Coastguard Station established. The built environment then as now, is dominated by single story housing stock that clusters along Montesano. Trees in the upper left grow on existing coastal dune. The corner of Ocean Ave and Montesano remains commercial.

2 helps to elucidate how the introduction of the jetty changed the shape of the Peninsula. It is worth noting the full extent of the Jetty, which stretched across the top of the peninsula and not just from the Western shore. The 1909 Kroll map (Figure 6) shows the full extent of the jetty from the harbor edge of the peninsula into the ocean. Likewise, the dotted line in Figures 7 and 9 show the trajectory of that original trestle. Figure 10 in particular shows the line of piers stretching from the harbor edge. To construct the jetty, workers used a pile driver to create this long trestle, train tracks were laid on top and rocks were carried along the length to be deposited (Mattheis and Hutchison). Although a rockery was not created along the whole length, a sea wall (visible in Figure 9) was constructed. While not a rockery, this likely still promoted infill.

Without the jetty, Westport could not have sited its marina where it did on the East side of Half Moon

Image credit// Westport South Beach Historical Society

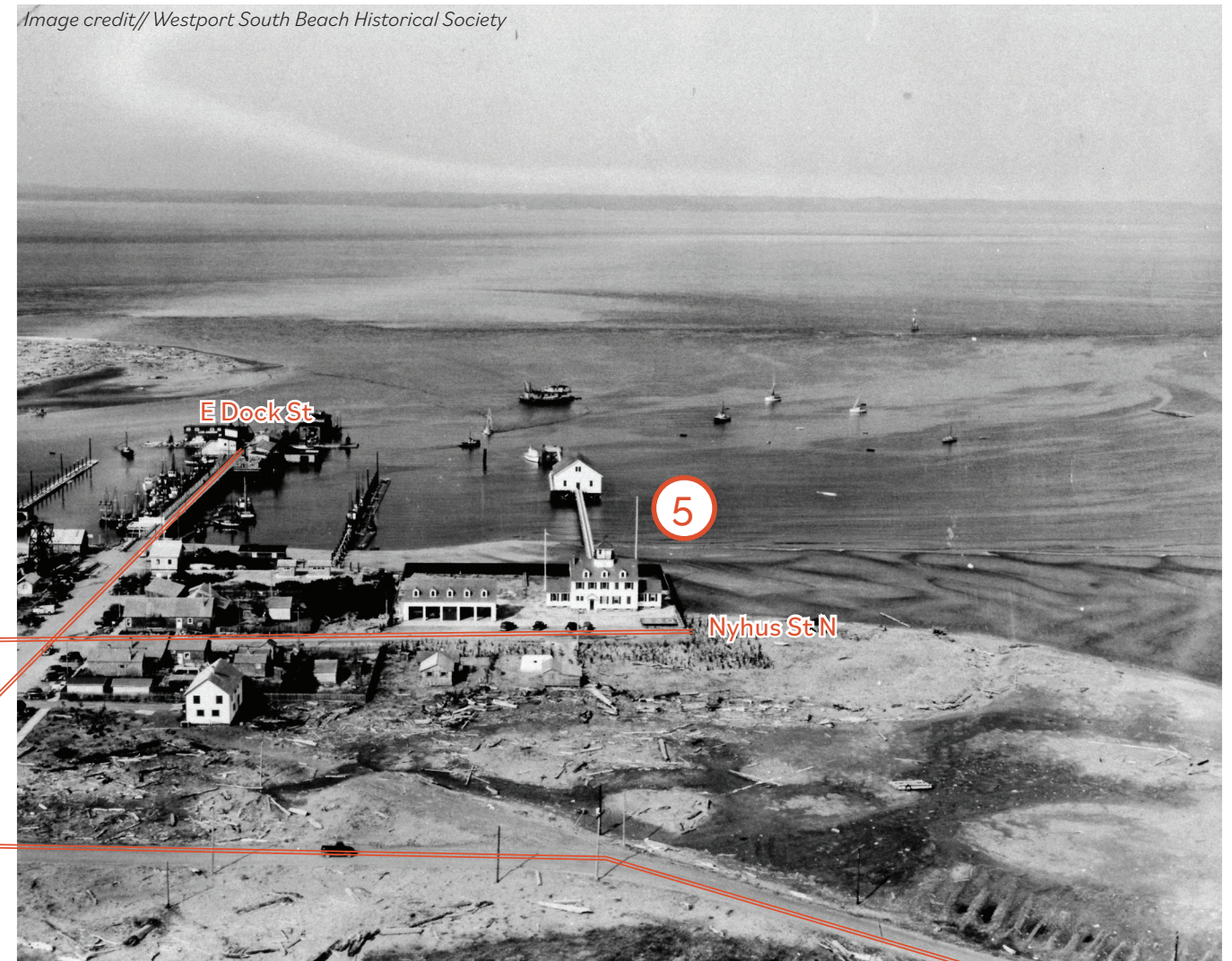


FIGURE 11. **1941** Aerial looking north showing a close up of Docks Street ending in several fish processing businesses. The US Coast Guard Station stands just next door. Drift wood shows high water mark behind buildings with roads filled to increase elevation.

Bay. Figure 10, which looks north up Montesano St, illustrates the distance between Point Chehalis with its newly formed marina district and the rest of Westport which shelters behind the furthest coastal dune (marked by the tree line in the upper left). For reference, Harriet Dorland Park's sand hill is part of this dune structure in the upper left hand corner of Figure 10. The places most vulnerable to tsunami are those that are not within walking distance of Westport's inner coastal dune which roughly aligns with the East side of Montesano Street (Figure 1). Early development, with the exception of the marina, fell within walking distance of high ground. Westport's marina, and particularly the South Jetty, is well beyond that zone of relative safety. Westhaven State Park, the area accreted by the introduction of the South Jetty, consists of a series of wetlands because, not surprisingly, it remains low lying. The deten-

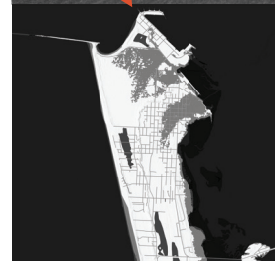
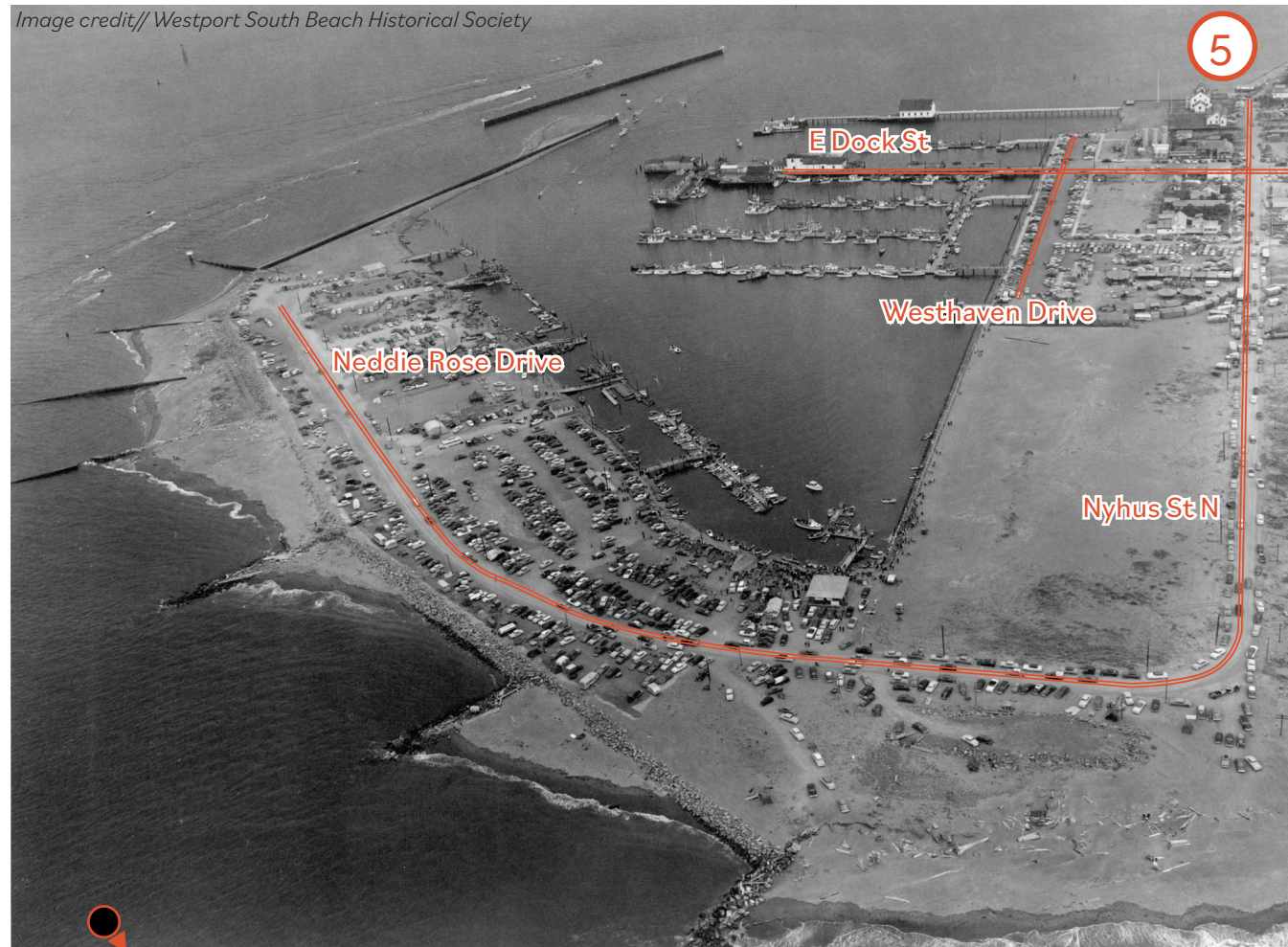


FIGURE 12. 1957-'58 Aerial looking South West towards the Pacific ocean. The Westport Maritime Museum (US Coast Guard) at far left within original sea wall (still extant). 2nd Sea wall and filling evident on Westhaven Drive, but the waterfront ends at the Maritime Museum, rather than extending another two blocks to Peterson St as it does later.

tion ponds left behind by the ill fated golf development are almost always filled with water because the water table is so high. This of course has implications for the extent of any proposed stormwater detention to help mitigate flooding and for siting density.

The Marina

Once you reach the South Jetty, turn right and head inland towards the Westport Maritime Museum on

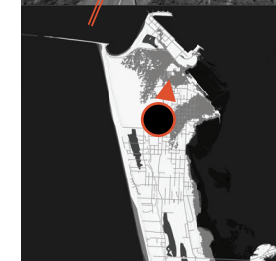
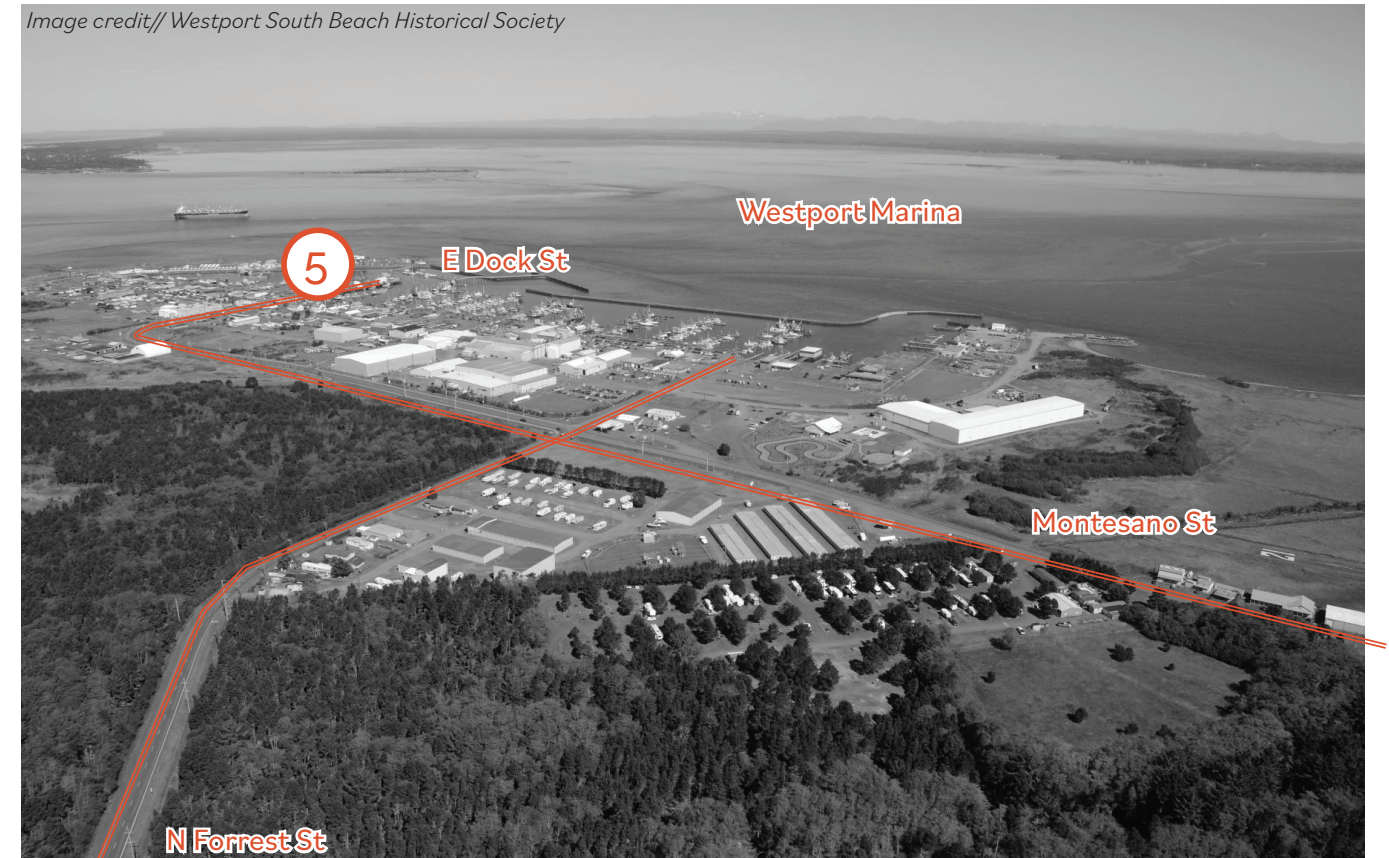


FIGURE 13. 2014 Existing conditions Westport looking North. The Westport Maritime Museum is in the upper left (6) demarcating the first edge of the Marina. Subsequent and significant filling to the East.

Westhaven Drive. Westhaven Drive sits on fill with chutes that drain stormwater off the road in the not uncommon instance of winter flooding - an adaptive design intervention implemented in 2010. Shop owners on Westhaven keep sandbags on hand to prevent water that overtops the sea wall from entering their businesses (Sparks). The marina has grown significantly over time. Figure 11 shows two early sea walls that protected the US Coast Guard Station (now the Westport Maritime Museum) and the buildings south of Nyhus St N respectively. Still, the vast majority of the harbor's edge slopes naturally to the sea. As you walk past the Maritime Museum you will see the edges of the sea wall poking up out of the grass at the property's perimeter. This helps to contextualize the amount of filling that Westport has pursued over the last 120 years - when the station was built it formed a single elevated platform above the water - an artificial island in tidal land. The coastguard station anchored the marina in its current location - far beyond the rest of the community and in a much more tenuous location. Subsequent development and fishery related industry filled in around it as fishing became one of the community's key economic drivers. Figure 7 shows the creation of the second sea wall and backfilling that allowed the formation of Westhaven Drive. These images help illustrate the somewhat suspect foundations of the Westhaven strip as it has emerged from the bay. The locations of lines of driftwood in all the aerials of

Image credit// Westport South Beach Historical Society

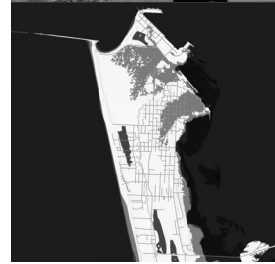


FIGURE 14. 1909 Photo looking West at Laidlaw island (now the home of Brady's Oysters), showing one footbridge used to access the Peninsula. Early land ownership exists along this axis as well as clustered around the Pacific Ave ferry landing and along the Pacific coast as illustrated in the Kroll property map of Westport (Figure 7)

Westport help to indicate high water marks. Many are ominously near to key buildings. Still, for a long time the marina area did not have a fully established retail core. Figure 12 shows the beginning of the tourist economy with cars parked all along Neddie Rose Drive. Neddie Rose Drive is also the home of another luxury condo building completed during the 2008 financial crisis. The Pointe at Westport Harbor, like Westport by the Sea, is located in a tenuous location, although because it is part of the marina complex, it benefits from all of the armoring primarily meant to protect the economic viability of the marina. Still, the building highlights potential pitfalls of unscrupulous or incompetent developers and contractors developing larger projects potentially in harms' way. In 2016, the Pointe's homeowners association sued their developer who then sued several of their contractors for serious engineering and construction defects that make the building vulnerable to seismic activity (*Pointe at Westport Harbor Homeowners' Ass'n, Corp. v. Eng'rs Nw., Inc.*). In addition, the building's location is an estimated 40-60 minute walk to the safety of high ground - far outside what is feasible in a tsunami evacuation scenario. Like Westport by the Sea, early 2000 development efforts focused density in particularly vulnerable locations because of the market for second homes and rentals at the ocean's shore. These locations

were made viable by large investments in armoring, and then became an added rationale for continuing to bulwark those engineered interventions. This potentially creates a cycle of greater and greater investment in engineered solutions over time - evidenced by the expansion of the marina and coastal armoring since the installment of the jetty. Each subsequent engineered intervention has led to others, snowballing to a point where Westport needs to invest in a multimillion dollar vertical evacuation structure to protect people at the marina in the event of a tsunami.

Back again...

From here you will complete your circle, walking back towards Pacific Ave. Note where the hills are as you walk South on Montesano. These are vestiges of the inner coastal dune, relatively stable sand where residents can evacuate in the case of a tsunami if they cannot make it farther down Montesano.

The Westport Peninsula is an exceptionally dynamic landscape. Hubs around key institutions have formed and hardened over time, but unlike many coastal communities that are dominated only by coastal tourism (such as Ocean Shores), the city does not have a huge amount of density in vulnerable places along the Pacific shoreline. This bodes well for coastal resilience work, because it gives the city options for focusing future growth away from vulnerable locations, and preventing future development from jeopardizing community safety. The Ocosta School already has a vertical evacuation structure, and the City is in the process of applying for funding for a second VES at the Marina. These two anchors, made critical by their economic and civic primacy developed over time, require this type of infrastructure.

Within this context, the two proposed park sites - near the library and Shop n' Kart on Montesano and the Pacific Street property respectively - are located on the peninsula edge of Westport's historic Montesano St core. Although vulnerable to Sea level rise, the properties are areas that can help increase the resilience of that core by providing more Bay side amenity spaces that are closer to safe evacuation routes than the Pacific edge. Additionally, they may have utility in more quickly draining stormwater away from these critical residential and commercial areas - design strategies that will be addressed later in this thesis.



Public works director Kevin Goodrich pitches students on park design project// Photo by author

CHAPTER 3: Community organizing for resilience planning: Westport framework

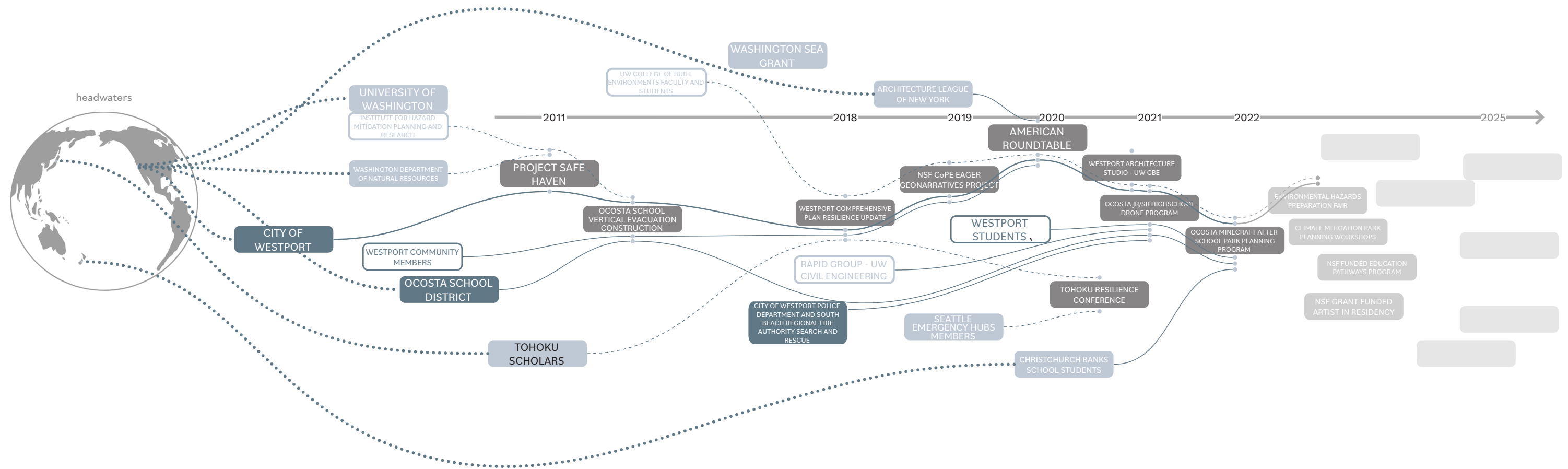
As with other community engagement, one of the chronic challenges of environmental planning is getting community members involved and sustaining public participation. In this respect, planning practitioners can borrow a leaf out of the book of community organizers whose work revolves around community mobilization. This includes considering the importance of ownership over planning processes, messaging, visioning and utilizing existing community hubs. This research focuses on the captive audience of students as a potent locus for community organizing for community adaptation.

For some context, after I graduated from college, I took a job with the Public Interest Network as a community organizer at Southern Oregon University in Ashland, Oregon. My role was to engage college students in the Oregon State Public Interest Group's (OSPIRG) many campaigns (save the bees, protect Crater Lake, get big money out of politics). That work taught me the rudimentary skills of community organizing including how to get people in the door, and once in the door, the importance of messaging, leadership development and leveraging existing community assets and resources to further the goals of the campaign. Community organizing, like community engagement in planning, requires strategy, working with existing social networks and community hubs (like schools, churches, existing community organizations and their leadership), and thoughtful messaging. In the case of the PIRGs, their campaign framing was designed to mobilize a large audience but at a low level of engagement (hence the fairly innocuous campaigns noted above). Unlike the PIRGS, coastal resilience work in a place like Westport requires a more targeted and tailored approach that aims for deep investment and commitment to action.

Unfortunately, the PIRGS used an exceptionally top down approach which has shaped how I think about public engagement in urban planning and design. At the PIRG's, messaging and campaign strategy came from Washington DC and there was no feedback mechanism lower down on the chain. This experience led me to believe that collective visioning and issue framing is an essential part of building long term investment and commitment to a cause whether it is a social justice campaign, or in the case of Westport, addressing the existential environmental threats facing a community.

Other work has discussed in significant detail Westport's efforts to incorporate resilience and hazard mitigation into community planning efforts. Cara Donovan's thesis (2021), which considers the use of geo narratives as a community planning tool in South Beach, does an excellent job of enumerating these efforts. Most of this work emphasizes tools, but is less specific about how and perhaps more importantly where, they are deployed to maximize their impact.

In conceiving of this thesis, I considered the work by Zehnep Tufekci, a Turkish computer scientist and political theorist whose work includes study of the political ecology of social movements. In her book, *Twitter and Teargas* (2017), Tufekci speaks to the coalescence of such movements including issue framing and mobilization tactics. I believe that coastal resilience work can borrow something from this lens of analysis. Tufekci's work considers different engagement strategies that social movements have used over time and particularly how they have changed since the advent of the internet and social media. Her analysis includes a discussion of the architecture of different social media platforms and how this



- catalyzing events - change the trajectory and mobilize new actors (rocks in the stream)
- driving actors external to the Westport Community
- driving actors within the Westport Community and Gray's Harbor

FIGURE 15. Positioning my thesis within Westport's ongoing resilience work. In 2011, the devastating Tohoku earthquake and tsunami precipitated a more concerted conversation around coastal resilience. In the above diagram, catalyzing events and driving parties are demarcated starting in that time and focusing primarily on University of Washington activities (this is not an exhaustive representation of involved parties). Like streams gathering into a river, these drivers build towards greater community capacity and a more diverse group of actors over time. My thesis is one small piece of this broader resilience work that engages students in Westport specifically - a group that is often underrepresented in resilience and community planning work.



FIGURE 16. Existing park programs and community assets as identified by Westport students (stickies and stickers) overlaid on NOAA sea level rise viewer map. Existing park properties are indicated with stickies including existing facilities and activities they support. Most assets are along Montesano St. including the Ocosta School. See appendix B.

architecture leads to different types of engagement and community building than the traditional town square or community hub. In particular, she looks at the depth and breadth of engagement inspired by these platforms. She argues that platforms like Facebook and Twitter are good at getting people in the door, but not necessarily at building sustained engagement and community capacity. In building a climate resilient Westport, some of these considerations come into play: in particular, how to inform and mobilize community members to support large-scale mitigation and resilience efforts (Tufekci 6-7). In considering what tools to use in my efforts with Westport students, this was a key consideration i.e. what tools and strategies would get students in the door, and then what subsequent work might help them to stay involved in the conversation over the long haul (a question that I start to address in the final chapter of this thesis).

As indicated above, in community organizing, one has to consider what messaging will galvanize support from the intended audience, but one also needs to understand where that intended audience is - both physically and more often than not, virtually. My thesis posits that community modeling in Minecraft is one tool that can find the student community where many of them already are, in a beloved video game. Tufekci argues that Facebook and Twitter by their architectural affordances are not necessarily the best platforms for organizing, however, their ubiquitousness is part of what makes them powerful mobilizing tools. Similarly, Minecraft partially because of its affiliation with Microsoft, is quite accessible. Although it is not free like the aforementioned platforms, with an educational Office 365 account, Mi-

necraft Education Edition is available for the relatively nominal fee of \$5 per subscription. Since its creation in 2011, Minecraft has gained 141 million players globally (Clement). Unlike Twitter and Facebook, Minecraft feels substantially less proprietary. In my Westport world building endeavor, I utilized several ancillary third party softwares and utilities and accessed a huge host of tools outside of Microsoft and Mojang. Although I am a novice to Minecraft (I started playing at the start of my thesis), there is already a huge and devoted community that benefits from its relatively open and democratic administration - a community whose expertise could be drawn upon to develop better tools for modeling environmental hazards within the game.

Minecraft creates a potential third space for kids to participate in community discussions and decision making. This is important, because in speaking with Kevin Goodrich and in my work at the Ocosta School, I was continuously reminded of the limited public space that kids in Westport regularly access. There may be a mismatch between existing public assets and the activities kids want to participate in. For instance, Westport devotes significant public space to baseball fields (four fields for a community of 2,300). When Kevin Goodrich, Westport's Public Works Director and John Shaw, Westport's Historical Society president, visited Minecraft club, we asked them about this mismatch. They told us that when they were kids, there was robust participation in little league baseball, justifying this use of public space. At that time, the baseball fields were, and to some extent, still are, critical community hubs where people got to know their neighbors. The current lapse in this type of involvement brings up two questions - as addressed above, where do we find Westport students in the community now that there is less engagement in organized sports, and how can future park development be used to capture their interest and to re-instill a sense of place and belonging in their physical community?

As referenced, another useful parallel between organizing for community resilience and Tufekci's analysis of social movement formation is the importance of movement framing and visioning. In the climate movement, some of this visioning has taken the form of speculative fiction that imagines alternative social orders and alternative futures as a vehicle for grappling with an uncertain future and rallying for change. In her book, *Imagining the future of climate change: world-making through Science fiction and activism*, Shelley Streeby (2018) focuses on the use of speculative fiction by indigenous and POC environmental activists as a galvanizing force. In a parallel vein, UW College of the Built Environments has partnered with the city of Westport on an ecological design and planning studio that provides several visions for sites in Westport that could increase the city's disaster preparedness and ecological resilience. These renderings provide a window into alternative futures for the community. However, because of time constraints and UW student ability to spend a significant amount of time on site, these visions can lack specificity and community grounding. In a conversation with Kevin Goodrich I asked him explicitly about the role of visioning in resilience work in Westport. I put forward the idea that having a somewhat unrealistic but inspiring vision can help to motivate community resilience investment. In his experience, seeing the UW student work was helpful to him in setting aside pragmatism and stepping back to see the bigger picture. My work with the students of Westport, which I discuss in chapter three, is an attempt to create a more bottom up or home grown visioning process by giving students in Westport the tools to indicate what they want for their community.

The geonarratives work mentioned above seeks to place South Beach's resilience work into a historical context of ecological change - in essence creating a framework to consider future adaptation in physical

form and social understanding. This is essential context with the potential to build momentum for deeper community involvement and mobilization of resources toward preparing for an unpredictable future. Ideally this work in narrative forms the basis for community visioning moving forward.

Tufekci (2018) demonstrates that the process of creating a social movement itself builds competency, clarifies community resources and develops flexibility and the ability to handle adversity. Social movements are constantly pivoting in response to new information, new parameters and changing political pressures. Resilience work must adapt to and accommodate these challenges also. Because of a social movement's refusal to accept the status quo, they are inherently self-reliant. They emphasize the importance of working from the bottom up, with a special focus on community assets and resources. In an emergency, in a remote location such as Westport, self-reliance and internal cohesion are critical.

It is no coincidence that historic hubs for social movement generation are churches and schools. These are places that bring people and resources together with a common vision and purpose. As indicated in the introduction of this paper, University of Washington has started to partner with the Ocosta Senior and Junior High School on several resilience programs. As mentioned, this work has taken a couple of forms, most notably the launching of an afterschool drone program that seeks to engage youth in different facets of hazard mitigation work including critical infrastructure assessment and search and rescue. Like Minecraft, drone club utilizes an appealing tool to get students involved, and then helps them to understand how that tool can be used for real world applications. In the process, we have gotten students out in their community flying drones and hanging out in public space. Drone club has also created a number of ties with community members and institutions creating a more robust resilience network as illustrated in Figure 15.

CHAPTER 4: Pedagogical Approach

I started this project with the perspective that any community in as precarious a position as Westport should leverage their city planning activities to build community capacity, preparedness, and literacy around environmental hazards. No location in Westport is immune to environmental risk, and so each site planning exercise provides an avenue for catalyzing critical discussions. This type of approach has played out in Westport before. Following the 2011 Tohoku earthquake and tsunami, the Ocosta school community leveraged the expansion of their elementary school to invest in North America's first vertical evacuation structure (VES). The process of building this structure: applying for grants, working through the political process, engaging the school community and relevant professionals, in itself built up the community's capacity to work together to solve complex problems and to call in outside actors to strengthen pre-existing hazard mitigation networks. Westport essentially wrote the book for VES in North America - prior to their project, FEMA had no guidance or funding mechanisms tailored to their specific environmental hazards (Personal conversation with Kevin Goodrich) As illustrated in Figure 15: infrastructure investments and other catalyzing events can act to pull new actors into the resilience conversation, and to give them new skills. For instance, by locating the VES at the Ocosta school, students have the opportunity to regularly use the VES for Tsunami drills, and the tower stands above the school as a constant reminder of environmental precarity. Working at Ocosta over the winter, I witnessed how having this piece of infrastructure on campus kept environmental hazards in the daily conversation of the school. With existential threats like sea level rise - site design can create an immediacy and a sense of agency - it gives a place to start and creates opportunities for concrete actions. My project tests a different strategy for leveraging site design to build community capacity and to increase literacy around Westport's environmental hazards.

Background on curriculum approach and why this approach was selected:

The Ocosta School is a critical hub because of its physical properties (as the only community Vertical Evacuation Structure) and the community investment it represents, as well as its potential role in building community capacity through its educational program. One of the mandates of a public school education is that schools provide students the tools to act as empowered and engaged citizens. If students decide to establish their lives in Westport beyond graduation, sea level rise and associated flooding is likely to become more prevalent and impactful on their lives and livelihoods. Consequently, schools present a potential pathway for engaging an essential stakeholder group in community adaptation work through education (Lawler & Patel, 2012).

The above chapter responds to questions about why community adaptation work should strategically engage schools but does not address the most effective ways to implement that work. In developing a curriculum for community adaptation work, several theoretical threads come to the fore. The first is evidence that connection to place can be galvanizing in creating ecologically minded behavior and civic efficacy. In their paper, Vaske and colleagues (2001) identified that adolescent students engaged in work related to a local environmental resource were more likely to exhibit ecological behavior. They posit that connecting to a specific environmental resource can lead to stronger place identity, which

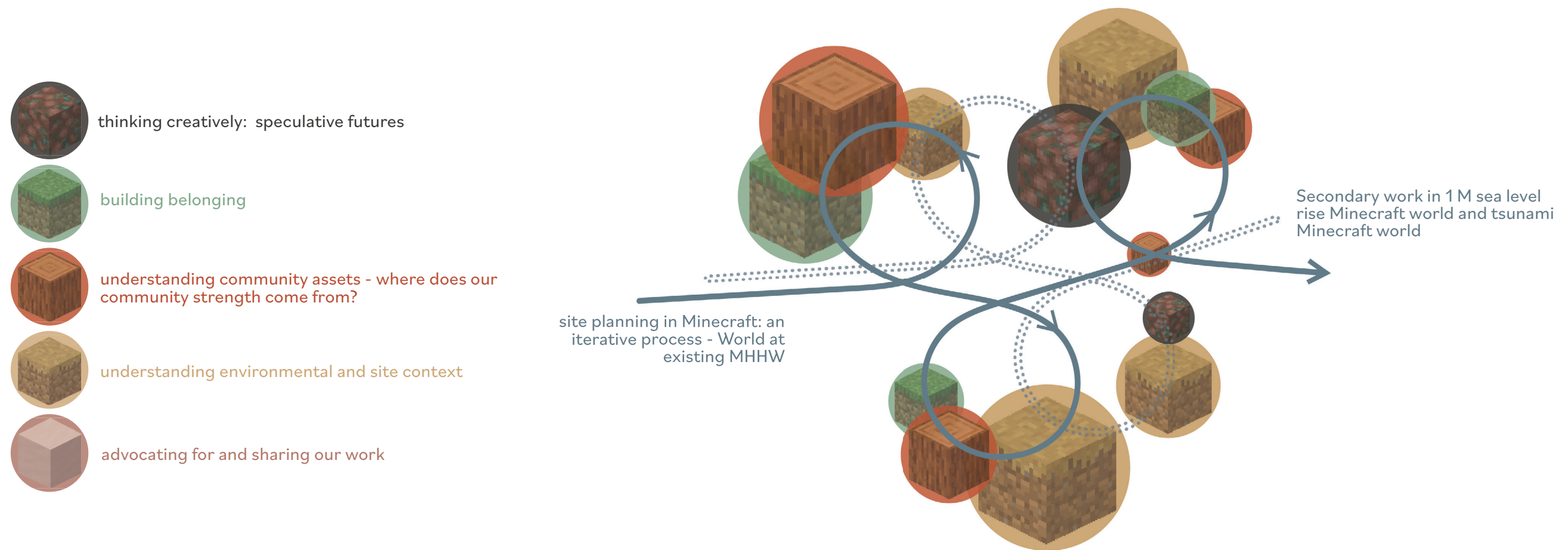


FIGURE 17. Framework highlighting curriculum guiding principles. Each lesson seeks to engage one or more of these principles. The backbone of the curriculum is site planning in Minecraft which we returned to every class period. This worked as an iterative process as I refined the base world of Westport to include more realism and to test different sea level rise scenarios and the students became more oriented to the scale of the model and their role in defining park planning solutions. See Appendix for lesson planning activities.

in turn mediates the relationship between place dependence and ecological minded behavior (Vaske & Kobrin, 2001). Lewicka found that place attachment in addition to more standard predictors such as social capital and community ties were important factors in catalyzing civic action (Lewicka, 2005). A curriculum for climate adaptation could work to strengthen community ties through relationship building with planning and policy professionals in addition to leveraging attachment to place.

The second point addresses the role that project based or applied curriculum can play in climate education. For instance, Henderson and Tudball find that when schools have students measure waste after meals they can engender greater peer to peer reinforcement and build efficacy (Henderson & Tudball, 2016). Similarly, Uitto et al. find that participatory school experiences can build sustainable behavior primarily through creating prosocial behaviors. Peers influence peers in promoting sustainable behavior. These findings support the use of applied curriculum to invest students in climate adaptation work that leverage relationships and collective problem solving.

The third point considers how educators can engage students in productive conversations about climate change. One of the concerns, which is particularly salient in a climate precarious community like Westport, is that climate education can lead to despair rather than imparting a sense of efficacy. Researchers have found that one effective method in combating this challenge is through student produced speculative fiction. Rousell and Cutter-Mackenzie discuss how production of speculative fiction can help students to inhabit and envision alternative futures. This approach in conjunction with participatory play can help to build hope for the future while strengthening climate knowledge. Like several of the studies referenced above, this research found that peers could influence peers through this narrative approach. One of the students who participated in their study wrote and illustrated a speculative climate fiction that led to multiple spin off stories by peers, highlighting the influence that such an approach could have on the student body at large (Rousell et al., 2017). This visioning and world building process is one possible strategy of the larger process envisioned in the previous chapter.

Combined, these threads provide a guide for a potential curriculum design. They indicate the importance of peer-to-peer learning for increased engagement with the material, the value of place specific education that leverages place attachment to enhance learning outcomes, the importance of play and imagination to deeply engage students, and the role of an applied project in strengthening community ties and sense of efficacy.

Community modeling using Minecraft is one method that can potentially tie together these somewhat disparate strands. Minecraft is a block based game where each block is a meter square. In remote sensing parlance, this means that the game is created out of voxels - i.e. three dimensional pixels at 1 meter resolution. Each block has different attributes - and many blocks interact - for instance you can only “spawn” a pumpkin block on a tilled field block, and you cannot grow anything on sand (a dubious conclusion if you take a gander through Westport). Players choose from a gallery of blocks which they can then deploy as they see fit. Each player has an avatar, and the player can choose their own “skin”. For this reason, modeling in Minecraft happens at human scale, and with real character investment and as such, does not suffer from some of the pitfalls of other modeling softwares like Rhino or Sketchup. In those programs, understanding scale can be challenging. In Minecraft, because the player builds “block by block” constructions at inhuman scales are extremely challenging and time consuming.

UN Habitat and others have successfully used Minecraft to engage young people in community modeling activities (Bashandy, 2020; de Andrade et al., 2020). The Block-by-Block project, a collaborative effort between UN Habitat and Microsoft (the owners of Minecraft) has completed dozens of community development projects around the world. In their study in Tirol, Brazil, De Andrade et al (2020) identified that the Minecraft platform was adaptable, easy to learn, promoted collaboration and was deeply engaging for young people (de Andrade et al., 2020).

However, Minecraft is a tool and not a method in and of itself. Bashandy (2020) argues that the Block-by-Block methodology often falls short of creating the democratic planning outcomes that the organization hopes to realize. He analyzes three Block-by-Block case studies to identify how closely end projects reflect community modeling efforts. He finds that the method can lead to a lack of iteration and reciprocity between the community participants and planning and design professionals. Block-by-Block workshops run for a couple of days and then there is very little follow up until the project is implemented, by which point participants may be disengaged. A curriculum approach can help to mitigate this shortcoming by creating a longer and more iterative process that allows students to present ideas that can be refined by a designer and then redesigned by students to home in on best solutions and consensus (this process as it occurred in Westport is enumerated in chapter 5).

Others have highlighted the role that Minecraft can play in more traditional community planning. Mather and Robinson (2016) discuss using Minecraft as one tool in a larger toolbox that has the potential to attract new stakeholders to the community planning process. One of the elements of the program that

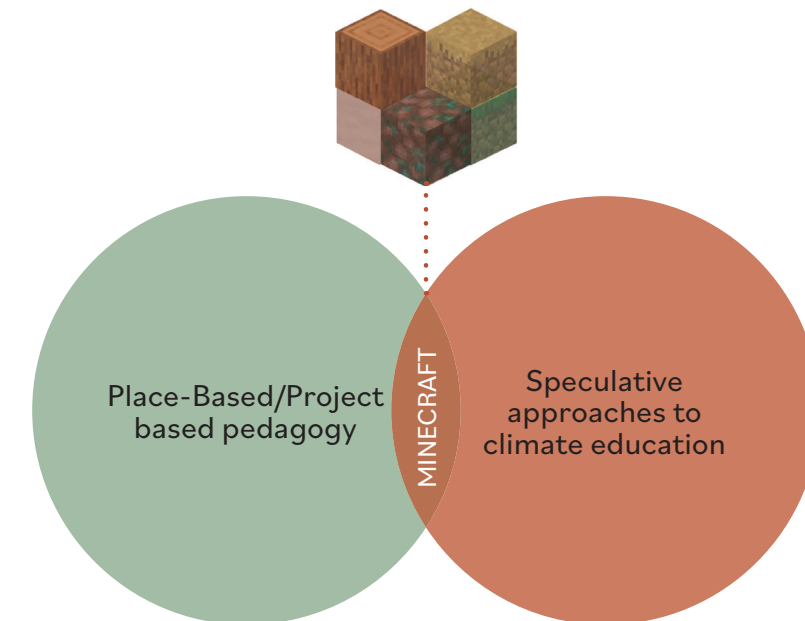


FIGURE 18. Rationale for this pedagogical approach.

they highlight is Minecraft's unresolved quality. When stakeholders are given finished or more resolved models, they may be less empowered to provide feedback or to think that their contributions will be incorporated into the final form. Community modeling in Minecraft may open that process up, and help to engage community members who feel less competent to participate – particularly youth (Mather & Robinson, 2016). However, this unresolved quality can also be a pitfall. Bashandy argues that Minecraft's block design forces the use of right angles and a specific large and static grain (Bashandy, 2020). This could be viewed as both a benefit and a drawback when designing for sea level rise adaptation. Westport is an exceptionally dynamic environment due to its depositional foundation and marine environment (see chapter 1). Minecraft struggles to convey the dynamism and nuance of changing sea levels and accompanying changing land massing. However, the consistent block sizing probably helps students to visualize and measure the influence of topographic changes for sea level rise scenarios at a coarse grain. Because of the human scale, each block is a meter squared and represents a physical impediment to movement. Elevation changes are not subtle in Minecraft and lend themselves to conversations about elevation and strategic earth moving.

Below is an idealized pedagogical framework for the Minecraft Planning Club. Some of this idealized pedagogy was not implemented in winter 2022 because of challenges getting the program going quickly, and adjustments due to student preparedness (and in my case, teacher preparedness).

Pedagogical Precedent: Banks Ave School, Adventure Ave

In addition to the framework addressed above, guiding principles are shaped in part by the work of the Banks Ave School Adventure Ave project in Christchurch, New Zealand. This project, a new park by kids and for kids, was initiated after the devastating 2011 Christchurch Earthquake. Like Westport, Christchurch sits in a seismically active area on top of a depositional environment subject to liquefaction. For background, the Banks School is adjacent to Christchurch's residential Red Zone, a series of neighborhoods along the Avon-Otakaro River corridor that liquefied and subsided by around three feet during the earthquake causing irreparable damage. Many families were subsequently displaced as the government decided not to rebuild infrastructure for the neighborhoods and instead to pursue a strategy of managed retreat. Subsequently, the school partnered with the Avon-Otakaro Network, a local nonprofit organization that sprung up in the aftermath of the earthquake, to provide students an opportunity to intercede in the future of part of the red zone by proposing and developing a small park. Over the course of several years, the students brainstormed the project's program, worked with local property owners to secure a piece of land, advocated in front of their city council for funding, and worked with local college students to break ground on their project. While cooking hotdogs for a volunteer event with the school's headmistress, Jan Thompson, filled me in on the amazing transformation she saw in the students participating in the program. She witnessed how their confidence grew, and how their relationship with a place of intense trauma has evolved into real feelings of investment and belonging. She and Sian also saw the importance of having a group of students passing on the project over the course of several years. This allowed older students to act as mentors to younger students which in turn built up their leadership skills.

I see my thesis work as one small piece of what could become a more robust curriculum in Westport that, like Adventure Ave, allows students to take on leadership within their community and potentially to help their community prepare for sea level rise over the long term. The pandemic is a very different type of trauma than losing one's home to an earthquake, however, my interactions with the seventh graders of Westport showed me that they are hurting and disconnected from their community also. This was a refrain I heard over and over from the teachers at the Ocosta School: that students were not present in the way they were prior to the pandemic. The pandemic created a different type of dispossession, and as indicated, I believe this project based approach may be useful in reconnecting students to their community by leveraging the virtual to reestablish a sense of belonging in their physical community.

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See appendix A for lesson plans by theme.

CHAPTER 5: Minecraft Resilience Planning Methods

The following chapter includes steps for creating a Minecraft world as well as guidance on student recruitment strategies. For more information on the lesson planning approach, see appendix A.

Methods

The below process outlines how to create a topographically accurate Minecraft world using a Digital Elevation Model (DEM).

Creating a topographically accurate Minecraft world requires a high quality DEM. For this project I used a NOAA 5m resolution lidar used in their sea level rise viewer. This ensured that I was showing the students consistent data online and within the Minecraft model space. Ideally, I would have located a 1m resolution lidar, because each Minecraft block is 1 square meter. This has implications for students being able to make comparisons between remote sensed images and what they see in Minecraft.

This process requires four main softwares: ArcGIS Pro, World Builder (a third party Minecraft world building software), MCC Tool Chest (which converts rendered world builder Minecraft models from Minecraft pocket to educational edition) and finally Minecraft Educational Edition licenses for participating students. These are available with an educational Office 365 account.

Step 1: Clean up DEM in ArcGIS Pro

Import DEM and identify high and low points - this forms the range of values that will be used to define sea level and the highest point in the Minecraft world.

Import sea level layers: Identifying mean sea level is essential for creating different sea level rise modeling scenarios. For this case, I added Mean High High Water, a layer created by NOAA for their Sea Level Rise viewer. This was overlaid over the DEM in the same grayscale hue as the color where the water vector intersects land. Remove values below this hue from the DEM to get a new range of values for lowest to highest elevations. If you have access to tsunami modeling, this polygon layer can also be overlaid for another scenario. Export with scale in meters.

Create layers to export with existing roads and building footprints.

Step 2: Import DEM into World Painter

Import the modified DEM into World painter and set the lowest and highest elevations. Set the under-surface materials. For Westport, I created a sand base so that if students decided to dig, they would find only sand replicating the conditions in Westport.

World painter is where the majority of large scale alterations occur to create a believable world. Once the model is imported, the scale should be modified so that 1 meter in Minecraft is equivalent to one

meter on the map.

Change land use cover based on elevation: based on the satellite, determine and apply different land use cover (these will show up as different blocks in Minecraft) according to elevation. This begins to show students the impact of elevations in determining vegetation coverage.

Download and import blocks into World Painter. There is a robust community of Minecraft makers. For this world, I downloaded pre-made native trees including a mix of Sitka Spruce and Douglas fir and uploaded them for application in World Painter which I then drew onto the map.

Draw existing streets and extrude buildings based on ArcGIS overlays referenced above - this is critical for students to understand where they are in the world and to have a sense of scale.

Outline intervention sites with an obvious material - for my scenarios I outlined the park parcels in lava to make sure students knew where they could and couldn't intervene.

Export World Painter model

Step 3: Convert model to Education Edition using MCC Tool chest, a third party Minecraft world converter. As of this thesis, World Painter only exports in Pocket Edition.

Step 4: Open in Minecraft Educational Edition: Fly around the world to see if extrusions and trees approximate appropriate scale. Build out critical infrastructure in Minecraft and identify the coordinates for those locations. Build out wayfinding by inserting street signs and signs for key buildings.

Repeat the above steps for different sea level scenarios.

Tip: Download Classroom mode for Educational Edition. This will allow you to control student materials including preventing them from using destructive blocks like TNT. Classroom mode allows you to see where each student is within the model space.

Step 5: Host students in your model world.

Building a Minecraft world for coastal resilience planning: steps

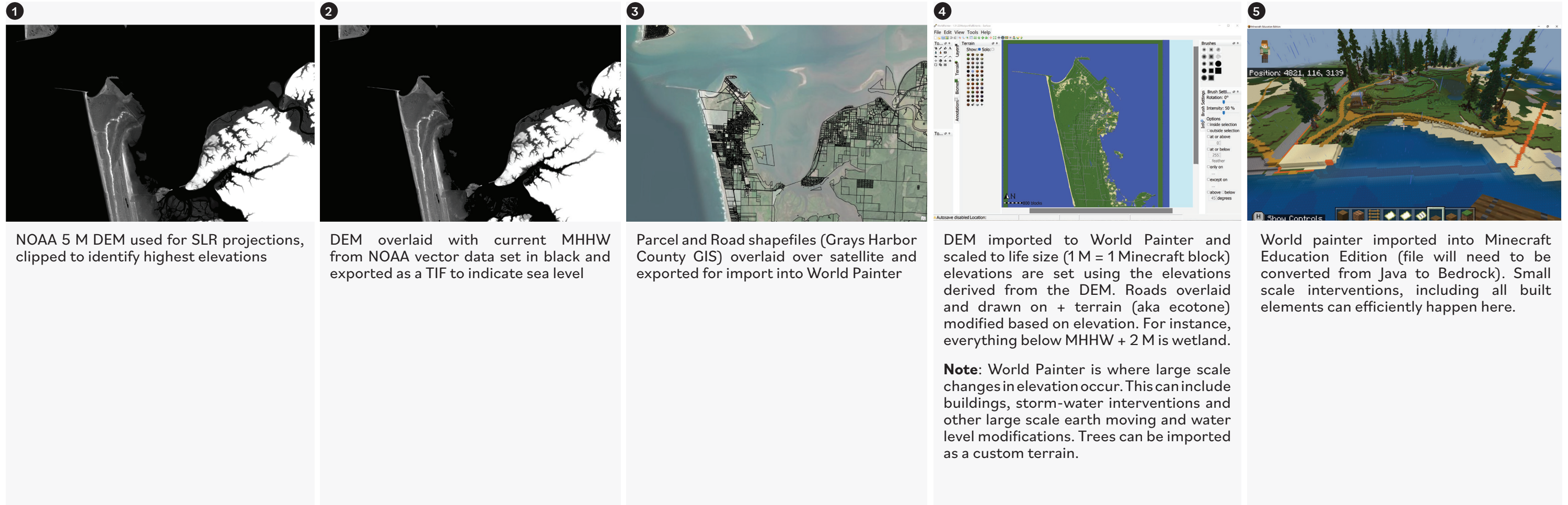


FIGURE 19. Above are the basic steps for converting an elevation model into a Minecraft world. I learned many things in this process, including the importance of inserting buildings into World Painter before exporting to Minecraft. Because Westport is so flat, it can be challenging to orient oneself in the Minecraft world. Points of reference such as correctly scaled roads, trees and buildings can really help students to understand the scale of their work and where they are in their community.

Student recruitment

Strategies

- Emails to teachers asking to give a quick class presentation and including program background (with the hope of informing and possibly involving them in the work)
- Posters put up around school and in major community hubs
- Minecraft recruitment during lunch period - I hooked my computer up to a large screen and let students play in Westport Minecraft. I also pulled up the world builder world so that they could see the overview of the world they were playing in.
- Pitched students at the beginning of each afterschool program.

Students interacting with Westport Minecraft during their lunch break. // Photo by author

Minecraft as a Tool for Investing Adolescents in Climate Adaptation

HELP WESTPORT PLAN FOR THE FUTURE... IN MINECRAFT



DESIGNING A PARK FOR HERE

AND HERE

YOU ARE HERE

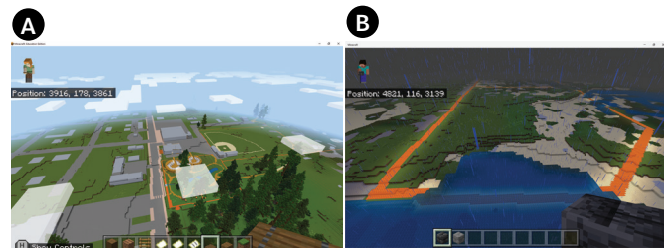
THIS IS 5' OF SEA LEVEL RISE

OCOSTA JR/SR HS AFTERSCHOOL PROGRAM
WINTER 2022
START 2.8.22

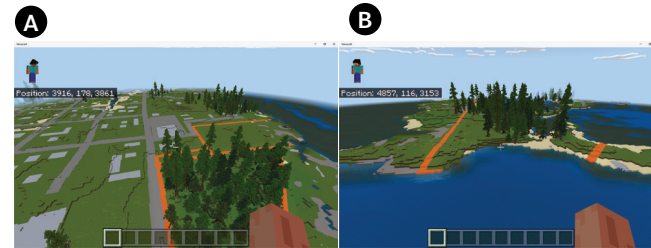
Chapter 5: Minecraft Resilience Pla

W COLLEGE OF BUILT ENVIRONMENTS
UNIVERSITY OF WASHINGTON

Field Trips: Sea Level rise + Tsunami



Existing MHHW



MHHW + 1M



MHHW + 7M (Bathtub tsunami)



FIGURE 20. Modeling in World Painter - Water level is modified in each scenario. Although we did not propose any site interventions at 1 Meter SLR and 7 Meters (bathtub tsunami) respectively, we did take several trips to emphasize the ramifications of these two scenarios, and to inform our designs at current MHHW.



Students playing Westport Minecraft during the after school program // Photo by author



CHAPTER 6: Recommendations based on student input for Westport park planning

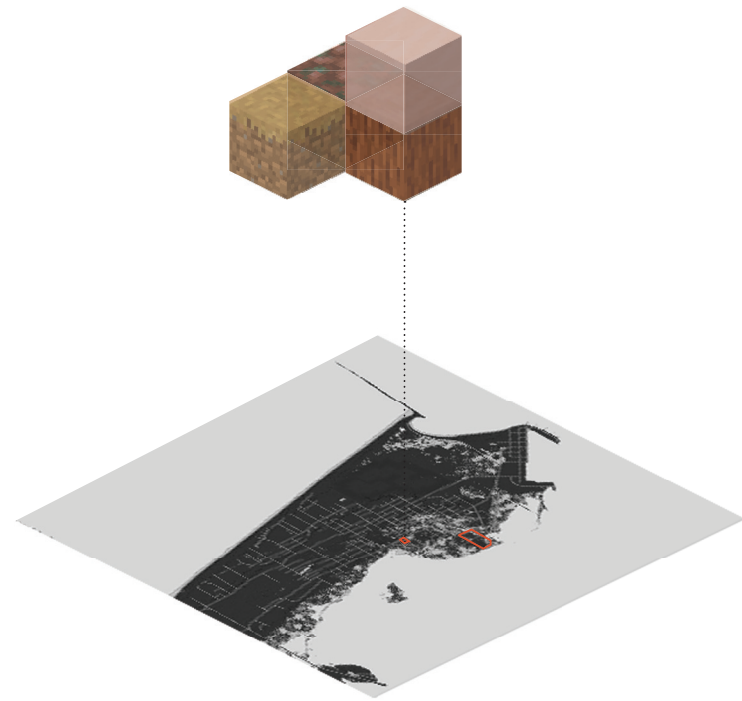
Students expressed a wide range of park programming ideas that elucidated gaps in current park and community offerings. Each iteration was a balance of the fanciful and practical but several key themes emerged. First, students were interested in seeing programs that allow space for the more than human. Interventions included several dog parks, a salmon run, a duck pond and an axolotl themed cafe. A second theme was access to risk. We had several conversations where we identified students' favorite park elements, and many of them included an element of danger. Park interventions included roofs where people could sit, jungle gyms with various dangerous elements, copious use of lava in various applications including at the bottom of slides and within a proposed soccer field and the use of TNT. Third was the importance of humor and novelty in landscape interventions. For instance, students proposed a duck pond in the form of a duck head, a pentacle for performing dark magic and a jail for "annoying" children. Based on these takeaways, Westport could benefit from adding more park programming that includes interventions for animals, opportunities for controlled risk and the use of novel park design solutions.

Modeling Iterations at Existing Mean High water

iteration 1: Students

SUGGESTED PROGRAMS:

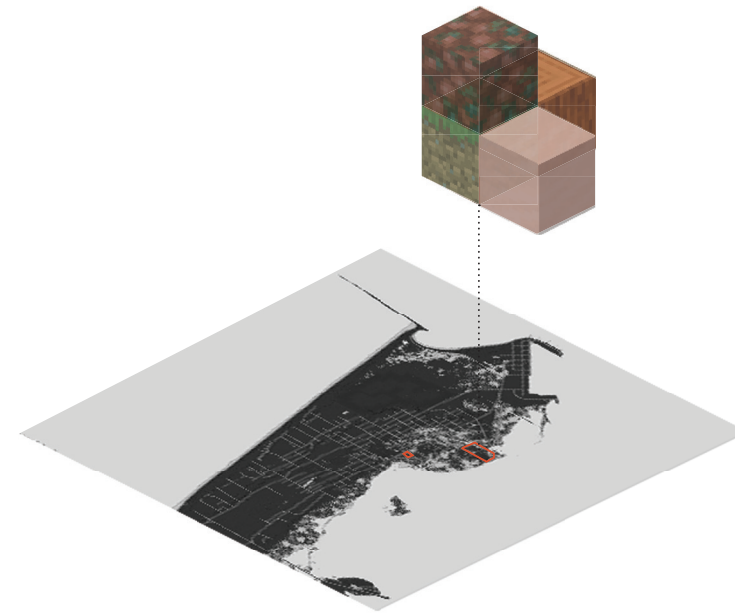
- A jail for “annoying” children
- Bathrooms
- Salmon pond and run
- Slide ending in lava (risk)
- Duck pond
- Dog park
- Small play structure made of logs



iteration 2: Students

SUGGESTED PROGRAMS:

- Concessions stand (hot dogs)
- Beginning of VES structure
- Lava mine
- Amethyst and glass structure - program unclear
- Public art
- Gold road paving (also possibly art)
- Shed filled with TNT
- Soccer field
- Dog park
- Pool
- Indoor/outdoor cafe

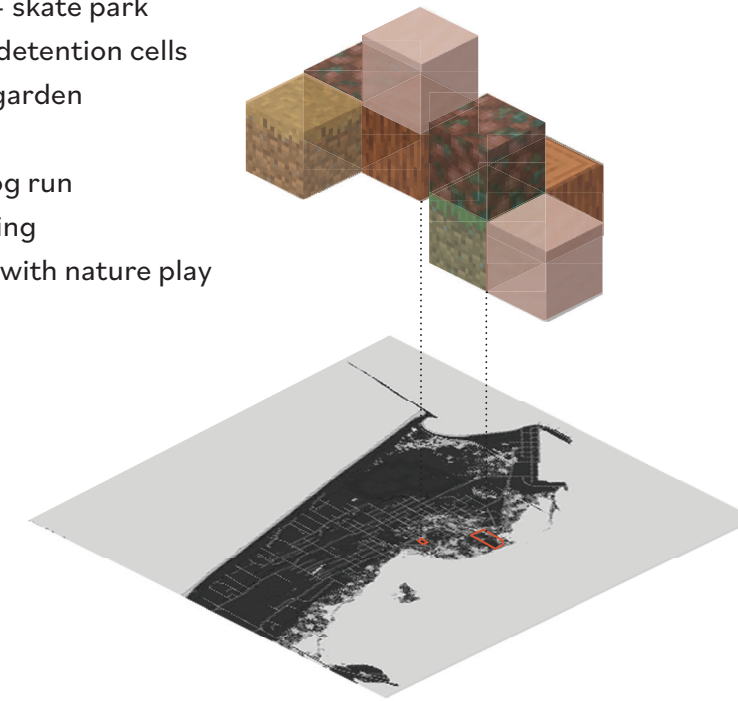


(world 1) = Westport with existing average high water (world 2) = (world 1) + native trees + building footprints

iteration 3: Instructor

SUGGESTED PROGRAMS:

- Indoor/outdoor cafe
- Canoe put in
- Ropes course
- Bathrooms
- Pump track + skate park
- Stormwater detention cells
- Community garden
- Playground
- Plateaued Dog run
- Landfill capping
- Forest paths with nature play

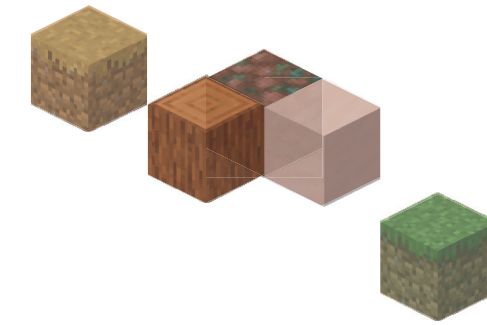


(world 3) = (world 2) + Sarah site design in plan + land massing alteration for climate adaptation

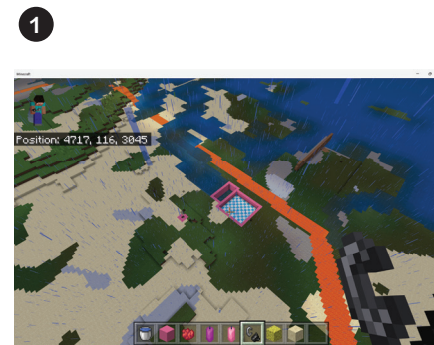
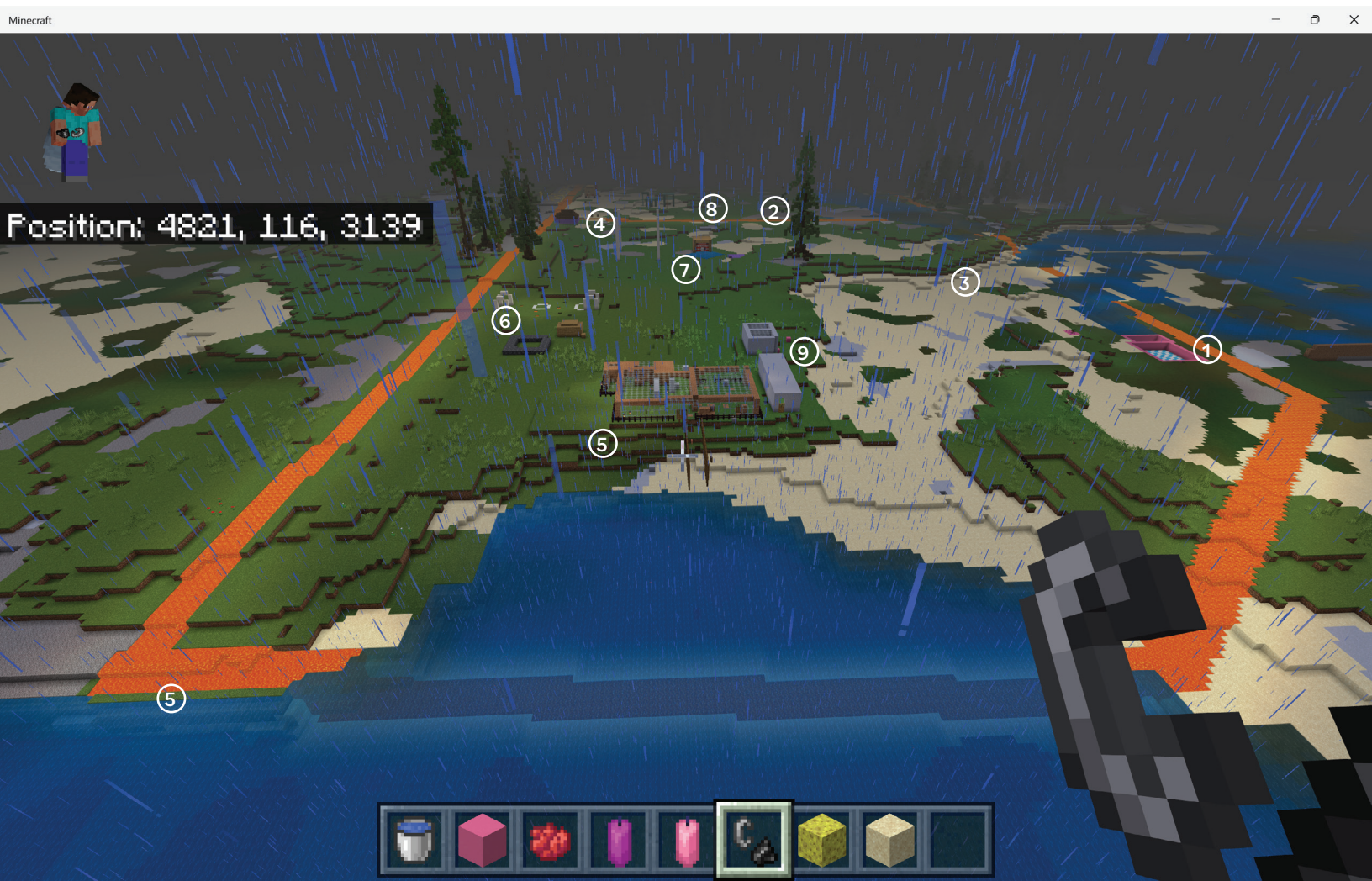
iteration 4: Students

SUGGESTED PROGRAMS:

- Laboratory
- Pool
- Pet amenities
- Dock and restaurant
- Search light for wayfinding
- Red archway



Pacific Property Intervention Development



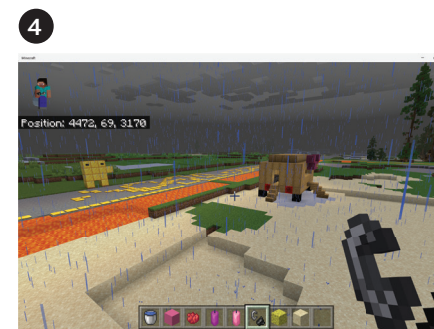
1
Carpeted swimming pool



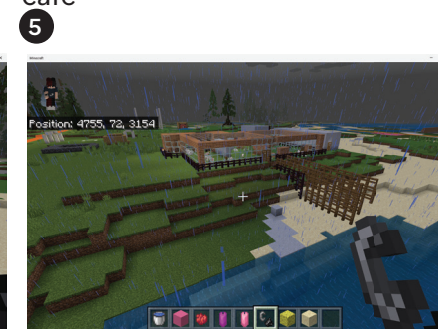
2
Elevated platform for outdoor cafe



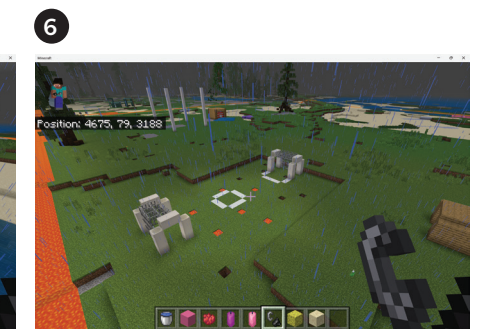
3
Second pool version



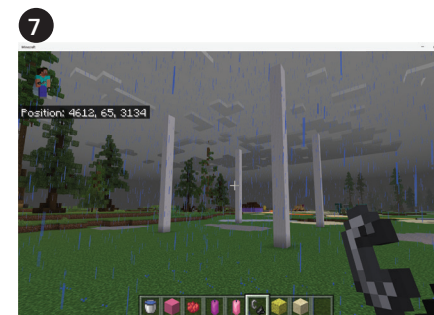
4
Elevated concessions Stand and public art.



5
Indoor dog run with water access



6
Soccer field (with lava pits)



7
In progress Vertical Evacuation Structure



8
Jungle Gym with mining element



9
Bathrooms

Iteration 3: site design process (Instructor)

Pacific properties: Dog park, nature play, stormwater detention, water access



1 ACRE +/-
200
200

Montesano Property Intervention Development



FIGURE 21. This aerial is looking up Montesano towards the Shop n' Kart and Harms field. This photo is taken from iteration 3 and includes recommendations for a pump track, run off management and a pump track adjacent to the library. Student interventions from Iteration 1 are to the right. Most of these interventions are within the existing Harm's Field property.



1



Duck pond



2



Jail for "small and annoying children"

3



1st version of dog park

4



Slide ending in lava

5



Women's bathroom. Gold toilets.

6



Salmon pond and run

7



Elevated outdoor cafe

8



Concrete slab to elevate property

Iteration 3: Instructor site design

Library adjacent property: pump track/skate park

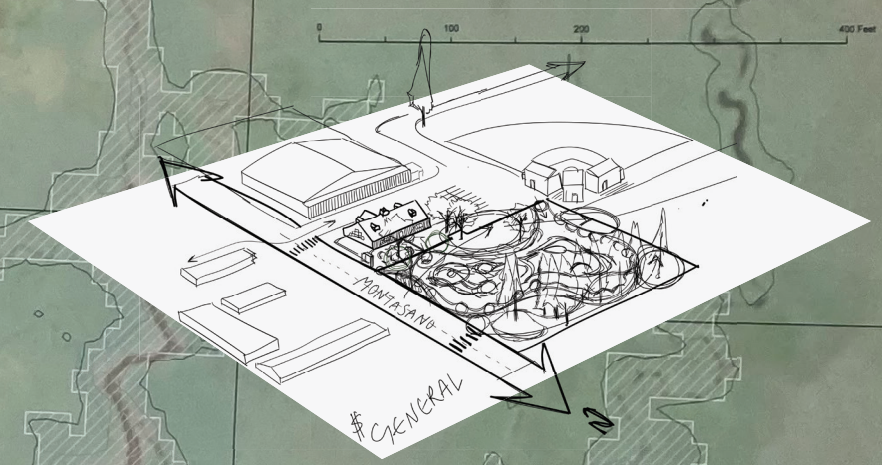


FIGURE 22. Concept sketch: Harms field pump track and skate park with Library adjacency.

1 FT CONTAINS
1" = 50'

CURRENT MHHW



Pacific property looking East, historic ferry piers // Photo by author

CHAPTER 7: Reflections and Takeaways, and where to next

“An Eskimo custom offers an angry person release by walking the emotion out of his or her system in a straight line across the landscape; the point at which the anger is conquered is marked with a stick, bearing witness to the strength or length of the rage” - Lucy Lippard, Overlay pp. 129-130

Since starting the Minecraft program, I’ve been reflecting on the quote above from art historian Lucy Lippard. I find this practice extremely evocative: externalizing and marking the duration and strength of anger on the landscape. Sitting in the fluorescently lit classroom that I temporarily took over for the after-school program in Westport, I felt like I was witnessing something similar in the students’ work in Minecraft. I don’t want to make too much of the similarities because this world that we built together is virtual and so the level of investment is different, and the physical ramifications are different. However, it is apt because many of these students occupy a virtual world almost more than our physical, embodied world. For the last two years of the pandemic, their world, like mine in graduate school, has become increasingly online and on screens. This includes their social and emotional life, which in the past would have been tested in the physical world – at the park, at school, in community.

Some Conclusions:

Throughout all our iterations of the world building exercise, I found that students used the virtual landscape of Westport to play out their sense of humor (dry to say the least). We had a petting zoo for wolves, an avant-garde duck pond shaped as a duck’s head, a jail for children with an incongruously rainbow tiled floor, a bathroom without doors (budget cuts - allegedly) and a slide that ended unceremoniously (ritualistically) in a pit of fire. More or less, their initial park design was one circle of Dante’s Inferno of hell. In this world, they antagonized each other, flooded each other’s buildings, occasionally helped each other, and occasionally teleported each other across our tiny world. Their emotional life made marks on the virtual landscape.

A personal anecdote – my middle school drama teacher taught improv to all her seventh-grade classes. This was a way for students to grow their sense of humor, to build worlds without pre-meditation. I’m grateful to her for giving us that space to create. Seventh grade is ripe for this type of thinking, but working on this curriculum with students reiterated to me the importance of the rules of the game in creating parameters for exploration. In improv, each game has a set of such parameters – for instance, you cannot say no – you must accept and build on other people’s suggestions. Depending on the game, you are given a prompt which creates the architecture of the game space. Games are only so good as their architecture – their menu of options. As I moved through winter quarter with the students, I repeatedly returned to the following questions: how much reality should I infuse into the virtual world to make it generative but not inhibitive, and how can one design a world that funnels students into asking and answering fruitful questions rather than spiraling in a sea of uncertainty (and proceeding without much thought

or thoughtfulness?). Like improv we worked through quick iterations – we threw out some ideas and then we started again with a new set of parameters. Not only was our site design refined through iteration, but the base world where we were working evolved too.

Both a benefit and a challenge of using Minecraft is that it creates an accessible opportunity for student engagement, but students often become more invested in how their social life is playing out in the game than in the proposed planning problems. I was interested in using Minecraft to create a simulation of Westport in part because I thought it could be a vehicle to use the virtual (where they spend their time) to reconnect them with the physical – their real-life community. In other words, using investment in a virtual process and landscape to create or recreate ties to the physical landscape of Westport. To that end, I covered the walls with maps showing potential Westport sea level rise inundation and demarcating the edges of the park properties where they were playing in Minecraft. I tried to move them back and forth between the satellite imagery, google street view and Minecraft to drive home these connections. I had them measure critical infrastructure in Google and then attempt to recreate it in our “Westcraft” world.

Nonetheless, Minecraft is a game that many of them have a history of playing – they know how to manipulate this virtual space in ways that I as a Minecraft novice had not foreseen. They were gods of both creation and destruction, and they knew that they could test my authority and test and antagonize each other through their gameplay. It should go without saying, but Minecraft is not the tabula rasa of Sketchup or Rhino. This is a game designed around player interaction, and those with the most skills tend to have the most social capital. I don’t know how this program would have played out pre-pandemic, but I suspect that social norms would have prevailed a little bit more strongly. As it was, I saw the good, bad, and ugly of kids learning to work together in virtual space – and that antagonism (and occasional cooperation) is inscribed in their world building. Sometimes when the antagonism became too much to bear, there were arguments in class – pulling us back into the physical community of school.

In chapter two I discuss the importance of challenge and adversity in building up community capacity. This is one reason that I believe this process in Minecraft is not an end in itself. I would liken using Minecraft to using Facebook to organize a rally. The first step is to get people in the room, but the real question is what you do once people are in the room. In other words, how do you leverage the tool to create deeper connections, more meaningful interactions, competency and investment.

I didn’t enter this project thinking I would be waxing poetic on the social dynamics of post pandemic tweens, but here I am, in part because community building is such a critical part of resilience planning. The project brought up questions of ownership that are very real – what I was seeing in the classroom was students contesting space. When a student built something, they de facto owned it, and woe be to the person who interfered on that patch of pixelated ground. For instance, a student who was deeply invested in creating a dog park became extremely territorial when another student entered her enclosure and started building a pool. This is an interesting dynamic in a park planning project – a project that is ostensibly for the community. For the most part, the students’ program interventions didn’t relate to one another – particularly initially. They would go off on their own into the Minecraft space to build their interventions – staking claim to a small zone for their work. This is possible in part because of the size of the park properties where we were intervening. A future iteration of this process might consider different sites in Westport including ones that are not currently in the process of development to

engage more with collective design (a downtown plaza space for instance). Two months was probably not enough time to create truly collaborative design. This isn’t to say that some students didn’t work together, but it was a rarity. However, when I asked them if they would like to build in separate parallel worlds rather than in one collective world, they all said no – at some level they did want to interact and play together. For this reason, the curriculum should include more intentional team building exercises. The building belonging section could be updated to building belonging and community.

In addition to the social challenges of students returning from the pandemic, I think there might be something about the built environment of Westport that lends itself to the way students engage in Minecraft. I don’t want to extrapolate too far, but there is not a lot of community organized space in Westport. Except for the Ocosta School and the small downtown, the built environment is quite piecemeal. Development has occurred in a pretty ad hoc fashion and no trespassing signs abound. The vernacular design language is tied together mostly with buoys and crab pots. This isn’t to say that Westport is not community minded, it is, but only to suggest that students may be primed to pursue more individualistic building practices. A similar project in a denser community might yield different results. This is another reason that I am excited about the impact of this process longer term. If students learn how to collectively create a space together, could it influence Westport’s development in other ways?

In addition to the above musings, I’m excited about the potential of Minecraft as a tool because it allows kids to flex their existing skills. As indicated above, many of these kids have played Minecraft almost since the cradle (an exaggeration? Hardly). They have developed habits of play, and ways of exploring, but that skill set, because it is derived from a video game, may be discounted by adults. This is a chance to put this skill set to use on a real world problem. I learned more from them about the affordances of the program than I ever would have on my own. At various points they taught each other, and they certainly taught me.

I didn’t anticipate that their sense of agency would play out in this way, but it created both challenge and potential. First the challenge; there’s a certain irony being a teacher with less tool competency than her students. We struggled to separate competence with the tool from competence with the overall process. There was often this mismatch where students knew the tool better than I did, and an assumption that because they knew the tool, they also controlled the larger process (perhaps something about using the masters’ tools against her?). A challenge that I grappled with was how to act less like a teacher and more like a fellow traveler; to model creative problem solving for students, but not to have a monopoly on competency. This process raised questions of power and democratic decision making in the classroom that are valuable to explore. Traditional methods of teaching are really one sided, and power is fairly hierarchical. Ideally this pedagogy could become more student driven, as it was in the case of the Adventure Ave playground in Christchurch.

One of the hopes of the curriculum was to build up student efficacy. When I was putting together the program, I had a neat idea of how their advocacy and efficacy would play out – hopefully earnestly in front of the Westport City Council – and not in open rebellion against my strictures and parameters in Minecraft. I was most successful (as I think most teachers are) when I met them where they were, and when they could take ownership of the process and of their production, even if that process ran counter or parallel to my desires at times. On one memorable occasion, I took them on a tour de’ Tsunami: our model inundated by a 24-foot wave. We teleported to the two water towers and to the Ocosta school to

highlight how the city tries to site critical infrastructure in high places. Before I knew it, lava was cascading down the side of the North water tower and what small islands existed were being excavated with TNT. More speculation, but I think this may have been a way for them to cope with the possibility of their community under water, and this was a valid way for them to react. With more experience in teaching, I would have interrogated them about where the impulse came from, but it was a reminder of how emotionally fraught the conversation about environmental hazards is, and the extreme care one should take in broaching the subject with kids.

Another challenge of using Minecraft is that the majority of users are male. In class I witnessed gender dynamics playing out in real time. Generally the boys had more game experience and so could torment those with less experience (primarily girls). Fortunately, our activities did not require a significant amount of tool competence, so this mismatch was less relevant. However, taking away admin permissions was essential to creating a fair play environment.

This curriculum could be the basis for some of these more serious conversations, ones that should be treated with gravity, and that could involve the whole school community. I like the method because it implies that there are solutions - concrete ways that the community can adapt. In an ideal world, I imagine the school devoting two weeks to climate adaptation curriculum each year. For instance, in english classes, students could write speculative fiction about how they see their community adapting and changing that could directly tie back into Minecraft scenario modeling. A biology class could call in local fisherman to talk about changes in harvest over time, people in the aquaculture business to teach about ocean acidification and local cranberry farmers could discuss salinization. All of these businesses exist close at hand, and are perfect for potential field trips, and could help students understand how different elements of climate change impact the various industries that their community relies on. In working with students in Westport, I saw again and again how tight knit the community is. There is a wealth of knowledge and experience in the community that could be drawn upon and that could help to strengthen networks and information dissemination over time. Students could interview members of their community about environmental change and how their community has adapted. The shop class could start construction on various park amenities - in fact they have already built multiple multi-use sheds on trailer beds with covid response related funding. The trailers could be one way of periodically activating the two future park sites, and could lead to other similarly temporary interventions to bring attention and investment to the sites and to conversations around climate change. My time in Westport has shown the validity of a more tactical or temporary approach to public space building, similar to what transpired after the earthquake in Christchurch. The Adventure Ave case study shows how a site can be the fulcrum of community visioning. A building approach that embraces flux and that has different and often lower levels of material investment may be the best way to engage with these sites at least in the interim, and in the case of the Pacific Site, possibly in the long term.

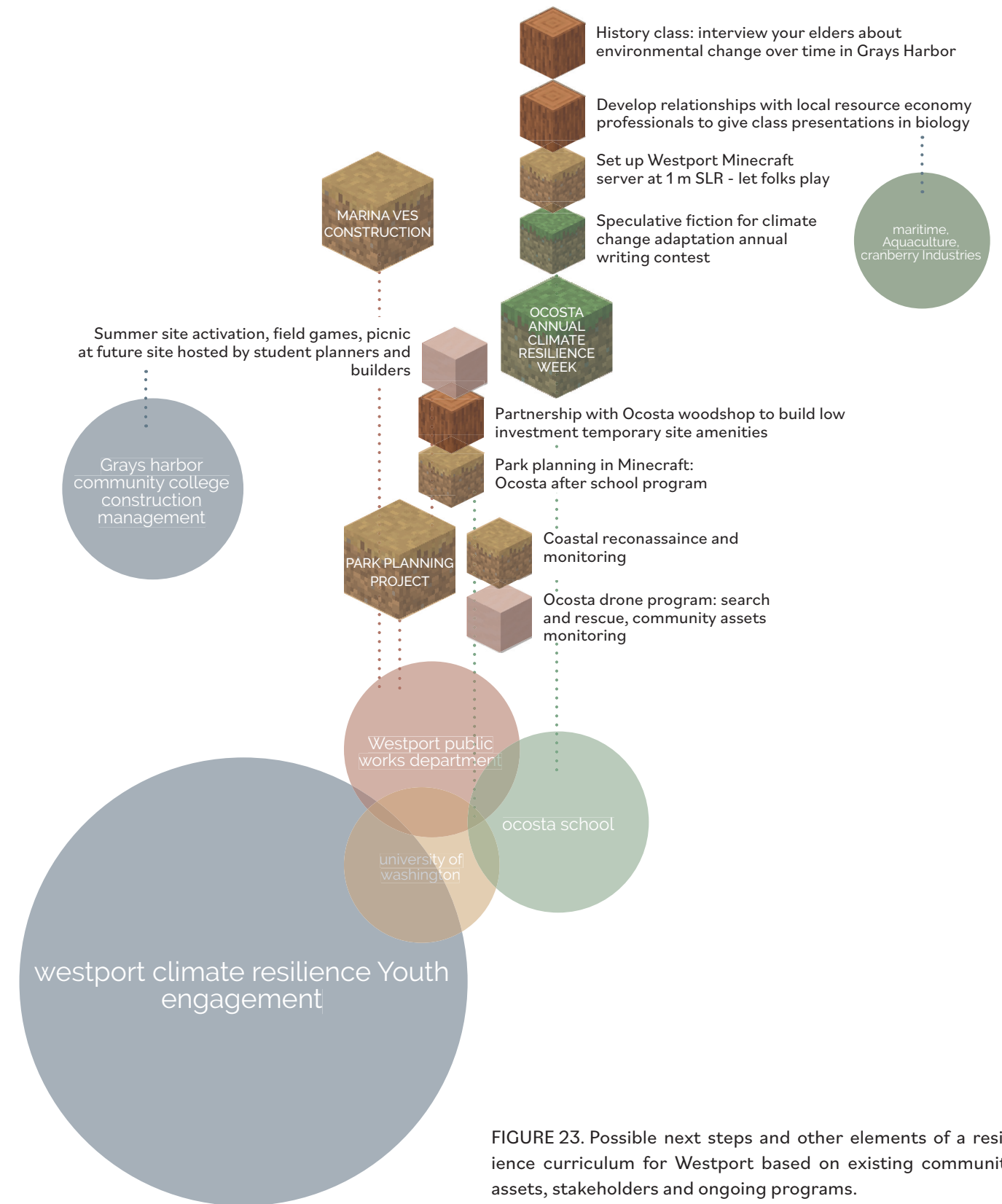


FIGURE 23. Possible next steps and other elements of a resilience curriculum for Westport based on existing community assets, stakeholders and ongoing programs.

CHAPTER 8: Conclusion

You will probably have noticed that this thesis is written in the first person. This is a conscious decision that stems from the same epistemological framework that informs this work more generally. My perspective is that the work that compels us most to action (whether it be engaging students in learning or organizing a community for climate adaptation) is work that helps us to shift scales - that captures our embodied experience and then helps us to see how that experience is nested or couched within larger narratives of change or larger organizational constructs. There is a reason that in the field of Landscape Architecture, site design presentations typically follow a set of conventions: a drawing showing the plan view or high-level organizational structure of a site proposal, a vignette showing what it might feel like to inhabit a space and sections or elevations that help to convey the more technical qualities of a landscape design. Each is essential for making informed and calculated decisions about how we should proceed or to argue for a particular vision that should be implemented. To extend the metaphor, most academic literature operates at the site planning scale, and tries to elucidate the high level organization of the question being asked, but does not always do a good job of making the information relevant and personal for us or for giving us as an audience a concrete understanding of how we might move forward. In community organizing, which I spoke to in chapter two, the first step is always creating a sense of investment in the work. In this case, I hope that form follows function - that you as the reader can feel embedded in the landscape of Westport and in this particular pedagogical approach through my first hand perspective as a practitioner and fellow learner and explorer, and that this is a vehicle for conveying the bigger picture - the possible role of site design based learning as a tool in climate adaptation education.

In his brilliant book, *Evicted*, Matthew Desmond uses ethnographic vignettes to invest readers in the lives of people in Milwaukee caught in the spiral of housing eviction (Desmond, 2017). These vignettes help us to empathize and pay closer attention when Desmond zooms out in the second half of the book to walk his audience through his quantitative survey conclusions. His work is compelling because it engages us at multiple scales - it uses our ability to relate to others and to a landscape and leverages it to help us understand and become invested in the bigger picture. In other words, starting with embodied experience helps us to ask better questions and to resonate more deeply with the larger issues at stake.

My thesis is one very preliminary approach to a climate pedagogy that starts at this personal and embodied scale to hopefully engage students in a larger conversation around climate adaptation. I would argue that one of the major failures of conventional climate education is that students are only given the birds eye view, aka, the world is ending, here's how at a global scale; but students are not necessarily given ways to contextualize this information in their personal experience. This can lead to apathy and disengagement or sometimes an inflated sense of personal responsibility; in my experience, often the only tools that adults give kids revolve around individual actions or consumer advocacy (e.g. how can I consume more thoughtfully). This is an exceptionally top down approach where the personal (where we spend our time) isn't leveraged to make the big questions that need addressing more accessible or resonant.

My intention was to create some symmetry between the pedagogical approach advocated in this project and its narrative structure. I hope the pedagogical approach advocated for compels students to

engage in climate adaptation conversations, and I hope that the narrative structure compels you, the reader, to consider picking up this project or a similar project. I've put forward a process that, like site design, will benefit from refinement and multiple iterations. As with the other resilience planning efforts that have occurred in Westport shown in Figure 15, I hope this paper can be one more catalyzing event that precipitates future action and helps to strengthen the resilience and environmental literacy of the Westport Community and perhaps other communities farther afield facing similar environmental challenges.

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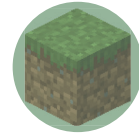
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LIST OF FIGURES

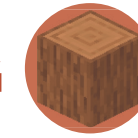
FIGURE 1. Tsunami inundation zone	11
FIGURE 2. Kaminski (2010) South Beach evolving shoreline	13
FIGURE 3. Walking route	15
FIGURE 4. Aerial looking East from above the Pacific	16
FIGURE 5. Erosion at the Westport by the Sea Condos between 2007 and 2016	17
FIGURE 6. Kroll map of Westport (1909) historic platting over current satellite	18
FIGURE 7. Aerial looking South West towards the Pacific ocean	19
FIGURE 8. 1993 South Jetty breach	20
FIGURE 9. Aerial looking North West towards future Neddie Rose Drive	21
FIGURE 10. Aerial looking North West up Montesano St towards Ocean Shores	22
FIGURE 11. Aerial looking north showing a close up of Docks Street	23
FIGURE 12. Aerial looking South West towards the Pacific ocean	24
FIGURE 13. Existing conditions Westport looking North	25
FIGURE 14. Photo looking West at Laidlaw island	26
FIGURE 15. Westport resilience work framing	31
FIGURE 16. Community park assets as identified by Westport students	32
FIGURE 17. Framework highlighting curriculum guiding principles	36
FIGURE 18. Rationale for this pedagogical approach	39
FIGURE 19. Steps for converting DEM into Minecraft world	44
FIGURE 20. Modeling in World Painter	48
FIGURE 21. Concept sketch: Harms field pump track and skate park with Library adjacency	58
FIGURE 22. Iteration 3: Aerial above Harms Field and the Library	61
FIGURE 22. Iteration 3: Aerial above Harms Field and the Library	61
FIGURE 23. Next steps: possible resilience and adaptation activities and programs	67

APPENDIX A: BUILDING BELONGING



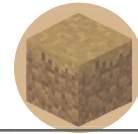
Activity Name	Lesson Tags/ Keywords	Expected duration	Learning Objectives	Materials	Steps	Reflections/improvements	Date Implemented
Get to know each other	Intro Question	25	What's something that fascinates you?	None	None		Not Implemented
Sharing a significant object	Intro Question	25	Bring in an object that describes home		Bring something in that describes home		Not Implemented
Draw Westport	Intro Question	40	Students draw Westport as they see it - physically, emotionally etc.	Blank paper Handouts with Westport outline Markers Printed examples of spatial Mind Maps	1. Draw a response to the prompt: Draw your community, including what's most important to you. 2. Break students into teams to share their maps. What similarities do you see? What differences? 3. Have students report back to main group any similarities - what key values do the maps express?		Not Implemented
Inhabiting Westport from another's perspective	Intro Question	40	Students are asked to draw community group members out of a hat. Students are asked to brainstorm programs and assets that these people (and animals) might want in a park.	Nametags/markers	Write community member names on nametags - for instance Sal the Salmon, Old Man Greg etc. Leave a couple blank so that those who want to can make brainstorm their own.	Students chose their nametags and we went around the group and each student volunteered an activity or park asset that they thought their community member would want in a park. When we were building in Minecraft subsequently, I asked them to build something for their community member.	2/22/22
What makes you feel alive?	Intro Question	20		Whiteboard	Have students answer the prompt, "When is a time that you felt... VERY ALIVE... where were you? What was it about the place or the activity?"	Lots of interesting responses here. Managed risk, certain video games, independence, water slides	2/24/22
What makes you feel safe?	Intro Question	20		Whiteboard	Have students answer the prompt, "Where in your community do you feel really relaxed and at ease? why do you think that is?"		Not implemented
Where in your community have you had the most fun?	Intro Question	20		Whiteboard	Have students answer the prompt, "close your eyes and think of a great time that you had in Westport. Where were you, and why was it so great?"		Not implemented

COMMUNITY ASSETS: IDENTIFYING WHAT MAKES OUR COMMUNITY STRONG



Activity Name	Lesson Tags/ Keywords	Expected duration	Materials	Learning Objectives	Steps	Reflections/improvements	Date Implemented
Taking pictures of Community assets	Low tech	HW	Shared photos album Printer Cameras	Students take pictures around the Peninsula to load to a shared drive	1. Have alternating groups of students take home camera to take photos of important places that respond to these questions: “show me a place where you feel safe and comfortable”, “show me a place where you would like to spend time with your friends”, “Show me a place you like to be outside? In winter? In summer?”	This proved challenging, because we were unable to get cameras and most students did not have phones. However, having the prompts on the wall was a reminder for them to pay closer attention day to day. Ideally this activity would be combined with other field trips done in the after school program.	Not implemented
Community Assets Mapping	Low Tech	30	Plotted Westport basemap with SLR projections, student photos generated from exercise 2.1	Identify what makes our community strong	1. Have students place their photo thumbnails on the Westport map where the photo was taken. 2. Identify hotspots. Where are the most important places/areas? What attributes do they have that we like? What qualities do they have?	This activity builds off of the above activity. Because we were unable to get photos, we used stickers on the SLR map to identify key locations	Not implemented
Community Assets Identification	No Tech	20	White Board with the following categories written up: Water, food, shelter, safety, self actualization	Identify key institutions and sources of community strength	Have students respond to the prompt “Let’s talk community assets... what makes your community strong?” Tag each of their suggestions with what basic needs it fulfills	I focused too much on physical assets, it might be beneficial to think about what other assets the community has outside of institutions or infrastructure. Afterwards we brainstormed what the community is missing ie emergency medical care	2/16/2022
Community Assets Mapping	No Tech	15	Plotted Westport basemap with SLR projections, google maps	Identify what makes our community strong	Have students locate the places identified in the above exercise on the SLR map using stickers. Stickers refer to different needs that are fulfilled. ie the community water tower would have a green sticker for fulfilling the community’s need for water.	This was helpful in showing locations in the community where multiple different needs are being fulfilled. Students indicated that Ocosta school was a location where they found safety, shelter and sense of belonging.	2/17/22
Park assets analysis	No Tech	20	Plotted Westport basemap with SLR projections, google maps	Identify existing park activities/facilities	On a basemap of Westport, indicate existing park properties with a sticky note. Have students put sticky notes with a list of activities next to each park. Use google maps satellite to make sure that you are capturing program elements.	Illuminating in the sense that many of the students didn’t know some of the parks or their programs.	2/18/22

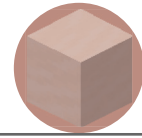
UNDERSTANDING ENVIRONMENTAL AND SITE CONTEXT



Activity Name	Lesson Tags/ Keywords	Expected duration	Materials	Learning Objectives	Steps	Reflections/improvements	Date Implemented
Natural history of the Chehalis River Valley		40	Infographics of Cascadia subduction zone, geological formation	Identify key environmental hazards in the context of the formation of the Chehalis River valley			2/24/2022
Liquifaction exercise		15	"Large tupperware filled with sand and water Weights (to represent houses)"	Demonstrate how the Westport depositional environment makes it vulnerable to liquefaction during seismic events, and the possible implications for the built environment	"Fill at large tupperware with 4"" of sand and water until the water starts to pool Place weights on top of sand Shake laterally back and forth to until weights begin to sink into the sand"	"If possible, I would give tupperwares to teams of students, this would increase the impact and bring in some kinetic learning If possible, a model with different adaptive design techniques could be useful, for instance instead of weights, one could use 3d printed buildings with pilings, elevated structures, and structures without footings (to replicate more of the trailer park built environment). How do each of these different building types perform?"	2/24/2022
Liquifaction video		20	Video: https://www.youtube.com/watch?v=j-hyOwsl_NY	Show real life examples of liquefaction (Christchurch)	"Show video Solicit reflections - what impact did liquefaction have on the City of Christchurch? After the earthquake, how is the city building back? How is Christchurch's built environment (shown in the video) similar or different from Westport's? What happened to roads? Why is this a serious concern in an environmental emergency?"		Not implemented
Adaptive design brainstorm		20	White Board	Students can name at least 3 adaptive design strategies and what environmental hazards they safeguard against	"Based on the video and exercise above, brainstorm what strategies can be used for each of the following environmental hazards: Liquefaction - preventing sinking Flooding - how do we elevate important assets above the level of flood or capture flood waters before they reach important assets? Tsunami - waves exert force, how do we make buildings less vulnerable to tsunamis? Based on the above, what areas of Westport and types of structures in Westport do you think are most vulnerable?"	Having students think about strategies already being used in their community was helpful - especially piers and boats - flooding is the easiest place for them to start.	2/24/2022

Sea level rise and king tides	30	"Westport in Minecraft: Tsunami Scenario 1m SLR, 2m SLR"	Students understand how elevation provides safety from sea level rise	"Take students on a tour of Westport Have them identify the location of the highest ground Where is high ground? What important places are underwater? Where should we try and site important structure and community services? "	In the tsunami version of the game, students struggled to know where they were because landmarks were under water. I implemented this lesson twice and the second time I built out key pieces of community infrastructure including the marina, the water towers, Ocosta School and the area around the Shop n Kart on Montesano. We then started in Existing MHHW Westport, and teleported to these different locations. Then we did the same tour in 1m, and tsunami scenarios to understand vulnerability.	03/03/2022
Westport History/ site history	45	Aerials of Westport over time, Kaminski diagram showing changes/time	Students understand the dynamism of Westport as a landform and how it has changed since 1860 white settlement	Have students identify major landmarks in aerials of Westport over time. Where are the major roads? What is vegetated?	We had John Shaw the Executive Director of the Westport South Beach Historical Society and Public Works Director Kevin Goddrich come in to talk about how the shape of the city has evolved over time. John has a large number of amazing aerials, many of which can be found in Section 1. He also brought in photos of the Pacific Site to highlight its history. We used this to think about how the past could inform our future park design.	03/08/2022

THINKING CREATIVELY: SPECULATIVE FUTURES



Activity Name	Lesson Tags/ Keywords	Expected duration	Materials	Learning Objectives	Steps	Reflections/improvements	Date Implemented
Invent your backstory	Avatar, Minecraft	40	Minecraft Education Edition	Have students create a fictional avatar that they relate to, to embody them in the game.	Have students consider the prompt: "it's 100 years from now and the sea level in Westport has risen 2 Meters. Choose a skin that will help you adapt to this new environment" what is your character's backstory? How long have they lived in Westport? What is their job?		Not implemented
Adaptive design challenge	Minecraft	40	Minecraft Education Edition		Sea level is rising! Give students a 100 ft square and have them collaboratively build a structure that can withstand storm surge + 2M SLR. Repeat at different elevations.		Not implemented

ADVOCATING FOR AND SHARING OUR WORK



Activity Name	Lesson Tags/ Keywords	Expected duration	Materials	Learning Objectives	Steps	Reflections/improvements	Date Implemented
Public works process sharing		30	Understand the role that you can play in influencing community governance		Public works comes and gives pitch for what they want to see in a new park and what role they think students can play in determining what gets built	I wish that we had invited Kevin in earlier - I think this would have given the students a greater sense of purpose and lended more legitimacy to the exercise.	03/08/2022
Case study: Christchurch Adventure Ave		30	Understand how students can influence the City by asking for what they want.	Video: https://councillive.ccc.govt.nz/video/8856	"Give background on Christchurch student work, and show video of their advocacy in front of city council. Reflect on what were elements of their presentation, what was successful? What lessons can we learn from them in advocating in front of our own City Council?"		Not Implemented
Case study: Christchurch Adventure Ave		Ongoing	Peer sharing		"Have a video conversation with students working on the Adventure Ave project - have them explain their process and where they are in the process Have students walk Christchurch students through their Minecraft world. Reflect: how are their communities similar or different? How do they both understand environmental risk?"		Not Implemented
Family Sharing		1 hour	Speak about your work	Students set up with a screen to share interventions with their families	Have students give a presentation on what they want in their park by walking their families through their park designs	This could be a great way to prep students before a presentation in front of decision makers and to bring their families into the planning process.	Not Implemented
City Council Meeting		1 hour	Advocate for program, convey specific asks to decision makers	"Students set up with a screen to share interventions"	Prepare students to speak at a City Council Meeting including creating a speaking order, their key asks for City Council and next steps	Although we did not get to do this because of time constraints, Kevin Goodrich shared that students participated recently in advocating for the library parcel skatepark and that it was a meaningful experience for them and a breath of fresh air for City Council	Not Implemented

- Food/water
- Shelter
- Safety/public health
- Belonging, community, self actualization

Westport viewing tower

- View
- Shopping

WESTPORT VIEWING TOWER
VIEW
SHOPPING

PARK
FACILITIES
ACTIVITIES
FACILITIES

Westport Light & Westhaven State park

- Fishing
- Surfing

WESTPORT LIGHT & WESTHAVEN STATE PARK
SURFING

Harriet Dorland:

- Baseball
- Play structure

HARRIET DORLAND
BASEBALL
PLAY STRUCTURE

Bottle Beach State Park

BOTTLE BEACH STATE PARK

Proposed Park 1

PROPOSED PARK I

Harms Field

- Baseball

HARMS FIELD
BASEBALL
BASEBALL
HARMS

Proposed Park 2

PROPOSED PARK II

Grand Army Memorial Park

- Baseball

GRAND ARMY MEMORIAL PARK
BASEBALL

Ocosta School Campus

- Football Field
- Playground
- Play & Events

OCASTA PLAYGROUND & FB FIELD
PLAY AND EVENTS
PLAYGROUND

Potential sea level rise and flooding in Westport, WA

SEA LEVEL RISE

Visualization Location

Water Depth

Low-lying Areas

Area Not Mapped

Leveled Areas

This map shows a 5 foot increase in high tide water level, which is equivalent to 2060's likely sea level rise plus a 100-year flood.

This water level is also possible with higher sea level rise (less likely by 2060) plus a smaller flood (more likely).

map source: NOAA Sea Level Rise Viewer (coast.noaa.gov/slr)

NOAA Sea Level Rise Viewer: coast.noaa.gov/slr



Student identified community assets:

Students were asked to use stickers to identify places in their community that make their community "strong". These places were added to the map in colors corresponding to which basic needs they fulfilled. This allowed us to identify gaps in Westport's services including a lack of healthcare providers.

Park assets were also identified so that students could brainstorm the gap in park programming that they might want to fill with their design proposals. Students identified that many parks have baseball programming. Many students struggled to identify existing park programming and indicated that they did not visit parks frequently.

These overlays are on top of the the NOAA Sea Level Rise viewer map so students could visualize which community assets are vulnerable.

○ FOOD/WATER
● SHELTER
○ SAFETY/PUBLIC HEALTH
● BELONGING/COMMUNITY/SELF ACTUALIZATION